Nirantar Science & Technology

Class 4

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निरन्तर प्रकाशन

Nirantar Prakashan

www. nirantarprakashan.com.np

Book : **Nirantar Science & Technology Class -4**

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Publisher : **Nirantar Prakashan**
Putalisadak, Kathmandu-29, Nepal
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Edition : 2079 *(New Curriculum)*

Design : Nirantar Desktop
Putalisadak, Kathmandu

Price : Rs. 331.00

Printed in Nepal.

नेपाल सरकार
शिक्षा, विज्ञान तथा प्रविधि मन्त्रालय
पाठ्यक्रम विकास केन्द्र
सानोठिमी, भक्तपुर
(मान्यता, समकक्षता तथा मूल्याङ्कन शाखा)

फोन नं. ६६३०५८८
६६३४१११
६६३००८८
फ्याक्स : ६६३०७९७
नोटिस बोर्ड: १६१८०१६६३०७९७

सानोठिमी, भक्तपुर
www.moecdc.gov.np

पत्र संख्या:- २०७८/०७९

चलानी नं.:- ४२६८

मिति: २०७८/१२/१४

विषय : पाठ्यसामग्री स्वीकृति सम्बन्धमा ।

श्री निरन्तर प्रकाशन

काठमाडौं ।

प्रस्तुत विषयमा त्यस प्रकाशनबाट मूल्याङ्कन र स्वीकृतिका लागि तोकिएको अवधिभित्र पेस हुन आएका तपसिलबमोजिमका पाठ्यसामग्री आवश्यक निर्णयार्थ पाठ्यसामग्री व्यवस्थापन तथा मूल्याङ्कन समितिमा पेस हुँदा विद्यालय शिक्षाको राष्ट्रिय पाठ्यक्रम प्रारूप २०७६, आधारभूत शिक्षा (कक्षा ४-५) पाठ्यक्रम २०७८, पाठ्यसामग्री विकाससम्बन्धी विद्यमान प्रावधान, ऐन, कानुन, निर्देशिका, कार्यविधि, प्रकाशन शैलीका प्रावधान, पाठ्यक्रम विकास केन्द्रले विभिन्न समयमा जारी गरेका र पाठ्यसामग्री सुधार/परिमार्जन/पुनर्लेखनका लागि दिइएका सुझाव र निर्देशनको परिपालना गरी स्वीकृति दिन सिफारिस भएअनुसार यस कार्यालयको मिति २०७८।१२।४ गतेको निर्णयानुसार तपसिलमा उल्लिखित निर्देशनको पूर्ण परिपालना गरी शैक्षिक वर्ष २०७९, २०८० र २०८१ गरी तीन शैक्षिक वर्षका लागि गुणस्तरीय एवम् त्रुटिरहित पाठ्यसामग्री विकास गरी प्रकाशन गर्न स्वीकृति प्रदान गरिएको छ । विद्यमान संवैधानिक व्यवस्था, ऐन, कानुन, निर्देशिका, कार्यविधि, पाठ्यक्रम विकास केन्द्रले विभिन्न समयमा जारी गरेका निर्देशनलगायतका प्रावधानहरूको पूर्ण परिपालना नगरी गुणस्तरहीन पाठ्यसामग्रीको विकास, प्रकाशन र बिक्री वितरण गरेको पाइएमा, पाठ्यक्रम परिवर्तन भएमा वा यस केन्द्रबाट अन्य निर्णय भएमा यो स्वीकृति जुनसुकै बेला रद्द हुने छ ।

तपसिल

(क)पाठ्यसामग्रीको नाम

१	Science and Technology	आधारभूत तह/ कक्षा ४

(ख) निर्देशन

१.पाठ्यसामग्री विकाससम्बन्धी विद्यमान प्रावधान तथा पाठ्यसामग्री सुधार र परिमार्जनका लागि यस अघि दिइएका निर्देशनको पूर्ण परिपालना गर्ने ।

२.पाठ्यक्रमको मूल मर्म र भावनाअनुरूप पाठ्यक्रमका सम्पूर्ण पक्ष एवम् विषयवस्तु समावेश गरी पाठ्यसामग्रीलाई गुणस्तरीय बनाउने ।

३.आवरण पृष्ठको अघिल्लो (Front) भागको बायाँ (Verso) पृष्ठमा नेपालको आधिकारिक नक्सा र आवरण पृष्ठको पछिल्लो (Back) भागको दायाँ (Recto) पृष्ठमा कोभिड १९ सङ्क्रमण रोकथामसम्बन्धी सूचना यस केन्द्रको वेबसाइटबाट डाउनलोड गरी समावेश गर्ने । विषयवस्तुको प्रकृति र आवश्यकताका आधारमा पाठ्यसामग्री भित्रका विषयवस्तु र पाठमा समावेश गरिने तथ्याङ्क तथा नक्सा आधिकारिक र प्रामाणिक हुनुपर्ने ।

४.स्वीकृति पत्र स्थान गरी पाठ्यसामग्रीको शीर्षक पृष्ठभन्दा पछि दायाँ (Recto) पृष्ठमा समावेश गर्ने । पाठ्यसामग्रीको प्रत्येक पृष्ठको पुच्छर (Footer) मा पाठ्यक्रम विकास केन्द्रबाट स्वीकृत भन्ने व्यहोरा उल्लेख गरी प्रकाशन गरेका पाठ्यसामग्रीका तीन प्रति यस केन्द्रमा पेस गरेपछि मात्र बिक्री वितरण गर्ने । शिक्षा, विज्ञान तथा प्रविधि मन्त्रालयको निर्णयअनुसारको मूल्य कायम गर्ने तथा मूल्य र मुद्रण प्रतिको सङ्ख्या सार्वाधिकार पृष्ठमा अनिवार्यरूपमा राख्नुपर्ने । प्रतिलिपि अधिकार (Copy right) को सम्बन्धमा लेखक र प्रकाशक स्वयम् जिम्मेवार हुने ।

५.राष्ट्र, राष्ट्रिय एकता, सार्वभौमिकता, भौगोलिक अखण्डता, स्वाधीनता, राष्ट्रिय हित, पहिचान, सम्मान र समृद्धिमा आँच आउने तथा विभिन्न जातजाति, भाषा, धर्म, संस्कृति, सामाजिक सहिष्णुता, सद्भाव, सांस्कृतिक मूल्यमान्यता, रहनसहन आदिमा प्रतिकूल प्रभाव पार्ने कुनै पनि विषयवस्तु, उदाहरण, चित्र, अभ्यास, सिकाइ क्रियाकलाप समावेश नगर्ने ।

६.जातजाति, भाषा, धर्म, संस्कृति, वर्ण, क्षेत्र, भौगोलिकता, अपाङ्गता, पेसा, व्यवसाय, सामाजिक सांस्कृतिक अवस्थाका आधारमा भावनात्मक रूपमा चोट पुऱ्याउने, आक्षेप लाग्ने, होच्याउने र विभेदीकरण गर्ने किसिमका विषयवस्तु, उदाहरण, चित्र, अभ्यास, सिकाइ क्रियाकलाप समावेश नगर्ने ।

७.पाठ्यसामग्रीमा समावेश गरिएका चित्र, नक्सा, चिह्न, सङ्केत आदि शुद्ध, स्पष्ट र बोधगम्य हुनुपर्ने ।

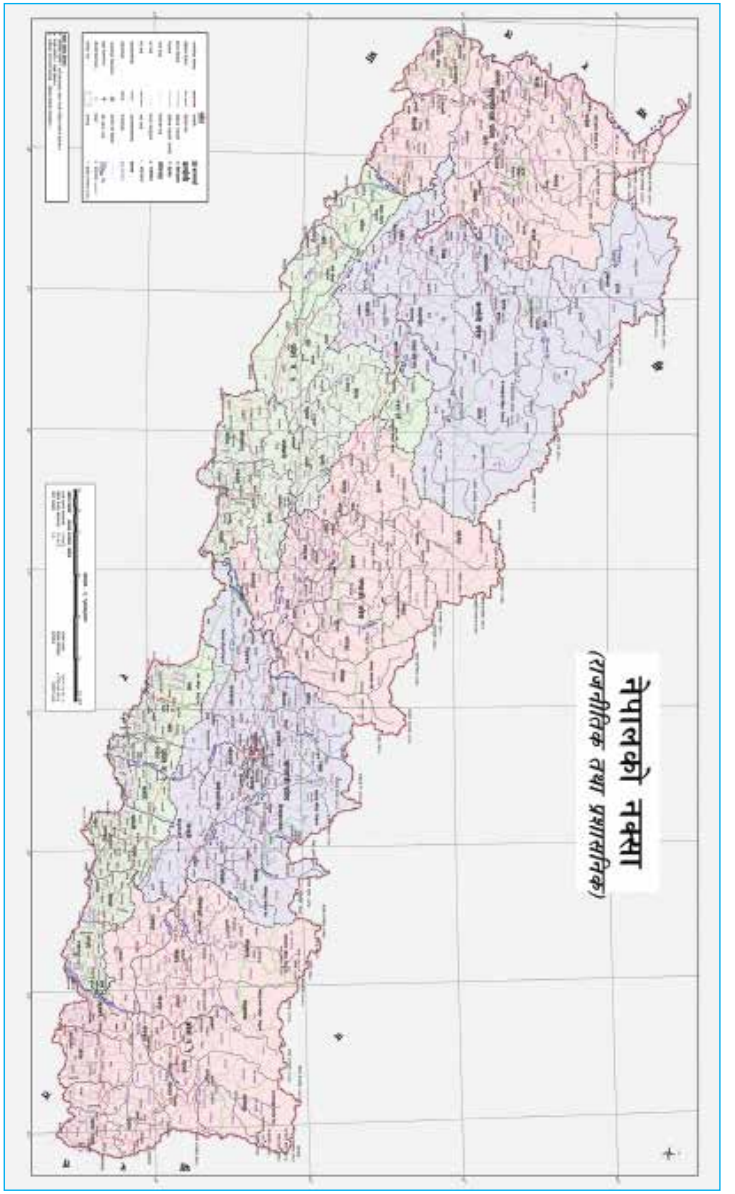
८.विद्यार्थीलाई थप भार पर्ने गरी पाठ्यक्रममा समावेश नगरिएका विषयवस्तु, अभ्यास तथा सिकाइ क्रियाकलाप पाठ्यसामग्रीमा समावेश नगर्ने ।

९.पाठ्यक्रम एवम् दिइएका सुझाव र निर्देशनबमोजिम पूर्णरूप दिइएको त्रुटिरहित गुणस्तरीय पाठ्यसामग्री मात्र प्रकाशन र बिक्री वितरण गर्ने ।

सारा पाण्डे तिवारी
पाठ्यक्रम अधिकृत

पुनश्च : यो स्वीकृति शैक्षिक वर्ष २०७९, २०८० र २०८१ का लागि प्रदान गरिएकाले सोहीबमोजिम प्रकाशन, बिक्री वितरण र प्रयोग गर्नु गराउनहुन सम्बन्धित सरोकारवाला सबैमा अनुरोध छ ।


कोरोना भाइरस रोग
(कोभिड-१९)
हाल चिनजधरी कैलिरर्दका नयाँ कोरोना भाइरसको संक्रमणबाट लागेको रोगलाई विश्व स्वास्थ्य संगठनले "कोभिड १९" को नाम दिएको छ र यसलाई विश्वव्यापी महामारीको रुपमा घोषणा गरिसकिएको छ ।
कोरोना भाइरस स्वासप्रश्वासको माध्यमबाट लाने रोग हो । यो संक्रमित व्यक्तिले खोक्दा वा हाछ्युँ गर्दा नाक वा मुखबाट निस्केको सिंघाको माध्यमबाट एक व्यक्तिबाट अर्को व्यक्तिमा सर्दछ ।
कोरोना भाइरस रोगको मुख्य लक्षणहरू
ज्वरो आउने
खोकि लाग्ने
स्वास फेर्दा गाह्रो हुने
यस्ता लक्षणहरू देखा परेमा नजिकको तोकिएको स्वास्थ्य केन्द्रमा सम्पर्क गर्ने ।
यस रोगको संक्रमणको जोखिमबाट बच्नको लागि निम्न उपायहरू अपनाउनुपर्दछ ।
ज्वरो र खोकी लागेको व्यक्तिबाट टाढा रहने वा आफूलाई ज्वरो र खोकी लागेको छ भने पनि अरु व्यक्तिबाट टाढा रहने र मास्कको प्रयोग गर्ने
खोक्दा वा हाछ्युँ गर्दा नाक मुख छिचु पैसा वा कुहिनाले छोप्ने र प्रयोग गरेको टिस्यु पेपरलाई फिको गरेको फोहर फाल्ने बाँडोमा फाल्ने र साबुन पानीले मिहिनेतिर हात धुने वा अल्कोहल भएको स्यानिटाइजर प्रयोग गर्ने
भिडभाडमा नजाने र आवश्यक पनि नजरुरी सुरक्षित दिने, हात मिलाउनुपर्ने सट्टा नमस्कार गर्ने
बेलाबेलामा साबुन पानीले कम्तिमा २० सेकेन्ड मिसिमिसे हात धुने वा अल्कोहल भएको स्यानिटाइजर प्रयोग गर्ने
कोरोना संक्रमित देखिएमा आफ्नो नजिकका स्वास्थ्य केन्द्रमा तुरुन्त जानुपर्दछ । घरैमा बसी परिवारका सदस्यहरुबाट पर दिन सम्म छुटै आईसोलेसनमा बस्नु पर्दछ ।
कोरोना भाइरस रोगका बारेमा थप जानकारीका लागि १११५ वा ९८५१२५५८३९, ९८५१२५५८३४ मा सम्पर्क गर्नु ।


नेपालको नक्सा
(राजनीतिक तथा प्रशासनिक)

PREFACE

Nirantar Science & Technology as a series I-X grade has been prepared strictly in a line to the recently upgraded syllabus and curricula issued by Curriculum Development Centre, Sanothimi, Bhaktapur, under the ministry of education, and the government of Nepal for the learners of basic level to secondary level with regard to educational framework 2063 B.S.

The series aims at providing both theoretical and practical cognitivity to the students of far and wide having some flair to science, scientific facts and processes with ample activities considering their needs, level, aptitude, intelligence and age factor by creating interest through proper selection and gradation of the subject matter to be taught and learnt. The entire desk of authors and editors claims that the series has come to adopt a thematic and activity centred approach, abundant illustrations and so on in order to make an understanding of science more effective and comprehensive.

The revised and updated version in your hand is solemnly dedicated to those scholars far and wide with a provision of richly sophisticated but only relevant pictures, diagrams, table, charts, fact files, reasons and logics, etc. as the soul of science. Apart from these, several other efforts have been put forward collectively in order to make the book more concise and student friendly so as to address the requirement of a perfect book to many students and teachers who like to culminate real practice in science in the days to come. Beside this, our another attempt through this presentation is to eradicate some misconceptions to science appeared in the growing mind of students especially in the classroom context by illuminating them in terms of these salient features incorporated within each book of the series.

Home Assignments/Worksheets: The revision exercises at the end of every chapter can be given as home assignments after teaching particular concepts.
Varieties of Questions: Objective type questions like, true or false, fill in the blanks, choose the correct answer, etc. are given in the exercises at the end of every chapter in this book, in order to fulfill the objectives of each lesson.
Activities : Numerous activities in the classroom can provide platform for active involvement of students in application of their theoretical knowledge and learning. Thus, interesting activities are given so as to arouse interest of the students in science.
Projects: Lots of activities in the book are dedicated to investigate research projects with information gathering and deducing. Some of these can be individual research projects and others assigned to group of students with an aim to make them more participatory.
Points to Remember: This section helps the students to understand the main points of each lesson.

Last, but not the least, our sincere thanks goes to **Nirantar Prakashan,** for their keen interest in publishing this series of books. We are also thankful to Mr. Shambhu Pd. Pokhrel (School Chairman), Mrs. Sujita Adhikari Pokhrel (Principal), Mr. Rudra Prashad Khanal (Vice Principal), Mr. Ram Shrestha (Science Teacher), Mr Badri Neupane (Science Teacher), Mr. Bishnu Bhattarai (English Teacher) at different institutions for their constructive suggestions and support.

Any constructive suggestions and recommendations for the betterment of this series will be highly acknowledged.

- Author

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Unit 1

Scientific Learning

Student's Learning Outcomes

After studying this unit, the students will be able to :

- perform general activities related to observation, classification, and testing in scientific studies and to find out their importance.
- recognize scientific instruments and draw schematic diagrams of them.
- state and adhere to the precautions that must be taken when conducting scientific experiments..
- introduce measurements and find examples of them in daily life.
- explain the significance of measurement in scientific experiment

1.1 Introduction

Fig. 1.1

Curiosity is the beginning of learning when you see an object or an event. People conduct extensive studies, discoveries, and research on the objects around them in order to meet their needs.The process of doing this has been going on continuously since ancient times. Early humans, it is believed, invented fire on the basis of seeing stones sparkle. They must have realised that fire can keep away wild animals and protect them from cold also. They learned that to make fire by rubbing two

stones and two bamboo sticks together. They discovered that fire can keep themselves warm, create light and frighten away wild animals. They also learned that animals meat when cooked on fire made it tastier and easier to eat.

Early humans realised that round things could move much more easily on land than sledges. Small pieces of tree trunks which were round in shape were fitted below the carts. The cart now could move easily on uneven ground. Thus, the wheel was invented. Land travel and transportation of heavy goods became easier and faster.

Similarly, the airplane was invented out of curiosity about how birds could fly. Such discoveries and inventions are possible only through continuous experience and effort. This is called scientific learning. In this way, observing, inquiring, guessing, researching, comparing, using, etc. in relation to the surrounding events all are learning processes.

Without science, we wouldn't know why water freezes, where the sun goes at night, or how our bodies fight disease. We have the answers, though, because someone was curious. Science always begins with a question.

Scientists want to find answer, but a good scientist doesn't stop working until he or she has the only possible answer. This because the best scientists are skeptics. They never say they've solved a scientific problem if other possible solutions can be found. Science is based on proof. Statements that don't have proof are guesses or opinions. The scientific method is a tools, scientists use to prove things. It begins with a question. For example, "Do birds like one color more than another ?

The next step is to answer the question. At this point, it's okay to make a guess or have an opinion. You need something you can test. In the scientific method, your answer is called the hypothesis. A hypothesis is a simple statement that can be proven right or wrong. "Birds will eat more food from a red birdfeeder than a blue one" is a good hypothesis.

Activities

What science process skillis the best shown in each situation? Choose from the word bank. Write your answer on the box below.

measuring, classifying, observing, predicting

a  b  c  d 

a. ..... b. .....

c. ..... d. .....

Now, you can test the hypothesis using experiments and observation. The tests must be designed carefully, though. If too many parts can be changed, it will be hard to tell why you got one result and not another. If a hypothesis is unable to be proven, the next step is to make a new hypothesis and test it. If the experiments show that a hypothesis is proven, you'll still want to test it again. For example, maybe birds don't see color at all. Something else might have been attracting them to the feeders.

After a scientist finishes experimenting, he or she writes a conclusion. Then, the scientist shares the results with other scientists. The scientific community looks closely at the results. This step is very important in the scientific method. Other scientists will try to get the same results. Scientists double- and triple-check each other's work. A hypothesis must be proven true many times before the scientific community accepts it as true. They're skeptics, remember? If a hypothesis makes it through lots and lots of testing, it will become a theory. A theory might still be proven wrong, but the chances are less. Theories that last for many, many years—and are never proven wrong—become scientific laws.

Scientist

When most people think of a **scientist**, they picture someone in a lab wearing a white coat. Of course, some scientists do work in labs, but just as many are out in the world doing their research. They wear jeans and dig through the dirt hoping to discover the bones of a new dinosaur. They wear snowsuits, gloves, and goggles as they trudge through the snow of Antarctica. Scientists go wherever the search for an answer takes them.

Like a detective, a scientist is an **investigator**. He or she looks for clues that will help solve the mysteries of our world. The most useful clues to a scientist are facts. Gathering facts is probably a scientist's most important job. Scientists collect samples, make observations, and perform experiments to get the facts they need.

The main kind of investigation a scientist does changes from one kind of science to another. For example, an archaeologist studies human history. He or she spends many hours outdoors, shifting through layers of ground looking for evidence. Pieces of bone, chips of clay pots, or the remains of an ancient campfire are all good clues. Archaeologists collect these artifacts, study them closely, and draw conclusions about our human ancestors.

Observation is another important method of investigation. Zoology is the science of animal life on Earth. Much of a zoologist's work is observing animals in their natural habitats. Dian Fossey was a famous zoologist who studied gorillas. For years, she lived in the mountain forests of Rwanda. The gorillas went about their lives while Fossey quietly observed them and took notes. Then, like any good scientist would do, she shared her information with the world.

Collecting and observing are both good ways of getting clues, but the scientists aren't really in charge. Instead, they must be in the right place

at the right time to get the facts they need. With an experiment, though, the scientist is in control. He or she designs an experiment to test exactly what needs to be known. Experimenting is an important scientific tool. It lets the scientist be in control.

Activity 1.1

What can you put on an apple to keep it from turning brown ?

Materials : Apple, knife, water, milk, lemon, soda .

Procedure :

i. Slice an apple into four part

ii. Put one of these things on each slice water, milk, lemon juice, soda

iii. Watch what happens to each . Do they all turn brown ? Which one turns first ? Which turns brown last ?

iv. Record your observations and draw a conclusion .
(If you put .....on an apple, it will not turn brown as fast)

Scientists

Scientist's Name	Introduction	Inventions/ Theories
 James Watt (1736 - 1819)	He was a Scottish instrument maker and inventor whose steam engine contributed substantially to the Industrial Revolution. Watt was also known for patenting the double-acting engine and an early steam locomotive. He developed the concept of horsepower, and the SI unit of power, the watt, was named after him.	 A portable James Watt steam engine

Thomas Alva Edison (1847-1931)

He was an American inventor who, singly or jointly, held a world-record 1,093 patents. In addition, he created the world's first industrial research laboratory. He had played a critical role in introducing the modern age of electricity. From his laboratories and workshops emanated the phonograph, the carbon-button transmitter for the telephone speaker and microphone, the incandescent lamp, a revolutionary generator of unprecedented efficiency, the first commercial electric light and power system, an experimental electric railroad, and key elements of motion-picture apparatus, as well as a host of other inventions.

The phonograph

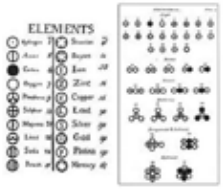
Sir Isaac Newton (1642–1727)

He was an English physicist and mathematician, who was the culminating figure of the Scientific Revolution of the 17th century. In optics, his discovery of the composition of white light integrated the phenomena of colours into the science of light and laid the foundation for modern physical optics. In mechanics, his three laws of motion, the basic principles of modern physics, resulted in the formulation of the law of universal gravitation. In mathematics, he was the original discoverer of the infinitesimal calculus.

Newton's reflecting telescope

John Dalton
(1766- 1844)

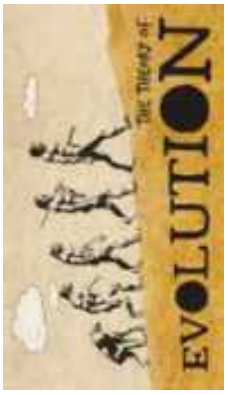
He was an English Chemist, meteorologist and physicist. He is best known for his pioneer in the development of modern atomic theory and his research into color blindness (sometimes referred to as Daltonism, in his honour. In the 1800s, he was the first scientist to explain the behavior of atoms in terms of the measurement of weight.



Dalton's
Elements

Charles Robert
Darwin
(1809-1882)

He was an English naturalist whose scientific theory of evolution by natural selection became the foundation of modern evolutionary studies. An affable country gentleman, Darwin at first shocked religious Victorian society by suggesting that animals and humans shared a common ancestry. However, his nonreligious biology appealed to the rising class of professional scientists, and by the time of his death evolutionary imagery had spread through all of science, literature, and politics.



Observations in scientific studies and thier importance

That's what it means to observe during a scientific experiment. It means to notice what's going on through your senses, but, more specifically, we can define observation as the act of knowing and recording something. This has to do with both the act of knowing what's going on, and then recording what happened.

Fig. 1.1

Observation is essential in science. Scientists use observation to collect and record data, which enables them to construct and then test hypotheses and theories. Scientists observe in many ways – with their own senses or with tools such as microscopes, scanners or transmitters to extend their vision or hearing. These tools allow for more precise and accurate observations. Scientists also use equipment to measure things like radiation or pH – phenomena not directly observable.

The first step of the scientific method involves making an observation about something that interests you. This is very important if you are doing a science project because you want your project to be focused on something that will hold your attention. Your observation can be on anything from plant movement to animal behavior, as long as it is something you really want to know more about. This is where you come up with the idea for your science project.

Classification in scientific studies and their importance

Classifying is an investigative approach that involves sorting objects or events into groups or categories. Classification and identification are important because they allow us to better understand relationships and connections between things. They also help scientists to communicate clearly with each other.

Classification fills a very human need to impose order on nature and find hidden relationships. By grouping organisms and species together it was originally hoped that huge masses of data could be stored and retrieved more easily. Knowledge about a species could be saved and recovered in a logical manner. Later it was seen that a good classification system would also help determine evolutionary relationships between species and even make it easier to see if, when and where new species were arising. So the hunt for a useful and unambiguous classification system continued.

Classification, in biology, the establishment of a hierarchical system of categories on the basis of presumed natural relationships among organisms. The science of biological classification is commonly called taxonomy. Classification is needed for convenient study of living organisms. It is necessary for knowing the different varieties of organisms. It helps in the correct identification of various organisms. It helps to know the origin and evolution of organisms.

It helps to determine the exact position of the organism in the classification. It helps to develop phylogenetic relation between different groups of organisms.

Testing in scientific studies and their importance

Experiment plays many roles in science. One of its important roles is to test theories and to provide the basis for scientific knowledge. It can also call for a new theory, either by showing that an accepted theory is incorrect, or by exhibiting a new phenomenon that is in need of explanation.

Fig. 1.2

A test can be considered an observation or experiment that determines one or more characteristics of a given sample, product, process, or service. The purpose of testing involves a prior determination of expected observation and a comparison of that expectation to what one actually observes.

Testing hypotheses and theories is at the core of the process of science. Any aspect of the natural world could be explained in many different

ways. It is the job of science to collect all those plausible explanations and to use scientific testing to filter through them, retaining ideas that are supported by the evidence and discarding the others. You can think of scientific testing as occurring in two logical steps: (i) if the idea is correct, what would we expect to see, and (ii) does that expectation match what we actually observe? Ideas are supported when actual observations (i.e., results) match expected observations and are contradicted when they do not match.

As a simple example of how scientific testing works, consider the case of Ignaz Semmelweis, who worked as a doctor on a maternity ward in the 1800s. In his ward, an unusually high percentage of new mothers died of what was then called childbed fever. Semmelweis considered many possible explanations for this high death rate. Two of the many ideas that he considered were (1) that the fever was caused by mothers giving birth lying on their backs (as opposed to on their sides) and (2) that the fever was caused by doctors' unclean hands (the doctors often performed autopsies immediately before examining women in labor).

He tested these ideas by considering what expectations each idea generated. If it were true that childbed fever were caused by giving birth on one's back, then changing procedures so that women labored on their sides should lead to lower rates of childbed fever. Semmelweis tried changing the position of labor, but the incidence of fever did not decrease; the actual observations did not match the expected results. If, however, childbed fever were caused by doctors' unclean hands, having doctors wash their hands thoroughly with a strong disinfecting agent before attending to women in labor should lead to lower rates of childbed fever. When Semmelweis tried this, rates of fever plummeted; the actual observations matched the expected results, supporting the second explanation.

Activity 1.2

By observing the various materials in your classroom and write down the characteristics of those in the following table:-

Name of the items	Size	Colour	Touch	Made of	Uses
Writing Board	Rectangular	White	Slippery and hard wood	Wood	Learning by writing
Desk					
Window					
Door					

1.2 Scientific Instruments

A Scientific instrument is a device or tool used for scientific purposes, including the study of both natural phenomena and theoretical research. They are also used for scientific purposes that are for indicating, measuring and recording physical quantities . Some scientific instruments are given below :

Name of Instruments	Introduction
 Beaker	A beaker is generally a cylindrical container with a flat bottom. Beakers are available in a wide range of sizes, from one milliliter up to several liters. A beaker is distinguished from a flask by having straight rather than sloping sides. Beakers are commonly made of glass (today usually borosilicate glass), but can also be in metal or certain plastics. Beakers are useful as a reaction container or to hold liquid or solid samples.

 **Test tube**	A test tube, also known as a culture tube or sample tube, is a common piece of laboratory glassware consisting of a finger-like length of glass or clear plastic tubing, open at the top and closed at the bottom. Test tubes are usually placed in special-purpose racks. Test tubes intended for general chemical work are usually made of glass, for its relative resistance to heat.
 **Funnel**	A funnel is a tube or pipe that is wide at the top and narrow at the bottom, used for guiding liquid or powder into a small opening.Funnels are usually made of stainless steel, aluminium, glass, or plastic. Test tubes are widely used by chemists to handle chemicals, especially for qualitative experiments and assays.
 **Bunsen burner**	A Bunsen burner is a laboratory instrument that can be used to provide a single, continuous flame by mixing gas with air in a controlled fashion. The ratio of gas to air that is mixed together can be manually adjusted, allowing the user to control the intensity, temperature, and size of the flame. The flame can then be used to heat or sterilize laboratory reagents and equipment.
 **Ruler**	A ruler is the most commonly used geometric tool for measurement in science and mathematics. It is used to measure the length or height of small things such as notebooks, pens, pencils and so on. Most of the rulers contain two measurement metrics namely centimeters and inches. Also, these rulers have lengths of 15 cm and 30 cm in most of the cases.

Watch

In the past, a common time measuring instrument was the sundial. Today, the usual measuring instruments for time are clocks and watches. For highly accurate measurement of time an atomic clock is used. Stop watches are also used to measure time in some sports.

Schematic Diagrams

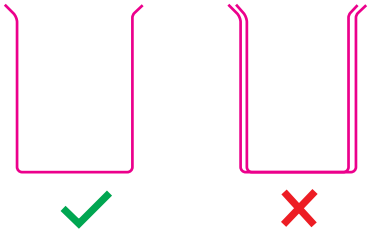
Many instruments are used in science laboratories. Using lines like these, the devices can be shown in the picture. The symbolic diagrams thus created are linear. That is called a schematic diagram. Schematic diagrams are drawn scientifically. These Because it is quick and easy to draw, it is widely used in science.

Rules for drawing schematic diagrams

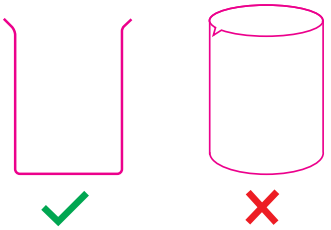
i. Always use only a sharp pencil. Do not use colored or dull pencils.

ii. Always use a ruler when drawing straight lines.

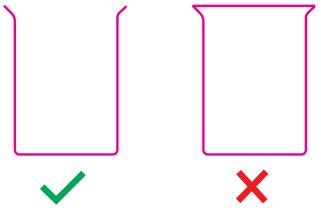
iii. When drawing, you should always draw a single line.



v. The picture should always be two-dimensional.

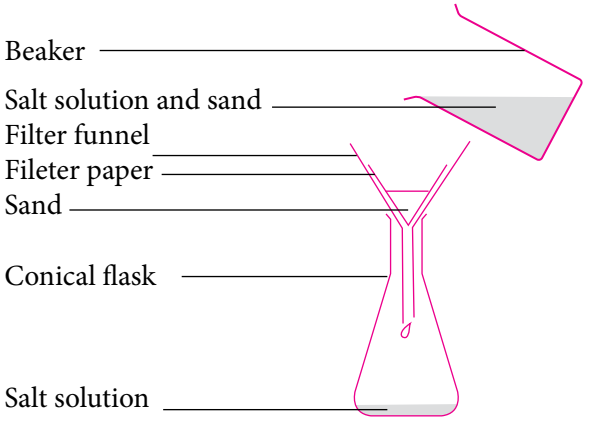


vi. Do not close the mouth of the picture.

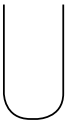
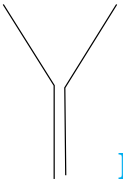
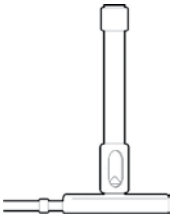
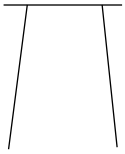
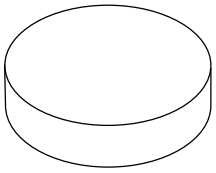


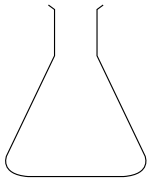
v. Do not color and shadow the picture.

vi. When naming all the devices, a straight line should be used.



v. The drawing should be done by matching the correct proportions of all the instruments.

A schematic diagram of some instruments	Draw schematic diagrams
 Beaker	
 Test tube	
 Funnel	
 Bunsen burner	
 Tripod Stand	
 Petri dish	

 Conical flask	
 Ruler	
 Watch	

1.3 Precautions to be considered while conducting science practical

1. Follow the instructions given by the teacher while doing the experimental work.
2. To work carefully without haste.
3. Working alternately with friends.
4. Don't run in the lab.
5. Observe carefully.
6. Note down new topics.
7. Do not taste / eat any object which are brought by teacher for experimental work.
8. Do not touch hot objects and chemicals directly.
9. Safety glasses must be worn at all times . Even if you normally wear glasses, safety glasses or goggles must be worn over them.
10. Wear clothing in the laboratory that will provide maximum body coverage. When carrying out experimental work you MUST wear a

fastened lab coat. Long trousers or jeans should be worn to cover all of your legs.

11. Prohibit foot wear includes sandals, flip flops and ballet shoes.
12. In case of a large chemical spill on your body or clothes, stand under the safety shower and flood the contaminated area with water. Remove contaminated clothing to prevent further reaction with the skin.

Activity 1.3

i. In the classroom, measure the length of the board. How long is the board compared to your scale? Does everyone in your class have the same measurment result? Write the conclusion.

ii. Compare the amount of water in a small bottle or cup. What is the distinction? Make a note on the copy. What is the purpose of Mana-Pathi?

1.4 Introduction to Measurements

Fig. 1.3

The comparing of an object to a given quantity is known as measurement. The action of measuring anything, or a certain number of objects, is a measurement. Also measuring certain things correctly is very necessary including distance, time, and accuracy. We can really know the universe around us by measuring such occurrences or, in other words, by taking such measurements. Measurements may also enable us to make decisions on the basis of the measurement result.

Measurements play an important role in daily life because they are useful to do basic tasks, such as take a child's temperature with a thermometer, make time estimations, measure out medicine and find weights, areas and volumes of different materials or substances. For examples, people use measurements in simple home task like cooking where one may need to use a weighing scale or read the temperature of an oven when baking foods.

Fig. 1.4

Nearly, all professions use measurements in one form or another. Nurses have to measure out doses of medicines, record blood pressure readings and take pulses. Similarly, engineers and architects have to read blueprints with precise dimensions and markings. Other professionals that use customary measurements are surveyors, actuaries, cartographers and accountants.

Did you ever wonder how the amount of matter is split more or less? How can you figure out how much rice, wheat, and other grains you have in the house? It is typical to calculate the amount of substance based on the location. Various objects are utilized for this. You may also roughly measure the various items in the house. This can be done with the help of a local scales. We can determine the quantity of an object by weighing it.

Is there a difference between two kilograms of rice and two kilograms of cotton?

Measurement is the process to know a quantity accurately. Without measurement it is not possible to have accurate knowledge about a quantity.

The Importance of Measurement

A measurement is the action of measuring something, or some amount of stuff. So it is important to measure certain things right, distance,

time, and accuracy are all great things to measure. By measuring these things or in other words, by taking these measurements we can better understand the world around us.

Beside above, what is the importance of measurement in science? Without the ability to measure, it would be difficult for scientists to conduct experiments or form theories. Not only is measurement important in science and the chemical industry, it is also essential in farming, engineering, construction, manufacturing, commerce, and numerous other occupations and activities.

i. The action of measuring anything, or a certain number of objects, is a measurement.
ii. Also measuring certain things correctly is very necessary including distance, time, and accuracy.
iii. We can really know the universe around us by measuring such occurrences or, in other words, by taking such measurements.
iv. Measurements may also enable us to make decisions on the basis of the measurement result.

Activity 1.4

	My measurement	My friend's measurement
Nose	_____ cm.	_____ cm.
Around the wrist	_____ cm.	_____ cm.
Around the head	_____ cm.	_____ cm.
Ear	_____ cm.	_____ cm.
Hand (tip of middle finger to wrist)	_____ cm.	_____ cm.

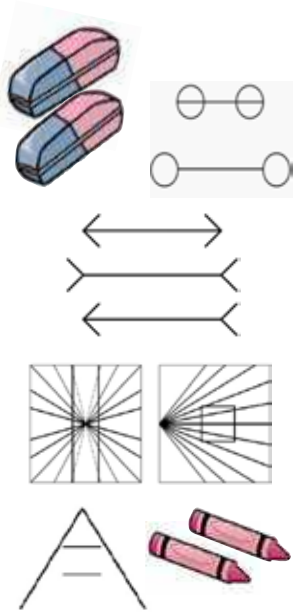
Compare your measurement with your friends.

- Who has the biggest head and who has the smallest head? _____ _____
- Who has the longest hand (from middle finger to wrist)? _____
- Which is longer? Your ear or your nose? _____
- Are any of your nails more than 1 centimetre long?

Activity 1.5

Which straight line /objects are longer or shorter in the pictures below? Observe and write. Now come to a conclusion by measuring what is true or false about your guess.

What you see and measure may vary. This is a visual illusion. Our senses may also be affected. So the correct measurement of an object should be taken correctly.

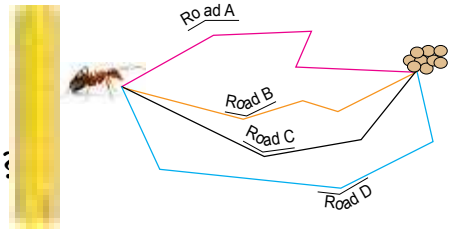


Activity 1.6

What are the methods for determining the quantity of objects (paddy, maize,rice, wheat etc.) in your home and neighborhood? Make a list of their names.

Gibli and the Grains

Ant Gibli has to reach the grains. She is looking for the Shortest road. Can you tell her which is the sortest?



Can you draw a road shorter than these?

What is the length of that road?_____

Points to Remember

- Without science, we wouldn't know why water freezes, where the sun goes at night, or how our bodies fight disease. We have the answers, though, because someone was curious. Science always begins with a question.
- Science is based on proof. Statements that don't have proof are guesses or opinions. The scientific method is a tool, scientists use to prove things. It begins with a question.
- Theories that last for many, many years—and are never proven wrong—become scientific laws.
- Curiosity is also good for your health. Studies show curiosity is associated with higher levels of positivity, better satisfaction with life, and lower anxiety.
- Observation is essential in science. Scientists use observation to collect and record data, which enables them to construct and then test hypothesis and theories.
- Practical learning is the unique ability to help you apply your skills in a non-classroom environment. While it's important to learn the theory of a topic or subject, getting out and applying the theory to a practical situation enables you to build upon existing skills- such as problem-solving.
- Scientists collect samples, make observations, and perform experiments to get the facts they need.
- Follow the instructions given by the teacher while doing the experimental work
- In case of a large chemical spill on your body or clothes, stand under the safety shower and flood the contaminated area with water. Remove contaminated clothing to prevent further reaction with the skin.
- The comparing of an object to a given quantity is known as measurement. The action of measuring anything, or a certain number of objects, is a measurement.
- Nearly, all professions use measurements in one form or another.

GLOSSARY

science	:	the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment.
curious	:	eager to know or learn something.
scientific method	:	a method of procedure that has characterized natural science since the 17th century, consisting in systematic observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses.
scientists	:	a person who is studying or has expert knowledge of one or more of the natural or physical sciences.
theories	:	a supposition or a system of ideas intended to explain something, especially one based on general principles independent of the thing to be explained.
scientific laws	:	the description of an observed phenomenon
Observation	:	the action or process of closely observing or monitoring something or someone.
hypothesis	:	a supposition or proposed explanation made on the basis of limited evidence as a starting point for further investigation.
practical learning	:	a task in which students observe and do things by themselves
samples	:	a small part or quantity intended to show what the whole is like
instructions	:	detailed information about how something should be done or operated.
experimental	:	of a new invention or product) based on untested ideas or techniques and not yet established or finalized.

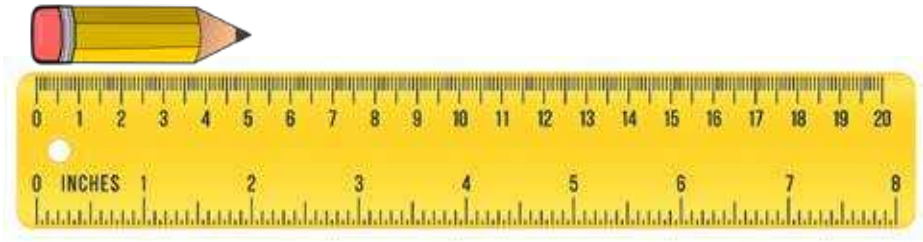
Exercise

A. Choose the correct one and put the tick mark(√)

i. The best way to test your hypothesis is to

a. follow the directions to an experiment and record your observations.
b. follow the directions to an experiment.
c. write what your partner thinks.
d. look up the answer in a book.

ii. How long is the pencil ?



a. 4cm
b. 5cm
c. 3cm
d. 1cm

iii. Which are correct order of scientific method

a. Hypothesis,Question, Procedure, Experiment
b. Question, Hypothesis, Procedure, Experiment
c. Procedure , Hypothesis, Question, Experiment
d. Question, Procedure, Hypothesis, Experiment

iv. Doing a lot of .....helps you shift through low-quality and high-quality information.

a. obsevation
b. practical
c. research
d. study

v. Which is not correct for precautions to be taken while doing experimental work?

a. To work carefully without haste
b. Working alternately with friends
c. Don't run in the lab
d. Don't observe carefully.

B. Match the correct length

Draw lines to match each picture with how long it can be.

2 kilometres

5 metres

10 centimetres

1 centimetre

1 metre

C. Fill in the blanks with suitable words

i. Science always begins with a .....

ii. A ..... is a simple statement that can be proven right or wrong.

iii. Follow the instructions given by the teacher while doing the .....work.

iv. The action of measuring anything, or a certain number of objects, is a .....

v. A Scientific ..... is a device or tool used for scientific purposes.

D. Write 'T' for true and 'F' for false statements

i. Science is based on proof.

ii. Practical learning is the unique ability to help you apply your skills in a non-classroom environment.

iii. Scientists use observation to collect and record data,

iv. Run in the laboratory .

v. All professions use measurements in one form or another.

E. Answer the following questions

i. What are scientific observations?

ii. What is the importance of observations?

iii. What is scientific classification?

iv. What is the importance of scientific classification?

v. What is testing in science?

vi. What is the importance of scientific testing?

vii. How do you introduce a measurement?

viii. What is measurement ?

ix. What is the concept of measurement?

x. Define the observation.

xi. What are the three importance of measurement?

xii. What do you mean by practical ?

xiii. Explain the importance of observation and practical in the study of science.

xiv. State the precautions to be taken while using scientific practical.

xv. How do you measure to differentiate between long/short, more/less or equal distance?

F. Give the reasons :

i. Observation is an important method of investigation.

ii. Working alternately with friends in laboratory

iii. Do not taste/eat any object which are brought by teacher for experimental work.

iv. The scientist shares the results with other scientists.

v. Measuring certain things correctly is very necessary

G. Differentiate with examples

i. Research and observation

ii. Measurement and comparision

H. Make meaningful word from the jumbled letters

i. SOBEAVOITN

.....

(hint : process of closely observing)

ii. EAMURSTNEM

.....

(hint: compare with other objects or events)

iii. LACITCATR

.....

(hint :sensible or usable)

iv. CHARESER

.....

(hint: the systematic investigation)

v. KERAEB

.....

(hint: useful as a reaction container)

I. Diagrammatic questions

a. Make a schematic diagram of the scientific instruments listed below

i. Beaker ii. Watch

iii. Funnel iv. Test tube

b. How heavy are the following objects?

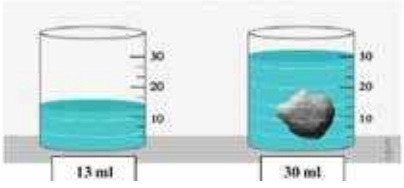
Warm up activities

a. **What colour is the ball with the bigger mass? write.**

b. **Look and read. Write A or B.**

_____ has a bigger mass.
_____ has smaller mass.
_____ has a bigger volume.
_____ has a smaller volume.
_____ has potatoes.

c. **What is the mass of the following object? And the volume? Calculate the density.**



M = _____ V = _____ D = _____

After calculating the density of the stone, will it sink or flout in the water?

_____

d.

Balance Scale
Used to measure:
_____
The units used are:
_____

Scientific tools
Scientists use these tools to study matter.

Rulers
Used to measure:
_____
The units used are:
_____

Measuring Cup
Used to measure:
_____
The units used are:
_____

Thermometer
Used to measure:
_____
The units used are:
_____

e. What science process skill is best shown in each situation? Choose from the word bank. Write your answer on the box below.

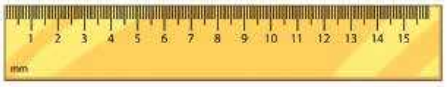
measuring, classifying, observing, predicting

1  2  3  4 

1. .....
2. .....
3. .....
4. .....

g. Match the tool with the correct picture.

1. scale
2. balance
3. ruler
4. hand lens
5. magnet



h. Match the pairs.

Invention	Sceientist
1. Radio	
2. Phonograph	
3. Steam Engine	
4. Evolution Theory	
5. Reflecting Telescope	

Project Work

i. Measure the length and width of your living room using tape or ruler scale. Calculate how long the length is greater than width. Write it in centimeters.

ii. Schematic drawing by observing the equipment in the science laboratory .

Present it in the table below.

Name of the equipment	Schematic Diagramm	Uses

iii. Complete the table below.

Item to be measured at home	Instrument for measuring	Schematic diagram of the measuring instrument
Rice	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Unit 2

Information and Communication Technology

Student's Learning Outcomes

After studying this unit, the students will be able to :

- identify newspapers, letters, television, radio, telephone and cell phone as information and communication sources.
- give a general introduction of computer
- run painting and typing software
- adopt computer security measures
- search for information on the Internet

Look at the images below and discuss about them with your classmates.

Fig. 2.1

i. What exactly is depicted in the image?
ii. What are the functions of all these tools?
iii. Are these information and communication sources?
iv. What are some of these communication tools?

Activity 2.1.1

1. Collect information about the various activities that take place in your school, prepare a news letter, and present it to the class.
2. Make a list of the similarities and differences between the information available from magazines and television.
3. Make a list of means of communication with a picture.

2.1 Introductions

This is the age of information and technology. We have reached a point where we cannot survive without information and technology. Radio, television, mobile phones, etc. are sources of information for us. Information boards in schools are a source of information. If we do not use information and technology properly, we may face various problems.

Information has always been a component of growth and development in human life starting from the primitive days of human civilization to the present day. Communication has been taking the role of connecting people and sharing/exchanging information among the human beings. Communication is one of the most pervasive human activities during the last of 20th centuries and the beginning of 21th centuries .

There is no single universal definition for the term "information". It may be defined as:

Information is obtained through processing of data."Data acquired" by informing or by being informed is information. Information is a flow of messages. Hence, it is a part of communication process. It is the building block of knowledge . Information is an element of knowledge spectrum.

The word "Communication" is derived from latin word "Communis" which means sharing. "Communication" is the process of sharing ideas, information, and message with others in a particular time and place. The connection between two or more people to exchang their knowledge/ ideas are communication. It is the transmission/exchange process of data/information. It is an information transformation system.

'Information Communication' means the communication of information. It is a combination of two different terms 'information' and 'communication'. Although they have different meanings, but they are

interrelated. In "information communication" the relationship between "information" and "communication"are :

- Information as a phenomenon
- Communication as a process.

Activity 2.1.2

i. Ask your parent to buy you a Nepali newspaper this coming Saturday. Now, tick the things you find in it :

a.	advertisements	b.	international news
c.	sports news	d.	story
c.	national news	d.	business news
e.	editorial	f.	cartoon strip

ii. What means of communication will you use in the following situations?

a. You need two days' leave of absence from your school
.....

b. You need to send a video to your friend
.....

c. You want to know the latest news
.....

iii. Write the answer of following questions?

a. How do you invite a friend to play?
.....

b. How do you talk with your father abroad?
.....

c. How do you get information about the happenings around you?
.....

d. How do you inform the drinking water office that there is no drinking water in your house?
.....

e. How do you tell others that you are not feeling well?
.....

2.1.1 Examples of the main means of information and communication flow

We are in a digital era. It is difficult to think of any event in our daily life that is not using Information and Communication Technology. Our schools and classrooms are no exceptions.

For a wider use of the information, the information must be communicated to people. It is only when the information reaches the intended audience, the purpose of creation of information as well as its communication would be served .

You would have noticed that the information created, stored, processed, transmitted, displayed and shared is in digital form and through electronic media. The technologies used in these processes are Information and Communication Technologies.

Traditionally also radio, television, and print media were the widespread technologies used for communication. The digital revolution has changed the way these traditional technologies function. The analog television has become digital television. In addition to the printed newspaper we also have electronic versions. Along with traditional radio, we also have online radio. All these have started appearing in the classroom to make the learning experiences rich.

Information and Communication Technologies (ICT) as forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means. It includes not only traditional technologies like radio and television, but also modern ones like cellular phones, computer and network, hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as video conferencing.

Let's Know

Types of Mass Communication

Print media
- Newspapers
- Magazines
- Books & Novels
- Comics
- Journals & Publications

Broadcast Media
- Flims
- Television
- Radio

Outdoor & Transit VMedia
- Billboards
- Boardings
- Posters
- Banners

Digital Media/New Media
- Social Media
- Video Platforms
- Websites
- Mobile Apps
- E-Books
- Podcasts, Online Radio

Information	Technologies
Creation	Personal computer, Digital camera, scanner, smartphone
Processing	Calculator, PC, Smartphone
Storage	CD, DVD, Pen drive, Microchip, Cloud
Display	PC, TV, Projector, Smartphone
Transmission	Internet, Teleconference, Video conferencing, Mobile technology, Radio
Exchange	e-mail, Cellphone

2.2 Introduction to computers in general

You would agree that in today's modern world, computers have become an essential part of everybody's life. Computers are being used in almost every field and everyday new areas of activities are being discovered. Hardly there is any area in our society, where computers are not being used. For example, computers are used in homes, offices, schools, colleges, universities, hospitals, shops and business establishments, industries, banks, bus stations, airports, research centers and many other organizations. As most of the routine activities in today's society are being performed by computers, it has become essential for everybody to acquire some basic knowledge about computers.

A computer is a fast calculating device that can perform arithmetic operations. It is not just a calculating device. It can perform any kind of work involving arithmetic and logical operations on data. It gets the data through an input device, processes it as per the instructions given and gives the information as output.

Hardware refers to any physical component of a computer. In today's computer industry, a wide variety of hardware components are available. Hardware components are classified according to their functional use within a computer system. They can be broadly classified into three categories namely input devices, output devices and storage devices. It is essential for us to be aware of the working and uses of different hardware components of a computer.

The internal design of computers differs from one model to another. But the basic components of computer remain the same for all models. To function properly, a computer needs both hardware and software. Hardware consists of the mechanical and electronic devices which we can see and touch. Keyboard, Monitor, DVD are some examples for computer hardware. The software consists of programs, the operating systems and the data that reside in the memory and storage devices. JAVA, Microsoft Office, Open Office are some examples for Computer Software.

A computer mainly performs the following four functions.

i. **Receive input –** accept information from outside through various input devices like keyboard, mouse etc.

ii. **Process information –** perform arithmetic or logical operations on the information.

iii **Produce output –** communicate information to the outside world through output devices like monitor, printer etc.

iv. **Store information –** store the information in storage devices like hard disk, compact disk etc.

A computer has the following three main components.

a. Input/ Output Unit
b. Central Processing Unit
c. Memory Unit

a. Input/ Output Unit: Computer is a machine that processes the input data according to a given set of instructions and gives the output. The unit used for getting the data and instructions into the computer and displaying or printing output is known as input/ output unit. Keyboard is the main input device while the monitor is the main output device.

b. Central Processing Unit: Central processing Unit (CPU) is the main component or 'brain' of the computer which performs all the processing of input data. In micro computers, the CPU is built on a single chip or Integrated Circuit (IC) and is called Microprocessor. The CPU consists of the following distinct parts:

i. Arithmetic Logic Unit (ALU)
ii. Control Unit (CU)
iii. Registers
iv. Buses
v. Clock

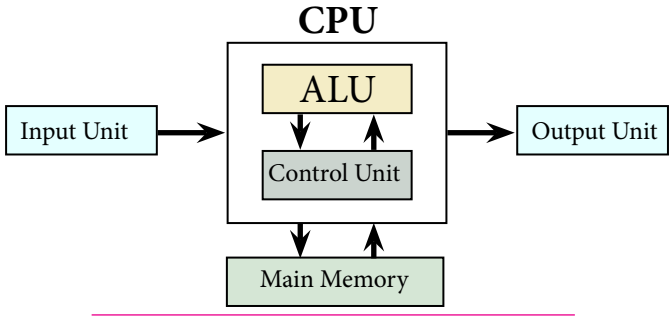


Fig. 2.2

i. Arithmetic Logic Unit: The arithmetic logic unit is responsible for all arithmetic operations like addition, subtraction, multiplication and divisions as well as logical operations such as less than, equal to and greater than.

ii. Control Unit: The control unit is responsible for controlling the transfer of data and instructions among other units of a computer. It is considered as the 'Central Nervous System' of computer as it manages and coordinates all the units of

the computer. It obtains the instructions from the memory, interprets them and directs the operation of the computer.

iii. **Registers:** Registers are small high speed circuits which are used to store data, instructions and memory addresses, when ALU performs arithmetic and logical operations. Depending on the processor's capability, the number and type of registers vary from one CPU to another.

iv. **Buses:** Data is stored as a unit of eight bits in a register. Each bit is transferred from one register to another by means of a separate wire. This group of eight wires which is used as a common way to transfer data between registers is known as a bus. Bus is a connection between two components to transmit signal between them. Bus is of three major types namely data bus, control bus and address bus.

v. **Clock:** Clock is an important component of CPU which measures and allocates a fixed time slot for processing each and every micro-operation. CPU executes the instructions in synchronization with the clock pulse. The clock speed of CPU is measured in terms of Mega Hertz or millions of cycles per second. The clock speed of CPU varies from one model to another.

c. **Memory Unit:** Memory unit is used to store the data, instructions and information before, during and after the processing by ALU. It is actually a work area (physically a collection of integrated circuits) within the computer where the CPU stores the data and instructions. Memory is of two types:

i. Read Only Memory (ROM)
ii. Random Access Memory (RAM)

i. **Read Only Memory:** Read Only Memory is an essential component of the memory unit. The memory which

Fig. 2.3

has essential instructions is known as Read Only Memory. This memory is permanent and is not erased when the system is switched off. The memory capacity of ROM varies from 64 KB to 256 KB depending on the model of computer.

ii. **Random Access Memory:** Random Access Memory is used to store data and instructions during the execution of programs. Contrary to ROM, RAM is temporary and is erased when the computer is switched off. RAM is a read/ write type of memory and thus can be read and written by the user. As it is possible to randomly use any location of this memory, it is known as random access memory. The memory capacity of RAM varies from 640 KB to several mega bytes with different models of computer.

Fig. 2.4

Hardware and software are two broad categories of computer components. Hardware refers to physical component while software to the programs required to operate computers.

Input Devices

An input device is any machine that feeds data, information and instructions into a computer. We may classify input devices into the following two broad categories.

i. Basic input devices
ii. Special input devices

Basic Input Devices: The input devices which are essential to operate a PC are called basic input devices. These devices are always required for basic input operations. These devices include keyboard and mouse.

Special Input Devices: The input devices which are not essential to operate a PC are called special input devices. These devices are used for various special purposes and are generally required for basic input operations. These devices include Trackball, Light Pen, Touch Screen, Joystick, Digitizer, Scanner, Optical Mark Reader (OMR), Bar Code Reader (BCR), Optical Character Reader (OCR), Magnetic Ink Character Recognition (MICR) and Voice-Input Devices.

Keyboard

Keyboard is the most common input device used for manual data entry. Computer keyboards are similar to electric-typewriter keyboards but contain additional keys. Keyboard has been standardized for use in all types of computers such as a PC, a workstation or a notebook computer. The keys on computer keyboards are classified as follows:

Fig. 2.5

i. **Letter Keys:** These are the 26 letters of English alphabet arranged as in a typewriter.

ii. **Digit Keys:** There are two sets of digit keys; one on the second row from the top of the keys just as in a typewriter and the other is a numeric key pad at the bottom right which allows quick entry of numbers with the fingers of one hand.

iii. **Special character keys:** These are characters such as <, >, ?, /, {, }, [,], (,), ., ", @, #, $, %, &, *, etc

iv. **Non-printable control keys:** These are used for backspacing, going to the next line, tabulation, moving the cursor up or down, insert, delete characters etc. There is also a space bar at the bottom for leaving a space.

v. **Function keys:** These are labeled F1, F2 up to F15 and when pressed invoke programs stored in the computer.

You can understand the function of each and every key actually by working on a PC. When any key is pressed, an electric signal is produced. This signal is detected by a keyboard encoder that sends a binary code corresponding to the key pressed to the CPU. There are many types of keyboards but 101 keys board is the most popular one.

Mouse

Mouse is a device that controls the movement of the cursor on the display screen. It is a small object you can roll along a hard, flat surface. Its name is derived from its shape which looks like a mouse. As you move the mouse, the pointer on the display screen moves in the same direction. Mouse contain at least one button and sometimes as many as three which have different functions depending on what program is running. There are three basic types of mouse. They are mechanical, opto mechanical and optical. Wireless mouse are also being manufactured. They transmit the motion of the mouse to the computer wirelessly and is convenient to use. Recently touch panel displays are manufactured which do not need a mouse as a locator. An appropriate icon on the screen may be touched either by finger or a pointing device such as a ballpoint pen to invoke the corresponding program.

Fig. 2.6

Monitor

Monitor is commonly known as Visual Display Unit (VDU) and it is the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.


Fig. 2.7

There are different kinds of monitors depending upon the number of pixels. Depending upon the resolution monitors can be classified as follows:

i. CGA (Colour Graphics Adapter)
ii. MDA (Monochrome Display Adapter)
iii. HGA (Hercules Graphics Adapter)
iv. EGA (Enhanced Graphics Adapter)
v. VGA (Video Graphics Adapter)
vi. SVGA (Super Video Graphics Adapter)

Depending upon the colour of display, monitors can be classified as Monochrome (with single colour black/white display) and colour (with all colours display) monitors.

Storage Devices

Memory units are the internal storage areas of a computer. The term "memory" refers to data storage that comes in the form of chips and the word "storage" is used for memory that exists on tapes or disks. The term memory is usually used as a short form for physical memory which refers to the actual chips capable of holding data. Every computer comes with a certain amount of physical memory usually referred to as the main (primary) memory or the Random Access Memory (RAM). The term RAM refers to read and write memory, that is, you can both write data into RAM and read data from RAM. Most RAM is volatile, which means that it requires a steady flow of electricity to maintain its contents. As soon as the power is turned off, whatever data was in RAM is lost. Read-only memory (ROM) refers to computer memory on which data has been prerecorded. Once data has been written onto a ROM chip, it cannot be removed and can only be read. Unlike the main memory (RAM), ROM retains its contents even when the computer is turned off. Hence it is nonvolatile. Most personal computers contain a small amount of ROM that holds instructions for starting up the computer.

There are different storage devices which are known as secondary memory devices. These devices are helpful in storing data, information and software permanently and they can be retrieved whenever required. They are also useful in transferring data or programs from one computer to another. Many storage devices are used with micro computers. Some of the common storage devices are explained below.

Hard Disk:

Hard disk is a magnetic disk on which you can store computer data. The term hard is used to distinguish it from a soft or floppy disk. Hard disks hold more data and are faster than floppy disks. Hard disk is fixed inside the computer and is not easily removable.

Fig. 2.8

Hard disk consists of one or more disk platters, an access mechanism and read/ write heads which are sealed in a case. Hard disk size depends upon the disk platter's diameter. There are many different platter sizes (5½, 3½, 2½ inch etc.) The 3½ inch size platter is common with PCs and 2½ inch with laptop/ portable computers.

There are different types of hard disks depending upon their storage capacities. Storage capacities of hard disks range from 10 MB to several GBs.

Floppy Disk:

Floppy Disk (FD) is a storage device which is small, flexible and easily removable. It is made of plastic disk coated with magnetic material which is sealed inside a square plastic jacket. It is called "Floppy" because it is soft having flexible physical properly. Data can be written on or read from this floppy by a drive called Floppy Disk Drive (FDD) which is fixed inside the computer.

Fig. 2.9

There are different types of floppies depending upon their sizes and storage capacities. Floppies come in two basic sizes namely 5¼" and

3½". The storage capacity of floppies varies from 360 KB to 1.44 MB. The floppies can store data on both sides (double-sided floppies) or on single side (single-sided floppies) depending on the floppy drive Double sided floppy drives are most commonly used.

Compact Disk:

Compact Disk (CD) is a storage device used to store data, information and software which can be read only and not be changed or erased. It is an optical read only memory made up of resin. Therefore it is actually called Compact Disk Read Only Memory (CD-ROM). The information is stored on CDs by using an expensive drive called CD-ROM drive. CD-ROM drives can be either internal or external.

Fig. 2.10

A single CD-ROM has the storage capacity of 700 floppy disks, enough memory to store about 3,00,000 text pages. Compact disks are very popular storage devices for micro computers because a large number of software including multimedia, audio and graphics software are available on these disks. They can be store a large volume of data (upto 680 MB) which is almost the same as a storage capacity of a 640 MB hard disk.

WORM (Write-once Read-many) is a type of compact disk which can be recorded only once and not erased. It can store more data than a CD-ROM, generally measured in gigabytes.

Digital Versatile Disk:

Digital versatile disk read only memory (DVD-ROM) is a read only digital versatile disk commonly used for storing large software applications. It is similar to compact disk read only memory (CD-ROM) but has a large capacity. A DVD-ROM stores around 4.38 GB of data whereas a CD-ROM usually stores 650 MB of data. A DVD-ROM permanently stores data files that cannot be changed, written over

Fig. 2.11

or erased. A personal computer with a DVD-ROM or a DVD-RAM drive is designed to read a DVD-ROM disk. Generally a DVD-ROM disk is not equipped to be used with a DVD drive connected to a home theatre system or television. But many DVD-ROM drives can generally read a DVD movie disk.

Compared to a CD-ROM, a DVD-ROM has the same 5 inch diameter and 1.2 millimeter thickness. But because a DVD-ROM uses a shorter wave length laser with tighter compacted pits, the disk capacity is increased. The smallest DVD-ROM can store approximately 7 times more data than a CD-ROM.

Pen Drive:

Pen drive is a portable device which allows user to transfer data (text, images, videos etc) to and from computer quickly. Users can easily read and write the data in the pen drive by plugging it into USB port on the computer. Pen drives are quite compact and fit easily into the pocket. They run without battery and draw power from the USB connection itself. Both floppy disks and compact disks are now being gradually replaced by pen drive as preferred means of data storage. It offers mass data transfer and storage capability and at a much faster rate.

Fig. 2.12

Storage capacity of Pen Drive can vary from few megabytes to over 100 megabytes. Pen Drive consists of an electronic circuit board and a USB connection that connects the drive to the computer. It is a memory chip which holds the data. Most Pen Drives are covered with plastic, metal or rubber casing for insulation. They are robust and scratch free thus ensuring maximum security for the data as compared to other traditional means of data storage.

2.3 Software for painting and typing

Paint Softwares

Drawing software is the Paint program on many computers. It is a graphics program that enables you to draw pictures, then store the images in files, merge them into documents, and print them. Unlike paint programs, which represent images as bit maps, draw programs use *vector graphics*, which makes it easy to scale images to different sizes. In addition, graphics produced with a draw program have no inherent resolution. Rather, they can be represented at any resolution, which makes them ideal for high-resolution output. Examples of popular drawing programs are Adobe Illustrator, CorelDRAW and Macromedia Freehand.

Although more painting tools are added to drawing programs and more drawing tools are added to paint programs, their inherent structure is entirely different. Drawing programs (vector graphics) allow for the creation of objects that can be manipulated independently. Paint programs (bitmapped graphics) provide a canvas that can be covered with electronic paint.

A paint program is a software graphics program that allows the user to draw or paint bitmapped images on a computer. Examples include: KolourPaint, XPaint, Deluxe Paint, MacPaint, and Microsoft Paint.

Paint programs also give provisions to draw common shapes such as straight lines, rectangles, circles, and ovals. Sophisticated paint applications are often called image editing programs. These applications support many of the features of draw programs, such as the ability to work with objects. MS Paint is a simple computer graphics program that has been included with all versions of Microsoft Windows. Nonetheless,

"painting" and "drawing" elements are often used together to create a finished graphic.

With a "drawing" program, one normally creates images by establishing points that are connected by straight or curved lines, resulting in shapes such as a rectangle or an oval. The shapes can then be filled with colors resulting in, for example, a red heart or a green leaf. . For instance, all versions of Windows come with a program called PaintBrush which can be accessed by going to Start>Programs>Accessories>Paint.

After launching PaintBrush a white "canvas" will appear, along with a variety of drawing tools and a color palette. The lower right corner of the canvas can be mouse-manoeuvred to adjust its shape, while the "paint bucket" tool can be used to fill it with a different background color. A finished graphic can be saved by going to File>Save As, where picture formats such as BMP, GIF or JPG, are available. When you use PaintBrush to open and edit photos, however, JPG is the format used most often.Professional graphic artists generally use programs such as Adobe Illustrator for "drawing" and Adobe PhotoShop for "painting." In Painting packages bitmapped graphics are used for images such as scanned photographs or pictures taken with a digital camera. Examples of graphics packages that produce bitmapped images include:- MS Paint, PC Paintbrush, Adobe Photoshop and JASC's Paint Shop Pro.

Tux Paint Software

Even great pictures can be easily drawn and painted on a computer. Pictures on the computer. Paint software is used for painting and coloring. MS Paint and Tux Paint are widely used painting software. Tux paint is great software for kids. To use this software, first you need to download and install Tux Paint on your computer.

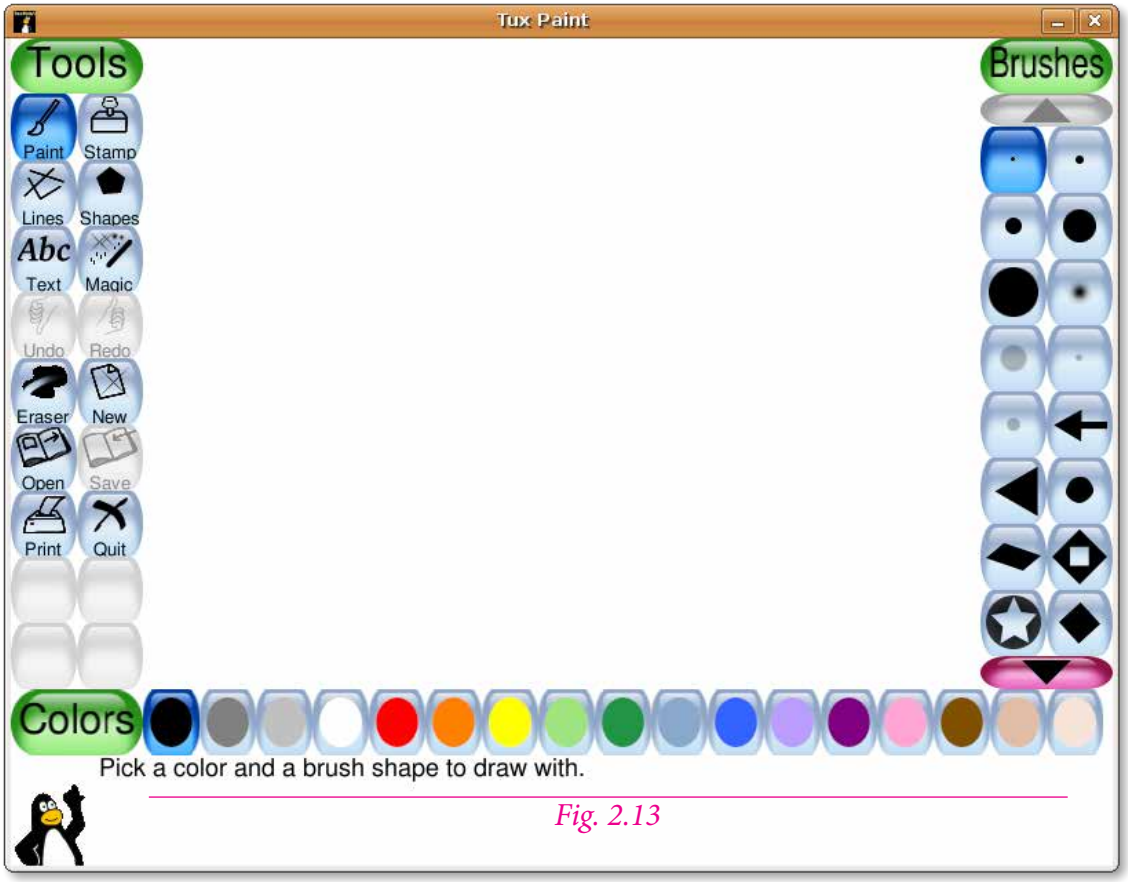


Fig. 2.13

Typing Softwares

Type master is a website that helps you to double your typing speed. It is one of the best typing software for PC which allows you to test your wpm (word per minute) speed and accuracy.

Animal Typing is a simple, most straightforward, and funny way to learn touch for people of all ages. You will get the Anila like snail, rabbit, horse according to your typing speed. The tool also rewards your accuracy.

Typing.com is free typing software that monitors progress from time to time. It is one of the best typing program that helps you to improve your typing accuracy and speed by opting for one-minute, three-minute, and five-minute typing tests.

Typing Club is web-based free typing tool. This tool helps teachers to manage several classes using TypingClub. You can monitor the progress of students and customize lessons using this typing tutorial tool.

TypeLift is free touch-typing courseware that runs directly in your browser. It assists you in practicing your keyboard skills efficiently and helps you to increase your typing speed immensely.

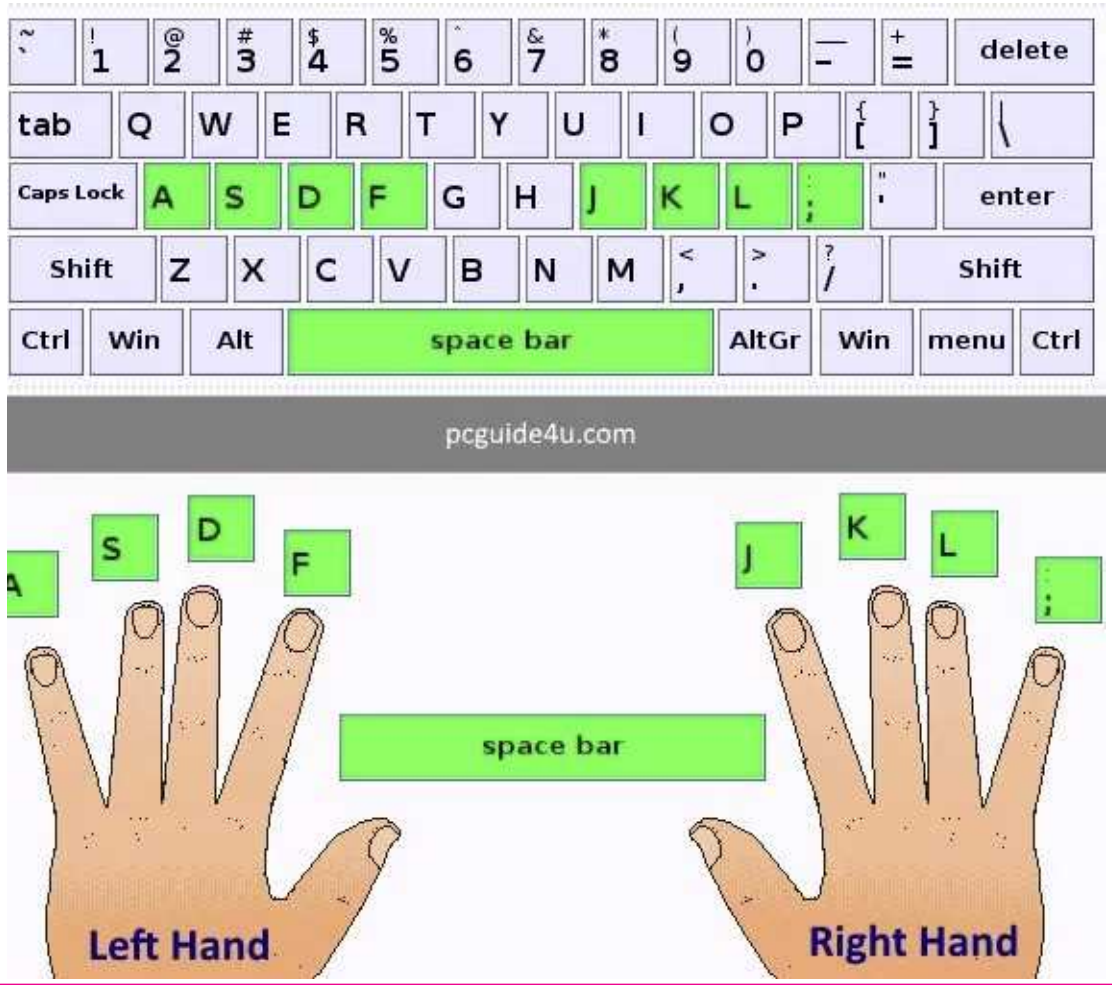


Fig. 2.14

2.4 Computers and our health

There are a number of health risks from using computers.Working at a computer can cause back, neck and shoulder pains, headache, eyestrain and overuse injuries of the arms and hands. Playing computer games for

too long or without correct furniture and posture can lead to health problems such as:

- Overuse injuries of the hand
- Obesity
- Muscle and joint problems
- Eyestrain
- Behavioural problems including aggressive behaviour
- Photosensitive epileptic seizures (caused by flashing or rapidly changing lights – this is rare).

Fig. 2.15

Management of health risk

- Set sensible time limits on game playing. Some guidelines recommend no more than two hours of screen time each day
- Set up the computer, desk, chair and keyboard to suit your height. For example, adjust the chair so that your feet rest flat on the floor
- Use an ergonomic chair
- Buy a smaller mouse, which suits the size of your hand
- Use the keyboard and mouse properly and safely, such as pushing the buttons and other controls gently. Using unnecessary force increases the risk of overuse injury.

2.5 Computer safety, cleanliness, and a espectable user

Computer safety

Fig. 2.16

The Internet provides us with an abundant amount of educational information, entertainment, and can connect us with people throughout the entire world. As wonderful as the Internet can be, it can also be a dangerous place for children and teens. When using the Internet, one must be careful about sharing any form of personal information because

unfortunately the Internet can be a platform for cyber criminals to target kids, teens, and young adults.

The most common types of criminals found on the web include (online predators), identity thieves, cyberbullies, and hackers. In order to protect your children and loved to the fullest extent one must take all the necessary precautions when using a computer.

Use a firewall : Windows has a firewall already built in and automatically turned on.

Keep all software up to date : Make sure to turn on automatic updates in Windows Update to keep Windows, Microsoft Office, and other Microsoft applications up to date. Turn on automatic updates for non-Microsoft software as well, especially browsers, Adobe Acrobat Reader, and other apps you regularly use.

Use antivirus software and keep it current : If you run Windows you have Windows Security or Windows Defender Security Center already installed on your device.

Make sure your passwords are well-chosen and protected : To learn how, see Protect your passwords.

Don't open suspicious attachments or click unusual links in messages : They can appear in email, tweets, posts, online ads, messages, or attachments, and sometimes disguise themselves as known and trusted sources.

Browse the web safely : Avoid visiting sites that offer potentially illicit content. Many of these sites install malware on the fly or offer downloads that contain malware. Use a modern browser like Microsoft Edge, which can help block malicious websites and prevent malicious code from running on your computer.

Stay away from pirated material: Avoid streaming or downloading movies, music, books, or applications that do not come from trusted sources. They may contain malware.

Don't use USBs or other external devices unless you own them :

To avoid infection by malware and viruses, ensure that all external devices either belong to you or come from a reliable source.

Computer cleanliness

Dust isn't just unattractive—it can potentially damage or even destroy parts of your computer. Cleaning your computer regularly will help you keep it working properly and avoid expensive repairs.

Fig. 2.17

Cleaning your computer's hardware and software is important for a lot of reasons.Clean hardware can help your computer run more smoothly and extend your computer's lifespan, which can save time and money. Regular cleaning protects your investment and your data. When you wipe off the screen and empty crumbs from your keyboard, you're helping your equipment perform better and you reduce the risk it will break down.

Dust and other unwanted dirt can build up and suffocate your PC's hardware. By regularly cleaning dust out of the fan vents and case, you can help protect the system from overheating and causing permanent damage to the internal parts of your computer and the information you store on it.

Some ways to make yourself a Better Computer User

- Assign Keyboard Shortcuts to Favorite Apps
- Use Macros to Enter Frequently-typed Text
- Employ a Password Manager to Log in for You
- Get Social Networking and Email Notifications Without Loading a Single Web Page
- Use Dual Monitors and Aero Snap to View Several Windows at Once

- Learn How to Touch Type Faster
- Search the Web Directly from Your Browser Address Bar
- Find Stuff Faster Using the Start Menu Search Box.
- Configure Your File Associations to Open Documents with the Program You Want
- Avoid the Scroll Bar
- Learn Windows' Keyboard Shortcuts
- Increase the Number of Google/Bing Results Per Page
- Set Your Taskbar to "Never Combine" Icons

2.6 Introduction to the Internet

Fig. 2.18

Hope you are familiar with the store-room. You might have seen it either at your home or at your work place right! Store means to collect/ gather and room is a place to keep all these collected materials. In the same way we have a technology assisted very big store house of learning material which is called Internet. The Internet is the collection of all computers across the world which can access each other in some way. The links between computers might include telephone, fiber optic cable, radio, microwave or satellite. Today tens of millions of computers are able to access each other. The Internet has no central organisation which controls its use. Because the Internet knows no borders, many governments have tried to control the flow of information across the Internet. However, communications technology is so varied and so widespread that this is a near impossible task.

Internet is a powerful resource for learning, and is an efficient means of communication. It is very useful in education and provides a number of learning benefits. It includes the development of independent learning and research skills. It helps by improving access to specific subject learning across a wide range of learning areas. It also includes integrated or cross-curricular studies and communication and collaboration, such as the ability to use learning technologies to access resources and create resources.

Generally, everyone thinks that the internet and web World Wide Web (WWW) are same, but it is false. The web is a software application or services that run on the internet .It is a collection of documents and resources. It is one of the fastest growing parts of the internet. It provides easy access to a huge range of information that is stored on computers around the world. There are different definitions for internet but the meaning is the same as shown below

Definition 1: The series of interconnected network allowing communication of data surrounded by millions of computers worldwide.

Definition 2: A global communication network that allows computers worldwide to connect and exchange information.

Definition 3: A worldwide system of computer network, a network of networks in which users at any one computer can get information from any other computer.

The word "Internet" exactly means "network of networks". The Internet consists of thousands of smaller regional networks spread throughout the world. It connects approximately 80 million users in Asian countries on any given day.

World Wide Web:

Fig. 2.19

The World Wide Web or WWW is a part of the Internet. The WWW consists of all the sites that can be accessed using a web browser such as Mozilla, Internet Explorer, Opera or Google Chrome. In order for a browser to access a web site, the web site must contain files that have a particular format constructed using Hypertext Markup Language or HTML. These sites are typically developed using special web development applications, but it is possible to create simple web sites using a word processor by saving the document in HTML format. The HTML documents are stored as web pages on special servers known as web servers. These run special web server software such as Apache Web Server or Internet Information Services.

The WWW enables the free flow of information across the world. Developments in technology have made access to the Internet easier and faster. As a result the WWW also became known as the Information Super high way. Most of the activities listed under the Internet in the previous section are now actually carried out using the World Wide Web. In other words, the sites are created in HTML or a similar format, are installed on web servers and are accessed by web browsers.

The internet is a great tool for developing the communication and collaboration skills of students and teachers. Above all, the internet is an effective means of building language skills. Through e-Mail, chat rooms and discussion groups, students learn the basic principles of communication in the written form. This gives teachers the opportunity to incorporate internet-based activities into normal literacy programs and bring variety to their teaching strategies.

Points to Remember

- Information has always been a component of growth and development in human life starting from the primitive days of human civilization to the present day.
- Communication has been taking the role of connecting people and sharing/ exchanging information among the human beings .
- "Communication" is the process of sharing ideas, information, and message with others in a particular time and place .
- In "information communication" the relationship between "information" and "communication"are :
  - Information as a phenomenon
  - Communication as a process.
- Traditionally also radio, television, and print media were the widespread technologies used for communication. The digital revolution has changed the way these traditional technologies function
- Information and Communication Technologies (ICT) as forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means.
- Computers are being used in almost every field and everyday new areas of activities are being discovered.
- Hardware refers to any physical component of a computer.
- Hardware consists of the mechanical and electronic devices which we can see and touch. Key Board, Monitor, DVD are some examples for Computer Hardware.
- The software consists of programs, the operating systems and the data that reside in the memory and storage devices. JAVA, Microsoft Office, Open Office are some examples for Computer Software.
- Memory units are the internal storage areas of a computer. The term “memory” refers to data storage that comes in the form of chips and the word “storage” is used for memory that exists on tapes or disks.
- Drawing software is the Paint program on many computers. It is a graphics program that enables you to draw pictures, then store the images in files, merge them into documents, and print them.

- Working at a computer can cause back, neck and shoulder pains, headache, eyestrain and overuse injuries of the arms and hands.
- The Internet provides us with an abundant amount of educational information, entertainment, and can connect us with people throughout the entire world.
- A technology assisted very big store house of learning material which is called Internet. The Internet is the collection of all computers across the world which can access each other in some way.

GLOSSARY

information : facts provided or learned about something or someone.

communication: the imparting or exchanging of information by speaking, writing, or using some other medium.

message : a verbal, written, or recorded communication sent to or left for a recipient who cannot be contacted directly.

print media : means of mass communication in the form of printed publications, such as newspapers and magazines

radio : the transmission and reception of electromagnetic waves of radio frequency, especially those carrying sound messages.

television : a system for converting visual images (with sound) into electrical signals, transmitting them by radio or other means, and displaying them electronically on a screen.

computer : an electronic device for storing and processing data, typically in binary form, according to instructions given to it in a variable program.

memory : the faculty by which the mind stores and remembers information.

hardware : the machines, wiring, and other physical components of a computer or other electronic system.

software : the programs and other operating information used by a computer.

Exercise

A. Choose the correct one and put the tick mark (√)

i. Select the odd one out on the basis of mode of communication.

a. Television b. Radio
c. Telephone d. Newspaper

ii. The means of communication can be called the _____ of a country.

a. lifeline b. death-line
c. lining d. connection

iii. The two types of means of communication are _____ and mass.

a. personal b. private
c. individual d. group

iv. Internet is a very large network of _____ connected to one another.

a. people b. roads
c. computers d. transport

v. A cinema can be a feature film or a _____ .

a. documentary b. document
c. docket d. none of above

vi. Which is not the type of communication channel ?

a. Speaking, listening b. Writing, reading
c. Visualizing,observing d. Thinking, acting

vii. The source is the .....of the message .

a. medium b. creator
c. receiver d. modulator

B. Write "T" for true or "F" for false statements

i. Information is obtained through processing of data. ☐

ii. "Information Communication" means the communication of information. ☐

iii. A computer is a fast calculating device that can perform arithmetic operations. ☐

iv. There are not any health risks from using computers. ☐

v. Internet is a powerful resource for learning, and is an efficient means of communication. ☐

C. Fill in the blanks using the words in the box.

Monitor	Mouse	CPU	Keyboard	electronic

1. A computer is an _____ machine.
2. The _____ displays and shows what is happening in the computer.
3. The _____ is used to click, drag and point at items on the computer screen.
4. The _____ has many keys and is used for typing and entering text into the computer.
5. The _____ is the brain of the computer and it is the place where all the work is done.

D. Answer these questions :

i. What role have science and technology played in communication?

ii. What do you understand by the means of private communication?

iii. How can you say that the telephone is the fastest means of communication?

iv. What is the internet?

v. What is a magazine?

vi. Write down the name of any five information and communication device .

vii. Make a list of the communications devices which are used by your parents . Write down the characteristics of all of them.

viii. What is a computer? Write down any three advantages .

ix. You create a model on your computer using paint software.

x. What is typing software used for?

xi. What types of information that can be obtained from the Internet?

xii. How to find the necessary information from the Internet?

E . Make meaningful word from the jumbled letters

a. MUNICATIONCOM

.....

(hint: the imparting or exchanging of information by speaking, writing)

b. ORTIONMAINF

.....

(hint: facts provided or learned about something or someone)

c. PERCOMUT

.....

(hint: a machine that can be programmed to carry out sequences of arithmetic or logical operations automatically.)

d. FTOAWSRE

.....

(hint: the programs and other operating information used by a computer.)

e. ARAREDHW

.....

(hint: a computer chassis, system unit, or cabinet)

f. TETERNIN

.....

(hint : a global computer network providing a variety of information and communication facilities)

F. Diagrammatic questions

i. Write the characteristics of the these devices/items using the Internet

ii. Write **I** for input and **O** for output for each device.

..... 1. Monitor

..... 2. Keyboard

..... 3. Scanner

..... 4. Pen

..... 5. Printer

..... 6. Mouse

..... 7. Speaker

..... 8. Camera

..... 9. Touchpad

..... 10. Headphone



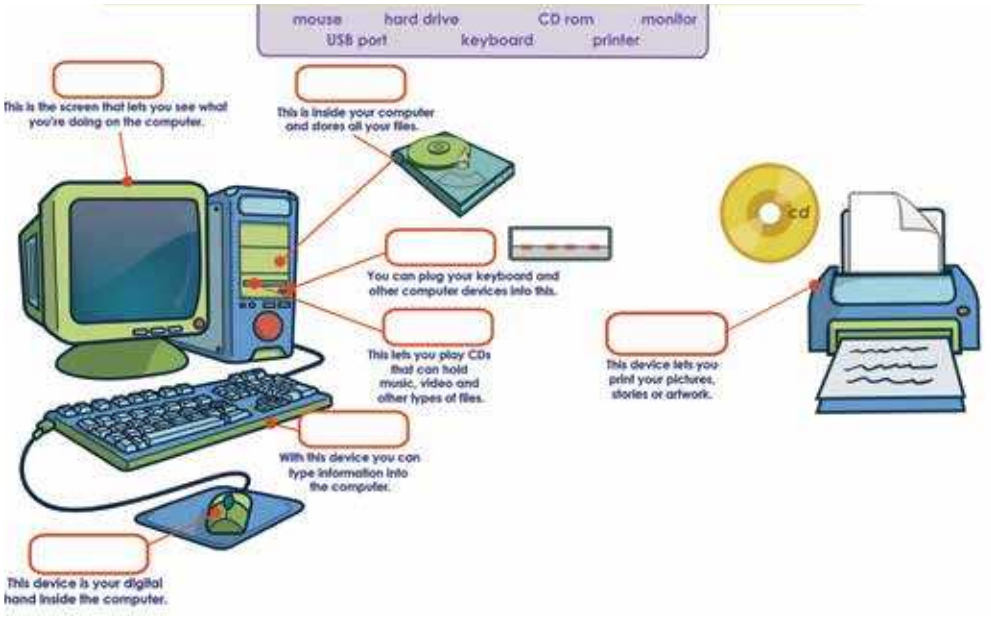







Warm up activities

a. Can you name all these computer parts? Use the word below and the descriptions for clues.



b. Look the following logos and find the names in Puzzle.

Messenger Classroom Chrome Viber Zoom Opera Gmail

C	O	M	P	U	T	E	R	A	B	I	T
D	A	M	E	S	S	E	N	G	E	R	Z
C	R	O	Y	P	U	Z	Z	L	E	L	O
D	B	W	C	H	R	O	M	E	L	O	O
C	L	A	S	S	R	O	O	M	O	O	N
H	A	P	P	L	E	M	P	E	N	U	P
R	A	B	B	I	T	H	E	A	H	L	E
O	W	D	V	I	B	E	R	O	S	E	E
M	O	N	D	A	G	M	A	I	L	S	Y

c. Fill in the paragraph with words from the list. There are two extra words:

Exchanged, Means, two-sided, files, avilable, Information, widely, call

Communication is basically defined as the transfer of _____ from on place to another of from one person/ source to another. Thus, it is a _____ process in which thoughts, feelings, ideas etc are _____ in a verbal or non-verbal manner. There are many _____ wasy of commucation is todays' word. Some of the most _____ used _____ are:

d. Select the means of Communication in each line.

Project Work

i. On the Internet, you will find useful information on science and technology. And exchange your information in the classroom.

ii. Use the paint software to create your favorite picture and share it with the teacher. If possible, print and keep records.

iii. Prepare a report on the progress and possibilities of science and technology in Nepal with the help of the internet.

Unit 3

Organisms And Environment

Student's Learning Outcomes

After studying this unit, the students will be able to :

- describe the factor that affect organisms (sunlight, air, water, soil and other organisms) and their relationship with them.
- confirm the fact that organisms get their need to survive from the environment
- explain the impact of population growth on the environment

Look at the picture below and answer the following questions.

Fig. 3.1

i. What exactly is depicted in the picture?
ii. What do you see in the picture? Make a list.
iii. Separate the biotic and abiotic factors from the list you have prepared.
iv. How do animals and plants benefit each other?
v. How do sunlight, air, water, and soil affect plants and animals?

3.1 Introduction

Look around . Everything you see and feel is a part of your environment. An environment includes living things such as plants, animals, people, and even the tiniest of microbes. The living portions of the environment are called the biotic factors. The non-living portions, such as soil, rocks, sunlight, water and air, are called the abiotic factors .

Interactions among organisms and their environments can be very complex because an organism gets everything it needs to survive from the biotic and abiotic factors of its environment. For example, a tree gets the energy it needs from sunlight, carbon dioxide from the air, and water and minerals from the soil. All organisms rely on the abiotic factors of their environment in addition to relying on other organisms for survival. Organisms that live in the same environment affect other living organisms within that community.

3.1.1 Factors that affect living things

Abiotic factors are the non-living components of the environment that can often have a major influence on living organisms. Abiotic factors include sunlight, air (oxygen and carbon dioxide), water, soil, temperature and other organic substances.

Sunlight

Sunlight is Earth's principal source of energy, making it an incredibly significant abiotic element. For photosynthesis, sunlight is required, the process where plants use carbon dioxide (CO_2) and water to create sugar which is the food for plants. Plants are eaten by animals and humans. Without the sunlight, plants cannot survive and without plants, no animals can survive. As plants are the source of oxygen and food for almost all species.

Activity 3.1

With and without light

What we need

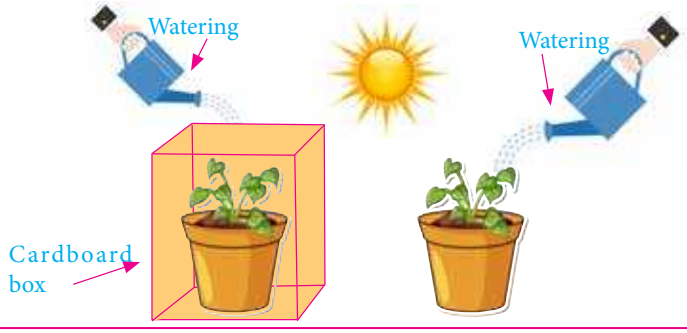
Two same sized seedings in plant pots, water, cardboard box.

what to do:

1. Place both seeding in a sunny place but cover one of the seedings with a cardboard box.
2. Water both seedings every day.
3. Observe the seedings for a week. Record yourobservations in your exercise book.
4. Share your ideas with your classmates. Discuss what happened to both seedings and what plants need to grow.

To investigate whether plants need light for growth, how should we control the conditions? What conditions should be the same?

Why do we have to cover one of the seedings with a cardboard box?



Water

Water (H_2O) is a very important abiotic factor-it is often said that "water is life." All living organisms need water. Plants must have water to grow. Water is a universal solvent and is very important for survival. Water maintains the cell structure and shape. Water comprises 60-75 percent of the weight of the human body. A loss of only 4 percent of total body water results in dehydration and a 15 percent loss may be fatal. Similarly, a person without food could survive a month but would not survive 3 days without water. All life forms are regulated widely by this essential dependency on water. Similarly, a plant requires water for its growth.

Activity 3.2

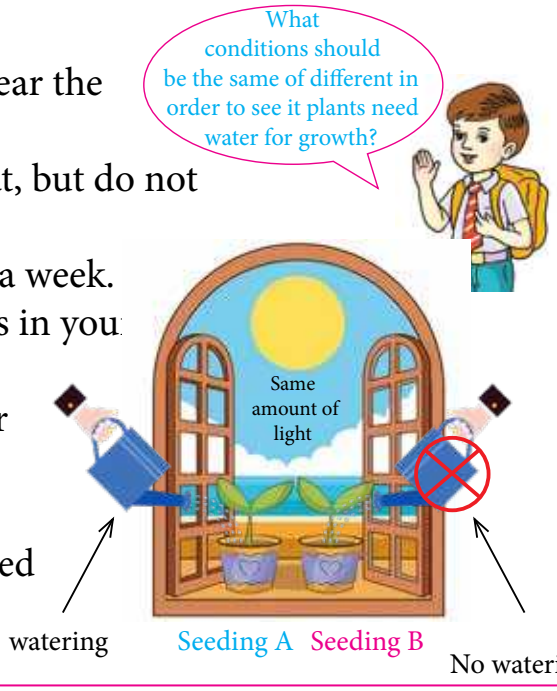
With and without water

What we need:

- two same sized seedings plant pots, water

What to do:

1. Place seedings A and B near the classroom window.
2. Water seeding A every dat, but do not water seeding B.
3. Observe the seedings for a week. Repord your observations in you exercise book.
4. Share your ideas with your classmates. Discuss what happened to the seeding with or without water added and what it needs to grow.



Soil

Soil is often considered an abiotic factor since it is mostly made up of small particles of rock (sand and clay) mixed with decomposed plants and animals. Plants draw water and nutrients from the soil using their roots. Soils vary from place to location – this can be a major factor in which plants and animals survive in a specific region.

Temperature

Temperature is an abiotic factor that is strongly influenced by sunlight. Temperature plays an important role for animals that cannot regulate their own body temperature, such as reptiles.

Oxygen

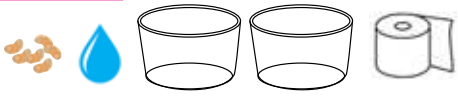
For most living organisms, oxygen is another essential abiotic element. Oxygen is used as an energy source by the cells. It gives cells the energy needed to perform important functions, such as to grow, respire, and reproduce. Without oxygen, human beings and other oxygen-using species will not be able to survive. Some organisms require oxygen for growth and are called **aerobic organisms**. Some organisms do not require oxygen for growth and these are called anaerobic organisms. Certain organisms can grow with or without oxygen and they are called **facultative anaerobes**. Most of the oxygen we obtain is from the photosynthesis process and 70% of Earth's oxygen comes from the ocean.

Activity 3.3

With and without air

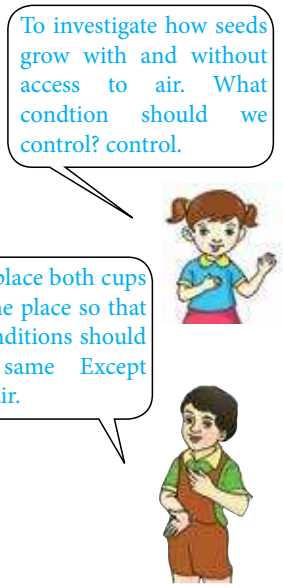
What we need:

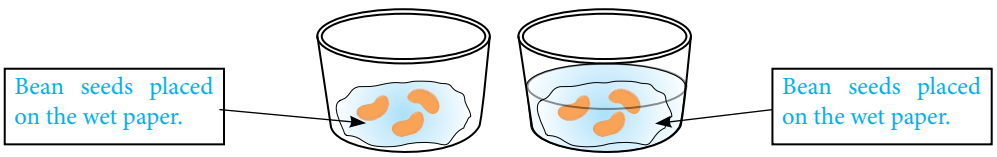
bean seeds, water, tissue paper, two cups



What to do:

1. Fold the tissue paper so that it will fit inside the cup.
2. Place the paper in each cup and than place bean seeds on the top of the paper.
3. Wet the paper in Cup A until it is completely most. Pour water in Cup B until the bean seeds are submerged.
4. Place both cups at the same location.
5. Observe the seeds for a week record your observation in your exercise book.
6. Share your ideas with your classmates. Discuss which beans germinated and why.





Animals and plants depend on each other

'Animals depend on plants in many ways.Animals breathe in oxygen that is produced by plants. They depend on plants for food. They also use plants for shelter and protection.

Plants as Food

Every part of a plant is food for some animal. Caterpillars and rabbits eat mainly plant leaves. Other animals, such as beetles, eat plant roots and stems. Animals such as earthworms and some snails eat plants that are no longer living. Bears, birds, bats, monkeys, and some lizards eat fruits and seeds.

Even meat eaters depend on plants for food. Remember, plants are the main source of energy entering food chains. Meat eaters depend on plant eaters. Plant eaters depend on plants. Directly or indirectly, all animals need plants for food.

Plants as Shelter

'Animals make nests, dens,burrows, and other shelters from plants. Squirrels move into tree holes and line them with soft moss and leaves. Many birds collect twigs and sticks and weave them into a tight nest. Birds use these nests to keep their eggs safe and care for their young.

An animal senses danger ahead.What can it do?

Hide! Leafhoppers and garter snakes hide in the grass for shelter and safety. A rabbit or bird stays out of sight in the bushes. Fish sneak among thick seaweed beds in the ocean. Plants help keep animals safe from harm.

Some plants depend on animals to reproduce

Flowering plants reproduce when male gametes are transported to female gametes in a flower. This process is called **pollination**. After pollination a seed develops. The seed can then grow into a new plant. The stamen holds the male cells. The pistil holds the female gametes. Flower parts cannot move by themselves.

How then do male and female cells join together?

Some animals help flowers with pollination. Animals such as bees, hummingbirds, wasps, butterflies, and bats travel from flower to flower. They collect a sweet drink inside the flowers called **nectar**. As an animal visits a flower, a powdery material called pollen rubs off the flower and onto the animal's body. Pollen is located in a flower's stamen. It holds the male gametes. When the animal visits another flower, some of this pollen rubs off on the flower. The animal does not know this, but the powder helps the flower reproduce.Pollination helps both plants and animals. Animals get nectar, a source of food, from the plants. The plants can reproduce.

Plants depend on animals to carry seeds

Seed dispersal is the process of spreading seeds. During this process, seeds are left in a place where they can grow into new plants. Animals play an important part in dispersing, or spreading, seeds.An animal eats a fruit and its seeds. The seeds are later left on the ground in the animal's waste. The seeds may grow into a new plant. Some plants have very sticky seeds. These seeds can easily stick to an animal's fur. When the animal moves to a new place, the seeds rub off. They fall to the ground. They may grow into new plants.

Animals and plants depend on each other in many ways

Animals:

- ***Food:*** Animals cannot make food by themselves. They must eat plants or other animals as food to get energy.
- ***Breathing:*** Animals use oxygen from air. Plant give off oxygen into air.
- ***Shelter:*** Animals use plant as shelter. For example, birds make nests in trees for shelter. Plant:

- ***Food:*** Plants make food with the help of carbon dioxide. Animals exhale carbon dioxide gas and plant absorb carbon dioxide from air.
- ***Nutrition:*** Animal's bodies after death organic fertilizer which supplies nutrients for plants.
- ***Pollination:*** Animals such as birds, insects help plants in pollination.

Plant:

- ***Food:*** Plants make food with the help of carbon dioxide. Animals exhale carbon dioxide gas and plant absorb carbon dioxide from air.
- ***Nutrition:*** Animal's bodies after death organic fertilizer which supplies nutrients for plants.
- ***Pollination:*** Animals such as birds, insects help plants in pollination.

Activity 3.4

How do plants and animal depend on each other?

Purpose

Find out how plants and animals use each other in their environmnet.

Meterial

- terrerium kit
- Spray bottle and water
- tape measure
- hand lens

Procedure

1. Make Model Place about 8 cups of soil in the container. Place the plants in the soil. Put the animal in the container and place the terrrium in a lighted area. Avoid direct sunlight. Spray the terrarium each day with a small amount of water.
2. Measure Carefully measure the organisms. Record the information in a data table.
3. Observe Use the hand lens to observe the ecosystem. How do the organisms depend on each other?
4. Measure Afte a week, measure the plants and the animal again. Record the information on the data table.

Draw conclution

5. Analyze data and draw a diagram of your terrerium. Draw arrows to show how the organisms depend on one another.

6 Infer what are the living and nonliving things in your terrerium?

Explore More

How might another animal use plants as food and shelter? How might you test your ideas?

3.2 Interrelationship between population and environment

What is the effect of an increasing human population on the environment? Let us discuss this question in depth for a moment. An increasing human population can have a very negative impact on the environment. Pollution, overuse of natural resources, unmanaged urbanization, etc. can be a problem. Similarly, changes in the population of other organisms can also affect the environment. Increasing or decreasing the number of organisms can disrupt the community ecosystem.

There is a close interrelationship between population and environment . Human being depend on the various resources of environment. Human fulfill their basic needs from the environment. They need water, air and food which are obtained from the environment. Unlike the other creature, human are not satisfy only with basic needs. They need different other facilities and materials to make their life comfortable and improve their living standard.

An increase of population demands more food, more shelter, more services and other facilities. If the population growth is higher, the natural resources will be over used, we should integrate the environment conservation and infrastructure development. As the population increases the use of the environmental resources increases. It forces to initiate more development activities to meet the needs of the people, but the people should not forget to conserve the environment along with the development activities. It is necessary to maintain a balance between population growth, environmental resources and development activities.

The relationship between population and the environment is a significant issue due to its impact on chances for achieving sustainable development, especially in developing countries. The interrelationship

between population growth and the environment, and both its direct and indirect effects on the potential for achieving sustainable development. World population growth and environmental degradation. Population growth and environmental degradation are two of the great concerns of our age, as both are seen to be problems of local and global importance.

We know that global warming is an effect that results in climate change. This is because of human activities such as the burning of fossil fuels, the use of large amounts of greenhouse gases like carbon dioxide and methane results in an enhanced greenhouse effect. As a consequence, the land gets heated faster than the ocean, deserts are expanding and the evaporation rate is much higher due to which the various life forms are affected drastically.

Environmental changes can be caused by natural disasters and human activities. The change can affect the changes in rainfall and temperature. the change in temperature and rainfall may cause different types of natural disasters such as flood, drought, storm and landslides. These natural disasters cause serious damage to living things like :

Disappearing habitat

The environment changes cause the destruction of habitats of many living things.

Lack of food

They cannot get proper food for the environmental change. Human have been cutting down trees to use as fuel or building materials. They have cleared forests for land to cultivate crops or livestock for food, and to build houses, roads, and factories. Human is also changing an environment to get natural resources.

Points to Remember

- An environment includes living things such as plants, animals, people, and even the tiniest of microbes. The living portions of the environment are called the biotic factors. The non-living portions, such as soil, rocks, sunlight, water and air, are called the abiotic factors.
- Abiotic factors include sunlight, air (oxygen and carbon dioxide), water, soil, temperature and other organic substances.
- Sunlight is Earth's principal source of energy, making it an incredibly significant abiotic element.
- Water (H_2O) is a very important abiotic factor-it is often said that "water is life." All living organisms need water. Plants must have water to grow. Water is a universal solvent and is very important for survival.
- Soil is often considered an abiotic factor since it is mostly made up of small particles of rock (sand and clay) mixed with decomposed plants and animals.
- Without oxygen, human beings and other oxygen-using species will not be able to survive. Some organisms require oxygen for growth and are called aerobic organisms. Some organisms do not require oxygen for growth and these are called anaerobic organisms. Certain organisms can grow with or without oxygen and they are called facultative anaerobes.
- Animals make nests, dens,burrows, and other shelters from plants.
- Flowering plants reproduce when male cells are transported to female cells in a flower. This process is called pollination .
- Seed dispersal is the process of spreading seeds. During this process, seeds are left in a place where they can grow into new plants.
- There is a close interrelationship between population and environment. Human being depend on the various resources of environment. Human fulfill their basic needs from the environment.
- Human have been cutting down trees to use as fuel or building materials. They have cleared forests for land to cultivate crops or livestock for food, and to build houses, roads, and factories. Human is also changing an environment to get natural resources.

GLOSSARY

environment	:	the natural world, as a whole or in a particular geographical area, especially as affected by human activity
substances	:	the real physical matter of which a person or thing consists and which has a tangible, solid presence.
aerobic organisms	:	aerobe is an organism that can survive and grow in an oxygenated environment
facultative anaerobes	:	are the most adaptable organisms that can survive in the presence, as well in the absence, of molecular oxygen.
pollination	:	the transfer of pollen to a stigma, ovule, flower, or plant to allow fertilization.
seeds	:	the unit of reproduction of a flowering plant, capable of developing into another such plant.
population	:	a community of animals, plants, or humans among whose members interbreeding occurs.
natural resources	:	materials or substances occurring in nature which can be exploited for economic gain.

Exercise

A. Choose the correct one and put the tick mark (√).

a. What do plants give off when they make food?

i. Oxygen ii. Carbon dioxide

iii. Water vapor iv. Nitrogen

b. Where do humans directly get the energy to survive?

i. Food ii. Water

iii. Road iv. River

c. Which of the following is not needed by plants to make food?

i. Sunlight ii. Water

iii. Carbon dioxide iv. Oxygen

d. Who can make their own food?

i. Plants ii. Animals
iii. Vertebrates iv. Invertebrates

e. Which of this is a special place where plants grow and animals live?

i. Atmosphere ii. Habitat
iii. Predator iv. Shelter

f. Which of the following is a place where animals can be safe?

i. Atmosphere ii. Habitat
iii. Predator iv. Shelter

g. What is the name of the gas that we breathe in?

i. Oxygen ii. Carbon dioxide
iii. Nitrogen iv. Hydrogen

h. What is the name of the gas that we breathe out?

i. Oxygen ii. Carbon dioxide
iii. Nitrogen iv. Hydrogen

i. Where do plants get the energy to make food?

i. Water ii. Carbon dioxide
iii. Sunlight iv. Oxygen

j. What do animals need to digest food?

i. Air ii. Water
iii. Soil iv. Oxygen

k. Humans fulfill their basic needs from the

i. environment ii. shelter
iii. forest iv. agriculture farm

B. Write the correct sentences in the answer script by matching the left-hand side with the right hand side:

A. living things need, food	i. plants and animals to get energy.
B. no living things can	ii. well without sunlight and water.
C. animals use the oxygen from	iii. Survive without water.
D. Plants cannot grow	iv. habitat, shelter, water, and to survive.
E. Human eat different kinds of	v. air and give off carbon dioxide.

C. Write "T" for true or "F" for false statements

i. Living things need food, habitat, shelter, water and air to survive. ☐

ii. Animals need food to get energy and nutrients for survive. ☐

iii. Habitat is the part of the environment where a plant or an animal lives. ☐

iv. Plants give off oxygen and use carbon dioxide from air. ☐

v. Plants need sunlight, water and carbon dioxide of air in order to make food. ☐

vi. Human directly or indirectly depends on the environment for their food. ☐

vi The environmental changes can not affect the changes in rainfall and temperature. ☐

D. Fill in the blanks using the words in the box.

cultivate,oxygen, the environment, sunlight, natural environment, shelter, energy, predators, rainfal, habitat, materials, digest,

i. A place where animals can be safe is called_____.

ii. Living things get all the necessary things from _____.

iii. Plants need _____, water and air in order to make food.

iv. Human changes the environment to get _____.

v. Shelter provides animals with protection from other _____.

vi. Plants give off _____ into air when they make food.

vii. All living things need _____ to survive and grow.

viii. A _____ is a special place where plants grow and animals live in.

ix. Animals drink water to help _____ their food.

x. Human have been cutting down trees to use as fuel or building _____.

xi. Human have cleared forests for land to _____ crops.

xii. The environmental change can affect the changes in _____ and temperature.

E. Answer these questions :

i. What do living things need to survive?

ii. Why do animals need food?

iii. Why do animals drink water?

iv. What do plants give off and get from air?

v. What do plants need to make food?

vi. Why does human depend on environment directly or indirectly?

vii. What do all living things need to survive and grow?

viii. What can cause environmental change?

ix. What can be affected by environmental change?

x. How do animals and plants depend on each other?

xi. How do animals depend on green plants?

xii. What are the relation between population and environment?

F. Make meaningful word from the jumbled letters:

i. SGHTUNLI

.....

(hint: Plants rely on the energy)

ii. XENOYG

.....

(hint : a chemical element)

iii. TERWA

.....

(hint : a substance composed of the chemical elements hydrogen and oxygen.)

iv. LOIS

.....

(hint : the loose surface material that covers most land)

v. MENTRONENVI

.....

(hint : the surroundings or conditions in which a person, animal.)

vi. LAPOTIPUON

.....

(hint : a group of individuals of the same species living and interbreeding within a given area.)

G. Diagrammatic questions

i. Match the living things to what they eat (or need to be nourished)

Human ●

Hummingbird ●

Plant ●

Snake ●

Frog ●

● Sunlight

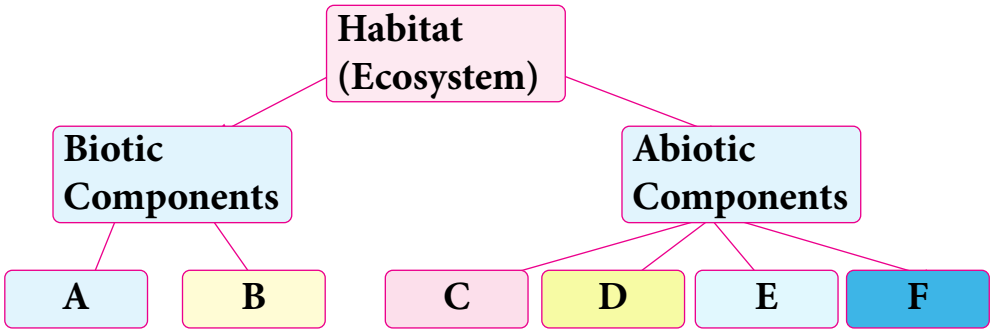
● Plant & Cheese

● Flower

● Mosquito

● Mouse

ii. Fill in the correct words in place of A, B, C, D, E and F.



Warm up activities

Global Warming

a. Fill in the gaps with: heat, deforestation, factories, absorb, endangered, thicker

Smoke from vehicles and .....cause the Carbon dioxide (CO_2) level to rise in the atmosphere.

Trees ..... CO_2. Human beings though are cutting the trees down to build more roads and buildings. This is called .....

This destroys the balance of CO_2 levels in the atmosphere and that the layer greenhouse gases in the atmosphere become ..... We call this the greenhouse effect. The thicker layer of greenhouse gases traps more ..... from the sun and increases the average temperature of the Earth. This is called Global warming.

The Earth becomes hotter and hotter. Many species of plants and animals are ..... and many have already become extinct. We can all take steps to reduce global warming to save our planet.

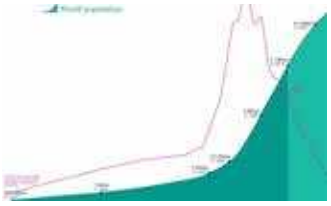
b. Drag the following word to caption the picture below.

CLIMATE CHANGE | DEFORESTATION | RAINFALL

HABITAT DISTRUCTION | PLLUTION | SOIL EROSION

POLULATION GROWTH | HURRICANES






c. List TWO ways that human population growth has damage the country in which you live.

i. _____

ii. _____

d. List THREE ways in which you impact the environment. It may be positive and/or negative.

i. _____

ii. _____

iii. _____

Project Work

i. An overview of the living and non-living things in the nearby terrestrial environment are given below. Identify Relationships:

Animal	Relation
Earth Worm	The earth worms live in the soil, get food from the soil and make the soil fertile. It's becomes food for Birds
Butterfly	The butterfly gets food from plants (sucking the sap of flowers and eating leaves in larval stage), it builds Builds habitat in plants

ii. Make a list of environmental elements and write a report on the interrelationships between animals, plants, and the environment. Present the report in the classroom.

iii. Write an essay on the interrelationship between organisms and the environment and present it in the classroom.

Unit 4

Classification of Living Beings

STUDENT'S LEARNING OUTCOMES

After studying this unit, the students will be able to :

- identify vertebrates with or without vertebrates.
- distinguish between vertebrates and invertebrates.
- identify the surrounding animals as lay eggs and child-bearing animals.
- distinguish between animals as lay eggs and child-bearing animals.
- give examples of animals that live on the land around us.
- describe the common characteristics of terrestrial animals.
- give examples of aquatic animals.
- describe the common characteristics of aquatic animals.
- distinguish between aquatic and terrestrial animals.
- classify the surrounding plants into herbs, shrubs, and trees.
- identify the different parts of the adult plant and to draw a picture of the plant and name the different parts.
- describe the characteristicsvof the plants found in the land.
- identify plants found in water.
- describe the characteristics of aquatic plants by observing them.
- differentiate between terrestrial and aquatic plants based on their characteristics.

Look at the picture below and answer the following questions

Fig. 4.1

i. What exactly is depicted in the picture?
ii. What do you see in the picture? Make a list.
iii. Separate the vertebrate and invertebrate animals from the list you have prepared.

4.1 Classification of Animals

There are at least five million **species** on Earth, and some scientists believe there could be double that number. A species is a group of animals that are more like each other than they are like any other group of animals. They can breed with each other but not with members of other species. A way of sorting through all those species is to organize them by similar **properties**, or characteristics. This process is called **classification**.

4.1.1 Classification of animals on the basis of their backbone

There are many types of animals around us. They have various structures and sizes. Some of the animals live on land and others live in water. They move in different ways. All animals are divided into two groups according to the presence and absence of a backbone.

Vertebrate

The animals having backbone are called as vertebrates. Backbone contains a number of bones. It is situated on the back part of the body. Vertebrates are highly developed animals. They are found on land as well as in water.

Invertebrate

The animals having no backbones are called as invertebrates. They have soft bodies. They are found on land and in water.

Classification of Vertebrates

Vertebrates are divided into five groups: Amphibians, Pisces (Fishes), Reptiles, Aves (Birds), Mammals

Amphibians

Animals which can live on land as well as in water are called amphibians. They breathe through lungs when on land and through gills or the skin when they are under water. They can swim in water with the help of their webbed feet. They have four limbs.

Fig. 4.2

Pisces (Fishes)

Vertebrates which live in water and swim with the help of fins are known as pisces. Fishes breathe through their gills. Their bodies are covered with scales.

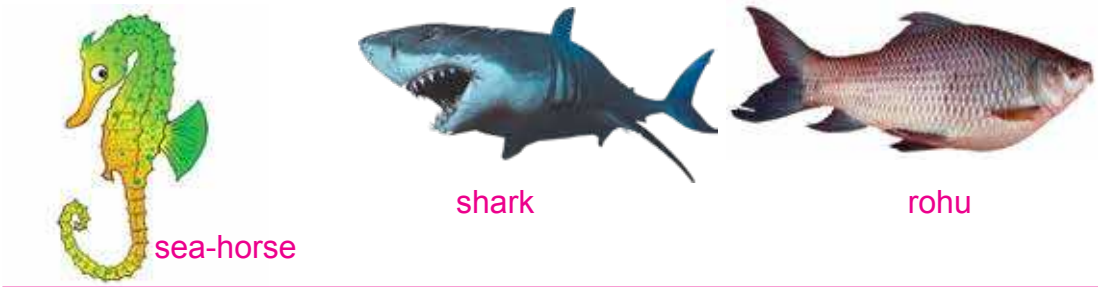


Fig. 4.3

Reptiles

Animals which crawl on the ground are known as reptiles. They live on land and few of them also live in water. They have lungs to breathe. They have limbs but some of them do not have limbs.(e.g. snakes)

Fig. 4.4

Aves (Birds)

Animals which can fly in the air with the help of wings and hollow bones are called aves (birds). Feathers help them to fly, keep body warm and protect them from injury. They have a pair of wings, a beak and a pair of legs. The birds such as kiwi, ostrich, etc. cannot fly.

ostrich

peacock

sparrow

Fig. 4.5

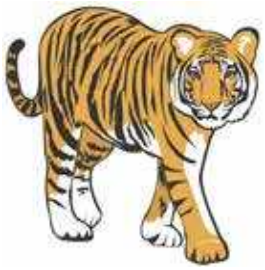
Mammals

Animals which directly give birth to their young ones and bodies are covered with hair or fur are known as mammals. They feed the baby with their milk. They breathe through lungs. Most of them live on land and some live in water. Bats fly whereas whales live in water.

cow

woman

cat



tiger

dog

bat

whale

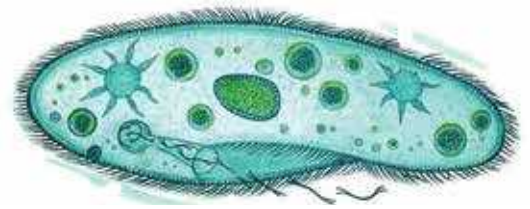
Fig. 4.7

Classification of Invertebrates

Invertebrates are divided into nine phyla. However, only few of them are shortly below. Protozoa, Flatworms, Roundworms, Ringworms, Insects, Mollusca,

Protozoa

Very simple animals, made up of single cell are known as protozoa. They are found in water as well as in soil. These can be only seen through microscope.



paramecium

amoeba

Fig. 4.8

Flatworms

Animals having long and flat bodies are known as flatworms. Some of them are found inside the body of other animals. They derive nutrition from the other living animals.

Fig. 4.9

Roundworms

Animals having long, thread like bodies and round in shapes are known as roundworms. Some of them live inside the bodies of other animals. They derive nutrition from other animals.

roundworm

Fig. 4.10

Ringworms

Animals having long segmented bodies are known as ringworms. They live in soil and water. Leech attaches itself outside the body of big animals and sucks blood. Earthworms are found in soil and decomposes the parts of dead plants.

Fig. 4.11

Insects

Animals having six legs with wings and antenna are called insects. Most insects can fly. Some of them cannot fly.

They are found everywhere. Insects are beautiful. Many are useful to us in many ways. Most of them have three pairs of legs.

Fig. 4.12

Mollusca

Animals having soft bodies which may cover with a hard shell are known as mollusca. They are mostly found in water and on land. They move muscles.

Echinodermata

Animals having spiny structure in skin are known as echinodermata. They are sea water animals with different shapes.

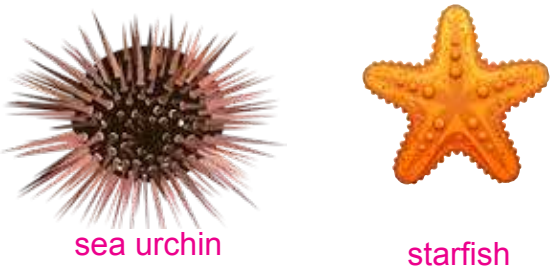


Fig. 4.13

Points to Remember

- Animals are divided into different groups according to the presence or absence of backbones
- Animals having backbones are called as vertebrates.
- Animals not having backbones are called as invertebrates.
- Amphibians, reptiles, aves and mammals are vertebrates.
- Protozoa, flatworms, round worms, ringworms, insects, mollusca and echinodermata are invertebrates.

GLOSSARY

backbone	:	the line of bones down the centre of the back
classification	:	arrangement of living things
wedded	:	having toes connected by a membrane.
limbs	:	arms or legs
gills	:	respiratory organs of fish and frogs
scales	:	the small, thin bony plates
segmented	:	divided something into different parts
antenna	:	a pair of long thin sensory part on the head
shell	:	the hard protective outer case
spiny	:	full of or covered with prickles

Exercise

A. Choose the best answer from the given alternatives.

i. It has gills and scales.

a. fish b. frog
c. dog d. dolphin

ii. It has backbone.

a. earthworm b. snake
c. starfish d. leech

iii. It does not have backbone.

a. earthworm b. snake
c. lizard d. anaconda

iv. It supports weight of our body.

a. bone b. blood
c. muscle d. cell

v. It gives birth to its babies directly.

a. dog b. hen
c. duck d. snake

vi. Invertebrates are the animals which do not have..... .

a. wings b. backbone
c. legs d. eyes

vii. The animals having vertebral column are called..... .

a. vertebrates b. amphibians
c. mammals d. birds

viii. Most of the invertebrates have..... .

a. hard body b. long body
c. strong body d. soft body

ix The invertebrate that lives as parasite is

a. tapeworm b. liver fluke
c. leech d. all of the above

x. The ..... is a vetebrate that gives birth directly.

a. bat b. parrot
c. crow d. sparrow

B. Match the followings:

Fish	on land and in water
Ringworm	fins help to swim in water
Protozoa	six legs and mostly fly
Amphibian	segmented body
Insect	simple, unicelluar animal

C. Fill in the blanks with suitable words.

1. A hard part on the back of our body is known as.....
2. Backbone helps us to stand.....
3. Sizes of bones of different animals are.....
4. Vertebrate animals have.....inside them.
5. Fishes have.....to breathe.

D. Write "T" for true and "F" for false statements.

1. Back bones are not found in lions. ☐
2. There are fixed shape of vertebrates. ☐
3. Bones make body strong and soft. ☐
4. Star fish is an insect. ☐
5. An ostrich can fly. ☐
6. Whale is an aquatic mammal. ☐

E. Answer these questions.

1. Name any two invertebrates that live in water and three invertebrates that live on land.
2. Name any two unicellular invertebrates and three multicellular invertebrates.
3. What is skeleton? Write any two functions of skeleton.
4. Name any two vertebrates that lay eggs and three vertebrates that directly give birth to their young ones..
5. **Define the followings:**

a.	vertebrate	b.	invertebrate
c.	amphibians	d.	fishes
e.	reptiles	f.	birds
g.	mammals	h.	protozoa
i.	flatworms	j.	roundworms
k.	ringworms	l.	insects
m.	mollusca	n.	chinodermata

6. **Differentiate between invertebrate and vertebrate.**
7. **How does frog breathe?**

8. **Differentiate between:**
   a. round worm and pin worm
   b. fish and frog
   c. bat and bird
   d. whale and fish
9. **Classify vertebrate with one character and an example.**
10. **Classify invertebrate with one character and an example.**

F. Give reasons.

a. Horse is called a vertebrate.
b. Butterfly is called an invertebrate.

G. Make meaningful words from the jumbled letters.

i. ISPCES

[hint: lives in water]

ii. GLUN

[hint: helps to breathe on land]

iii. HIDOPNL

[hint: aquatic mammal]

iv. RFOG

[hint: lives in land and water]

v. MMMALA

[hint: gives birth directly]

Warm up

a. 

b. 

c. 

d.

1. Can you identify the given diagrams? Express your response with a tick (✓) or a cross (✗).

a	b	c	d

2. Have you really seen these animals? Respond with a (✓) or a cross (✗).

a	b	c	d

3. Can you write their names?

a	b	c	d

Project Work

1. Observe different types of animals around us and separate them in the given table.

Invertebrates	Vertebrates
1.	_____
2.	_____
3.	_____
4.	_____

4.1.2 Classification of animals on the basis of breeding methods

The process by which new living beings, resembling their parents, are produced is called reproduction. Reproduction is the main characteristics of living things. All animals do not reproduce in the same way. Some animals are born whereas others are hatched from eggs. Animals reproduce for the continuity of their generations.

Animals which Lay Eggs

Birds, fish, amphibians, reptiles and insects reproduce through eggs. The young ones grow inside the eggs of animals. Eggs are found in all sizes and colours. The shape of an egg is usually round and oval. The egg of an ostrich is the biggest egg in the world. Its weight is about 1.5kg.

Birds lay eggs in nests and sit on them to keep them warm. The eggs hatch and baby birds come out. They are of the same kinds as the parent bird. All eggs have a similar structure with hard protective outer covering called shell.

Some other animals such as fishes, frogs and insects lay their eggs in water. Sea turtles, tortoises, lizards, crocodiles and snakes lay their eggs in the soil and sand.

Birds which sit over the eggs and use the heat of their bodies to keep the eggs warm is known as incubation. After a few days, when the young animal is fully developed, it breaks open the shell of the egg and comes out. This is known as hatching.

Fig. 5.1

Do you know?

Al Most animals that live on land lay eggs that are protected by hard shells.

Animals which Give Birth to Babies

Animals that give birth to young ones and then feed them with their milk are called mammals.

They are the most developed among all animals. Their bodies are covered with hair. Cats, dogs, elephants, tigers are some mammals. Man too is a mammal. Though bats fly like bird, they too are mammals. Whales and dolphins live in water and hairless but they are also mammals. Parental care is most advanced in human beings.

Fig. 4.1.2

[Note : Animals which give birth to their young ones directly are called viviparou. whereas animals which lay eggs are called oviparous.]

Care of the young

Mammals take care of their babies for a long time. Usually the mother cares for the young. In certain mammals, the father also helps. Father hunts for food and guards the young ones. The mother feeds the babies, cleans them and keeps them warm. Mother protets them against enemies. As they grow, they live on their own. Human beings also look after their children.

Points to Remember

- The process by which new living beings, resembling their parents, are produced is called reproduction. Reproduction is the main characteristics of living things.
- Birds, fish, amphibians, reptiles and insects reproduce through eggs.
- All eggs have a similar structure with hard protective outer covering called shell.
- Sea turtles, tortoises, lizards, crocodiles and snakes lay their eggs in the soil and sand.
- Birds which sit over the eggs and use the heat of their bodies to keep the eggs warm is known as incubation.
- Animals that give birth to young ones and then feed them with their milk are called mammals.

GLOSSARY

backbone	:	the line of bones down the centre of the back
resembling	:	having a similar appearance
characteristic	:	a feature or quality of something
continuty	:	the unbroken
generations	:	born and living at about the same time
protective	:	intended to protect someone or something
shell	:	the hard protective outer cases
bursts	:	break open or apart suddenly
jelly	:	semi solid, somewhat elastic material

Exercise

A. Fill in the blanks with suitable words.

1. The process of producing young ones is called.....
2. The larva of a butterfly is called a.....
3. The young one of a frog is called a.....
4. Animals need to reproduce to continue their.....
5. The larva of a housefly is called a.....

B. Write "T" for true and "F" for false statements.

1. Cow gives birth to baby directly. ☐
2. Frogs lay eggs on leaves. ☐
3. Fishes lay eggs but do not care their young ones. ☐
4. All animals feed their babies with their milk. ☐
5. Whale is a fish. ☐

E. Match the followings:

Rat	lay eggs in water
Pigeon	lay eggs on the leaves
Fish	flying mammal
Butterfly	lay eggs in nest
Bat	give birth babies

D. Answer these questions.

1. Why do animals reproduce?
2. How do birds reproduce?
3. What are the four stages in the life cycle of a butterfly?
4. Why do some animals lay eggs in large numbers?
5. How do mammals take care of their young ones?
6. Define the followings :
   - a. Life cycle
   - b. Reproduction
   - c. Larva
   - d. Hatching
   - e. Incubation

7. How do birds look after their eggs to hatch?
8. Differentiate between the life cycle of a butterfly and a frog.
9. Write two differences between the reproduction in mammals and birds.

E. Choose the best answer from the given alternatives.

i. It lays eggs only to produce new babies.

a. butterfly b. bat
c. cat d. rat

ii. It is a viviparous animal.

a. snake b. bat
c. butterfly d. crocodile

iii. The incubation period of hen is…..

a. 21 days b. 31 days
c. 11 days d. 41 days

iv. It is breathing organ of tadpole.

a. skin b. gills
c. lungs d. mouth

v. It feeds upon leaf.

a. butterfly b. caterpillar
c. pupa d. eggs of butterfly

F. Make meaningful words from the jumbled letters.

OROUSVIPA ☐ [Hint: lays egg]

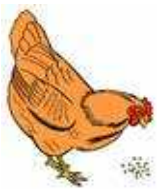
VALAR ☐ [Hint: eats lots of leaves]

FTTLBUERY ☐ [Hint: beautiful insect]

LETAODP ☐ [Hint: baby frog]

PAUSVIVIRO ☐ [Hint: lays egg]

Warm up activities

a. Can you identify the given diagrams? Express your response with a tick (✓) or a cross (×).

a	b	c	d

b. Have you really seen these animals? Respond with a (✓) or a cross (×).

a	b	c	d

c. Can you write these are oviparous or viviparous?

a	b	c	d

d. Choose the correct dropdown based on the animals classification.

Lay Egg

Give birth

Project Work

i. Make a separate list of animals with a backbone and those without a backbone that you see around your home. Choose any two animals from your list and draw pictures of them.

ii. Collect pictures of animals laying eggs and giving birth from old books or magazines. Divide all into two sections, one for laying eggs and the other for laying eggs. Post pictures of mammals in a visible place in the classroom.

iii. Collect plants from ponds, streams, or other water sources around you. Observe them and discuss the features with your friends.

4.1.3 Classification of animals on the basis of habitat

The ability of animals to adjust in particular environment is known as adaptation. Those animals which are able to adapt can survive. The others which are not able to adapt cannot survive. The home or natural environment of a living thing is called its habitat. Animals can be grouped according to their habitat.

Terrestrial Animals

Animals which live on land are called terrestrial animals. Such animals have legs to move on the ground and lungs to breathe in air. Dogs, cows, buffaloes, donkeys and horses are domestic animals. They have legs to run around. They also have a pair of horns on their head that protect them from enemies. They have a pair of split hooves on each foot.

Fig. 4.1.3.1

These animals have two sets of teeth. The front teeth are sharp and strong for biting and cutting the plants. These teeth are called incisors. They have strong and flat grinding teeth at the back for chewing the parts of the plants.

Fig. 4.1.3.2

Desert Animals

Animals which live in desert are known as desert animals. They have feet with pads which do not sink deep in sand, which help them to walk fast on the sand. A camel has two humps in its body which store fat. It can also store water in their stomach. They can live for many days without food and water. They have thick skin and it is covered by fur which prevents the loss of water from its body. In desert, camel is used as chief means of transportation. Therefore, it also called a ship of the desert.

Fig. 4.1.3.3

Mountain Animals

Yak and polar bears live in cold climates which is covered with snow. They have thick coat of fur and thick layer of fat below the skin that protect them from cold. Animals which live in high altitude are known as mountain animals.

Fig. 4.1.3.4

Carnivorous Animals

Tigers, lions, jackals and leopards have sharp teeth and claws for tearing the flesh. They have powerful legs to chase their prey. They have sharp eye sight and good sense of smell. Animals which eat flesh of other animals are known as carnivorous animals.

Fig. 4.1.3.5

Arboreal Animals

Some animals spend most of their time on trees are called as arboreal animals. Monkeys, squirrels, tree lizards, etc. are arboreal animals. They have claws and broad lip girdles to support their body while climbing. The spines or plates on their bodies prevent them from slipping. A monkey's long and curly tail helps it to hang down from a branch.

Lizards have adhesive pads on their legs, which help them to climb on trees and walls.

Squirrels have teeth and claws that help them with grabbing and eating hard foods like nut and acorns.

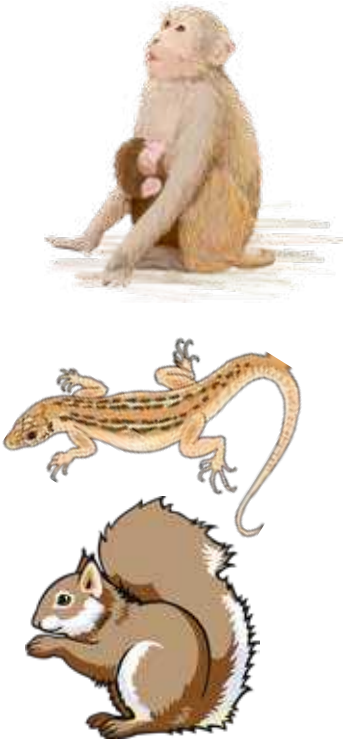


Fig. 4.1.3.6

Aerial Animals

Animals that fly in the air are called aerial animals. Such animals, like birds and bats, have wings to fly. Their bodies are light because of light bones and feathers. The shape of the body is so light that they can easily go through the air.

Fig. 4.1.3.7

They do not have teeth to eat their food. They swallow their food. They have strong beaks.

Many insects are also aerial animals that can fly with their wings. The body of an insect consists of three parts: head, thorax and abdomen.

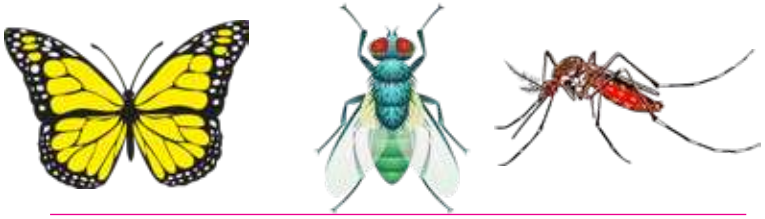


Fig. 4.1.3.8

Aquatic Animals

Animals that live in water are called aquatic animals. Fishes, snails, turtles, crabs are some aquatic animals. Fishes have fins that help them to swim in water and tails help them to change its directions. A fish breathes through gills.

Fig. 4.1.3.9

The webbed feet of a duck and the paddle-like flippers of a turtle help them to push back water while swimming.

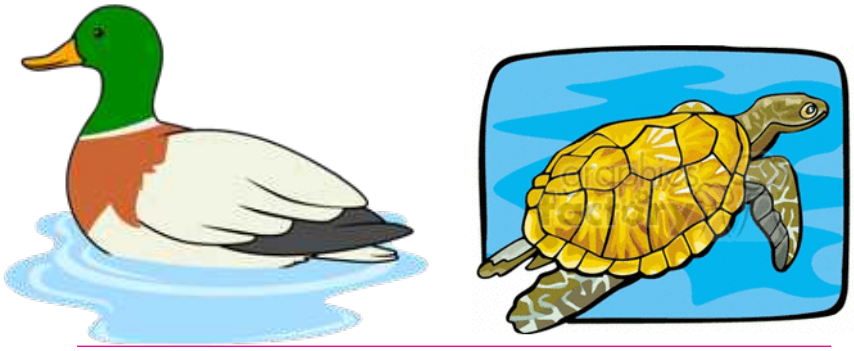


Fig. 4.1.3.10

Amphibians

Animals that spend their lives partly in water and partly on land are called amphibians. Frogs, toads, salamanders and newts live both on land and water. They have limbs that are suited to swim in water. They have moist skin to breathe in water. However, they also have lungs which help them to breathe on land.

Fig. 4.1.3.11

4.1.3.1 The texture of terrestrial/land animals

Parts	Description
Body shape	• Its body texture is different • Some terrestrial animals have sharp teeth with pointed canines and sharp claws to catch their prey
Outer cover	• Polar bear living in the polar region and Yak living at high mountain range have thick coat of fur on their body, which protects them from the chilling cold. • Camel has thick skin and very little hair on their body. This thick skin protects it from scotching sun during the day and also from the nights that is cold. Camel has a hump at its back. It can live on its fat in the hump, and can survive without food or water for several days. • Penguin and polar bear have a thick layer of fat called blubber under their skin to keep them warm. • Emperor penguin and their chicks huddle together. The birds take turn to occupy the outermost position.
To assist in the move Limbs	• Most of these animals have legs, which help them to run fast. They have to run fast to catch their prey or to protect themselves from becoming prey of other animals (predators) • These animals have well developed sense organ, which helps them to look for food in the dark night or by mere movement of their prey.
Breathing organs	• They breathe through well-developed lungs.

4.1.3.2 The composition of aquatic animals

Parts	Descriptions
Body shape	• Aquatic animals have special body shape like spindle shaped, flattened or disc shape. Dog fish, spindle shaped sting ray has a flattened shape. Aquatic animals swim in water.
Outer cover	• They have a hard protective shell as an outer covering. • Many species of fish are covered with scales that protect them like roof shingles protect a house
Organs that help move	• They have special organs called fins or paddles, which help them in swimming. • The back legs of frogs, are stronger than their front legs, this help them to jump. They have webbed feet which help them to swim in water.
Breathing organs	• Most of the aquatic animals breathe air dissolved in water, through organs called gills. Animals like dolphins and whale breathe through their lungs. • Special features that make them a perfect amphibian is the lungs to breathe on land and moist skin to breathe in water.

Quick Reply

- Name two aquatic animals.
- Name two amphibians.
- Name two domestic animals.
- Name two plants eating animals.
- Have you seen frogs and toads?

Points to Remember

- The ability of animals to adjust in a particular environment is called adaptation
- Animals which live on land are called terrestrial animals.
- Land animals mainly breathe through their lungs.
- Animals which live in water are called aquatic animals.
- Aquatic animals breathe through gills or skin.
- Animals which live both on land and in water are called amphibians.

GLOSSARY

split	:	break something
hooves	:	horny parts of the foot
incisor	:	a narrow edged tooth at the front of mouth
humps	:	large, round raised areas or parts
altitude	:	height of something
tearing	:	ruling apart
sense	:	feeling of something
slipping	:	the action or fact of sliding
adhesive	:	able to stick fast to the surface
pads	:	thick pieces of soft materials
thorax	:	the part of body between neck and abdomen
abdomen	:	the belly, part containing digestive and reproductive organs
flippers	:	broad flat limbs without fingers

Exercise

A. Fill in the blanks with suitable words.

1. Animals that fly in the air are called.....
2. Monkeys use their.....for balancing themselve.
3. Fishes use.....to breathe.
4. Camel is known as the ship of the .....
5. Animals adapt themselves according to their.....

B. Write 'T' for True and 'F' for False statements.

1. Animals that live both in water and on land are called amphibians. ☐
2. Yak consists of long and thick hair. ☐
3. Wall lizard consists of adhesive pads. ☐
4. Tigers consist of thick front teeth and strong paws. ☐
5. Goats have an un-split hoof on each foot. ☐
6. Birds have teeth to eat their food. ☐

C. Match the followings:

Cow	flat and thick hoof
Ant	sharp teeth and strong paws.
Camel	thick and long hair
Lion	breaking food and grinding teeth
Yak	head, thorax and abdomen
Duck	breathe through gills
Fish	breathe oxygen
Dolphin	from atmosphere
Frog	webbed feet, soft and moist skin

D. Answer these questions.

1. Define the followings.

a. Adaptation
b. Habitat
c. Aquatic animals
d. Terrestrial animals
e. Arboreal animals
f. Amphibian animals

2. Differentiate between camel and yak according to their body structure.
3. Write three animals characters of a buffalo.
4. Write three animals characters of a lion.
5. Draw clear and labelled diagram of a fish.
6. Give any two animals characteristics of a duck.
7. Write different between fish and frog according to their body structure.
8. How are animals grouped according to the environment they live in?
9. How are animals grouped according to the food they eat?
10. The polar bear is an animal found in a very cold region. How is it adapted to its environment?
11. Why do aerial animals have light bodies?
12. The frog is an amphibian. How is it adapted to live on land and in water?

E. Differentiate between :

1. Arboreal and herbivores
2. Animals that live in desert and animals that live in cold places.
3. Desert animals and mountain animals.
4. Aquatic and amphibians.

F. Give reasons :

1. Yak and polar bear can live in cold places.
2. Tiger and lions are called carnivorous animals.
3. Camel is a ship of the desert.
4. Frog is an amphibian.

G. Choose the best answer from the given alternatives.

i. It is an aquatic animal.

a. hen b. duck
c. fish d. both 'b' and 'd'

ii. It is an arboreal animal.

a. fish b. sparrow
c. monkey d. dog

iii. It is a flesh-eating animal.

a. herbivore b. carnivore
c. omnivore d. none of these

iv. It has adhesive pad to live in ceilings of our house.

a. lizard b. wall lizard
c. house fly d. snake

v. It is a mountain animal.

a. yak b. camel
c. dolphin d. zebra

H. Make meaningful words from the given jumbled letters

i. OPLEDAR ☐

[Hint: runs very fast]

ii. IZALRD ☐

[Hint: crawling animal]

iii. UATIC AQ

[Hint: water]

iv. RAEIAL

[Hint: air]

v. AKY

[Hint:mountain animal]

Warm up activities

a. b. c. d.

a. Can you identify the given diagrams? Express your response with a tick (✓) or a cross (×).

a	b	c	d

b. Have you really seen these insects? Respond with a (✓) or a cross (×).

a	b	c	d

c. Can you write their names?

a	b	c	d

Project Work

i. Write the name of 10 terrestrial animals with one character.

S. No.	Name of Animals	No. of legs	Type of hoofs	Horn	Food	Claws

ii. Collect the pictures of the animals given below. Separate them into different group and paste their pictures in a chart paper.

ant, tiger, sparrow, lion, goat, camel, bear, butterfly, sheep, crocodile, frog, duck, cat, crow, rabbit, eagle, donkey, fox, housefly

Sharp Pointed teeth and claws	Hoofs	Wings and hollow bones	Jointed legs and wings	webbed feet

4.2 Differences between aquatic animals and terrestrial animals

Aquatic animals	Terrestrial animals
An aquatic animal is an animal who lives in water.	A terrestrial animal is an animal who lives exclusively in the land.
Respire through gills or their skin.	Respire through lungs or trachea.
Show adaptations such as streamline bodies, fins, webbed feed and air bladder.	Show adaptations such as legs, waterproof skin, feathers, covered eggs and kidney.
Skin is slimy, slippery and soft.	Skin is leathery, hard or spiny.

4.3 Classification of plants

4.3.1 Herbs

Small plants with soft green stems and a short life span are known as herbs. Usually, their height is less than one metre. They have weak bodies and grow only in one season. Many flowering plants, vegetables, wheat, paddy, maize are some herbs.



Fig. 4.3.1

4.3.2 Shrubs

Medium sized, bushy plants with a longer life period than herbs and have strong stems with many branches are known as shrubs. They are weak unlike big trees. They live for more than one year.


cotton plant


rose plant


tea plant

Fig. 4.3.2

4.3.3 Trees

Tall plants with hard woody stems and many branches are known as trees. Roots are well developed. They live for many years.

4.4.1 Differences between plants found in terrestrial and aquatic

Plants grow in different places. The ability of plants to live in a particular place is known as adaptation. Plants grow in places where soil and climate are suitable for them.

Depending upon the habitat, plants can be divided into two groups: Terrestrial plants and aquatic plants.

Fig. 4.3.3

Terrestrial Plants

Most plants grow on land. Plants that grow on land are called terrestrial plants.

In hilly areas, trees are generally tall and straight. Some have needle- like leaves in place of ordinary leaves and cone-like parts instead of flowers. These trees grow in a cold climate.

Fig. 4.3.4

- In the terai, trees have lots of branches. These trees can bear heat, their leaves in winter protect themselves against the cold. In general, the leaves of the plants in winter shed down. Mango, sheeshau, peepal, banyan, sal etc. are some plants of terai.

peepal banyan

Fig. 4.3.5

- In hot and damp areas too, plants have lots of leaves. But, they do not shed their leaves in winter. They remain evergreen throughout the year. Teak and coconut tree are the examples. The other plants are : Pepper, rubber, sugarcane and cotton.

Fig. 4.3.6

- Ferns and mushrooms are those plants that grow in damp and shady places. These plants do not need plenty water and sunlight.

Fig. 4.3.7

- Plants that grow in desert areas are very different. Cactus and tumbleweed,agave, desert sage, joshua tree are desert plants. Some desert plants do not have leaves. Not having leaves is a way of saving water as water is not easily found in deserts.

Aquatic Plants

Fig. 4.3.8

Plants that grow in water are called aquatic plants. There are three types of aquatic plants.

1. Floating Plants

These plants float because they are either light with spongy or air-filled parts or are small in size. Duckweed, water lettuce and water hyacinth are such plants.

Fig. 4.3.9

2. Fixed Plants

Some plants are fixed to the bed of the pond. Such plants have a long hollow stem and broad floating leaves. The stems are hollow and light to keep the leaves and flowers float.

lotus waterlily

Fig. 4.3.10

3. Underwater Plants

Plants such as tape grass and hydrilla grow underwater. Their narrow leaves have no stomata. They breathe through their body surface.

tape grass hydrilla plant

Fig. 4.3.11

Parts of a Plant

Non-flowering plants are simpler than flowering plants. In some non-flowering plants, roots, stems and leaves are not distinguished.

Flowering plants have distinct roots, stems and leaves. They have flowers that develop into fruits and fruits consists of seeds. Seeds germinate into new plants. Roots help plants to grow straight and absorb water, minerals from soil. Stem supply water and minerals to different part of a plants. Stems bear leaves, branches, flowers and fruits.

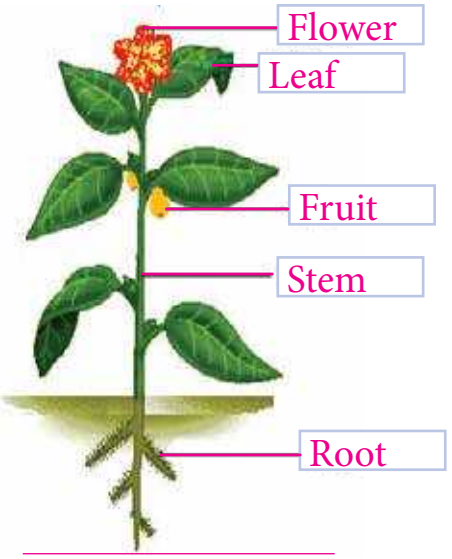


Fig. 4.3.12

Quick Reply

- Name different parts of a plant.
- Name some fruits you like the most.
- Name three terrestrial plants.
- Name three aquatic plants.

Points to Remember

- On the basis of their habitat, plants can be divided into two groups: terrestrial and aquatic plants.
- The plants, which grow in land, are known as terrestrial plants.
- The plants, which grow in the water, are known as aquatic plants.
- Plants can be divided into three groups on the basis of size: herb, shrubs and trees.
- Most plants consist of three parts i.e. root, stem and leaf.

GLOSSARY

terai : flat land area
damp : slightly wet
shady : situated in or full of shade
float : rest or move on or near the surface of liquid
hollow : empty space inside
distinguish : differentiate
classification : a systematic arrangement in groups
species : a group of animals that are more like each other than they are like any other group of animals
property : a special quality of something
mammal : any of a class of warm-blooded vertebrates that include human beings and all other animals that nourish their young with milk produced by mammary glands and have skin usually with some hair
bird : any of a class of warm-blooded egg-laying vertebrates with a body covered with feathers and forelimbs modified as wings
reptile : any of a group of cold-blooded, air-breathing vertebrates (such as snakes, lizards, turtles, and alligators) that usually lays eggs and has skin covered with scales or bony plates
amphibian : any organism that is able to live both on land and in water; especially, any of a class of cold-blooded vertebrates (such as frogs and salamanders) that in many respects are between fishes and reptiles
insect : any of a class of arthropods (such as butterflies, true bugs, two-winged flies, bees, and grasshoppers) with a three-part body clearly divided into head, thorax, and abdomen; three pairs of jointed legs; and usually one or two pairs of wings
fish : a cold-blooded vertebrate that lives and breathes in water and typically has a long, scaly, tapering body, limbs developed as fins, and a vertical tail fin

Exercise

A. Fill in the blanks with suitable words.

1. The underground water plants have.....and.....leaves
2. Trees are.....and.....plants.
3. Herbs are.....and.....plants.
4. Flowers develop into.....
5. Plants which live for one season are called as.....

B. Write "T" for true and "F" for false statements.

1. Tomatoes live for many years. ☐
2. Duckweed is a fixed aquatic plants. ☐
3. In places where there is plenty of rain and sunshine, plants cannot grow properly. ☐
4. Mango is an aquatic plant. ☐
5. Ferns are flowering plants. ☐

C. Match the followings.

Hydrilla	long and hollow stem
Cactus	under water plant
Lotus	needle-like leaves
Algea Pinus	damp and shody places
Ferm	desert plant

D. Answer these questions.

1. What is habitat?
2. What is plant adaptation?
3. What are terrestrial plants.?
4. What are aquatic plants?
5. Define the followings.
   a. Herbs b. Shrubs c. Trees
6. What kinds of plants grow in places with plenty of rain and sunlight?
7. How does a cactus survive in the desert?

8. A lotus plant grows in water. How does it adapt itself to live in water?
9. Why do aquatic plants have a hollow stem?
10. How do needle like leaves help the plants in cold regions?
11. Why do some trees lose their leaves in winter?

E. Differentiate between.

1. Herbs and Shrubs
2. Herbs and Trees
3. Shrubs and trees
4. Floating and fixed aquatic plants.

F. Give reasons.

1. Mango and peepal are called terrestrial plants.
2. Tulsi and marigold are called herbs.
3. Rose and cotton are called shrubs.
4. Some aquatic plants float on water.

G. Choose the best answer from the given alternatives.

i. It is a floating plant.

a. water hyacinth b. lotus
c. cactus d. hydrilla

ii. It is a fixed plant.

a. pistia b. lotus
c. cactus d. hydrilla

iii. It is an underwater plant.

a. Lemna b. pepper
c. cactus d. hydrilla

iv. It grows in deserts.

a. rubber b. mushroom
c. cactus d. coconut

v. It grows in cold mountainous place.

a. sal b. sugarcrane
c. cycas d. mango

H. Make meaningful words from the given jumbled letters.

i.	TLOUS		[Hint: fixed aquatic plant]
ii.	EETR		[Hint: lives for many years]
iii.	EHRB		[Hint: does not have stem]
iv.	ELOWATMNER		[Hint: has many seeds]
v.	EPIN		[Hint: plant of cold region]

I. Write the corect word to complete each sentences. Choose your answer inside the box.

Lizards, invertebrates, warm-blooded , Fish , reptiles, Snakes, mammary gland, cold-blooded, amphibians, Birds

i. A group of animals lacking of backbones or vertebral column is called.....

ii. Fishes, amphibians and reptiles are .....animals

iii. Mammals and Birds are ..... animals

iv. .....have gills to breathe and fins to move,

v. A group of animals that lives in and out of water are called .....

vi ..... covered with tough, dry skin, and protective scales.

vii. ..... have a hard beak to get food and to defend themselves and feathers to cover thelr body,

viii. Mammal havel..... that makes mik.

ix. Crocodiles..... turtle, and [are the four main groups of reptiles.

J. Diagrammatic questions

1. Direction: Write the characteristics of each animal group.

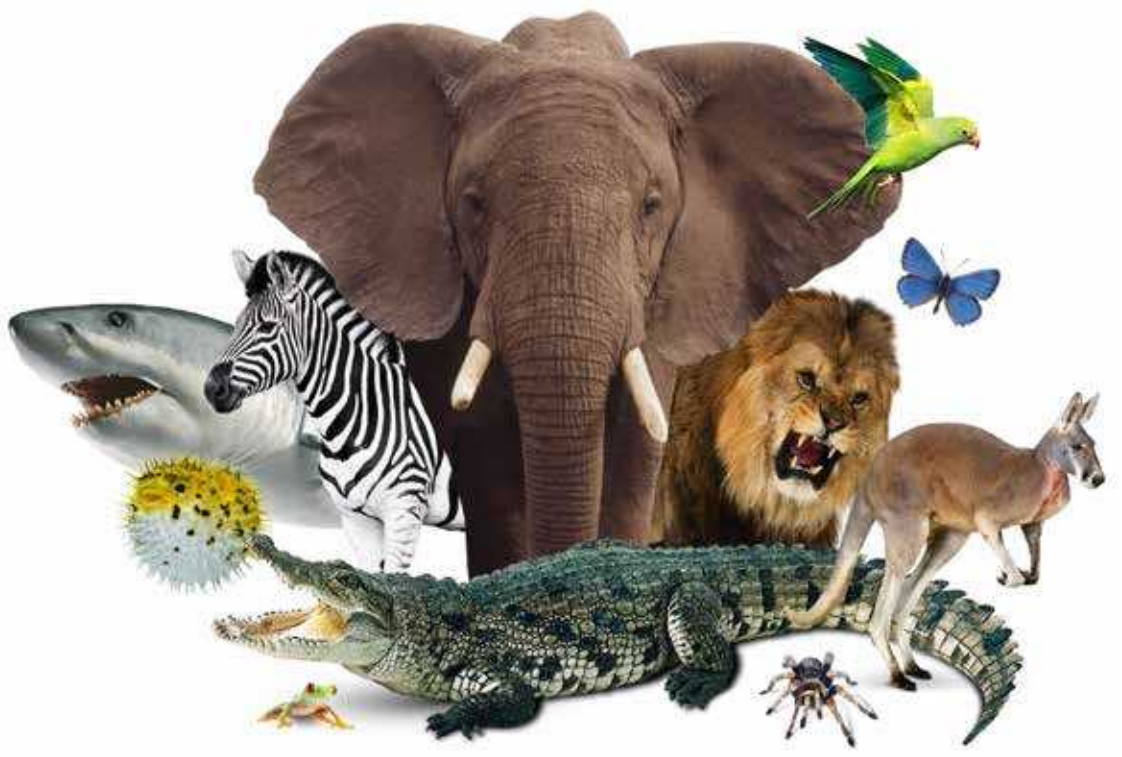
fur feathers gills hair beak
six legs fins dry skin hard skin

Mammal	Bird	Reptile	Fish

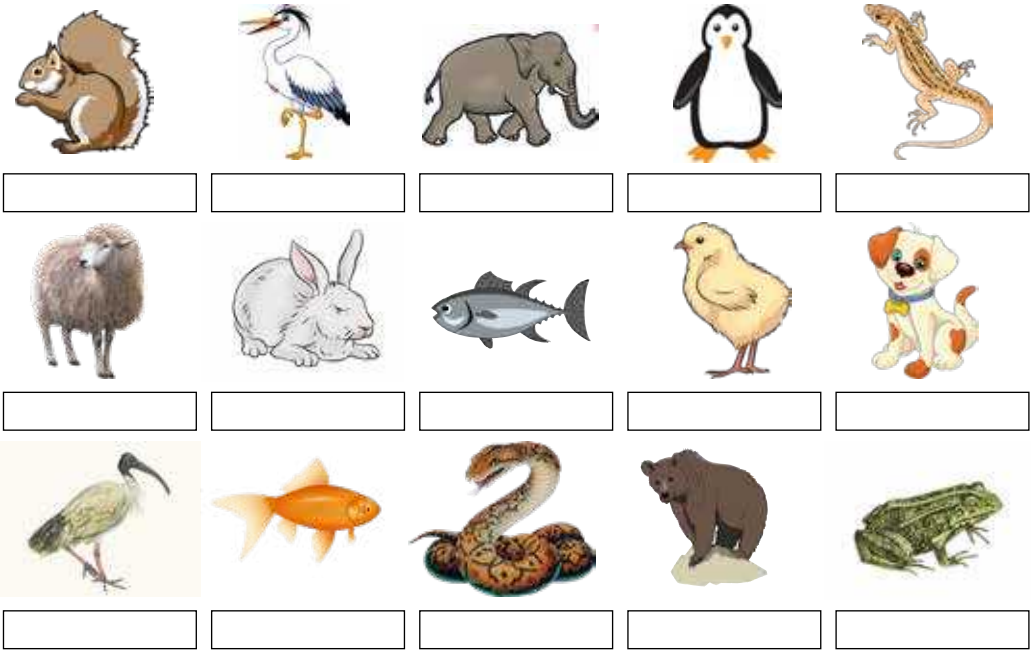
2. How are birds and insect alike?

_____

_____



2. What is this?
Mammal, bird, reptile, amphibian or fish



3. Vertebrates and Invertebrates

Vertebrate Animal Have a spine	Invertebrate Animal don't have a spine

mammals

birds

amphibians

fish

reptiles

molluscs

worms

spiders
(8 legs)

insects
(6 legs)

4. Vertebrate or invertebrate? Choose the right answer:







Warm up activities

i 

ii 

iii 

iv 

a. Can you identify these parts? Express your response with a tick (✓) or a cross (×).

i	ii	iii	iv

b. Have you really seen these parts? Respond with a (✓) or a cross (×).

i	ii	iii	iv

c. Can you write the name of these parts?

i	ii	iii	iv

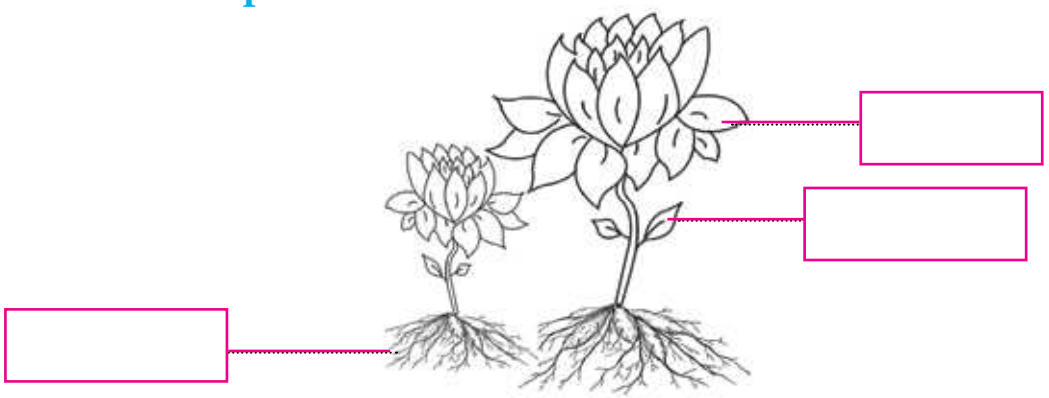
Project Work

i. Separate the following plants into terrestrial and aquatic plants.

Lotus, grass, cactus, water hyacinth, algea, tulsi, lotus, amala, mushroom, garlic, hydrilla, mango

Terrestial	Aquatic

ii. Copy the following picture in your exercise book and label all parts.



iii. Collect different plants from yours surrounding and write each character of root, stem and leaf.

Name of plants	leaf	stem	root
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

iv. Copy and complete the table below with characters.

Description	Herbs	Shrubs	Trees
Roots			
Stems			
Life duration			
Leaves			
Example			

Unit 5

Life Process

Student's Learning Outcomes

After studying this unit, the students will be able to :

- describe the stage of animal development.
- describe thf stage of plant development.
- identify and describe various stages of the life cycle of a butterfly.

Look at the picture below and answer the following questions.

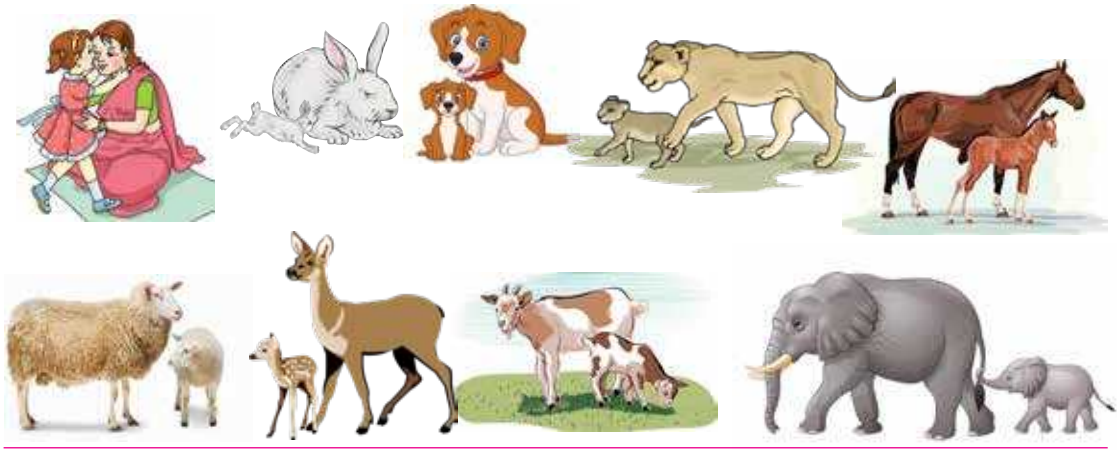


Fig. 5.1

i. What do you see in the picture? Make a list.

ii. What exactly is depicted in the picture?

iii. Complete the table below. Write down the conclusion of this activity.

Name of some Animals	Their youngs Ones
Dear	.....
Hare	.....
.....	Cub

.....	Leveret
Dog	.....
Kettle	.....
.....	Kitten
.....	Calf
Sheep	.....
.....	Colt
.....	Kid
Man	.....

Table 5.1

5.1 Stages of animal life

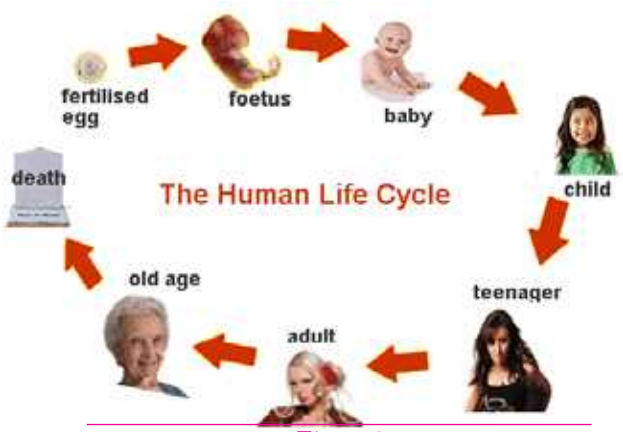


Fig. 5.2

Your life began as a single cell, no bigger than a pinprick, inside your mother's body. Over time, that cell grew and developed into your complex body containing trillions of cells. Our bodies change and develop over the course of a lifetime. From birth to old age, we go through several distinct stages of life. During infancy and continuing through childhood, we grow rapidly and pick up life skills. In our teenage years, we mature into adults. As grown women and men, we may have children of our own. Finally, in old age, our bodies start to wear out.

The picture above shows some animals and their young. This shows that all animals are born. Everyone has a baby. These young people grow up to be adults. Later, they, too, have children. As shown in the picture below, animals die after birth, reproduction, and aging.

The life cycle of some other animals

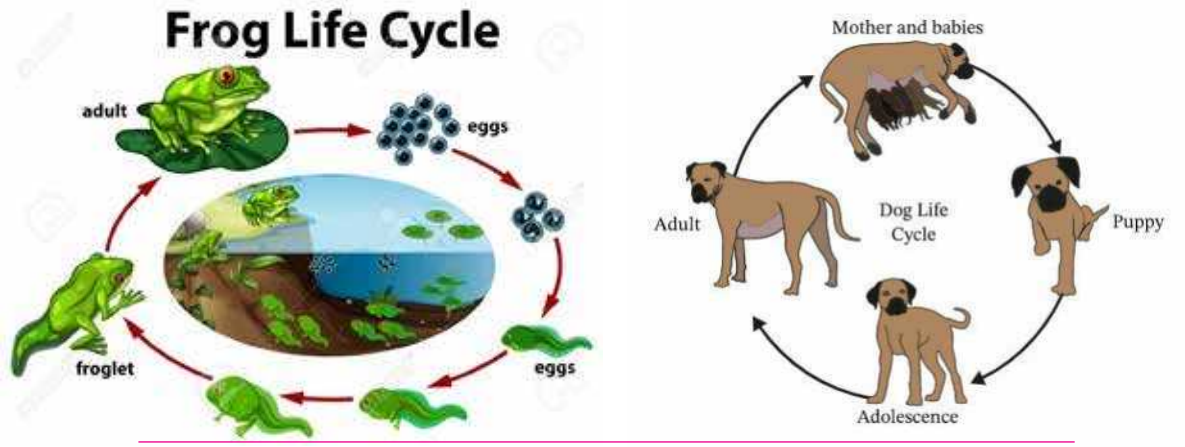


Fig. 5.3

Activity 5.1

The picture below shows the different stages of a goat's life cycle. Make a picture of each step and write it with the name.

5.2 Plant development stages

A series of stages that a plant passes through from conception (seed), to birth (sprout), to infancy(seedling), to juvenile(sapling), to adult (mature), to elderly (decline) or plant and to death (snag/rotting log) . There are three different plant life cycles: haploid (1n), diploid (2n), and the more common haploid-diploid (1n-2n). A haploid organism consists of a multicellular structure of cells that contain only one set of chromosomes, whereas, a diploid organism's multicellular stage contains two sets of chromosomes. All plants have a life cycle with alternation of generations. Plants alternate between diploid sporophyte and haploid

gametophyte generations, and between sexual reproduction with gametes and asexual reproduction with spores.

Life Cycle of a Plant start as seeds, then most form flowers and fruit. Plants start as seeds. After a flower is fertilized, most plants make seeds in the form of fruit. The seed inside the fruit can be planted and grow into a new plant, and the cycle starts over again.

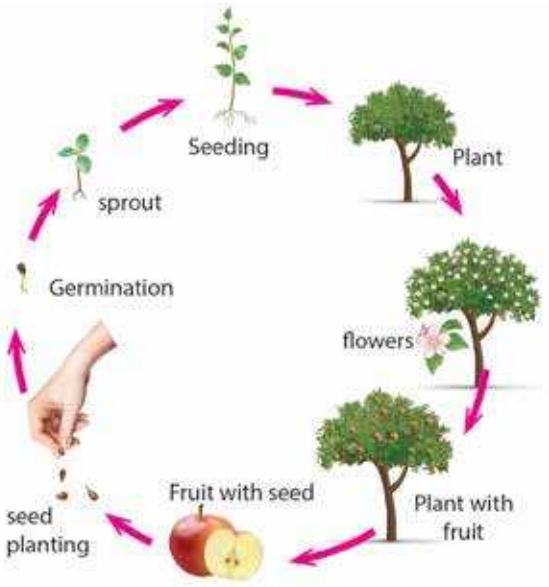


fig. 5.6 Plant life cycle

Seed

The plant life cycle starts with a **seed**. From the outside, seeds are protected by a tough layer, called **Outer Coat**. But inside every seed, there is a tiny baby plant, known as an **embryo**. The embryo has a root, shoot as well as the first true leaves.

Seeds wait to germinate until three needs are met:- **water, correct temperature (warmth), and a good location (such as in soil).**

Germination

The next stage is germination. Did you know? Before a seed germinates, it is DORMANT (means, alive but inactive). For germination, seeds need a suitable condition i.e. water, correct temperature and right location (such as in soil).

Fig. 5.7

When the proper conditions are met for the seed, it will begin to sprout. The first root begins to grow downward. There are few tiny hairs on the roots which absorb water and minerals from the soil.The process of the sprouting of seed usually after a period of dormancy is called germination.

Seedling

The next step is seedling. Seedling is a very young plant that grow after germination. It starts growing towards the sunlight. Plants need sunlight, nutrients, water, and air to survive and grow. Photosynthesis helps the seedling grow into a mature plant.

Adult Plant

When a plant becomes mature, it starts to grow flower (in a flowering plant) and flowers produce seeds. A mature plant has leaves, roots, stem, flower and fruits. Flowers are the reproductive part of a plant. It makes seeds which in turn make new plants. There are different parts of a flower such as petals, sepals, stamen, pistil, etc.

Pollination

Pollination plays a very important role in the plant life cycle. Flowers use pollen to make seeds through a process called pollination. Pollen is transferred by different pollinators, such as birds, butterflies, insects, bees or even wind.When a butterfly or other insect lands on a flower, dust of pollen sticks to its legs. As the butterfly flies to the next plant, it transfers the pollen to the pistil. So, when pollen move from the stamen to the pistil, it is called pollination. And once pollination takes place, the seeds start to grow

Seed Dispersal

Finally, seeds get dispersed (scattered) away to new places and the plant life cycle starts again. Seeds can get spread by animals, wind, and water.

What is Seedless Plants?

The plants which do not produce the flowers and seeds to reproduce are called Seedless Plants. Such as fern or mosses produce different kinds of cells called "Spores". Spores are the part of the plants or their remaining. New plants are produced from the spores and continue to grow.

Activities

Plant locally available seedlings such as gram, corn, beans, etc. in the school garden or pot. Observe the different stages of the plant you have planted (seed germination, capillary, flower, fruit). Prepare a report with the facts you have gained during the observation. Introduce to the class the information about each stage of plant development that you have prepared.

Can you tell?

- Look at the puppies and their mother in the picture. Do you see some similarities?
- Look at the butterfly and the caterpillar that has come out of the egg. Do you see any similarities?

The life cycle : Human vs Plant

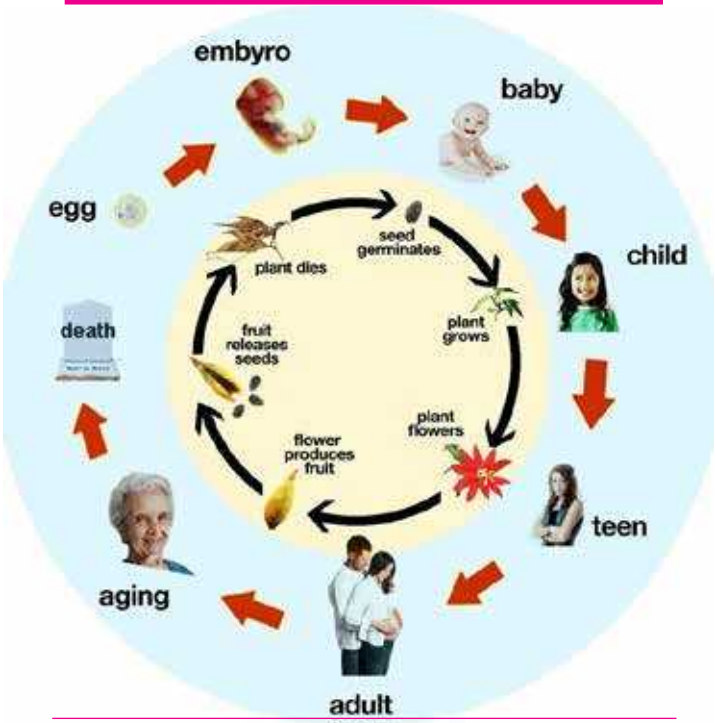


Fig. 5.8

5.3 Life cycle of Butterfly

The completion of one cycle from egg to adult or from young baby to adult is known as life cycle. Butterfly completes its life cycle in four stages. The young one that hatches from the egg is very different from the adult, it is called as caterpillar. It does not have wings. The larva is called caterpillar. The larva of housefly is called as maggot. The larva feeds and grows rapidly. After sometime, the larva stops eating and makes a covering for itself. Now, It is called a pupa. After a while, the pupa bursts and the adult insect comes out. Insect babies are not looked after by the parents.

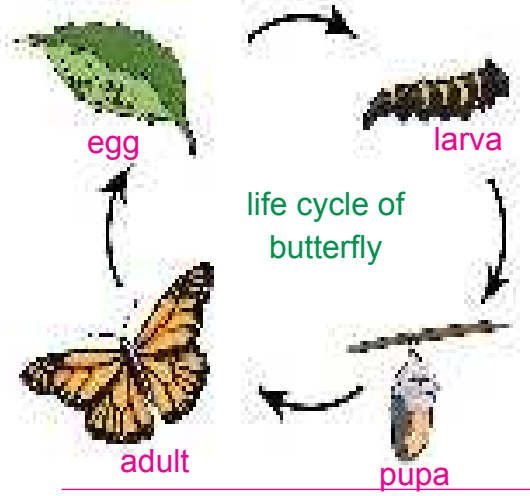


Fig. 5.9

Points to Remember

- From birth to old age, we go through several distinct stages of life. During infancy and continuing through childhood, we grow rapidly and pick up life skills. In our teenage years, we mature into adults. As grown women and men, we may have children of our own. Finally, in old age, our bodies start to wear out.
- A series of stages that a plant passes through from conception (seed), to birth (sprout), to infancy(seedling), to juvenile(sapling), to adult (mature), to elderly (decline) or plant and to death (snag/rotting log).
- Life Cycle of a Plant start as seeds, then most form flowers and fruit. Plants start as seeds. After a flower is fertilized, most plants make seeds in the form of fruit.
- The plant life cycle starts with a seed. From the outside, seeds are protected by a tough layer, called Outer Coat.
- The process of the sprouting of seed usually after a period of dormancy is called germination
- Pollination plays a very important role in the plant life cycle. Flowers use pollen to make seeds through a process called pollination. Pollen is transferred by different pollinators, such as birds, butterflies, insects, bees or even wind.

GLOSSARY

Fertilized egg: When sperm fertilizes (meets) an egg, this fertilized egg is called a zygote (ZYE-goat). The zygote goes through a process of becoming an embryo and developing into a fetus. The male reproductive system and the female reproductive system both are needed for reproduction.

Foetus : A fetus or foetus is the unborn offspring of an animal that develops from an embryo. ... In human prenatal development, fetal development begins from the ninth week after fertilisation (or eleventh week gestational age) and continues until birth.

Froglet : a young frog;

specifically : one that has recently metamorphosed from a tadpole.

Exercise

A. Choose the best answer from the given alternatives

i. Which of the following gives birth to babies?

a. Snake
b. Cockroach
c. Lion
d. Butterfly

ii. Butterflies and moths go through _____ stages in their life cycle before becoming adults.

a. one
b. two
c. three
d. four

iii. In the life cycle of a butterfly, at which stage does the organism cover itself in a cocoon?

a. egg
b. larva
c. pupa
d. adult

iv. Which of the following is not an egg- laying animal?

a. Eagle
b. Snake
c. Crocodile
d. Dog

v. Which of these happen FIRST in the life of a plant?

a. A seedling begins to grow.
b. A seed germinates or sprouts.
c. Flowers bloom on an adult plant.
d. A seedling grows into a young adult plant.

vi . Why are seeds important?

a. Because they can grow into new plants.
b. Because they are all the same size.
c. Because they always stay in one place.
d. Because they hold up the plant.

vii. Wind, water, and animals can DISPERSE plant seeds. What does DISPERSE mean?

a. to spread
b. to save
c. to get sick
d. to die

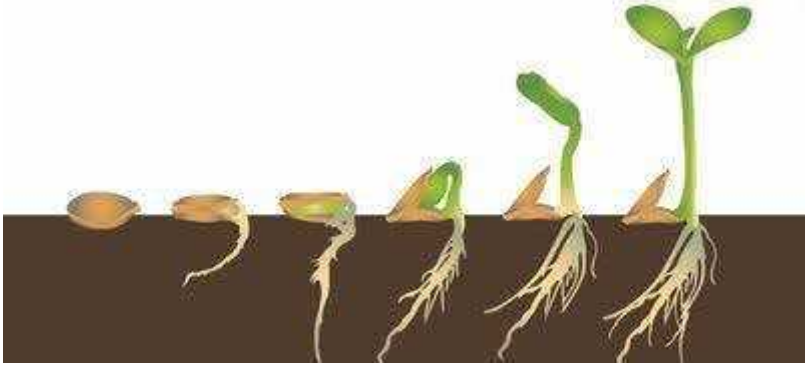
viii. What is the part of a flower from which a new plant grows?

a. Seed
b. Fruit
c. Flower
d. Cone

ix. A seed needs soil and water to grow. What else does it need?

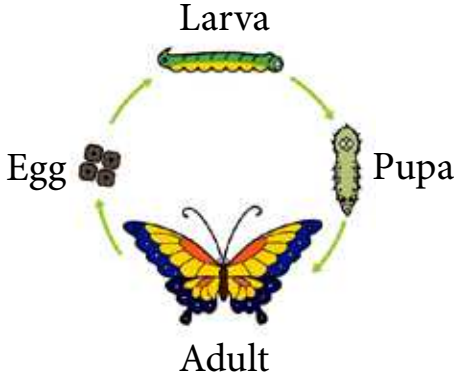
a. snow
b. money
c. the right temperature
d. exercise

x. The following illustration shows _____.



a. Seed Dispersal
b. Pollination
c. Photosynthesis
d. Seed Germination

xi. List the four stages of the complete metamorphosis life cycles in the correct order.



a. Egg, Pupa, Larva, Adult
b. Egg, Larva, Pupa, Adult
c. Adult, Egg, Larva, Pupa
d. Adult, Egg, Pupa, Larva

xii. What is the first stage of the insect life cycle?

a. larvae
b. egg
c. pupa
d. adult

xiii. What is the second stage of an insect life cycle

a. pupa b. larvae

c. egg d. adult

B. Write "T" for true and false " F" statements.

i. All living things have a life cycle.

ii. Our bodies change and develop over the course of a lifetime.

iii. Everyone has a baby. These young people grow up to be adults.

iv. All plants have a life cycle with alternation of generations.

v. Plants start as baby.

vi. Butterfly completes its life in two stages.

C. Write the corect word to complete each sentences. Choose your answer inside the box.

matamorphosis	reproduce	pupa
egg	tadpole	gills
larva	adult	life

i. A ladybug egg hatches and a _____ comes out.

ii. Through _____ a tadpole becomes and adult frog.

iii. During complete metamorphosis, a larva become a _____

iv. A _____ cycle includes many stages in a organism's life.

v. After the pupa stage, a ladybug is an _____

vi. A _____ is an immature form of a frog.

vii. Most birds and reptiles _____ by laying eggs.

viii. _____ allow a tadpole to breathe under water.

ix. Birds lay an _____ as part of their life cycle.

D. Answer these questions :

i. What are the stages of animal life?
ii. Illustrate the stages of animal life.
iii. What are the first and last stage of the life cycle an animal?
iv. What are the stages of plant development?
v. Draw a picture of the butterfly's life cycle.
vi. What is the life cycle of a plant called?
vii. Which stage does life cycle of plant begin from?

E . Make meaningful word from the jumbled letters

i. SCENSEADOLE

.....

(hint : (a young person) in the process of developing from a child into an adult.

ii. THBIR

.....

(hint: the emergence of a baby or other young from the body of its mother; the start of life as a physically separate being.

iii. TIONMINGERA

.....

(hint: the development of a plant from a seed or spore after a period of dormancy)

iv. LINEDGSE

.....

(hint: a young plant grown from seed)

v. BYAB

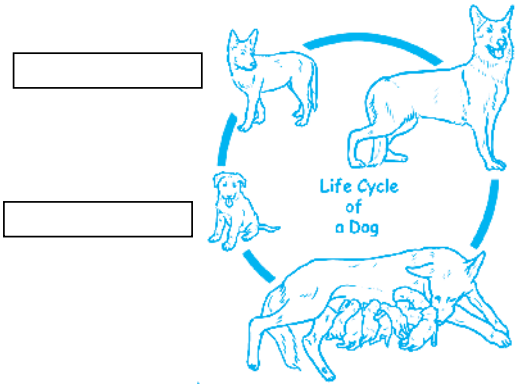
.....

(hint: a very young child)

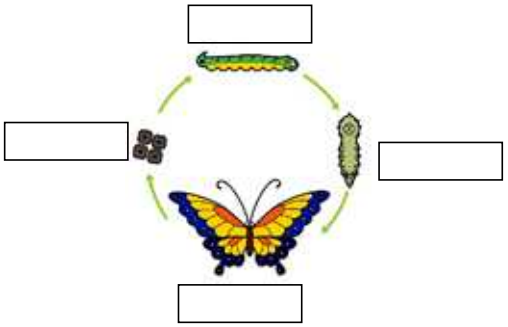
F. Diagrammatic questions

i. Animal life cycle

Drag the following words and rop them in the correct rectangle to complete each life cycle.



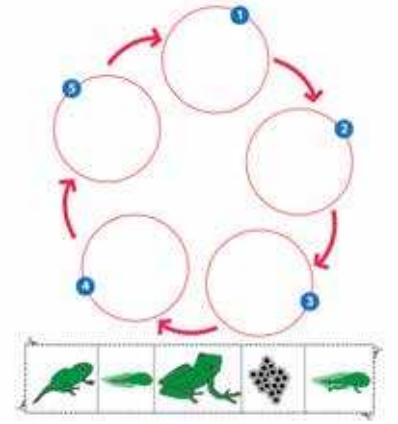
Adolescense
Birth
Adult
Puppy



Pupa
caterpillar
Butterfly
Egg.

ii Life cycle of a frog

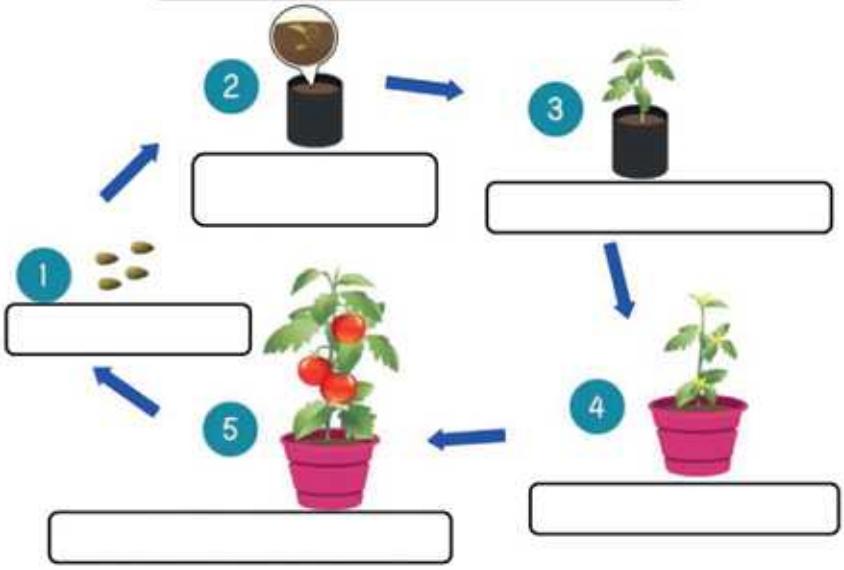
Cut out the pictures and paste them in the correct order on the life cycle chart.



iii. **Rearrange the stages of the growth of a plant in their correct order.**

Seed	plant	Seeding

iv. Stages of a plant's growth.



Warm up activities

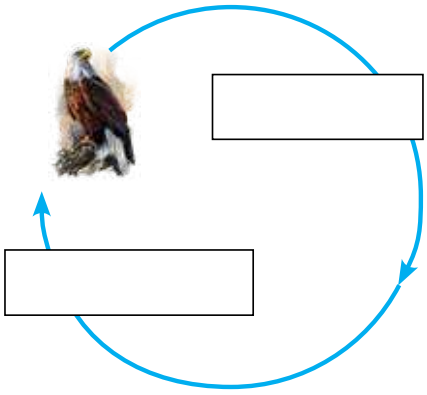
a. **Write down the animal's life stages below.**



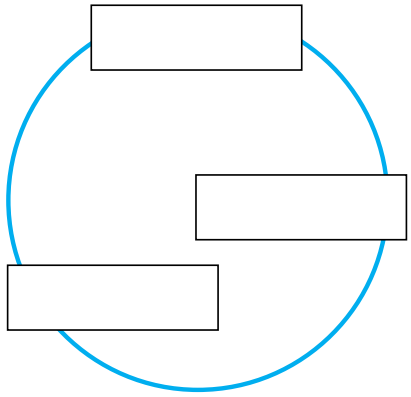
....
....
....
....

b. Complete the life cycle of an eagle and a turtle given below.

Life Cycle of an Eagle



Life Cycle of a Turtle



Four Stages

Some animals undergo metamorphosis. Metamorphosis is the major change in the form of structure of some animals or insects that happens as they become adult. Some animals go through a complete metamoprphosis, some an incomplete mamorphosis. Read the butterfly's life cycle.

Fist Stage:

A butterfly starts life as a very small, round, voal or cylindrical egg. Butterfly eggs are usually laid on the leaves of plants, so if you are actively searching for these very tiny eggs. You will have to take some time and examine quite a few leaves in other to find them.

Second Stage:

When the egg hatches, the caterpillar will start the work and eat the leaf they were born onto. This is really important because the female butterfly needs to lay her eggs on the type of leaf the caterpillar will eat- each caterpillar type likes only certain types of leaves.

c. Match the pictures with the descriptions of each stage of the kangaroo life.

While in the pouch, it latches onto its mother and safely grow for the next 7-9 months.

Kangaroos are two years old when they become adults.

In begins to come out of the pouch and will use its long tails to help balance.

The new-born is blind, hairless and so small

Project Work

i. Make a list of animals found in the water and on land. Collect pictures of the animals included in the list and present them in the classroom.

ii. Make a sample of the butterfly's lifecycle using local materials and paste it in the classroom.

iii. Prepare a report on the stages of plant development by observing the plants around your home or in your school garden.

Unit 6

Matter

Student's Learning Outcomes

after studying this unit, the students will be able to :

- identify the properties of water
- identify the three forms of water and to mention the role of heat in the process of transformation of water
- define the process of evaporation, liquefaction, freezing and melting.
- perform sample activities related to water cycle
- interpret unintended changes in the physical properties of the surrounding water as water pollution
- identify the causes of water pollution in your area and the measures adopted or can be adopted to reduce pollution
- use of water in technology (including panighatta and hydroelectricity)
- explain ways to conserve water resources.
- define air as a mixture of different gases, water vapor, and dust particles,
- identify the physical properties of air
- illustrate the use of air with examples
- define undesirable changes in the quality of the surrounding air as "air pollution,"
- present the causes, effects, and mitigation measures of air pollution at the local level,
- describe the physical properties of rock
- identify rocks and classify them into hard and soft rocks
- explain the general use of rocks

A. Choose the picture that matches the property

Flexible



Shiny



Hard



Breakable



Waterproof



Fig. 6.1

B. The figure below shows the model of molecules in water, air, and rock. Which models are water, air, and rock in it ? Discuss and write a conclusion. What are the commonalities among all these?

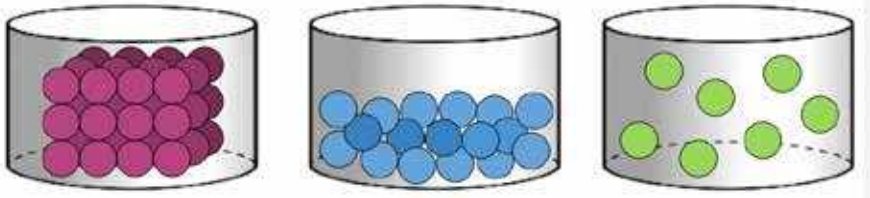


Fig. 6.2

6.1 Water

Everything around us is matter . Matter can be solid, liquid or gas . Some matter has parts that are too small to see. Everything in universe is composed of matter . Matter is everything that has mass and volume. Toys are matter. Balloons are matter. Water is matter, too.

Water is the most important liquid on Earth. It covers almost 75 percent of Earth's surface in the form of oceans, rivers, and lakes. All plants and animals need water to live.

People have many uses for water besides drinking. They use it for washing and cooking. They use it to irrigate crops and lawns, to clean streets, and to operate air-conditioning units and heating systems. They also use the power of flowing water to produce electricity.

Water plays an essential part in the beliefs and rituals of religions and cultures throughout the world. New members are welcomed into Christianity with a baptism by water. Hindus believe the Ganges River is a goddess brought to Earth. Native Americans place great importance on water in many of their ceremonies.

When matter is solid, molecules stay locked together in the same shape. When matter is liquid, molecules stay close together but can move around. When matter is a gas, molecules spread away from each other.

Matter

Matter is anything that occupies space and has mass

Fig. 6.3

6.1.1 Physical properties of water

It is essential to monitor the physical aspects of water quality to determine if the water is polluted or not. Physical characteristics can be determined by:

- **Color –** Pure water is colorless; colored water can indicate pollution. Colour can also show organic substances. The maximum acceptable level for the color of drinking water is 15 TCU (True color unit).
- **Turbidity –** Pure water is clear and does not absorb light. If turbidity appears in the water, it may indicate water pollution.
- **Taste and odor –** Pure water is always tasteless and odorless. If any type of taste and smell is present, it may indicate water pollution.
- **Temperature –** The temperature is not directly used to evaluate whether water is drinkable or not. However, in natural water systems like lakes and rivers, the temperature is a significant physical factor that determines water quality.
- **Solids –** If water is filtered to remove suspended solids, the remaining solid in the water indicates the total dissolved solids. If the dissolved solids in the water exceed 300 mg/l, it adversely affects living organisms as well as industrial products.
- **Shape -** Water has no shape. In its liquid form, it borrows the shape of the container it occupies.
- **Volume -** Water has volume . One milliliter (1 mL) of water has a volume of 1 cubic centimeter ($1cm^3$)
- **Ability to flow -** Water has the ability to flow. Capillary action refers to the ability of water to flow upwards against the pull of gravity through a porous material. Wood is such material.
- **Mass -** Water has mass and weighs
- **Solvent -** Water is called the "universal solvent" because it is capable of dissolving more substances than any other liquid.

6.1.2 The States of water

Water can occur in three states: **solid** (ice), **liquid**, or **gas** (vapor).

Solid water—Ice is frozen water. When water freezes, its molecules move farther apart, making ice less dense than water. This means that ice will be lighter than the same volume of water, and so ice will float in water. Water freezes at 0° Celsius, 32° Fahrenheit.

Liquid water is wet and fluid. This is the form of water with which we are most familiar. We use liquid water in many ways, including washing and drinking.

Three different forms of water

Fig. 6.4

Water as a gas—Vapor is always present in the air around us. You cannot see it. When you boil water, the water changes from a liquid to a gas or water vapor. As some of the water vapor cools, we see it as a small cloud called steam. This cloud of steam is a miniversion of the clouds we see in the sky. At sea level, steam is formed at 100° celsius, 212° Fahrenheit.

The water vapor attaches to small bits of dust in the air. It forms raindrops in warm temperatures. In cold temperatures, it freezes and forms snow or hail

Freezing: the substance changes from a liquid to a solid.

Melting: the substance changes back from the solid to the liquid.

Vaporization: the substance changes from a liquid to a gas.

Liquefacation : the process that generates a liquid from a solid or a gas

Sublimation: the substance changes directly from a solid to a gas without going through the liquid phase.

Properties of Matter

Solid:	It has a fixed shape and structure. It cannot be compressed. The particles are highly rigid. It has a definite mass. The particles are tightly packed.	 Tree  bicyle
Liquid:	Takes the shape of the container. It cannot be compressed. The particles are not rigid. It has a definite mass. The particles are closely packed.	 rain  juice
Gas:	It does not have a fixed shape and structure. It can be easily compressed. Particles are not rigid. It does not have a definite mass Particles are loosely packed.	 smoke  air

The role of heat in changing the state of water

The three states of water depend on air pressure and temperature. A solid may be liquefied by applying heat. This process is called fusion. At the beginning the temperature of a body rises with the application of heat and at one stage the temperature does not change even if more heat is

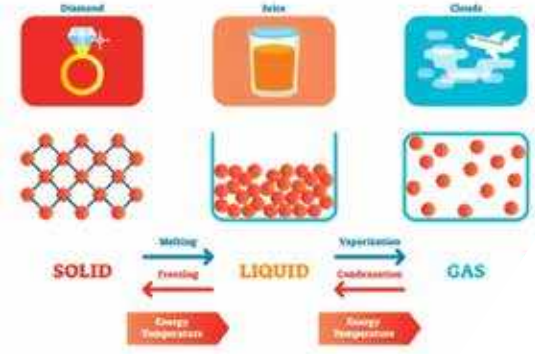


Fig. 6.5

applied. At this moment the amount of heat absorbed by a body is used to convert the solid into liquid only. If heat is applied to ice below 0°C, temperature will rise and reach at 0°C. After this if more heat is applied the temperature will not rise but the ice will begin to melt to water.

The amount of heat absorbed during the conversion of a solid to liquid is used to break the inter molecular bond of the molecules. On further heating, the temperature of water of 0°C starts to rise. At a stage, water starts vaporizing and the temperature remains unchanged. During this time, water absorbs heat to become vapor.

Here also the effect of heat is used to break the inter molecular bond among the liquid molecules. On the other way around, gaseous substance may be converted to liquid and liquid to solid by extracting heat from them. So, on the transformation of substances effect of heat is remarkable.

6.1.3 Water Cycle

Fig. 6.6

Water on Earth is always moving. It moves from Earth's surface into the atmosphere and then returns to the surface. This movement is called the water cycle.

The Sun, air, and gravity work together to create the water cycle. Heat from the Sun causes water to evaporate from the surface of lakes, streams, oceans, and plants. The water vapor moves into the atmosphere. In the cool air high above the ground, the water vapor changes into droplets of water. Large groups of these droplets are called clouds. Gravity pulls the droplets back to Earth as rain. The rain falls into oceans and lakes, enters rivers, and seeps into the ground.

Water is made of tiny units called molecules, which are combinations of even smaller units called atoms. A molecule of water is made of two hydrogen atoms and one oxygen atom. The scientific formula for water is H_2O.

6.1.4 Water pollution

Fig. 6.7

Water pollution is when waste, chemicals, or other particles cause a body of water (i.e. rivers, oceans, lakes) to become harmful to the fish and animals that need the water to survive. Water pollution can disrupt and negatively impact nature's water cycle as well. And hence, water pollution is the release of substances into bodies of water that makes water unsafe for human use and disrupts aquatic ecosystems. Water pollution can be caused by a plethora of different contaminants, including toxic waste, petroleum, and disease-causing microorganisms.

Causes of Water Pollution

Natural Causes of Water Pollution: Sometimes water pollution can occur through natural causes like volcanoes, algae blooms, animal waste, and silt from storms and floods.

Human Causes of Water Pollution : A lot of water pollution comes from human activity. Some human causes include sewage, pesticides and fertilizers from farms, waste water and chemicals from factories, silt from construction sites, and trash from people littering

Sewage : Even today sewage is flushed directly into streams and rivers in many areas around the world. Sewage can introduce harmful bacteria that can make people and animals very sick.

Farm animal waste : Waste from large herds of farm animals such as pigs and cows can get into the water supply from the runoff of rain and large storms.

Pesticides and herbicides : Pesticides are often sprayed on crops to kill bugs and herbicides are sprayed to kill weeds. These strong chemicals can get into the water through runoff of rain storms. They can also contaminate rivers and lakes through accidental spills.

Construction, floods, and storms : Silt from construction, earthquakes, floods, and storms can lower the oxygen content in the water and suffocate fish.

Factories : Factories often use a lot of water to process chemicals, keep engines cool, and for washing things away. The used waste water is sometimes dumped into rivers or the ocean. It can be full of pollutants.

Oil Spills : Some of the most famous incidents of water pollution have been oil spills. One was the Exxon Valdez oil spill which occurred when an oil tanker hit a reef off the coast of Alaska and over 11 million gallons of oil spilled into the ocean. Another bad oil spill was the Deepwater Horizon oil spill when an explosion at an oil well caused over 200 million gallons to spill into the Gulf of Mexico.

Acid Rain : Air pollution can also have a direct effect on water pollution. When particles like sulfur dioxide get high into the air they can combine with rain to produce acid rain. Acid rain can turn lakes acidic, killing fishes and other animals.

Measures to minimize water pollution

Use Less Plastic : It is very difficult to break down plastic after it is produced. Much of the plastic we consume ends up in the world's water supply, where it is even harder to fish out and safely throw away.

Do Not Dispose Oils in the Sink : While there is nothing wrong with consuming oils in your food or applying them on your body, it is a bad idea to dispose of grease, fat and used cooking oil in the sink or down the drain. It is better to dispose oils in the garbage, or collect all your excess oil in one bottle and then throw that away.

Cleaning Chemicals : Similar to oils, cleaning chemicals are hazardous when they enter the water supply. If you are emptying containers of household cleaning supplies, do it in the trash can, not in the sink.

Handle Toxic Chemicals Properly : The toxic chemicals like ammonia, bleach, paint, paint thinner, and many other chemicals are becoming a severe problem, and if these are dumped down the drain or the toilet, the effects add up. Therefore, proper disposal of these chemicals is important. There are many recycling centers and drop-off sites for safe disposal of these hazardous wastes that can take the old paint, used motor oil, and other chemicals and recycle them.

Avoid Buying Non-Biodegradable And Toxic Materials: Try to avoid buying products that contain persistent and dangerous chemicals in the first place. Nowadays, companies are selling non-toxic cleaners and biodegradable cleaners and pesticides.

Do Not Throw Away Medicines : Never throw away medicines in the water supply, either. Even if you do not need them, it is a bad idea to flush

pills, liquid or powder medications or drugs down the toilet or crush them in your kitchen sink disposal. Hormones and other compounds end up causing adverse effects on fish and other aquatic wildlife, on septic systems and contaminate drinking water. Follow the safe way for proper disposal for all types of medical wastes.

Avoid Toilets For Throwing Household Items : Do not throw household items, such as dust cloths, tissues, dental floss, wrappers, and other paper goods into the toilet when you are done with them. Toilet paper is specifically made in a way that breaks down easily in water pipes, but the fiber-reinforced cleaning products that pollute the system. Even though most homes have a garbage disposal system in the sink, it is better to use it as rarely as possible. This system can break down solid objects, but those items are harmful to the water supply. It is better to throw them in the trash can when possible.

Avoid Pesticides : If you need to overhaul your garden, attempt to do so without using any herbicides or pesticides. These are very harmful to the environment. Talk to landscaping companies in your area about environmentally-friendly replacements for these products.

Just Do Not Litter : If you are visiting an area where there is a nearby lake, river, or ocean, do not throw any type of litter or trash into or near the water. Even if you throw away a wrapper on the beach, the tide will eventually pick it up and take it into the water supply.

6.1.5 Uses of water

The use of water in our daily life

- Drinking
- Cooking
- Washing clothes
- Cleaning fruits
- Brushing teeth
- Bathing
- Cleaning dishes
- Watering plants
- Cleaning vegetables
- Used in the generation of hydroelectric power.

a. The use of water in Panighatta

Fig. 6.8

The power of falling water has been harnessed widely through the use of water mills, locally known as 'Ghatta', for centuries. They are used for grinding of cereals, mainly for maize and wheat. The basic principle in operation of any water mill is the conversion of the kinetic energy of falling water into mechanical energy. After the diversion of stream water through a simple construction of stones or brushwood weirs, an earthen channel carrying about 40- 100 litres per second (lps) water is extended and led towards the water mill. In a traditional water mill, the water is then fed through a wooden chute made of a hollow tree trunk. A gate (a piece of flat stone) for safety overflow is opened when the mill is to be stopped. When the gate is opened, the water is diverted away from the water mill. A wedge is inserted at the end of the chute to direct the water to the runner. The centre-piece of the turbine runner is a massive boss in which a forged steel tip is driven into the lower cone. The wooden blades of the turbine runner, with the peg on the other side, are driven tightly into the boss. The boss is coupled to its counterpart with a wooden wedge and then led to the shaft and key at the top. The whole runner rests on a steel plate with a conic depression. The shaft of the runner projects above the bottom of the grinding stone into which the key is inserted. The key exactly fits in the slot on the upper grinding stone and runs the mill. The grinding stone is made locally, and is grooved from time to time

as per the requirement. There are about 25,000 traditional water mills, comprising a major source of rural energy for agro-processing across the country. They have been used for centuries by the communities in the hills and mountain regions of Nepal.

Water mill is the traditional mill for grinding flour . There is a turbine made by wood is rotated by the force of water and the wheel of stone began to move for grinding the flour . We can see water mill in the rular parts of Nepal.

b. The use of water in Hydropower

Flowing water creates energy that can be captured and turned into electricity. This is called *hydroelectric power* or *hydropower*.

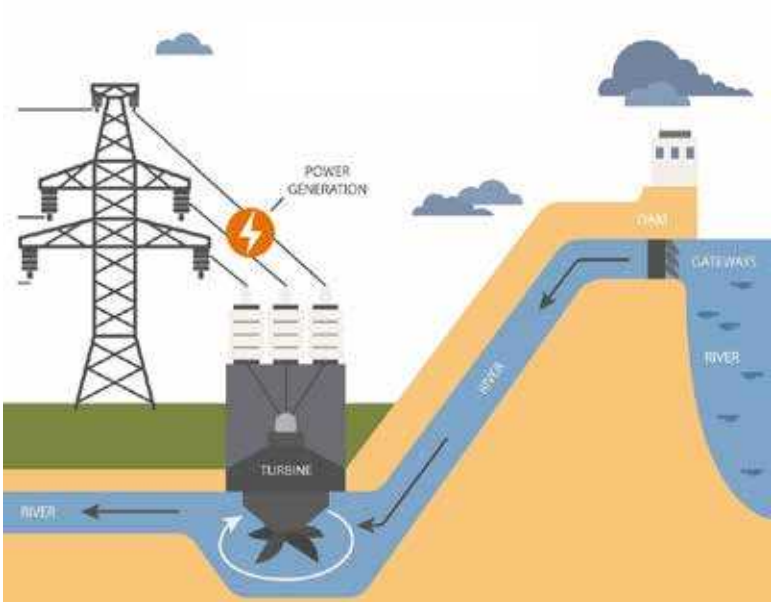


Fig. 6.9

The most common type of hydroelectric power plant uses a dam on a river to store water in a reservoir. Water released from the reservoir flows through a turbine, spinning it, which in turn activates a generator to produce electricity. But hydroelectric power doesn't necessarily require a large dam. Some hydroelectric power plants just use a small canal to channel the river water through a turbine.

Another type of hydroelectric power plant – called a *pumped storage plant* – can even store power. The power is sent from a power grid into the electric generators. The generators then spin the turbines backward, which causes the turbines to pump water from a river or lower reservoir

to an upper reservoir, where the power is stored. To use the power, the water is released from the upper reservoir back down into the river or lower reservoir. This spins the turbines forward, activating the generators to produce electricity.

A small or micro-hydroelectric power system can produce enough electricity for a home, farm, or ranch.

Conservation of water resources

Conservation of water mainly refers to protect, preserve, and control the usage of water and its resources. It is the system introduced to manage freshwater, reduce the wastage and protect the water and its resources in order to reduce and to avoid the scarcity. Therefore, we all should come forward to create awareness about conservation of water among our own friends, family, neighbours, society, etc. Conservation of water is very much essential as it saves life on earth.

There are several ways to conserve water. Here are some important and easy ways for the conservation of water

- Keeping the tap closed when not in use.
- Check for the openings or leaks in water distribution pipes.
- Make sure to use collected rainwater for gardening or washing purpose.
- Always have a measure of how many buckets of water is wasted in a day and try to reduce.
- Do not run more water than necessary while washing and cleaning clothes, utensils, etc.
- Do not prolong your bathing. Go for a quick shower rather than wasting buckets of water
- Rainwater harvesting is one of the best method used for conserving water. There are different methods used to preserve rainwater instead of getting it wasted.

6.2 Air

Air refers to the Earth's atmosphere. Air is a mixture of many gases and dust particles. It is the clear gas in which living things live and breathe. It has an indefinite shape and volume. It has mass and weight, because it is matter. The weight of air creates atmospheric pressure. There is no air in outer space.

Air is a mixture of about 78% of nitrogen, 21% of oxygen, 0.9% of argon, 0.04% of carbon dioxide, and very small amounts of other gases. There is an average of about 1% water vapour.

Animals live and need to breathe the oxygen in the air. In breathing, the lungs put oxygen into the blood, and send back carbon dioxide to the air. Plants need the carbon dioxide in the air to live. They give off the oxygen that we breathe. Without it we die of asphyxia.

Wind is moving air. This causes weather. Air can be polluted by some gases (such as carbon monoxide, hydrocarbons, and nitrogen oxides), smoke, and ash. This air pollution causes various problems including smog, acid rain and global warming. It can damage people's health and the environment.

Since early times, air has been used to create technology. Ships moved with sails and windmills used the mechanical motion of air. Aircraft use propellers to move air over a wing, which allows them to fly. Pneumatics use air pressure to move things. Since the late 1900s, air power is also used to generate electricity. Air is invisible: it cannot be seen by the eye, though a shimmering in hot air can be seen.

6.2.1 The physical properties of air

- Air takes up space.
- Air is affected by heat.
- Air can be compressed
- Air has mass.
- Air exerts pressure.
- Air is affected by altitude.

6.2.2 Uses of Air

A. The use of air in daily life

- Air consists one of the main life-sustaining gas called oxygen. Almost all living things breathe in and breathe out this air. Nitrogen and Carbon dioxide are also other gases that are vital for plants and their growth.
- Apart from this, air supports burning or combustion. The oxygen present in air help in burning of the fuels to basically carry out activities like cooking food, running industries and vehicles as well as generating heat and electricity.
- Another important aspect of air is that it helps in maintaining the temperature on the earth surface by circulating hot and cold air. Air acts as a conductor of heat as well. Even phenomena such as water cycle are dependent on air.
- Carbon dioxide, which is a component of air is used by plants during the process of photosynthesis. Here oxygen is also released by plants. And we already know how vital oxygen is.
- Other uses of air :
- To pump your vehicle's tyres.
- To vacuum suck dust from floor, carpets.
- To heat and cool homes, cars, closed spaces.
- To fly a kite, planes, etc.
- To aerate fish tanks for the fishes to live

B. The use of air in technology

i. Windmill

A windmill is a machine that harnesses the power of the wind. Windmills may be used to grind grain into flour, to pump water, or to produce electricity.

Fig. 6.10

A windmill has a number of blades that spin around when wind blows on them. The blades are mounted on a tall tower or

building. They are connected to a vertical shaft, or rod. When the blades spin, they turn the shaft. The turning shaft powers a device that does work—for example, a water pump or millstones, which grind grain. The shaft also may provide power to a machine called a generator, which produces electricity.

People in western Asia built the earliest known windmills more than 1,000 years ago. They used these windmills to grind grain. Windmills spread to Europe by the 1100s. The Dutch used them to pump water out of low-lying areas near the sea. By the 1800s, however, many people used steam engines rather than wind power to run mills and to do other work.

Today modern windmills, called wind turbines, produce electricity for many communities. A group of wind turbines working together is called a wind farm.

ii. Airplane

An airplane moves through the air with the help of its engine and wings. The wings are shaped in a particular way so that air flows over them and gives them lift. By contrast, balloons and airships are lifted by gases that are lighter than air. Helicopters are lifted by spinning blades.

6.2.5 Air pollution

Air pollution is when unwanted chemicals, gasses, and particles enter the air and the atmosphere causing harm to animals and damaging the natural cycles of the Earth. Air pollution can be defined as the presence of toxic chemicals or compounds

Fig. 6.11

(including those of biological origin) in the air, at levels that pose a health risk.

Causes of air pollution

Natural Causes of Air Pollution : Some sources of air pollution come from nature. These include eruptions of volcanoes, dust storms, and forest fires.

Human Causes of Air Pollution : Human activity is a major cause of air pollution, especially in large cities. Air pollution is caused by things such as factories, power plants, cars, airplanes, chemicals, fumes from spray cans, and methane gas from landfills.

Burning Fossil Fuels : One of the ways that humans cause the most air pollution is by burning fossil fuels. Fossil fuels include coal, oil, and natural gas. When we burn fossil fuels this releases all sorts of gasses into the air causing air pollution such as smog.

Effects of air pollution

Air pollution and the release of gases into the atmosphere can have many negative effects on the environment.

Global warming : One type of air pollution is the addition of carbon dioxide gas into the air. Some scientists believe that releasing too much carbon dioxide into the atmosphere is one of the causes of global warming. This upsets the balance of the carbon cycle.

The ozone layer : The ozone layer helps protect us from harmful rays from the sun. It is getting damaged from air pollution such as methane gas from livestock and Chlorofluorocarbons (CFCs) from spray cans.

Acid Rain : Acid rain is created when gases such as sulfur dioxide get high into the atmosphere. The wind can blow these gases for miles and then they get washed out of the air when it rains. This rain is called acid rain and can damage forests and kill fish.

Effects on Health : Air pollution can also make people sick. It can make it difficult to breathe and cause diseases such as lung cancer, respiratory infections, and heart disease. According to the World Health Organization, 2.4 million people die each year from air pollution. Air pollution can be especially dangerous to children living in big cities with bad smog.

Measures to reduce air pollution

- The use of solar, wind and geothermal energies reduce air pollution at a larger level. By minimizing and reducing the use of fire and fire products.
- Since industrial emissions are one of the major causes of air pollution, the pollutants can be controlled or treated at the source itself to reduce its effects. For example, if the reactions of a certain raw material yield a pollutant, then the raw materials can be substituted with other less polluting materials.
- Fuel substitution is another way of controlling air pollution.
- Another way of controlling air pollution caused by industries is to modify and maintain existing pieces of equipment so that the emission of pollutants is minimized.
- Sometimes controlling pollutants at the source is not possible. In that case, we can have process control equipment to control the pollution.
- A very effective way of controlling air pollution is by diluting the air pollutants.
- The last and the best way of reducing the ill effects of air pollution is tree plantation. Plants and trees reduce a large number of pollutants in the air. Ideally, planting trees in areas of high pollution levels will be extremely effective.

6.3 Rock

A rock is a solid made up of a bunch of different minerals. Rocks are generally not uniform or made up of exact structures that can be described by scientific formulas. Scientists generally classify rocks by

how they were made or formed. There are three major types of rocks: Metamorphic, Igneous, and Sedimentary.

Fig. 6.12

Metamorphic Rocks : Metamorphic rocks are formed by great heat and pressure. They are generally found inside the Earth's crust where there is enough heat and pressure to form the rocks. Metamorphic rocks are often made from other types of rock. For example, shale, a sedimentary rock, can be changed, or metamorphosed, into a metamorphic rock such as slate or gneiss. Other examples of metamorphic rocks include marble, anthracite, soapstone, and schist.

Fig. 6.13

Igneous Rocks : Igneous rocks are formed by volcanoes. When a volcano erupts, it spews out hot molten rock called magma or lava. Eventually the magma will cool down and harden, either when it reaches the Earth's surface or somewhere within the crust. This hardened magma or lava is called igneous rock. Examples of igneous rocks include basalt and granite.

Fig. 6.14

Sedimentary rocks : Sedimentary rocks are formed by years and years of sediment compacting together and becoming hard. Generally, something like a stream or river will carry lots of small pieces of rocks and minerals to a larger body of water. These pieces will settle at the bottom and over a really long time (perhaps millions of years), they will form into solid rock. Some examples of sedimentary rocks are shale, limestone, and sandstone.

6.3.1 Physical properties of rock

Physical properties are colour, lusture, form, hardness, cleavages, fracture and tenacity as described below.

Streak: It is the colour of powdered mineral and is more reliable and consistent indicator than the body colour of the mineral.

Lusture: It is the reflection from the mineral surface in ordinary light. It may be metallic, nonmetallic or sub-metallic. It is the appearance of a mineral surface in reflecting light. Minerals with no lusture are described as dull.

Cleavage: The tendency of a mineral to break along a certain definite direction and yield almost a smooth plane is called cleavage. It may be perfect or imperfect e. g. Halite and Galena have perfect cleavage. Many minerals possess a tendency to split in a certain regular direction and yield smooth plane surface called cleavages, i.e. Cleaves can be perfect (for mica), good, distinct and imperfect.

Fracture: Breaking of a mineral in a direction other than that of cleavage is known as fracture. It may be even and uneven. Most minerals show uneven fracture.

Hardness: It shows the resistance of its surface to abrasion or scratching.

Tenacity: The response of a mineral to hammer or blow to cutting with knife and to bending is described as its tenacity.

Malleability: Due to this, a mineral can be beaten to new shapes e.g. gold. However, most minerals are brittle and get fractured when struck with a hammer.

6.3.2 Hard rock and Soft rock

Some rocks are harder than others. For example, granite is a very hard rock. This makes it a good material for building as it doesn't wear away easily. Marble is another hard rock. It has an attractive texture and colour and it can be cut and polished. Because of this, it is used to make floor tiles and wall tiles. Some statues are made from marble too.

Chalk is a soft rock and wears away easily. This makes it ideal for making chalk sticks to write on blackboards. Some rocks, such as sandstone or chalk, let water soak through them. They are called permeable rocks.

Hard rock scratches glass and steel. Soft rock does not scratch steel but will scratch fingernails.

Other rocks, such as slate, do not let water soak through them. They are called impermeable rocks. Slate also splits easily into thin sheets. This makes it ideal for making roof tiles.

6.3.3 The importance of rock

Rocks are important in the making of many objects, such as plates and jewelry . Most houses are also built of materials obtained from rocks. Some of the most valuable rocks used in the manufacturing of items include graphite, slate, limestone, gypsum and pyrite. These types of rocks help in the production of stationery and the building of houses. Coal, which is an organic rock made mainly from plant materials, has various uses. It can be used in the production of gas, and its residue is used in making plastics and several synthetic materials.

Rock mining provides employment opportunities for casual workers, especially in places where formal jobs are difficult to find. Rocks contribute greatly to the economy of a country or region where they are found. Rocks are also used in the medicine industry. Bismuth is helpful for people with stomach upsets, while silver is used in the manufacturing of dental equipment.

Points to Remember

- Water is the most important liquid on Earth. It covers almost 75 percent of Earth's surface in the form of oceans, rivers, and lakes. All plants and animals need water to live.
- Water is colorless; colored water can indicate pollution. Colour can also show organic substances.
- When you boil water, the water changes from a liquid to a gas or water vapor. As some of the water vapor cools, we see it as a small cloud called steam.
- The Sun, air, and gravity work together to create the water cycle. Heat from the Sun causes water to evaporate from the surface of lakes, streams, oceans, and plants. The water vapor moves into the atmosphere.
- Water pollution can be caused by a plethora of different contaminants, including toxic waste, petroleum, and disease-causing microorganisms.
- Air refers to the Earth's atmosphere. Air is a mixture of many gases and dust particles. It is the clear gas in which living things live and breathe.
- It has an indefinite shape and volume. It has mass and weight, because it is matter.
- Air consists one of the main life-sustaining gas called oxygen. Almost all living things breathe in and breathe out this air. Nitrogen and Carbon dioxide are also other gases that are vital for plants and their growth.
- Fuel substitution is another way of controlling air pollution.
- A rock is a solid made up of a bunch of different minerals. Rocks are generally not uniform or made up of exact structures that can be described by scientific formulas.

GLOSSARY

An ocean	:	is a huge body of salt water. Oceans cover nearly 71 percent of Earth's surface. They contain almost 98 percent of all the water on Earth.
River	:	is a large natural stream of water that flows over land. Even though rivers hold only a tiny fraction of Earth's total water, they have always been essential to human civilization.
Lake	:	is a large body of water that is surrounded by land. Lakes contain less than 1 percent of the world's fresh water, but they are a very important freshwater source.
Molecule	:	is the smallest unit of a substance that has all the properties of that substance.

Exercise

A. Choose the best answer from the given alternatives.

i. What are the properties of matter?

a. No mass but occupies space.
b. Mass but occupies no space
c. Mass and occupies space
d. No mass and occupies no space

ii. In which of the following, the molecules are tightly packed?

a. Oxygen gas
b. Oil
c. Television
d. All of these

iii. Which of the following reactions is depicted in the following figure?

Water $\xrightarrow[\text{Temperature}]{\text{Rise in}}$ Water vpour

a. Evaporation b. Condensation
c. Precipitation d. Freezing

iv. Which process is the opposite of evaporation?

a. Melting b. Freezing
c. Condensation d. Boiling

v. Match the following:

List - I		List - I	
A.	Liquid ⟶ Solid	1.	Melting
B.	Vapour ⟶ Liquid	2.	Evaporation
C.	Solid ⟶ Liquid	3.	Freezing
D.	Liquid ⟶ Vapour		

a. A-3, B-4, C-1,D-2 b. A-2, B-1, C-3, D-4
c. A-4, B-1, C-2, D-3 d. A-1, B-2, C-3, D-4

vi. Air is a .....of gases

a. mixture b. both
c. compound d. all of these

vi. The amount of .....in air varies from place to place and from time to time

a. water vapour b. dust
c. smoke d. none of these

vii You cannot see air around you because it has .....colour

a. many b. no
c. three d. none of these

viii. Dust and smoke make the air dirty . It is called....

a. air pollution b. air filtration
c. water pollution d. none of these

ix. Which disease is caused due to air pollution ?

a. asthma b. anaemia
c. pressure d. daibetes

x. What are rocks made of?

a. minerals b. seeds
c. living things d. wood

xi. Soil is made from _____.

a. Plants b. rocks
c. grass d. none of these

B. Write "T" for true and false " F" statements.

i. Ice is solid water .
ii. Glaciers are an example of liquid water .
iii. Water can exist as solid and liquid
iv. Water vapor is water gas
v. Liquid water is found in lakes , river and oceans etc.
vi Rocks are made up of minerals.
vii. All rock types can become metamorphic rocks.
viii. We can drink water straight from ponds.
ix. We cannot breathe underwater
x. When the wind blows, we feel cool.

C. Write the corect word to complete each sentences. Choose your answer inside the box.

animals	ferry	drink	leaves	seeds	clean
oxygen	rain	wind	water	carbon dioxide	

i. We breathe in _____ and breathe out _____
ii. Moving air is called _____
iii. Strong wind can blow away _____.
iv. Wind helps to spread the _____ of plants.
v. Living things need water to _____
vi. People can move from place to place on water by _____
vii. Some _____ live in the water.
viii. We only can use _____ water.
ix. Do not waste _____
x. Water comes down from the sky as _____

D. Match the followings:

Read the causes of air pollution and match them to the effects on people and our environment.

• Deforestation	• pollutes the air and it's the major source of pollution in big cities.
• Vehicle smoke	• Pollute the air by releasing various types of substances such as sulphur dioxide, oxides of carbon into others.
• Factories fumes	• The loss of trees and other vegetation can cause climate change, soil erosien, fewer crops, floods, increased greenhouse gases in the atmosphere.
• Extinguishers and aerosols	• pollute the air by depleting the ozone layer.
• Smoke	• increase carbon dioxide levels in the atmosphere, contributing to the greenhouse effect and climate change. Many animals die in the flames and other lose their habitats. Some species can be in danger of extinction.
• Wildfires	• pollutes the air by emitting carbon monoxide and nicotine. It also affects the respiratory system, causing lung cancer.

E. Answer these questions.

i. What is matter ?
ii. What are the properties of water?
iii. Write down the three forms of water and mention the role of heat in the process of transformation of water.
iv. Define the process of evaporation, liquefaction, freezing and melting.
v. What is water cycle ?
vi. Write the short note about water use in technology.
vii Explain ways to conserve water resources.

viii. Define air as a mixture of different gases, water vapor, and dust particles.
ix. What are the physical properties of air?
x. Write the uses of air with examples.
xi. Define air pollution.
x. Describe the physical properties of rock.
xi. Identify rocks and classify them into hard and soft rocks.
xii Write the general use of rocks.
xiii. What is water pollution ?
xiv. What can cause water pollution ?
xvi. What is air pollution ?
xvii. What can cause air pollution ?

F. Make meaningful word from the jumbled letters

i. LIDSO

.....

(hint: a nearly incompressible fluid that conforms to the shape of its container)

ii. AGS

.....

(hint: one of the three fundamental states of matter)

iii. IQUILD

.....

(hint: a nearly incompressible fluid that conforms to the shape of its container)

iv. OCRK

.....

(hint: any naturally occurring solid mass or aggregate of minerals or mineraloid matter. I)

v. PULATPOION

.....

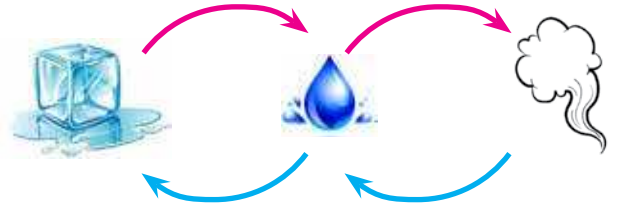
(hint: a distinct group of individuals,)

G. Diagrammatic questions

i. Fill in box .

Changes in matter

A. B.



C. D.

ii. Ari pollution is caused by:

Vehicles smoke	Deforestation	Factory fumes	wildfires
trash-burning	fertilizers and pesticides	volcanic eruptions	

_____ _____

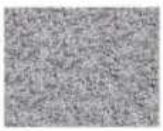
_____ _____

_____ _____

_____

Warm up activities

Match the rock with its products

Rocks	*Products*
	
	
	
	
	

Project Works

i. Prepare a good model of the water cycle using local materials and present it in the classroom.

ii. Write an essay on water pollution and present it in the classroom.

iii. A model is present in the classroom with a report on the role of heat in changing water conditions.

iv. Collect and sort the stones around your home or school. How do you define it? Include your reasoning behind it. Also, prepare a brief report on all of them and present it in the classroom.

Unit 7

Energy in Daily Life

Student's Learning Outcomes

After studying this unit, the students will be able to :

- define energy as the ability to work
- identify the sources of energy required by humans, animals and engines
- give simple examples of daily use of electricity
- create and identify energy sources
- separate magnetic and non-magnetic objects with the help of magnets
- compare the magnetic potential of different magnets
- describe the areas of use of magnets in daily life

Fig. 7.1

7.1 Energy

Energy is a measurement of the ability of something to do work. It is not a material substance. It can be stored and measured in many forms. The simple definition of energy is " the capacity for doing work".

7.1.1 Introduction to Energy

Do you love playing outside during recess? Do you love to play an instrument? Do you enjoy watching TV and playing video games? If you enjoy doing all these things, there is one thing that you need to do all of them: energy.

Energy is the ability to do work, and energy is happening all around us. It happens as the sun comes up in the morning. It happens as your dog catches a Frisbee or when you ride your cycle. It even happens when you turn on the light in your bedroom.

Did you know that there are many different forms of energy ? When the sun shines outside it is giving off light energy through its bright rays. Make sure you have your sunglasses on when this energy is shining through.

Rub your hands quickly together. You may feel them getting warm. This is an example of heat energy. The molecules in your hands move fast to make heat.

There is also electrical energy, which happens when something called electrons move around a circuit to make electricity. These are just a few of the many different kinds of energy we use every day.

Energy is another word for power. Energy makes things move. It makes machines work. Energy also makes living things grow.

Energy may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other various forms. There are, moreover, heat and work—i.e., energy in the process of transfer from one body to another. After it has been transferred, energy is always designated according to its nature. Hence, heat transferred may become thermal energy, while work done may manifest itself in the form of mechanical energy.

The picture below shows the working activities of people of different age groups. Based on this, answer the following questions:

Activities



i. Who eats the most?
ii. How works more?
iii. Write the conclusion of the above questions.
iv Who can do more work?
v. Who needs more energy?

7.1.2 Sources of Energy

The picture below shows living beings eating food and refueling various vehicles. Answer the following question on this basis:

Fig. 7.2

i. Why are living beings eating food?
ii. What are their food sources? What happens to them without it?
iii. Why do vehicles need fuel? What is the source of the fuel?

The main source of energy is the sun. The sun's rays are changed into chemical energy for the plant to help it grow big and strong. Plants are important because it is how humans and animals get food. We get the energy we need by eating rice, fruits, meats, and vegetables. Food is a source of energy for us. When we are hungry, we don't feel like working. When we eat food, we have the energy to do things we enjoy. The main reason for this is the energy in the food we eat.When we use this energy in motion, like riding a cycle, it is called kinetic energy. But did you know that when you rest you still have energy? This energy is called potential energy because you're not using it yet.

Another source of energy is fossil fuels. It includes petroleum, natural gas, and coal. These are used to run factories, heat homes, and power automobiles.

Fossil fuels pollute the atmosphere when they are used. They are also being used up very quickly. Scientists therefore have tried to find other sources of energy to replace the fossil fuels. Some of these sources have been used directly for many years. These include wind, water, and heat from Earth. Sailboats harness the power of the wind to move them along. Water mills use water flowing through rivers to turn wheels that grind grain. In ancient times some people used hot water and gases from Earth to heat their houses. They ran the hot air in pipes underneath their floors to provide heat.

Scientists gradually learned to use these natural sources to create new forms of energy. These new forms include electricity and nuclear energy. For example, the energy of wind is now used to turn machines that create electricity. On many rivers people have built dams. The dams use the energy of the flowing river to operate machines that also create electricity. In sunny areas devices collect the heat of the Sun and store it. That heat can be used to heat water and houses. Other devices convert the Sun's rays into electricity. This is known as solar energy. Scientists have also learned how to use certain atoms to make nuclear energy. Nuclear power in turn can be used to create electricity.

7.1.2.1 Importance of Energy

Energy is essential for all life and all processes that occur across the entire universe. On Earth, the Sun is the ultimate source of all energy that is available and used by people, animals, plants, and microorganisms. This energy may come directly, such as in the form of photosynthesis, or indirectly, such as in the form of fossil fuels, which long ago trapped the energy of the sun that is released when burned.

Energy is so important in our daily lives because it is a basic human need. We use energy to not only heat our human-made structures but we use it to cool them as well. Energy is necessary for getting up out of bed, walking down the street, or even lifting your finger. It's also necessary in abundance for all types of modern conveniences, from light bulbs to appliances to vehicles.

We need energy for countless reasons. First and foremost, it is needed to simply stay alive. Energy is in everything that we eat, consume, or use.

Energy fuels and regulates the body's natural internal functions. It repairs cells and body tissue, is used to build muscle, and is necessary to maintain homeostasis — and the harsher the environment, the more energy is needed to maintain this.

Going a little deeper into the human body, energy is needed to produce enzymes, contract and move muscles, and carry electrical impulses between cells. In society, energy is needed for everything from driving to watching television to keeping homes and businesses lit with artificial light.

Energy is needed for almost anything and everything in life. Even when we are not paying attention to it, energy is present, regulating body functions while at rest or powering your household appliances even if they are turned off.

7.2 Electricity

Fig. 7.3

Electricity is the flow of tiny particles called electrons and protons. It can also mean the energy you get when electrons flow from place to place. Electricity can be seen in nature in a bolt of lightning. Lightning is nothing but a large number of electrons flowing through air all at once, releasing a huge amount of energy. Scientists have also learned how to generate, or create, electricity. This is useful because electricity that is generated can be controlled and sent through wires. It can then power such things as heaters, light bulbs, and computers. Today, electricity provides most of the energy to run the modern world.

Everything in the universe is made of tiny objects called atoms. Each atom has even tinier particles called protons and electrons. These tiny particles swirl around each other continuously. An electron has what is called a negative charge. A proton has a positive charge. Positive and negative charges try to pull each other together. However, two positive charges, or two negative charges, will push each other away. Electricity results when electrons are pushed and pulled from atom to atom.

Most objects have a balance of positive and negative charges, so they are considered neutral. This means that they do not push or pull on each other electrically. However, sometimes electrons can build up in an object. Two such objects can push or pull on each other because they are no longer neutral. This push or pull from extra electrons is called static

electricity. Static electricity can cause interesting effects, such as sparks or lightning bolts, when it is released. Sometimes the extra electrons build up by rubbing one object against another. For example, when one rubs a balloon against one's hair, electrons move from the balloon to the hair. Because the hairs then all have extra electrons, which all have the same kind of charge, they try to fly away from each other and end up sticking into the air like spikes!

Many moving electrons are called an electric current. A city's power plant produces a powerful electric current and sends it through wires. The electricity used for lighting, heating, and running appliances is made by machines called generators. Generators cause a current to flow by moving a magnet past a coil of wire, which pushes electrons through the wires of the coil. Wires carrying the current travel to houses and other buildings. More wires connect to the power outlets in rooms. When a person plugs in an iron or another electric device, the current travels into the device. The current then makes the device work. A chemical reaction in a battery can also produce an electric current.

7.2.1 Uses of Electricity

We use electricity constantly in our daily lives. It is one of the most important types of power and energy that we use.

Electricity in our House: Electricity travels to our house over power lines from a big power plant somewhere far away. Your parents actually have to pay for how much electricity is used. There is an electric meter outside of your house that keeps track of this. The more the lights are on or the TV is running, the higher the bill will be from the electric company. Once the power comes to our house, it gets sent out on wires to sockets in the walls. We can plug all sorts of things into these sockets and use the power from electricity. In our homes we have power lights, air conditioning, televisions, ovens, and more from electricity. Without it, we'd be bored, hot, and sitting in the dark.

Batteries: Some electricity comes from batteries. Batteries use chemicals to store up electricity that can power devices like cell phones, radio controlled cars, handheld video games, and flashlights. Batteries run out of power after a while and either need to be recharged or recycled. Remember to always recycle your batteries as there are dangerous chemicals in them.

Other uses : Electricity is used in cars too. There is a big battery to help the engine get started. Then the engine generates electricity for the radio, lights, and other cool features. Some cars run 100% on electricity by using big batteries that get charged up from a wall socket. Electricity can also make magnetism. This can be used to create giant powerful magnets as well as fast and quiet magnetic trains. Electric motors generate magnetism to turn the motor and cause movement for all sorts of uses.

7.2.2 Sources of Electricity

Below are pictures of various batteries or cells. Write the names of the devices used in these batteries or cells. How and why are these batteries or cells used in these devices ?

Fig. 7.4

An alarm clock, wall clock, or stopwatch uses a battery (dry cell) as a power source. Similarly, batteries are also used in mobile phones. Batteries are also used in motorcycles, buses, and cars. Thus, batteries used in vehicles, solar batteries, bicycle dynamos, and generators are used as sources of electricity.

Electricity can be created in a variety of ways such as:

- burning fossil fuels (oil, gas, coal) at power stations,
- using wind power generated by wind turbines,

- using solar power generated by the sun,
- using water power (sometimes called hydropower) generated by running or falling water.

7.3 Magnet

How can the objects in the picture below be distinguished as magnetic or non-magnetic objects? What method do you use to compile a list of magnetic and non-magnetic objects?

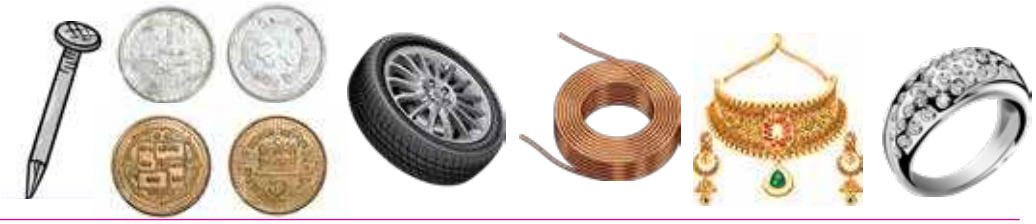


Fig. 7.5

A magnet is a rock or a piece of metal that can pull certain types of metal toward itself. The force of magnets, called magnetism, is a basic force of nature, like electricity and gravity. Magnetism works over a distance. This means that a magnet does not have to be touching an object to pull it.

People have known for a long time that a certain type of rock, called load stone, is a natural magnet. When scientists learned why that is, they also learned how to make other metals into magnets.

Magnetism happens when tiny particles called electrons behave in a certain way. All objects in the universe are made up of units called atoms. Atoms in turn are made up of electrons and other particles (neutrons and protons). The electrons spin around the atom's nucleus, which contains the other particles. The spinning electrons form tiny magnetic forces. Sometimes many of the electrons in an object spin in the same direction. In these cases, all the tiny magnetic forces from the electrons add up to make the object one big magnet.

It is possible to make a magnet by taking an existing magnet and rubbing another piece of metal with it. The new piece of metal must be rubbed continuously in the same direction. This will make the electrons in that metal start to spin in the same direction.

Electricity can also create magnets. Electricity is a flow of electrons. As electrons move through a piece of wire they have the same effect as electrons spinning around the nucleus of an atom. This is called an electromagnet.

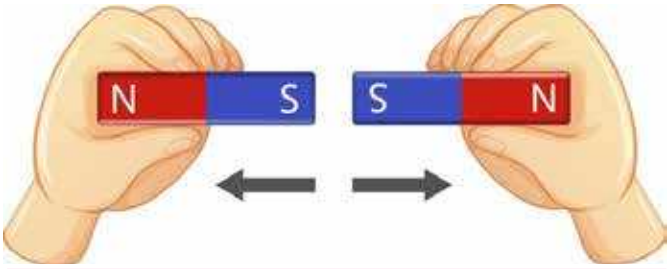


Fig. 7.6

Because of the way their electrons are arranged, the metals iron, steel, nickel, and cobalt make good magnets. Once these metals become magnets, they can stay magnets forever. Then they are called hard magnets. But these metals and others can also act like magnets temporarily, after they have been near a hard magnet. Then they are called soft magnets. Most other materials—for example, water, air, and wood—have very weak magnetic properties.

Magnets strongly attract objects that contain iron, steel, nickel, or cobalt. Magnets also attract or repel (push away) other hard magnets. This happens because every magnet has two opposite poles, or ends: a north pole and a south pole. North poles attract the south poles of other magnets, but they repel other north poles. Likewise, south poles attract north poles, but they repel other south poles.

The magnetic forces between the two poles of a magnet create a magnetic field. This is the area affected by the magnet. A magnetic field surrounds all magnets.

7.3.1 Magnetic and Non-Magnetic Objects

A magnetic object is an object that can be attracted by a magnet. Magnets can be made from magnetic objects. Iron, steel, etc. are magnetic objects. An object that cannot be attracted by a magnet is called a non-magnetic object. Magnets cannot be made from non-magnetic objects. Aluminum, silver, gold, etc. are non-magnetic objects.

Magnetic Objects

Let's take a look at some of the most well known magnetic metals/objects. Some of them are magnetic at all times. Other, like stainless steel, have magnetic properties only with a certain chemical composition.

Iron is an extremely well-known magnetic metal. It is, in fact, the strongest ferromagnetic metal. It forms an integral part of the earth's core and imparts its magnetic properties to our planet. That is why the Earth acts as a permanent magnet on its own.

Nickel is another popular magnetic object with ferromagnetic properties. Like iron, its compounds are present in the earth's core.

Cobalt is an important magnetic metal. For over 100 years, cobalt's excellent magnetic properties have helped develop a variety of applications.

Cobalt can be used to produce soft as well as hard magnets. Soft magnets that use cobalt have advantages over other soft magnets.

Steel also displays magnetic properties as it is derived from iron. Most steels will be attracted to a magnet. If needed, steel can also be used to make permanent magnets.

Non-magnetic objects/metals

Aluminium's crystal structure, similarly to lithium and magnesium, makes it non-magnetic. Gold is a diamagnetic metal like most other metals. In its pure form, gold is non-magnetic and shows only a weak repulsion towards magnets like all diamagnetic metals.Silver is another non-magnetic metal. This property makes identifying fake silver possible. If the "silver" coins or jewellery attracts to magnets, it is something else.

Copper itself is not magnetic but interacts with magnets to some extent. This property helps generate electricity in power plants.

7.3.2 Comparison of Magnetic Capacity

Magnetism is an invisible force or field caused by the unique properties of certain materials. In most objects, electrons spin in different, random directions. This causes them to cancel each other out over time. However, magnets are different. In magnets the molecules are uniquely arranged so that their electrons spin in the same direction. This arrangement of atoms creates two poles in a magnet, a North-seeking pole and a South-seeking pole.

Take two magnets and hang an alpine or paperclip on them alternately. It can be concluded that the magnet that attracts more alpine or paperclip has more capacity. Argue what happens if a powerful magnet is placed in the middle of a classroom.

7.3.3 Uses of Magnet

One of the earliest uses of magnets was in compasses. A compass is a needle-shaped magnet that is free to turn around. The planet Earth is a giant magnet. Because the south pole of a compass is attracted to the north pole of Earth, the compass needle always points north.

Today magnets are found in many places. Magnets hold papers on refrigerator doors. They also hold the doors shut. Credit cards have a magnetic strip. Automatic doors, stereo speakers, and many electric motors use electromagnets.

Activities

1. Make a list by observing where magnets have been used in your home and school.
3. Find a pencil or another small object in your home. Place the object on the edge of a desk or table. What type of energy does it have? If it is safe to do so, tap the object so it falls off of the desk. What type of energy does it have as it is falling?
2. Identify three objects in your home that have energy. What type(s) of energy does each of these objects have?

Points to Remember

- Energy is the ability to do work. Work means moving an object by some distance. For instance, moving your hand requires energy.
- The simple definition of energy is " the capacity for doing work"
- Energy can be classified as either potential (stored) energy or kinetic energy, which is the energy of movement. Some other types of energy include heat energy and light energy.
- Energy can't be created, so we get energy from converting stored (potential) energy into another form. Most energy that fuels life on Earth comes from the sun.
- heat transferred may become thermal energy, while work done may manifest itself in the form of mechanical energy.
- The main source of energy is the sun. The sun's rays are changed into chemical energy for the plant to help it grow big and strong. Plants are important because it is how humans and animals get food. We get the energy we need by eating rice, fruits, meats, and vegetables.
- Some electricity comes from batteries. Batteries use chemicals to store up electricity that can power devices like cell phones, radio controlled cars, handheld video games, and flashlights.
- Magnetism happens when tiny particles called electrons behave in a certain way. All objects in the universe are made up of units called atoms. Atoms in turn are made up of electrons and other particles (neutrons and protons).
- Electricity can also create magnets. Electricity is a flow of electrons. As electrons move through a piece of wire they have the same effect as electrons spinning around the nucleus of an atom. This is called an electromagnet.
- Energy is another word for power.
- Aluminium's crystal structure, similarly to lithium and magnesium, makes it non-magnetic.
- Iron is an extremely well-known magnetic metal.

GLOSSARY

Kinetic energy: form of energy that an object or a particle has by reason of its motion.

Electricity: is the set of physical phenomena associated with the presence and motion of matter that has a property of electric charge.

Electron: lightest stable subatomic particle known.

electromagnetism: physical phenomenon in which certain electrically uncharged materials strongly attract others

Exercise

A. Choose the best answer from the given alternatives.

i. What type of energy do the have cars?

a. Solar energy b. Kinetic energy
c. Potential energy d. Light energy

ii. The ability to cause a change is called .

a. kinetic energy b. thermal energy
c. energy d. conduction

iii. Which of the following uses the most energy?

a. jumping b. shouting
c. writing d. thinking

iv. Which type of energy is in the food we eat?

a. light b. thermal
c. radiant d. chemical

v. The simple definition of energy is .....

a. the capacity for doing work
b. the capacity of attraction
c. the capacity of converting power
d. None of above

vi. Heat transferred may become

a. thermal energy b. sound energy
c. light energy d. chemical energy

vii. The main source of energy is the.....

a. star b. plant
c. sun d. heat

viii. Batteries run out of .....after a while and either need to be recharged or recycled.

a. power b. heat
c. light d. electricity

ix. .....happens when tiny particles called electrons behave in a certain way.

a. Magnetism b. Electricity
c. Energy d. None of above

x. A magnetic object is an object that can be attracted by a.....

i. magnet ii. electron
iii. atom iv. electricity

B. Write "T" for true and false " F" statements.

i. Energy is not the ability to do work.
ii. Energy may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other various forms.
iii. Animals converting food to heat and motion is an example of one form of energy being changed to another.
iv. Iron is an extremely well-known magnetic metal.
v. Electricity can not create magnets.
vii. Electricity is a flow of electrons.
viii. As electrons move through a piece of wire they have the same effect as electrons spinning around the nucleus of an atom is called an electromagnet.

C. Write the corect word to complete each sentences. Choose your answer inside the box.

electricity , magnetic, power, electrons, non-magnetic

i. Energy is another word for .....
ii. Electricity is a flow of .....
iii. Aluminium's crystal structure, similarly to lithium and magnesium, makes it .....
iv. Iron is an extremely well-known ..... metal.
v. Batteries use chemicals to store up .....

D. Match the followings:

a.	Food	i.	Energy
b.	Petroleum oil	ii.	Mobile phone
c.	cell	iii.	Iron, Nickel and Cobalt
d.	Magnectic object	iv.	Sources of energy of organism
e.	Hydropower	v.	Car

e. Answer these questions :

i. Define energy as the ability to work.
ii. Identify the sources of energy required by humans, animals and engines.
iii. Give any five examples of daily use of electricity.
iv. How do separate magnetic and non-magnetic objects with the help of magnets.
v. How do compare the magnetic capacity of different magnets?
vi. Describe the areas of the use of magnets in daily life.
vii. Why is energy important?
viii. Why is energy so important in our lives?
ix. Why do we need energy?

E. Make meaningful word from the jumbled letters

i. RGYENE

.....

(hint: ability to be active : the physical or mental strength that allows you to do things) :

ii. NETMAG

.....

(hint: a body having the property of attracting iron

iii. ECTRICITYEL

.....

(hint: movement and interaction of electrons

iv. ERIESBATT

.....

(hint: source of electric power _

v. ODFO

.....

(hint: any substance consumed to provide nutritional support for an organism.)

F. Diagrammatic questions

i. Which of these objects use electrical energycircle them.

Warm up activities

a. In the picture below, what are the potential energy, mechanical energy and kinetic energy in A, B and C.

b. Complete each sentence with the corresponding word Potential or Kinetic?

Potential Energy is stored energy and is waiting to work.
Kinetic Energy is energy that is working.

The apple on the table is _____ energy.
The apple falling from the table is _____ energy.

If the rock falls from the hill, it is _____ energy.
If the rock is still, it is _____ energy.

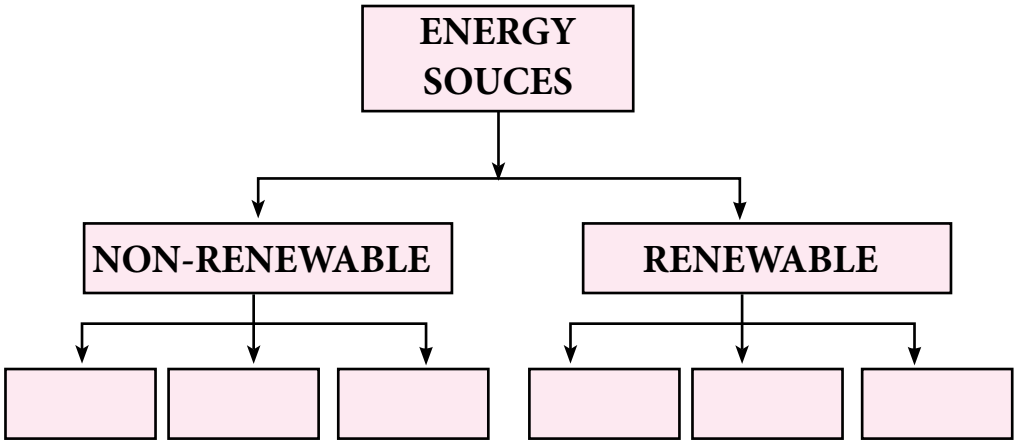
If the cyclist is still, he has _____ energy.
If he is moving, he has _____ energy.

If the yoyo is still at the top, it is _____ energy.
If the yoyo is moving, it is _____ energy.

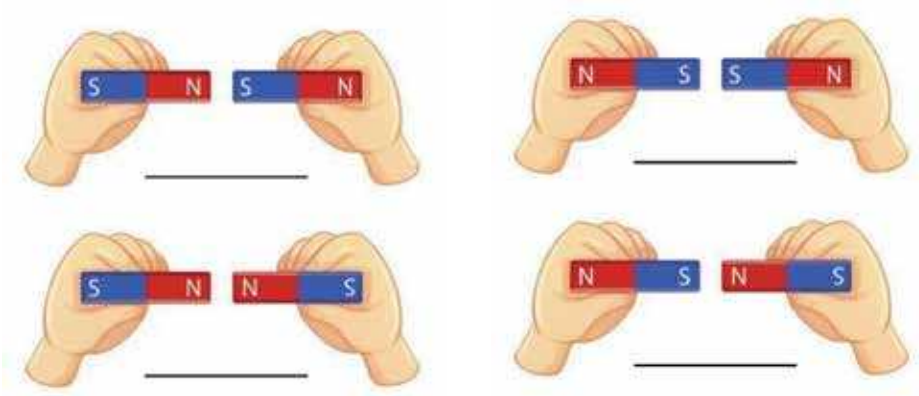
If the boy throws the ball is _____ energy.
The ball on the boy's hand is _____ energy.

c. Complete the diagram with these words. You must write them.

OIL	SUN	COAL	WIND	WATER	GAS



d. For each pair of magnets, write attract or repel



Project Work

Where is electricity used at home and at school? Observe and prepare a report. Include the names and uses of electrical equipment in the report.

Unit 8

Earth and Space

Student's Learning Outcomes

After studying this unit, the students will be able to :

- describe the earth's shape and size.
- describe the earth's surface.
- introduce the atmosphere
- introduce various types of weather and describe people's activities during that season.
- observing and reporting on weather changes over a specific time period.
- by estimating the weather in the near future by gathering data from various sources,
- make a simple estimate of the weather by looking at the condition of the clouds.
- Creating a weather chart
- introduce natural disasters
- explain the environmental effects of natural disasters
- be aware of the precautions that can be taken to avoid natural disaster

A satellite image of the Earth and a globe are given below. Answer the following questions on this basis:

Fig. 8.1

i. What is the shape of the Earth?

ii. Find your place of residence in the globe of your school, the place of residence of relatives or acquaintances in neighboring countries and abroad.

8.1 The Earth's Shape and Size

Chances are you've caught or thrown a baseball, or at least seen one on television. You've probably eaten an orange, too. And if you have ever seen a globe, a model of our planet Earth, then you may have noticed that all of those objects have the same shape: a sphere. A sphere is a round, solid shape. The Earth is not quite a perfect sphere: it actually is a little fatter at the equator, the invisible line that goes around the middle of the Earth.

It was only a few hundred years ago that people thought that our planet was flat. They worried that if they sailed across the ocean, they would eventually get to the end of the Earth, and they might even fall off of an edge.

But how do we know for sure that the Earth is round? There are actually a few ways that you can confirm for yourself that our planet is not flat. For example, when the Earth is between the sun and the moon, you can see the Earth's shadow on the moon. You can tell that the shadow is round and curved. Airplanes also help prove that the Earth is round. They can fly around the entire planet without stopping !

Size of the Earth

It can be hard to understand just how big the Earth is; unlike a ball or an orange, we cannot hold it in our hands or put it on a scale to weigh it. You could start by imagining a track around a football field. It's probably about 0.25 miles long. The equator is 24,901 miles. That means if you stretched out this track, it would fit around the Earth 99,604 times. Imagine trying to run this quarter-mile track almost 100,000 times!

You can also think about the size of our planet in terms of its mass, or weight. Our Earth weighs 6.6 sextillion tons. Want to write that number? You'll need to use 20 zeroes! In addition, the Earth is actually gaining a tiny bit of weight each day as meteors from the solar system land on our planet.

Volume is another way to understand the size of our planet: how much solid space does it take up? It has a volume of about 260 billion cubic miles. That means if you built a box that was one mile tall, deep, and wide you could fit 260 billion of them inside the Earth.

8.2 The Earth's Surface

About 70% of the Earth's surface is covered with water and most of that is ocean. It is known as the "Blue Planet". Only a small portion of the Earth's water is freshwater, which is found in rivers, lakes, and ground water. Earth's surface can be built up or torn down due to erosion and deposition of soil, rock, sediment, and glacial movement. Catastrophic events such as flooding, volcanoes, and earthquakes can create landforms. Common landforms and features include: streams, deltas, floodplains, hills, mountains/mountain ranges, valleys, sink holes, caves, canyons, glacial features, dunes, springs, volcanoes, and islands. Rocks change shape, size, and/or form due to water or ice movement, freeze and thaw, wind, plant growth, gases in the air, pollution and catastrophic events such as earthquakes, mass wasting, flooding, and volcanic activity.

Weathering is defined as a group of processes that change rock at or near Earth's surface. Some weathering processes take a long time to occur, while some weathering processes occur quickly.Water, wind and ice physically remove and carry (erosion) rock, soil and sediment and deposit the material in a new location. Gravitational force affects movements of water, rock and soil. Weathering is the breakdown of large rock into smaller pieces of rock. Erosion is what carries the weathered material to a new location. Gravity plays an important role in understanding erosion, especially catastrophic events like mass wasting (e.g., mudslides, avalanches, landslides) or flooding

8.3 Introduction to the Atmosphere

The atmosphere is the layer of gas that surrounds Earth. It is often called air. Other planets, and some of their larger moons, also have atmospheres.

The atmosphere consists of several different gases. The gases are held close to Earth by a force called gravity. Near Earth's surface, the atmosphere is about three-fourths nitrogen and one-fifth oxygen. At higher elevations, the atmosphere is mostly hydrogen and helium.

Scientists divide the atmosphere into five regions, or layers. The layer closest to Earth is the troposphere. It extends up to about 6 miles (10 kilometers) above Earth's surface. Most of Earth's weather, including the wind and most clouds, exists in the troposphere. The second layer, the stratosphere, extends to about 30 miles (50 kilometers) above Earth's surface. The stratosphere includes the ozone layer. Ozone blocks much of the Sun's radiation that would harm plants and animals if it reached Earth.

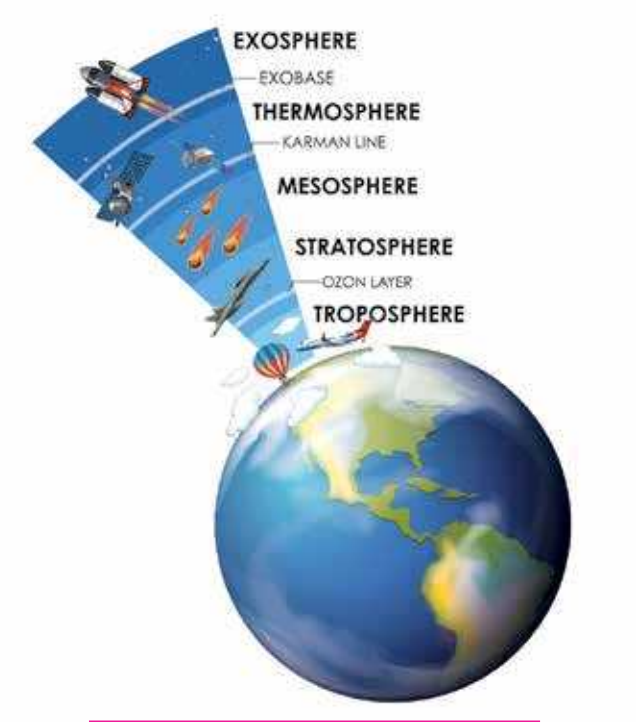


Fig. 8.2

The third layer is the mesosphere. It extends up to about 50 miles (80 kilometers) above Earth's surface.

The fourth layer, the thermosphere, ranges from about 50 to 300 miles (80 to 480 kilometers) above Earth. The fifth and highest layer of the atmosphere is the exosphere. This layer ends where Earth's gravity is too weak to prevent particles of gas from drifting into space.

8.4 Weather

Weather is the daily state of the atmosphere, or air, in any given place. Climate is the average of weather conditions in an area over a long period. The weather is important to people. It affects their comfort, their food supply, and even their safety.

Fig. 8.3

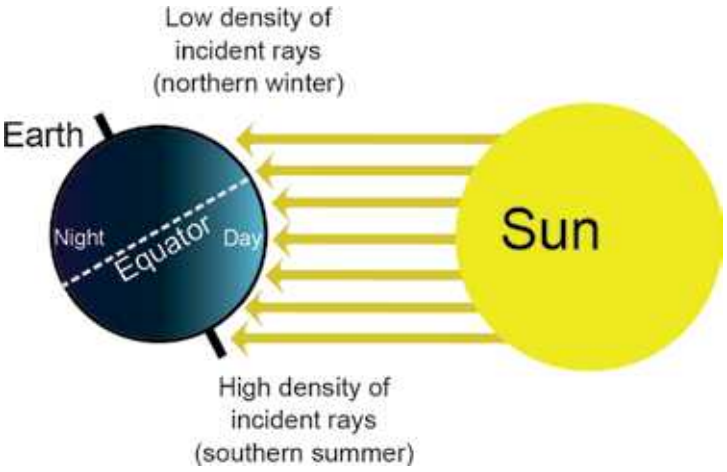
8.4.1 Introduction to the Weather

Look out the window. Is it raining? Is it sunny? Is it hot or cold? The answers to these questions tell you what the weather outside at that moment in time. Put very simply, weather is the state of the atmosphere at any given period of time. The atmosphere is made up of the gasses, like oxygen, that surround the Earth. What is happening in the atmosphere is the weather. Weather includes several different factors that we can measure. Have you ever watched the weather forecast on the news or online? What kind of things do they tell us? Most weather forecasts will tell us what the temperature will be, if it's going to rain or snow, and whether it will be cloudy or sunny. Those factors combine together to make the weather.

What Causes Weather?

What shape is the Earth? The fact that the Earth is round contributes to the weather. The Sun heats up the atmosphere and the Earth, but since the Earth is round, it hits different parts at different times of the day and the year. It also hits at different angles. Areas around the equator get more direct sunlight and are warmer. Areas around the poles get indirect, or angled, sunlight, so they are colder. The Earth is tilted on its axis, giving us the seasons. The different temperatures across the planet as the seasons change cause the atmosphere to move and churn. The movement is what causes wind, clouds, storms, and precipitation. Precipitation is moisture

that falls to the ground from clouds in the form of rain or snow. The cycle of warm and cold air mixing and churning creates the weather cycle across the globe.



The tilt of the Earth causes the rays of the Sun to hit at different angles, affecting the weather and seasons

Fig. 8.4

8.4.2 Weather Changes

Because the Earth is round and not flat, the Sun's rays don't fall evenly on the land and oceans. The Sun shines more directly near the equator bringing these areas more warmth. However, the polar regions are at such an angle to the Sun that they get little or no sunlight during the winter, causing colder temperatures. These differences in temperature create a restless movement of air and water in great swirling currents to distribute heat energy from the Sun across the planet. When air in one region is warmer than the surrounding air, it becomes less dense and begins to rise, drawing more air in underneath. Elsewhere, cooler denser air sinks, pushing air outward to flow along the surface and complete the cycle.

8.4.3 Forecasting the Weather

Should you wear a raincoat or a sweater today? Should you go to the school from home? These are all everyday questions we might only be

able to answer with the help of a weather forecast. When dangerous weather conditions like hurricanes or snowstorms arrive, our choices about what we should or shouldn't do can often mean the difference between life and death.

Weather forecasting is the prediction of what the atmosphere will be like in a particular place by using technology and scientific knowledge to make weather observations. In other words, it's a way of predicting things like cloud cover, rain, snow, wind speed, and temperature before they happen.

Tools Used for Weather Forecasting

Weather forecasters use all kinds of tools to achieve this goal. We have instruments called barometers to measure air pressure, radar to measure the location and speed of clouds, thermometers to measure temperature, and computer models to process data accumulated from these instruments. However, to this day, humans with good experience can still do a better job at predicting the weather than computer models alone because humans are often involved in picking the most appropriate model for a situation.

The main ways we can forecast the weather include looking at current weather conditions, tracking the motion of air and clouds in the sky, finding previous weather patterns that resemble current ones, examining changes in air pressure, and running computer models.

Types of Weather Forecasting

There are four main types of weather prediction we're going to discuss in this lesson: short-range, medium-range, long-range, and hazardous weather forecasting.

Short-range forecasts are predictions made between one and seven days before they happen. Medium-range forecasts are usually given between one week and four weeks in advance. Long-range forecasts are given between one month and a year in advance. The further into the future

you're trying to predict, the harder it is to be sure. Longer-range forecasts are only useful if the forecaster says how likely he or she believes it is that the prediction is accurate. This is called a level of confidence. For example, a forecaster may predict rain next Tuesday with a 90% level of confidence. Short-range forecasts are far more accurate than medium- or long-range ones.

8.4.4 Types of Clouds

Fig. 8.5

Clouds are made up of very light water droplets or ice crystals. These particles can float in the air. When warm air rises, swells and cools, it forms clouds. Many water droplets formed together scatter reflect sunlight and you see a white could, but with a dark or gray cloud, the sunlight is scattered in all directions instead of reflected. The different types of clouds are cumulus, cirrus, stratus and nimbus.

Cirrus Clouds

Fig. 8.6

Cirrus clouds are the thin, wispy clouds seen high in the sky. They look as if someone took a cloud, stretched it, pulling pieces off, like a cotton ball when it is pulled apart. They are thin because they are made of ice crystals instead of water droplets. A blue sky and a few cirrus clouds high in the sky, usually means it is going to be a nice day.

Cumulus Clouds

Fig. 8.7

Cumulus clouds are the puffy clouds that are usually scattered throughout the sky. In Latin, the word cumulus means pile.

Just like when we say "accumulate," it means things pile up. This type of cloud is formed when warm air rises carrying water vapor with it by evaporation. Cumulus clouds can be white or gray. White fluffy clouds means no rain, but when they form into dark or gray clouds, it is going to rain.

Stratus Clouds

Stratus clouds look like a huge thick blanket covering the sky. These clouds are a sure sign of rain if it is warm and snow if it is cold. If stratus clouds are near the ground, they form fog. These clouds form when the weather has been cold and warmer moist air blows in. The amount of moisture in the air and the difference between warm and cold air determine how thick the cloud or fog is.

Fig. 8.8

Nimbus Clouds

The word nimbus means a cloud that already has rain or snow falling from it. These clouds are dark and seen during a thunderstorm along with thunder and lightning. They can be a combination of two clouds, like a cumulonimbus, which means a puffy black cloud with rain falling out or it, or a stratonimbus, which is a dark blanket with rain falling out of it.

Fig. 8.9

8.4.5 The Weather Chart

Weather charts are the fundamental basis for weather analysis and forecasts. They are based on the data collected by weather stations

Weather charts are used in various ways, primarily to display weather predictions using boxes. Each box represents one day of weather and normally shows a picture of what the weather for that day will look like. Each box also shows temperatures, such as the high and low predictions for the day. Weathermen illustrate the conditions for the upcoming week using a chart that shows these items. You can make a weather chart by recording actual temperatures instead of predicted temperatures.

Fig. 8.10

The process of creating a weather chart

i. Write the title on the top of a page of construction paper, such as “Monthly Weather Chart" or "Five Day Weather Report."

ii. Using a ruler to create columns for each day of the week. You can either choose five days or seven days for a full week. Write in the days of the week in the columns. You can make the chart good for one week, or multiple weeks by adding more rows in each column.

Under each column title, you create a box that will allow you to write in the weather for the day. If it is a sunny day, you have to draw a picture of a sun. If it is raining or cloudy, you can draw rain or clouds. Each day, you must observe the weather and add something.

Depending on how long you will use the chart, write in the days or dates. Make a box for each day. Each morning or afternoon at school, fill in the weather. Ask students to guess the temperature and then find out the real temperature and write it in the box.

8.5 Natural Disasters

Natural disasters are violent events that are outside the control of humans. They are caused by the forces of nature and may result in loss of life, injury, and damage to property. There are many types of natural disaster, including floods, landslides, fires, and earthquakes.

8.5.1 Introduction to Natural Disasters

Natural Disasters are catastrophic events that result from any of the Earth's natural phenomena. These can range from floods and hurricanes to tsunamis and earthquakes.

The Earth, over its 4.54 billion-year history, has seen many natural disasters. Some of these disasters have led to several mass extinctions and drastic repercussions for various surviving species. A natural disaster can be defined as:

"A major event brought about by the natural processes of the Earth that causes widespread destruction to the environment and loss of life."

A disaster (Fr. desastre=bad star) refers to sudden serious disruption of normal functioning of a society, involving large damages to life, property and environment, beyond its ability to cope with its own resources. It can be natural or man-made A natural disaster is a natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. E.g. agricultural diseases & pests, damaging winds, drought and water shortage, earthquakes, emergency diseases (pandemic influenza), extreme heat, floods and flash floods, hail, hurricanes and tropical storms, landslides & debris flow, thunderstorms and lighting, tornadoes, tsunamis, wildfire etc. Man-made disaster: Human-instigated disasters are the consequence of technological hazards E.g. hazardous materials, power service disruption & blackout, nuclear blast, radiological emergencies, chemical threat and biological weapons, cyber-attacks, war etc. Some disasters can result

from combination of both Natural and Man-made causes. These are called as complex emergencies.

8.5.2 Effects of Floods, Landslides, Fires and Earthquakes

Flood is a common cause of flood in the rainy season in Nepal, and has been most frequent, highly damaging and wide spread natural hazards. Floods occur when land that is usually dry is submerged by large amounts of water. Sudden submergence or inundation of land area with water is called as flood. The occurrence of floods can be due to both natural and human causes.

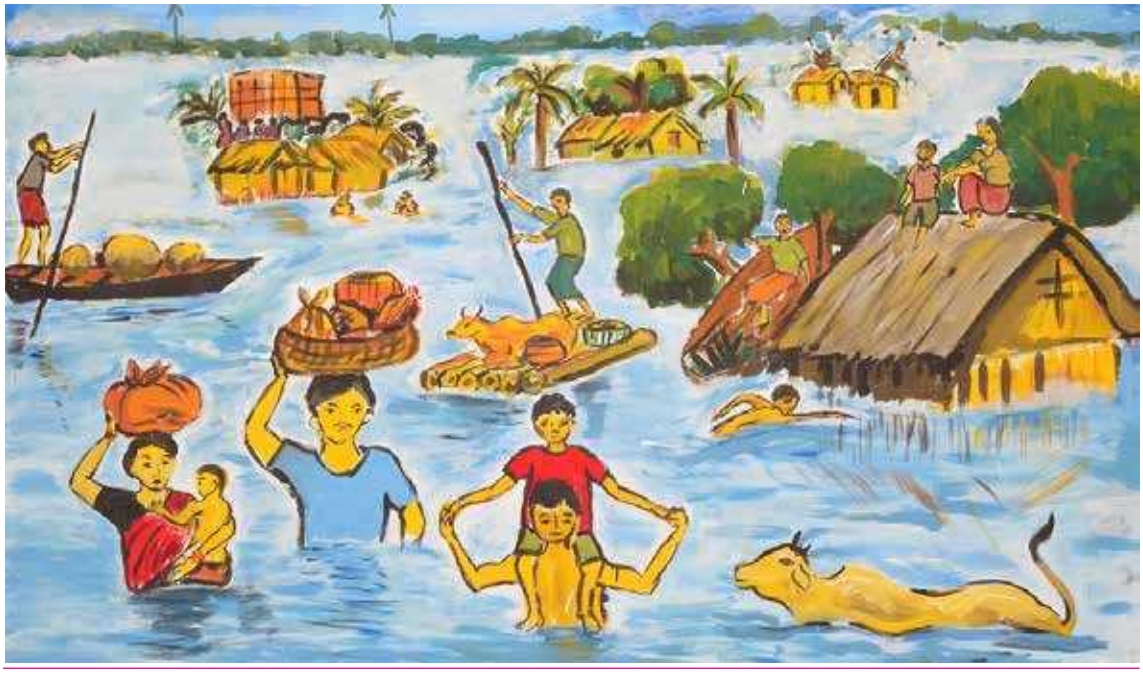


Fig. 8.11

Effects of floods

Loss of life: Floods mostly strike people unprepared, leading to loss of lives in drowning. Along with livestock and other life forms. Impact is higher in flood plain areas which are densly populated,

Damage to infrastructure and property: Flood cause huge losses to homes, roads, power supply and other infrastructure.

Spread of Diseases: After flood water recedes, shallow stagnant water may cover areas over a considerable period of times. This may result in outbreak of water borne diseases. Moreover homeless flood victims are housed in temporary shelters which are mostly overcrowded and with poor sanitation conditions which may turn situation worse.

Loss of natural habitat: Trees, vegetation and other natural habitats may get destroyed leading to loss of biodiversity.

landslides

Fig. 8.12

Landslide is one of the very common natural hazards in the hilly region of Nepal. A landslide/landslip is primarily a combination of several geological processes that include earth movements like extensive slope failure, rocks falling, and debris flow under the action of gravity. Landslides occur when gravitational and other types of shear stresses within a slope exceed the shear strength (resistance to shearing) of the materials that form the slope.

Effects of landslides

Landslides blocks streams with debris and stones, leading to overflowing. It disrupts vehicular movement, damages vegetation, roads, communication networks and buildings. It also results in accidents. Overall it acts as a risk to life.

Fires

Of the total households of the country, nearly 78 percent house holds are agro-base households. In the rural areas thus, about 86 percent of the population lives in the houses made of earthen wire, stone and wood. In Nepal, houses for residential purpose are developed in cluster basis which are more susceptible to catching fire and spreading over there immediately due to close connectivity especially in the dry season. Wildfire is another cause of natural disaster which usually occurs during dry season, especially in the mid hill areas. In the Terai region, fire, including the wildfire occurs mainly in the dry season.

Fig. 8.13

Effects of Fires

Wildfire is a part of nature. It plays a key role in shaping ecosystems by serving as an agent of renewal and change. But fire can be deadly, destroying homes, wildlife habitat and timber, and polluting the air with emissions harmful to human health. Fire also releases carbon dioxide—a key greenhouse gas—into the atmosphere. Fire effects are influenced by forest conditions before the fire and management action taken or not taken after the fire, and may be long-lasting.

Earthquakes

An earthquake (also known as a quake, tremor or temblor) is the shaking of the surface of the Earth, with sudden release of energy in the form of seismic waves on the surface of the earth. The point inside the crust where the pressure is released is called the focus. The point on the Earth's surface above the focus is called the epicentre. When earthquake occurs beneath the sea it causes tsunami.

Fig. 8.14

Effects of Earthquakes

Soil Liquefaction: Due to earthquakes granular material (such as sand) temporarily loses its strength and transforms from a solid to a liquid (Soil liquefaction). This causes rigid structures, like buildings and bridges, to tilt or sink into the liquefied deposits.

Landslides and avalanche : Earthquakes can produce slope instability leading to landslides and avalanche.

Tsunamis: When earthquakes occur under sea it causes tsunami. Most destructive tsunamis are caused by earthquakes of magnitude 7.5 or more.

Floods: These are secondary effects of earthquakes, as they may occur if dams are damaged.

Fires: Earthquakes can cause fires by damaging electrical power or gas lines.

Destabilization: It destabilizes ecological and social structure of nation. Essential services also got disrupted.

Loss of life and property: An earthquake may cause injury and loss of life, general property damage and collapse or destabilization of buildings. The aftermath may bring disease, lack of basic necessities, mental consequences such as panic attacks and depression to survivors etc

8.5.3 Measures to Avoid Floods, Landslides,

Disasters	Measure to Avoid
 Flood	- Introduce better flood warning systems - Increase spending on flood defences - Protect wetlands and introduce plant trees strategically - Improve soil conditions - Sustainable drainage: permeable pavement, sidewalks and gardens - We should conduct various educational programmes to aware people.
 Landslides	- Construction of roads and dams should be restricted to fragile area . - Afforestation should be promoted and intensive grazing by domestic animals should be avoided. - Terrace farming on the hills slows down the rate of landslides
 Hurricanes	- Stay Inside & Away From Windows - Stay in Tune with Local and National Alerts - Be Ready to Turn Off Main Energy Sources - Beware of Water Coming into Your Home

 **Fires**	- Unplug items you're not using - Never leave flames unattended - Keep flammable items away from heat - Put out the fire - Turn off heated appliances when you leave the house - Keep oils and gases away from flames and sparks
 **Earthquakes**	- Seek shelter under stable tables or under door frames. - If outside, stay away from buildings, bridges and electricity pylons and move to open areas. - Avoid areas at risk from secondary processes, such as landslides, rockfall and soil liquefaction. - After an earthquake, check gas, water and electricity pipes and lines for damage. - Listen to the radio and follow the instructions issued by the authorities. Earthquake-proof planning and design of buildings

Points to Remember

- About 70% of the Earth's surface is covered with water and most of that is ocean. It is known as the "Blue Planet". Only a small portion of the Earth's water is freshwater, which is found in rivers, lakes, and ground water.
- Water, wind and ice physically remove and carry (erosion) rock, soil and sediment and deposit the material in a new location. Gravitational force affects movements of water, rock and soil. Weathering is the breakdown of large rock into smaller pieces of rock.
- Cirrus clouds are the thin, wispy clouds seen high in the sky. They look as if someone took a cloud, stretched it, pulling pieces off, like a cotton ball when it is pulled apart. They are thin because they are made of ice crystals instead of water droplets.
- Weather charts are the fundamental basis for weather analysis and forecasts. They are based on the data collected by weather stations.
- Natural Disasters are catastrophic events that result from any of the Earth's natural phenomena. These can range from floods and hurricanes to tsunamis and earthquakes.
- Flood is a common cause of flood in the rainy season in Nepal.
- Landslide is one of the very common natural hazards in the hilly region of Nepal. A landslide/landslip is primarily a combination of several geological processes that include earth movements like extensive slope failure, rocks falling, and debris flow under the action of gravity.
- After flood water recedes, shallow stagnant water may cover areas over a considerable period of times.
- Landslides blocks streams with debris and stones, leading to overflowing.
- In the Terai region, fire, including the wildfire occurs mainly in the dry season.
- The point inside the crust where the pressure is released is called the focus.

GLOSSARY

Kinetic energy : form of energy that an object or a particle has by reason of its motion.

Globe : is a spherical model of Earth, of some other celestial body, or of the celestial sphere.

sphere : a round solid figure, or its surface, with every point on its surface equidistant from its centre.

Equator : a line notionally drawn on the earth equidistant from the poles, dividing the earth into northern and southern hemispheres and constituting the parallel of latitude 0°.

Sextillion tons : Sextillion may mean either of the two numbers (see long and short scales for more detail): 1,000,000,000,000,000,000,000 (one thousand million million million; 10^{21}.

Planets : are large natural objects that orbit, or travel around, stars.

Gravity : All objects attract other objects because of a force called gravity. Gravity is a pulling force that works across space. That is, objects do not have to touch each other for the force of gravity to affect them.

Nitrogen : The chemical element nitrogen is a gas that makes up much of the air in Earth's atmosphere. It is also one of the principal chemical elements that are a part of all living things. Scientists use symbols to stand for the chemical elements. The symbol for nitrogen is N.

Exercise

A. Choose the best answer from the given alternatives.

i. The Earth shape is .....

a. Round b. Sphere

c. Flat d. Square

ii. About 70% of the Earth's surface is covered with ..... and most of that is .....

a. water, ocean
b. land, water
c. grass, land
d. hills, desert

iii. Water, wind and ice physically remove and carry (erosion) rock, ... and deposit the material in a new location.

a. water and soil
b. soil and sediment
c. mud and water
d. water and plant

iv. Air is pressure measured by.....

a. thermometerb. calorimeter
c. barometer
d. computer

v. Cirrus clouds are the thin, wispy clouds seen high in the sky.

a. wispy
b. black
c. blue
d white

vi. Weather charts are the fundamental basis for ..... analysis and forecasts.

a. climate
b weather
c. temperature
d. season

vii. Natural Disasters are catastrophic events that result from any of the Earth's.....

a. natural phenomena
b. artificial phenomena
c. natural and artificial phenomena
d. none of above

viii. .....is one of the very common natural hazards in the hilly region of Nepal. A landslide/landslip is primarily a combination of several geological processes that include earth movements like extensive slope failure, rocks falling, and debris flow under the action of gravity.

a. Landslides
b. Hurricanes
c. Tsunami
d. Earthquakes

B. Write "T" for true and false " F" statements.

i. Only a small portion of the Earth's water is freshwater, which is found in rivers, lakes, and ground water.

ii. Gravitational force affects movements of water, rock and soil.

iii. Cirrus clouds are thick because they are made of ice crystals instead of water droplets

iv. Natural Disasters can range from floods and hurricanes to tsunamis and earthquakes.

v. Flood is a common cause of flood in the rainy season in Nepal.

C. Write the corect word to complete each sentences. Choose your answer inside the box.

fire, rock, blue planet, debris, focus

i. The earth is known as the.....

ii. Weathering is the breakdown of large ..... into smaller pieces of rock.

iii. Landslides blocks streams with .....and stones, leading to overflowing.

iv. In the Terai region, ...including the wildfire occurs mainly in the dry season.

v. The point inside the crust where the pressure is released is called the.....

D. Answer these questions :

i Describe the earth's shape and size.

ii. Describe the earth's surface.

iii. What is the atmosphere ?

iv. How many types of cloud ?

v. What is weather ?

vi Define the weather chart.

vii What do you mean by natural disasters?

viii. Explain the environmental effects of natural disasters.
ix. What is the importance of weather?
x. What is weather write in brief?
xii. What is weather give example?
xiii. How do you measure weather?
xiv. Make a list of flood, landslide, fire and earthquake prevention measures and present them through the table.

E. Write short note :

a. Flood
b. Landslides
c. Weather
d. The Earth shape
e. Natural disaster

F . Make meaningful word from the jumbled letters

i. STERDISA

.....

(hint: a sudden accident or a natural catastrophe that causes great damage or loss of life.)

II. ATHER WE

.....

(hint: the state of the atmosphere at a particular place and time as regards heat, cloudiness, dryness, sunshine, wind, rain, etc.)

III. CASTFOR

.....

(hint: predict or estimate (a future event or trend).

iv. SLAND LIDES

.....

(hint: he usually rapid downward movement of a mass of rock,)

V. MOAERETSPH

.....

(hint: the envelope of gases surrounding the earth or another planet.)

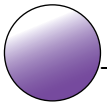
G. Diagrammatic questions

i. Match

- This is land
- This is water

ii. Complete the sentences.

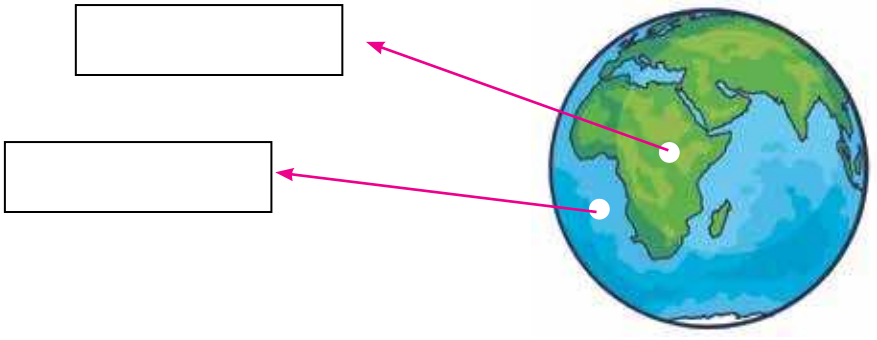
Earth	sphere	ball

This Earth is a  _____

It has this shape of a  _____

Most of the  _____ is covered by water.

iii. Complete with "ocean" or "continent".



iii. What is the word? Write the word undert the picture.

cold	hot	warm	cloudy	foggy
sunny	riny	snowy	windy	stormy

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Warm up activities

a. Match the picutre and the words:

b. Put the pieces together:

na	tsu	mi	
he	al	anc	av
rri	ne	hu	ca
na	tor	do	
nt	ug	dro	

c. What are these things:

i. A sudden strong shaking of the ground:

_____

ii. A long time when there is not enough rain:

_____

iii. Too much water in a place:

_____

iv. A terrible snowstorm:

_____

d. Match the photos to the names of natural disasters.

		
		
		
hurricane	**volcanic eruption**	**drought**
tsunami	**flood**	**tornado**
avalanche	**forest fire**	**earthquake**

Project Work

Complete the table below by observing the land surface around your village or town. Write sloping or smooth in the form of land and in cover you can write canals, lakes, forests, sand, stones, loose soil, etc.