



Right Science

5

***Teacher's
Resource Book***

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Chapter 1: Science

Branches of Science 1.1

Learning objectives:

- In this lesson we will learn about the branches of science in detail.
- We will learn about biology, zoology, botany, and microbiology.
- We will learn about chemistry, organic chemistry, inorganic chemistry, physical chemistry, analytical chemistry and biochemistry.
- Further we will learn about Physics, mechanics, optics and electromagnetism.

Teacher Starters:

Start by asking students about what the science is? Also ask them how many branches of science are? You can tell them name of the important branches such as biology, chemistry and physics. The students should only have the basic idea of these three fundamental branches i.e. chemistry deals with chemicals and chemical reactions, physics deal with matter, motion, energy and force while biology deals with life and living beings.

Teaching:

Get the lesson read in class, emphasizing more basic branches of science i.e. chemistry, physics and biology. Point to the pictures given in the unit, such as that showing cells and organ for biology, and force, energy and motion for physics. Give them examples related to the topic. For example, tell them that those learning biology in advanced stages end up being doctors, nurses or veterinary physicians. It helps them to think.

Extended Teaching

Resources at www.learningwell.pk

Log on to your personal account at www.learningwell.pk to view electronic print of this lesson and a full-length video lecture or animation pertaining to the lesson. You will also find extended exercises or MCQ-based tests based on the lesson to help your students improve their learning. Additional teaching resources are also available at www.TeachingWell.pk

Web Resources:

For further information visit these sites and links:

1. www.factmonster.com
2. www.infoplease.com

Test Your Knowledge

A. Match with correct science:

Answers:

1. Geology
2. Physics
3. Chemistry

4. Biology
5. Astronomy
6. Ecology
7. Botany
8. Entomology
9. Zoology
10. Palaeontology

B. Branches of Earth Science:

Match the event to the branch of earth science:

Events

Meteorology	(a tornado roaring across country)
Geology	(a landslide falling down a hillside)
Oceanography	(waves crashing on a beach)
Astronomy	(a meteorite crashing into Earth)

Match the branch to the activity of the scientist.

Scientist activity

Geology	(searching for new natural deposits)
Astronomy	(trying to discover if there is life on other planets)
Meteorology	(investigating climate change) c)
Oceanography	(tracking ocean currents)

Scientist activity

- | | |
|--------------------------|----------------------------------|
| a. Map earthquakes | e. make topographic maps |
| b. Study Solar energy | f. study hurricane control |
| c. Forecast weather | g. design new rocket engine |
| d. Study the ocean floor | h. chart the movement of iceberg |

Branch

Oceanography Study the ocean floor chart the movement of iceberg

Meteorology Forecast weather study hurricane control

Astronomy Study Solar energy design new rocket engine

Geology Map earthquakes make topographic maps

Think and Write

A. Answer the following questions:

1. What could happen to us if the science is not here?
 - Without science our lives would be harder, dangerous and disconnected-such as;
 - i) We would not be able to talk our friends, living away from us.
 - ii) We would not be able to read and write after the sunset.
 - iii) We would be cooking food on fire.
 - iv) We would be wearing natural clothing such as animal hide, sheep's wool or cotton.



2. What is biology? Give a detailed account of its branches with examples.

- Biology is the branch of science that studies life and living organisms. It helps us to understand living things and their way of life. It is divided into three sub-branches;

a) Zoology:

In zoology we study animals and their life. Scientists who study animals are called zoologists. They study about their body parts, population, reproduction, habitat, food and how animals interact with other animals. E.g. Rabbit, dog, cat and bear etc.

b) Botany:

In botany, structure, classification, properties and biochemical processes that take place inside plants are closely studied. Botany also includes the study of plant diseases and the interaction of plants with their environment. E.g. wheat, corn, sugar cane etc.

c) Microbiology:

Microbiology is the study of microbes or micro-organisms, which are so tiny that we cannot see them with the naked eye. People who study microorganisms are called microbiologists. They study properties, structure and behaviour of microbes, including identifying which ones are good and which ones are bad. E.g. bacteria, algae, fungi, viruses and protozoans.

3. What does chemistry deal with? Write its types and their importance in our life.

- Chemistry deals with the composition and properties of matter and the changes it goes through. The matter is anything that you can see, touch, feel or smell. Everything around us is matter. So chemistry is the study of everything. There are five sub-branches of chemistry;

a) Physical Chemistry:

It is a combination of physics and chemistry. Physical chemists use physics to understand chemical problems. It is important for research and development of new material.

b) Inorganic Chemistry:

It studies those substances which do not have carbon in them. It holds the study of everything other than organic substances. It helps us in the production of ceramics and glass.

c) Analytical Chemistry:

It is the qualitative and quantitative study of substances, or the study of quality and quantity of the different types of matter. People who study analytical chemistry are called analytical chemists. They analyze blood samples and food products to maintain their quality. They also measure drugs in medicines.

d) Bio Chemistry:

It is the combination of biology and chemistry. It helps us to study the chemical reaction of food and tells us how stomach and liver produce chemicals to facilitate digestion of food.

e) Organic Chemistry:

It is the study of matter made from element carbon. Carbon is present in almost everything. Studying organic chemistry helps us in manufacturing useful products such as plastic, rubber and medicines to cure diseases.

4. What is physics and how it is important for us?
 - Physics is the study of properties of matter and energy and interaction between them. Everything present on our planet Earth interacts and affects other things. It is important for us because it explains how the world around us works. Many inventions such as electronic machines, buildings and cars all are the gift of physics.
5. Which branch of physics helps us in building aeroplanes?
 - Mechanics is the branch of physics which help us in building aeroplanes.
6. Why science of optics important for us? Elaborate with examples.
 - It is important because optic tells us how the human eye works. It helped us to treat eye disorders. It has given us laser technology to treat eye illness. It has also given us great inventions such as cameras to capture pictures, telescopes to see stars in the sky, binoculars to see distant objects and birds.
7. Write the difference between organic and inorganic chemistry.

Organic Chemistry	Inorganic chemistry
It is the study of matter made of the element carbon	It studies those substances which do not have carbon in them
Organic chemists study the structure, properties and reaction of carbon-containing substances	Inorganic chemists study the substance like minerals, ammonia, hydrogen sulphide, chlorine and all metals such as gold, silver, aluminium, lead etc
It helps us in manufacturing plastic, rubber and medicines to cure diseases	It helps us in the production of ceramics and glass

8. If you want to study about animals, which branch of science will you study?
 - Zoology is the sub-branch of biology in which we study about animals and their life.
9. If we got sick, then which branch of science will help us and why?
 - If we got sick, organic chemistry will help us in manufacturing medicines to cure diseases.

B. MCQ's

Answers:

1. Pure science
2. Life science
3. Ecology
4. Physiology
5. Chemistry
6. Genetics
7. Applied science

Learning New Words:-

Words	Meanings
Universe	all of space and everything in it including stars, planets, galaxies etc
Biology	a science that deals with things that are alive. (such as human beings, plants, animals)
Organisms	a system with many parts that depends on each other and work together
Bacteria	a large group of very small living things that often cause disease
Zoology	a branch of science that involves the study of animals and their behaviour
Reproduction	the process that produces babies, young animals or new plants
Habitat	the place where a plant or animal naturally or normally lives or grows
Species	a group of similar animals or plants and can produce young animals or plants
Botany	a branch of science that deals with plant life
Biochemical	characterized and produced by or involving chemical reactions in living organisms
Microorganisms	an extremely small living thing that can only be seen with microscope
Microbes	a microorganism, especially a bacterium causing disease or fermentation
Algae	a plant like organism of any of several phyla, divisions or classes of chiefly aquatic
Fungi	any of a kingdom of saprophytic and parasitic spore producing filamentous organisms
Viruses	any of a large group of submicroscopic infective agents
Protozoan	a tiny organisms whose body is a single cell
Microscope	a device used for producing much larger view of very small objects
Antibiotics	a drug that is used to kill harmful bacteria and to cure infections
Vaccines	a substance injected into a person or animal to protect against a particular disease
Therapeutics	a branch of science that deals with the ways to treat illness
Chemistry	it deals with the structure and properties and with the changes that they go through
Chemists	a person who studies or does research in the science of chemistry
Organic chemistry	the branch of chemistry that deals with carbon compound
Carbon	a chemical element that forms diamonds and coal
Reactions	an action or attitude that shows disagreement with or disapproval of something
Substances	a material of a particular kind
Inorganic chemistry	the branch of chemistry that deals with inorganic compounds
Aluminum	aluminium is a lightweight metal used, it is silvery-grey
Lead	lead is a chemical element; it is heavy metal that is denser than most common materials
Physical chemistry	it deals the chemical and physical properties of a substance
Physics	it is the study of properties of matter and energy and the interaction between them

Analytical chemistry	a branch of chemistry that deals with the identification of compounds and mixtures
Biochemistry	the chemistry of living things
Digestion	the process by which
Inventions	to discover and find something
Optics	the science that studies light and the way it affects
Laser	a device that produces a narrow and powerful beam of light
Technology	the use of science in industry, engineering etc, to invent useful things or to solve problems
Telescopes	a device shaped like a long tube that you look through in order to see things that are far away
Binoculars	involving or designed for both eyes
Electromagnetism	a magnetic field that is produced by a current of electricity

Scientific Method 1.2

Learning objectives:

- In this lesson we will learn about scientific method.
- We will learn about the steps of scientific method: Questions, research, hypothesis, experiment, analysis, conclusion and theory.
- We will learn that research helps scientists to guess answers.
- We will learn that a hypothesis is an educated guess or an idea that must be proved.

Teacher Starters:

Start by asking students what they know about the scientific method. As they answer, explain which steps they are including or missing while explaining something scientifically. For example, in order to figure out whether one has some disease such as fever, how would the scientific approach follow. Tell them that question, research, hypothesis, experiment, analysis, conclusion and theory are the steps of scientific method.

Teaching:

Get the lesson read in class, emphasizing more on the scientific method of approaching things. Point to the pictures given in the unit so it will help the students to understand the topic easily. Tell students that science entails these steps to arrive at meaningful, accurate and concrete answers. Without scientific process and these steps, the students should know, they will not be able to solve many problems in their daily life.

Extended Teaching

Resources at www.learningwell.pk

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exercises or MCQ-based tests based on the lesson to help your students improve their learning. Additional teaching resources are also available at www.TeachingWell.pk

Web Resources:

For further information visit these sites and links:

1. www.surpriseride.com
2. www.livescience.com

Think and Write**A. Answer the following questions:**

1. What are scientific methods?
 - Scientific method is a way in which a scientist studies and learns things. The scientific method has a number of steps such as question, research, hypothesis, experiment, analysis, conclusion and theory. Scientists follow these steps. They ask questions and find the answers through experiments.
2. What are the scientific methods used for?
 - The scientific methods are used in finding answers to our questions scientifically. It allows us to arrange our thoughts and procedures so that we can be sure about their findings. We can use scientific method to study a cat, ocean or a flower.
3. Why is it important to conduct scientific tests more than one time?
 - It is important to conduct series of scientific tests because hypothesis is changed as we run any experiment to fit our result. After series of tests, we record data to confirm the results.
4. What is the importance of questioning in scientific methods?
 - Science begins by asking questions and then seeking answers. However, science education focuses upon the end game of “facts” rather than the exploratory root of the scientific methods. Encouraging questioning helps to bring the true spirit of science and the art of asking good questions constitutes an important skill to foster for practicing scientists.
5. What is theory?
 - Once a hypothesis is tested by every possible means and proved correct, it is adapted as a theory for a span of time until someone proves it wrong. Not every correct hypothesis becomes theory.

B. MCQ's**Answers:**

1. Hypothesis
2. Observation
3. To find the answer to a question
4. Procedures

5. Evidence
6. Observation
7. Ask a question, make a hypothesis, test the hypothesis, analyse results, draw conclusions and communicate result

Learning New Words:-

Words	Meanings
Scientific	done in an organized way that agrees with the methods and Principles of science
Statement	something that is stated
Derived	being, possessing, or marked by a character not present in the ancestral form.
Inventions	to discover and finding something
Research	careful study that is done to find and report new knowledge about something
Phenomenon	something that can be observed and studied that is or difficult to understand
Hypothesis	a theory that is not proven but leads to further study or discussion
Procedures	a medical treatment or operation
Data	facts or information used usually to calculate, analyze or plan something
Analyzes	to study something closely and carefully
Conclusion	an opinion or decision that is formed after a period of thought or research
Theory	the general principles or ideas that relate to a particular subject

Chapter 2: Living Things

Investigating Living Things 2.1

Learning objectives:

- We will learn that all organs of our body are made of millions of tiny cells.
- We will learn about investigating living things.
- We will learn that multicellular organisms are made of multiple cells.
- We will learn that unicellular organisms are made of only one cell.
- We will know that microorganisms are so tiny we can only see them with microscope.
- Further we will learn that Bacteria, Viruses, Algae, Fungi and Protozoa are the types of microorganism.

Teacher Starters:

Start by asking students about the most common thing in plants, animals and humans. They may answer about various body parts but then plants are very dissimilar to animals and



humans. Again they can answer blood but then plants have a different form for transporting oxygen. They should finally arrive at the basic building block of life i.e. cell. Ask them to suggest any possible difference between animal and plant cell? As they answer, tell them more about it. Prepare them for the topic. Always give them topic-related examples.

Teaching:

Get the lesson read in class, emphasizing more on the topic 'investigating living things'. Point to the pictures given in the unit, especially pictures of cells and cell structures. Tell students that animal and plant cells have different functions and structures. Tell them about unicellular and multicellular organisms. Also discuss micro-organisms for e.g. bacteria, viruses, fungi, protozoa and algae. Tell students about the importance of micro-organisms.

Extended Teaching

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Web Resources:

For further information visit these sites and links:

1. <https://courses.lumenlearning.com>
2. <https://en.m.wikipedia.org>

Test Your Knowledge

The foods listed in this data table were left in plastic bags in a warm container for five days. Observations were made and recorded at the end of the experiment. Use this information to answer the next four questions.

Food Observation

1. If different foods are used, and then different bacteria will grow.
2. how different kinds of food rot
3. Different microorganisms grow on different foods.
4. Use a microscope to identify the kinds of organisms.

Think and Write**A. Answer the following questions:**

1. What are living things? What are the basic requirements for living things to survive in this world?
 - Plants, animals and humans are living things. They need air to breathe and food to eat to survive in this world.

2. What are the tiniest components of living things which make their structure?
 - The tiniest component of living things is called cells. They are the building blocks of all living organisms.
3. Write down the differences between animal and plant cell with illustrations.
 - Illustration will be made by the students themselves.

Animal cell	Plant cell
1. They have no cell wall.	They have cell wall.
2. Cell membrane is a soft thin outer layer of animals cell.	In plants cell membrane is present beneath the cell wall.
3. They have no chloroplast in them.	3. Chloroplast is the food producer for the plant cell.

4. What are unicellular and multicellular organisms?
 - **Unicellular Organisms:**
Living organisms that are made of only one cell are called unicellular organisms. The one cell they are made of is completely capable of performing all functions important for life. These organisms do not get bigger. Just like a cell, we can only see them through microscope. E.g. Amoeba and Euglena.
 - **Multicellular Organisms:**
Organisms that are made of multiple cells are called multicellular organisms. All the plants, animals and humans are multicellular organisms.
5. What are micro-organisms? How many kinds of micro-organisms are there?
 - Answer. Millions of tiny living organisms are called micro-organisms. They need food energy, they grow in numbers, they reproduce, they excrete, they move and they need a specific environment and temperature to survive. These creatures are found all around us in water, air, soil on our skin and even inside us. They are so tiny that we cannot see them with our naked eyes.
There are five different kinds of micro-organisms;
1) Bacteria 2) Viruses 3) Fungi 4) Protozoa 5) Algae
6. Write short notes on:
 - **Bacteria:**
Bacteria are microorganisms. Bacteria come in all sorts of shapes including rod, spiral and sphere. Good bacteria present in our stomach, help us in digesting our food. They help us to fight harmful microorganisms and various diseases. Some bacteria are used in making food like yogurt, cheese and pickles. Harmful bacteria can cause your food to go bad and make you sick.
 - **Viruses:**
Viruses are parasitic which live inside the living cells. They are always harmful and do not have legs cannot move on their own. They travel from person to person by shaking hands,

sneezing, touching food etc. They can cause serious infectious diseases such as chickenpox, measles, dengue etc.

Algae:

Algae are living things that are found all over the world. They also vary in sizes. Some algae grow on animals like turtle and polar bears and some grow near damp places like ponds, pools and sewage pipe. Microscopic algae are used in the toothpaste. Microalgae like seaweeds are found near sea and rivers.

Fungi:

Fungi are a vast group of living organisms. They vary in sizes ranging from microscopic to the big giant. They are helpful for decomposing dead material and help in cleaning our planet Earth. Mushrooms and yeast are a type of fungi. Some harmful fungi like mould that we see on fruits and bread, when left for a longtime.

Protozoa:

Protozoa are unicellular organisms which can be harmful and useful depending on their kind. Some protozoan live on their own, some live in large groups called colonies, while some are parasitic and to survive they live inside the bodies of animals. Harmful protozoa can cause malaria and sleeping sickness. Some protozoa are useful in the treatment of sewage where they eat all the harmful bacteria and make sewage safe for disposal.

7. Are the micro-organisms important for us? How?
- Yes, the microorganisms are important and helpful for us in many ways. They are;
 - 1) They are used to make medicines, vaccines, insulin and diagnostic kits.
 - 2) They are used to make various food products such as yogurt, cheese, butter, pickles, cream and bread.
 - 3) They widely used in agriculture as bio fertilizers, which is a substance that facilitates the growth and development of plants.
 - 4) They are use to treat waste water and solid waste. They decompose toxic material present in the waste.
 - 5) They are use for making useful chemicals such as ethanol, detergents, plasticizers, lubricants, synthetic fibers, resins, pesticides glycerol.
8. How can we protect us from harmful micro-organisms?
- We can protect us from harmful micro-organisms by following such good habits;
 - 1) Wash our hands before and after eating food, after using a toilet and after playing.
 - 2) Brush our teeth twice a day.
 - 3) Cover our mouth while coughing and sneezing to protect others from getting infected.
 - 4) Always eat properly cooked food.
 - 5) Keep our nails short.
 - 6) Cover the food which you are not eating to protect it from houseflies.
 - 7) Avoid eating food from the vendors outside, it is unhygienic.
 - 8) Visit a general physician for a regular checkup.

B. MCQ's

1. a bacteria
2. algae
3. Cells in a multicellular organism can survive on their own while unicellular cells require other cells to survive.
4. covered in hair or fur
5. tissues
6. living things
7. both a and b,
8. harmful
9. all around us
10. cyanobacteria
11. bread
12. female anopheles
13. microscope
14. They are harmful
15. they feed and grow
16. to stop bacteria spreading from one to other
17. a sprained ankle
18. Bacteria that decompose leaves
19. fruit mould
20. they are both the same size
21. brushing
22. Micro-organisms are all around us

Learning New Words:-**Words****Meanings**

Cells	a transparent sheet of celluloid and building blocks of all living organisms
Organism	a system with many parts that depend on each other and work together
Tissue	the material that forms the parts in a plant or animal
Organ	a part of the body that has a particular function
Digestive system	digestive system having the system which helps in digestion
Small intestine	the long, narrow upper part of the intestine in which food is digested
Large intestine	the end part of the intestine that is wider and shorter
Kidneys	two organs in our body that remove waste products from our blood and make urine
Organelles	a specialized cellular part that has a specific function such as chloroplast or nucleus
Multicellular	more than two cells
Unicellular	having or consisting of a single cell
Microorganisms	an extremely small living thing that can only be seen with a microscope
Autotrophs	an organism that is able to form nutritional organic substances from simple inorganic substances



Heterotrophs	an organism deriving its nutritional requirements from complex organic substances
Pathogens	something (such as a type of bacteria or a virus) that causes diseases
Bacteria	large groups of very small living things that often cause diseases
Viruses	any of a large group of submicroscopic infective agents
Algae	a plant organism of any of several phyla, divisions or classes of chiefly aquatic
Fungi	any of a kingdom of saprophytic and parasitic spore producing filamentous organisms
Protozoa	a tiny organism whose body is a single cell

Chapter 3: Humans

Brain: The Control Panel 3.1

Learning objectives:

- In this lesson we will learn that brain is the controlling organ of our body.
- We will learn about the structure of brain which includes three main parts: cerebrum, cerebellum and brainstem.
- The brainstem is made of the midbrain, Pons and medulla.
- We will learn that brainstem is located at the base of the brain and connects the brain with the spinal cord.

Teacher Starters:

Start by asking students that which thing is controlling their body organs, their limbs, their head, their internal organs etc.? They should be able to arrive at brain. Next, you go on to explain the various parts of brain. You can do this elaborately by drawing a diagram of the brain given in the chapter. Label the parts of brain with its functions.

Teaching:

Get the lesson read in class, emphasizing more on how brain acts as the controlling panel for the entire human body, including internal organs. Point to the pictures given in the unit so that students appreciate the complex structure of brain. Tell students. Briefly tell them about various parts of brain: Cerebrum, Cerebellum and Brainstem with their functions.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. <https://quizlet.com>
2. <https://en.m.wikipedia.org>

Test Your Knowledge**A. Write the correct name for the parts of the brains:**

1. Frontal lobe
2. Cerebrum
3. Parietal lobe
4. Occipital lobe
5. Temporal lobe
6. Cerebellum
7. Brain stem
8. Spinal cord
9. Cerebrum
10. Cerebellum
11. Medulla
12. Brain stem
13. Parietal lobe
14. Occipital
15. Temporal
16. Frontal lobe

Think and Write**A. Answer the following question:**

1. Who is the boss of our body? Elaborate.
 - Brain is the boss of our body. It is the higher authority over everything we do intentionally or unintentionally. It tells our body organs to do their job. It cannot move, but it consumes 20% of body's energy because it performs a lot of tasks simultaneously. It tells us how to protect ourselves and remember stuff. It also works when we are sleeping.
2. What is a brain? Write its importance.
 - A brain is the controlling organ of our body. It is located in the topmost part of our body known as the skull. It is responsible for all actions; voluntary or involuntary. It controls our senses and helps us memorize important stuff. Brain connects with the nerves that travel throughout the body. Our senses send signals to the brain through these nerves. The brain then works on the message, solve problem, general a response and tells our body what to do. The brain is far faster and powerful than the most advanced computers in existence.



3. Write in detail about brain structure with a diagram.
- The brain is very delicate and soft yet very powerful organ of our body. It is a mushy grey coloured wrinkled mass surrounded by membranes and fluids. It is about the size of our two fists together. It has three main parts;
 - 1) Cerebrum:** It is the biggest and the topmost part of the brain. It is in charge of our sense-touch, sight, hearing, smell and taste. Signal sent from senses are received by the cerebrum. It interprets the information and decides for every action we perform. It is divided into two sections; the left brain and the right brain, both parts work together to function.
 - 2) Cerebellum:** It is present at the back of the brain below the cerebrum. It controls all the body movement, balance and coordination. Without cerebellum, you cannot stand up straight and perform multiple actions at a time. It is important part of the brain.
 - 3) Brain stem:** It is located at the base of the brain. It connects the brain with the spinal cord. It sends messages in and out of the brain. It is a small mass of tissues that lets neurons reach the brain and from the brain to different parts of the body. It controls involuntary muscles of our body which are present in our stomach and heart. The brain stem is made of the mid brain, Pons and medulla.

Note : Make brain structure diagram with the help of book
4. What is spinal cord and what are its functions?
- The spinal cord runs down from our brain to our lower back. It is protected by bone segments called vertebrae. The thin nerves that spread throughout our body are connected to our brain through the spinal cord. Its functions are;
 - 1) It carries message signals of motion from our brain to our body parts.
 - 2) It returns sensory signals from body parts to our brain.
 - 3) It performs reflexive actions.

B. MCQs

- 20 percent
- foramen magnum
- brainstem
- cerebellum
- Left parietal lobe
- Wernicke's area
- dressing
- medulla
- cerebrum

Learning New Words:-

Words

Meanings

Brain	the organ of the body in the head that controls functions, movement, sensation and thoughts
Skull	the structure of bones that form the head and face of a person or animal
Fluid	capable of flowing freely like water



Voluntary	done or given by choice
Involuntary	not done by choice
Membranes	a thin sheet or layer of tissue that is a part of a plant or an animal's body
Lobes	a curved or rounded part of something (such as a leaf or a part of the body)
Frontal	relating to or showing the front of the human body
Parietal	relating to the walls of a part or located within the parietal bone or parietal lobe of the head
Occipital	relating to or located within or near the occipital or occipital bone
Temporal	a bodily part (such as a bone or muscle) that is near the temples or the sides of the skull behind the orbit
Midbrain	the middle of the three primary divisions of the developing vertebrate brain
Pons	a broad mass of chiefly transverse nerve fibres in the mammalian brain stem
Medulla	the inner or deep part of an animal, plant or human structure (bone marrow)
Spinal cord	the large group of nerves which run through the center of the spine and carries messages between the brain and the rest of the body
Brain stem	the part of the brain composed of the midbrain, pons and medulla
Neurons	a cell that carries messages between the brain and other parts of the body

Stomach and Digestive System 3.2

Learning objectives:

- In this lesson we will learn about stomach and our digestive system in detail.
- We will learn that we get energy from the food we eat.
- We will learn about the stages of digestive process: chewing, swallowing, stomach, small intestine, large intestine and rectum.
- We will further learn about the various disorders of the digestive system.

Teacher Starters:

Start by asking students about what they know about the transportation of food 'inside the body. They may be able to answer important parts of the digestive path, including of course, the mouth and teeth, esophagus, stomach and intestines. As they answer, tell them further details about functions of each part. Draw pictures of each part and label it, so they can understand topic easily.

Teaching:

Get the lesson read in class, emphasizing more on the topic the digestive path that our food takes right from the mouth till the rectum. Point to the pictures of the digestive system parts

given in the unit so that student can relate them. Explain each and every part with its functions in detail. Do not hesitate to discuss problems of the digestive system that lead to certain diseases such as constipation, dysentery, vomiting, nausea etc.

Extended Teaching

Resources at www.learningwell.pk

Log on to your personal account at www.learningwell.pk to view electronic print of this lesson and a full-length video lecture or animation pertaining to the lesson. You will also find extended exercises or MCQ-based tests based on the lesson to help your students improve their learning. Additional teaching resources are also available at www.TeachingWell.pk

Web Resources:

For further information visit these sites and links:

1. www.niddk.nih.gov
2. www.webmd.com

Test Your Knowledge

A. Name the following digestive parts

1. Chewing (mouth)
2. Swallowing (esophagus)
3. Small intestine
4. Stomach
5. Small intestine
6. Large intestine

B. Label the diagram:

1. mouth
2. esophagus
3. stomach
4. small intestine
5. large intestine

Think and Write

A. Answer the following questions:

1. What do we need to survive?
 - Answer. We need the following basic things to survive;
a) Food b) Water c) Air d) Sunlight e) Temperature
2. What is energy and why do we need it?
 - Energy is the ability to do work, moving something against a force like gravity. We need energy to work, to grow, to study and to run.



3. How do we get this energy?

- We get the energy from the food we eat. The energy is stored in the form of big complex molecules. Our body breaks big molecules present in our food into small and simple molecules. This simpler form of food absorbs in our cells to give us energy.

4. Write complete functions of the digestive system?

- The digestive system helps us process the food we eat. There are some stages involved in digestion, they are;

1) Chewing:

It is the first step of digestion. We chew food in our mouth and break it down into small pieces with the help of our teeth and saliva. Digestion begins with the physical breakdown of food.

2) Swallowing:

Tongue pushes food down our throat, this process is called swallowing. It takes food to the next stage. The food in the form of bolus travels down to the stomach for digestion through a pipe called oesophagus.

3) Stomach:

It is the next mixing and holding area. Here actual digestion takes place, as the gastric juice is added to the food. This gastric juice further breaks down the food and kills bacteria so that we do not fall sick. Stomach converts bolus into a liquid mixture. From stomach, the digested food is then transferred to small intestine.

4) Small intestine:

It is a long tube-like organ that further processes the food. The wall of small intestine release enzymes that help extract proteins, fats minerals and vitamins from the liquid food. Juices excreted from pancreas and liver help small the liquid food. Juices excreted from pancreas and liver help small intestine in breaking the food particles. Nutrients extracted from food in the small intestine are easily absorbed into the blood stream. Once nutrients enter the blood stream, the unabsorbed food and water move to the next organ, that is the large intestine.

5) Large Intestine:

It is twice as big as the small intestine. It absorbs salt and water from the undigested food. Later the left over semi-solid waste is transferred to the rectum.

6) Rectum:

It is a part of the large intestine. It stores the solid waste and water until it is excreted out by the anus.

5. How many different parts contribute to the digestion of food?

- The different parts contribute to the digestion of food are as follow;
1) Mouth 2) Esophagus 3) Liver 4) Gall bladder 5) Pancreas 6) Large intestine
7) Small intestine 8) Rectum

B. MCQ's

1. Digestive system
2. fat



3. small intestine
4. large intestine
5. to take in and break down food for use by the body
6. esophagus
7. liver
8. small intestine
9. liver
10. large intestine
11. stomach
12. diarrhea

Learning New Words:-

Words	Meanings
Molecules	the smallest amount of a particular substance that has all the characteristics of that substance
Absorbs	to take in (something, such as water) in a natural or gradual way
Digestive system	the system of organs responsible for getting food into and out of the body
Physical	existing in a form that you can touch or see
Chemical	a substance (such as an element or compound) that is made by a chemical process
Enzymes	a chemical substance in animals and plants that helps to cause natural processes (such as digestion)
Protein	a chemical substance in animals and plants that helps to cause natural processes (such as digestion)
Chewing	to use your teeth to cut food into small pieces before you swallow it
Saliva	the liquid produced in our mouth that keeps it moist and makes it easier to swallow food
Throat	the tube inside the neck that leads to the stomach and lungs
Oesophagus	the part of the alimentary canal which connects the throat to the stomach
Stomach	the organ in our body where food goes and begins to be digested after we swallow it
Gastric juice	a thin watery acid digestive fluid secreted by glands in the mucus membrane of the stomach
Hydrochloric acid	a strong acid used especially in scientific experiments and in manufacturing
Intestine	a long tube in the body that helps digest food after it leaves the stomach
Liver	a large vascular glandular organ of vertebrates that secretes bile and causes important changes in the blood
Pancreas	a large gland of the body that produces insulin and other substances that helps the body digest food
Nutrients	a substance that plants, animals and people need to live and grow
Rectum	the end of the tube in our body that helps digest food



Diarrhea	an illness that causes us to pass waste from our body very frequently and in liquid rather than solid form
Constipation	the condition of being unable to easily realize solid waste from our body

Respiration and Respiratory System 3.3

Learning objectives:

- In this lesson we will learn about respiration and respiratory system.
- We will learn about the organs involved in respiratory system.
- We will learn that mouth, nose, trachea, bronchi and lungs are the organs of respiratory system.
- We will learn about the disorders related to respiratory system.

Teacher Starters:

Start by asking students about which thing is necessary to live? Some of them may be able to answer 'air'. From air, you can elaborate on the breathing process. You may ask them about certain parts or organs of the respiration system, such as lungs. Prepare them for the topic. Give them examples so it will be easy for them to understand the topic easily.

Teaching:

Get the lesson read in class and stress on how respiration system works in totality from the point of inhaling of air from the nose or mouth to the point of returning unwanted air back from the nostrils/mouth. Point to the pictures given in the unit so that students can see the 'inside' of the respiratory path. Tell students about the related organs involved in the process. Also discuss a few respiratory system disorders e.g. Influenza, Asthma, Pneumonia and Lung Cancer.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. www.livescience.com
2. www.myvmc.com

Test Your Knowledge

A. Complete the passage

1. mouth
2. nose
3. sinuses
4. trachea
5. lungs
6. alveoli

B. Label the Respiratory System

- Label the diagram with the help of teacher and book

Think and Write**A. Answer the following questions:**

1. What is essential for us to live?
 - Breathing is essential for us to live. It provides the most important thing we need to live that is oxygen.
2. What could happen to us if we don't get oxygen?
 - Without oxygen, we would be like a cellphone without battery or a plant without water. Lack of oxygen in our body can damage our body cells which will eventually cause death.
3. What is respiration?
 - The oxygen we breathe helps us convert glucose (sugar and carbohydrates in our food) into energy. This chemical process of converting glucose into energy is called respiration.
4. Are breathing and respiration same? Elaborate your answer with examples.
 - No! It is not a same thing. Breathing involves inhale of oxygen from the atmosphere into the lungs and exhale of carbon dioxide from the lungs into the atmosphere; whereas respiration involves breakdown of glucose into carbon dioxide and water in living cells, releasing energy.
5. Write down different parts of the respiratory system with their functions and with illustrations.
 - Different parts of the respiratory system are as follow;
 - 1) Mouth and Nose:**
When we breathe in, air enters through our mouth or nose, passes through the holes in our skull called "sinuses". It travels down the back of our throat and reaches our windpipe also known as "trachea". Tiny hair present in our nose called "cilia" is there to trap dust particles and germs. They also warm the air we breathe.
 - 2) Trachea or Windpipe:**
It is a long tube that connects our nose or mouth with the lungs. It also protect us from germs and dust particles that cilia missed and excretes them as sputum (phlegm). These

impurities adhere to the lining that causes coughing. Coughing helps to remove these impurities from the trachea.

3) Bronchi:

Trachea then branches into two bronchi also called bronchial tubes. Bronchi are two tubes that carry air to each lung. Each bronchi is lined with microscopic hair called cilia.

4) Lungs:

Our right lung has three lobes and our left lung has two lobes. The left lung is a little smaller than the right lung to give space to the heart. Inside each lung, bronchus is further divided into thinner branches like a tree. These smaller air passages or tubes are called bronchioles. The main job of bronchioles is to make sure that all alveoli receive air.

6. Write about some of the ailment which can make a person sick if the respiratory system is affected.

- Some common diseases of respiratory system are:

1) Influenza:

Flu is the most common viral infection caused by the virus called influenza. This virus infects the respiratory system causing extreme fatigue, fever, sore throat and headache.

2) Asthma:

In asthma, the patient gets periodic attacks. In these attacks bronchial tubes contract and make it difficult to breathe in and breathe out. These attacks initiate because of the things a person is allergic such as dust particles, perfumes, cigarette smoke or chemical fumes.

3) Pneumonia:

It is the infection of alveoli. It may be caused by bacteria, virus or fungal infection. In pneumonia tissue fluid piles up in alveoli making it difficult to breathe.

4) Lung Cancer:

Lung cancer occurs when the tissues start growing abnormally. It can happen in any part of the lung. Smoking cigarette is the most common cause of lung cancer. The smoke of cigarette contains lots of harmful chemicals. It has tar in it which forms a layer on the inside surface of lungs making it less able to absorb oxygen.

B. Short answers questions.

1. What is the function of the respiratory system?

- The function of the respiratory system is to breathe in and breathe out.

2. Name five parts of the respiratory system?

- Five parts of the respiratory system are;
 - 1) Mouth and Nose
 - 2) Trachea
 - 3) Bronchi
 - 4) Lungs
 - 5) Alveoli

3. How does the air enter your body?

- When we breathe in, air enters to our body through our mouth or nose.

4. What is the gas that is exchanged for oxygen in the lungs called?

- The gas that is exchanged for oxygen in the lungs is called Alveoli.

5. What is the purpose of the diaphragm?
- Diaphragm separates the chest from the abdomen.

B. MCQs

1. passageway
2. trachea
3. bronchial tubes
4. alveoli
5. decreases, allowing outside air to flow into the lungs
6. in the alveoli
7. nose
8. diaphragm
9. bronchial tube

Learning New Words:-

Words

Meanings

Oxygen	a chemical that is found in the air, which has no colour, taste or smell that is necessary for life
Carbon dioxide	a gas that is produced when people and animals breathe out
Glucose	a type of sugar that is found in plants and fruits
Carbohydrates	it is made of carbon, hydrogen and oxygen that provide our body with heat and energy
Respiration	the act or process of breathing
Windpipe	the tube in our neck and chest that carries air into and out of our lungs
Bronchi	the two primary divisions of the trachea that lead respectively into the right and the left lung
Sinuses trachea	any of several spaces in our neck and chest which carries air that connect with the nostrils
Cilia	hair like out growths of certain cells
Sputum	a thick liquid that comes up from our lungs when we are sick
Phlegm	a thick, yellowish liquid that is produced in the nose and throat especially when a person has a cold
Bronchial tubes	a primary bronchus or any of its branches
Mucus	a thick liquid that is produced in some parts of the body such as the nose and throat
Bronchus	either of the two primary divisions of the trachea that lead respectively into the right and the left lung
Bronchioles	a thin walled branch of a bronchus
Alveoli	a small air-containing compartment of the lungs
Capillaries	one of the many very small tubes that carry blood within body
Diaphragm	a large flat muscle that separates the lungs from the stomach area and that is used for breathing

Chapter 4: Animals

Life Cycle of the Living Things 4.1

Learning objectives:

- In this lesson we will learn about the lifecycle of living things.
- We will learn that all living organisms go through the process of birth, growth, reproduction and death.
- We will learn about asexual and sexual reproduction.
- We will learn about the plant lifecycle and the animal lifecycle in detail.
- We will learn about the metamorphosis and types of metamorphosis

Teacher Starters:

Start by asking students that what they know about various stages of human life, including birth, childhood, adolescence, adulthood etc.? Also ask them what they know about the reproduction. As a caution, you may restrict this topic to only reproduction in animals. You can tell them some examples of animals. Explain them about lifecycle of each with diagram. Tell students about the plant life cycle and animal life cycle. Also tell them about human life cycle.

Teaching:

Get the lesson read in class and focus more on the various stages of life a living being will undergo. Point to the pictures given in the unit, the basic stages including birth, adulthood, reproduction and death. Tell students about the reproduction, asexual reproduction and sexual reproduction. Also explain them the difference between the plant lifecycle and human lifecycle.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. www.exploringnature.org
2. www.biologyreference.com

Test Your Knowledge

A. Choose one animal and draw its life cycle in the boxes

- Do as directed)

Think and Write

A. Answer the following questions:

1. What do you understand by the term life cycle?
 - All living organisms go through the process of birth, growth, reproduction and death in their lifetime. This series of change a living organism goes through is called its life cycle. Every lifecycle is same for every generation. Though the basic stages of life cycle remain the same within the stages, there are differences.
2. What is reproduction? How many kinds of reproduction are there? Elaborate.
 - Reproduction is the biological process by which new individual organisms are produced from their parents. In this stage living organisms produce more like them. There are two kinds of reproduction.
 - i) Asexual Reproduction:**

It is the reproduction that occurs by a single cell. In this type of reproduction that occurs by a single parent cell divides into two new identical cells. Each cell grows into an individual member of the species. Organisms produced by asexual reproduction are identical to their parents and each other. This type of reproduction takes place in microorganisms and plants.
 - ii) Sexual Reproduction:**

It is the reproduction that occurs by two parent cells. In this type of reproduction, one male reproductive cell sperm and one female reproductive cell or egg combine to form a new cell. As they combine, fertilization takes place to form a zygote. This zygote carries the characteristics of both its parents and hence the offspring is not the exact copy of its parents. Humans, animals and most plants reproduce sexually.
3. Why is reproduction a necessary part of the life cycle?
 - Reproduction is necessary part of the life cycle because living organisms reproduce to continue their line. Without a mechanism for reproduction, life would come to an end.
4. Choose a vertebrate animal and study its life cycle.
 - A frog is a vertebrate animal, its life cycle is:
Diagram is given on page number 48.
Life Cycle:
Egg → Tadpole → Tadpole with legs → Froglet → Adult Frog → Egg
A baby frog is a tadpole. It grows into a froglet which then grows into an adult frog.
5. What is metamorphosis? Explain in detail with examples.
 - Metamorphosis is a changing process that animals go through to become an adult. A complete metamorphosis consists of the following stages, eggs are laid, larvae hatch, and then they develop into pupae from which the adults finally develop. Animals grow until they become mature adults and then they are able to reproduce so that the cycle starts again. Animals change from one form to a different form, just as a frog is a lot different than a tadpole. We humans also change with time but the change is not big and our general physical structure a baby, ahead, two legs and corms remains the same.

6. Write about a plant's life cycle with the diagram.
- Plants also go through some stages in their life cycle. That is; pollination, fertilization, dispersal, germination, growth and maturity.
(Diagram is given on page 47)
7. What do you think about which phase of life you are in right now?
- I am in puberty phase of life right now. This period is from nine to thirteen, which is the beginning of adolescence.

MCQ's

- puberty
- an egg
- wings
- nymph
- metamorphosis
- larva
- lifecycle
- an adult
- seedling
- to change into an adult
- lifespan
- to reproduce
- living thing
- false
- true
- true
- without reproduction, animal would not continue to grow and develop
- feeding
- adolescence
- egg → larva → pupa → adult
- between 50 and 60 years
- frog
- robins
- rabbits

Learning New Words:-

Words

Meanings

Reproduction	the process that produces babies, young animals or new plants
Life cycle	the series of stages through which a living thing passes from the beginning of its life until its death
Asexual	a kind of reproduction that does not involve the combining of male and female cells
Sexual	a kind of reproduction that involve the combining of male and female cells



Sperm	a cell that is produced by the male sexual organs
Egg	a cell that is produced by the female sexual organs
Fertilization	the process of union of two gametes where by the somatic chromosome number is restored and the development of a new individual is initiated
Zygote	a cell that is formed when an egg and a sperm combine
Pollination	the transfer of pollen from an anther to the stigma
Dispersal	the process of the spreading of organisms from one place to another
Germination	to cause (a seed) to begin to grow
Maturity	the quality or state of being mature especially means full development
Species	a group of animals or plants that are similar and can produce young animals or plants
Moths	a kind of insect that is similar to a butterfly but flies mostly at night and is usually less colourful
Larvae	a very young form of an insect that looks like a worm
Hatch	to produce young from an egg by applying natural or artificial heat
Pupae	an insect in the stage of development between larva and adult
Tadpole	a small creature that becomes an adult frog or toad
Metamorphosis	relating to or produced by metamorphosis
Holometabolism	characterized by complete metamorphosis

Chapter 5: Plants

Flowering and Non-Flowering Plants 5.1

Learning objectives:

- In this lesson we will learn about the flowering and non-flowering plants.
- We will learn about the major classification of plants.
- We will learn that non-flowering plants can be divided into two groups: Bryophyte (seedless plants) and Gymnosperms (seed-bearing plants).
- We will learn about the structure of seed in detail.
- We will learn about Monocot and Dicot plants.

Teacher Starters:

Start by asking students about plant and their various parts, such as root, stem, fruits and flower. Also ask them what they know about the lifecycle of plants. Is it the same lifecycle as in humans, how? You can tell them with some examples. Discuss non-flowering plants and flowering plants in detail. Explain them about structure of a seed. Also cover the topic monocot and dicot plants, which is included in this chapter.

Teaching:

Get the lesson read in class, emphasizing more on the topic 'flowering and non-flowering plants'. Tell students that flowers are the reproductive organ of a plant and flowers make seeds



within a fruit. Tell them that plants are divided into two categories; Flowering plants and non-flowering plants. Point to the pictures given in the unit. Also tell them that life cycle of a flowering plant has five major stages that is seeds, young plant, adult plant, flower and fruit. Discuss the types of plants; monocot and dicot and tell them about their differences.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. www.smartsiencepro.com
2. <https://study.com>
3. www.hunker.com

Test Your Knowledge

A. Complete the Venn diagram

Answer.

Flowering	Non-Flowering	Alike
1) They produce seeds surrounded by fruit.	They do not produce seeds enclosed in fruits	Gymnosperms (non-flowering plants) seeds are open to the air without covering like the seeds of flowering plant
2) They produce flowers	They do not produce flowers.	
3) They have flat and broad leaves	They have needle like leaves	

Think and Write

A. Answer the following questions:

1. What are flowers and why are they important for us?
 - Flowers are the reproductive organ of a plant. They are a beautiful creation of nature which makes the world around us smell better. Flowers are important because they help plants to make seeds with in a fruit. Plants use these seeds to reproduce and grow when suitable conditions are provided to them.
2. Collect different seeds and bisects them. Write your observations in your journal with illustrations.
 - (Do as directed)

3. What is the classification of plants? Write in detail with examples and pictures.
- Plants are important for all other living organisms because, they are producers. They produce food and oxygen for all of us. Plants are divided into two categories according to their tendency of growing flowers.

1) Non-flowering plant:

Plants that do not produce flowers are called non-flowering plants. Non-flowering plants do not produce seeds enclosed in fruits. They use spores, fungi or cones for reproduction. They usually have needle-like leaves. Algae, moss, fern and conifer are common examples of non-flowering plant.

2) Flowering plant:

Flowering plants are also known as Angiosperms. All the flowering plants produce seed in their lifecycle. Their seed is surrounded by fruit. They usually have flat and broad leaves. They are the most developed category of plants. Apples, sunflower, rose, bananas, oranges and hibiscus plants are examples of some flowering plants.

Life cycle of a flowering plant has five major stages;

i) Seed ii) young plant iii) adult plant iv) flower v) seed

4. What does seed consists of? Support your answer with a detailed diagram.

- A seed is consists of four major parts:

a) Seed Coat:

It is the outer covering of a seed. It can be thin and soft such as in beans or hard and thick such as coconut seed. It protects the inside parts of seed from injury and also from drying out.

b) Endosperm:

It is the food storing part of the seed. It supplies food to the plant until it becomes capable of making its own food. It surrounds the embryo and helps it grow.

c) Embryo:

It is the baby plant that grows into a new plant under suitable conditions.

d) Cotyledons:

They are the newly developed leaf-like parts. They are also known as seed-leaves.

(Diagram is given on page no. 57)

5. Collect different flowers and sort them out in dicot and monocot plants.

- The flower of a dicot plant has a number of petals divisible by four or five. It usually has four, five, ten etc number of petals.

E.g. China rose, mountain ebony, periwinkle, rose, yellow bells.

MCQ's

- seeds
- it doesn't have flowers
- cones
- fruits
- angiosperms

6. gymnosperms
7. the seeds of gymnosperms have no covering
8. parallel
9. two
10. d) tap
11. tiny organisms that contain only a single cell
12. have short growths called rhizoids instead of roots
13. inside cones
14. germination

Learning New Words:-

Words	Meanings
Non-flowering	producing no flowers
Spores	a cell made by some plants that is like a seed and can produce
Fungi	a wide variety of organisms that reproduce by spores, molds yeast and mildews
Cones	a hard and dry part that is the fruit of a pine tree or other ever green plant and contains many seeds
Algae	small plants that grow in or near water and do not have ordinary leaves or roots
Moss	a type of green plant that has very small leaves and no flowers and that grows on rock, bark or wet ground
Fern conifer	a bush or tree that produces cones and has large green leaves and no flowers
Bryophyte	division of a non flowering plants comprising the mosses, liverworts and hornworts
Gymnosperms	a group of vascular plants that produce naked seeds not enclosed in an ovary
Rhizoid	a root like structure
Pine	a tree that has long, thin needles instead of leaves that stays green throughout the year
Cycads	a tropical palm like evergreen plant that have a stout
Ginkgo	a large Chinese tree that has fan-shaped leaves and woody trunk
Yews	an evergreen tree or bush with stiff needles and small red berries
Seed coat	an outer protective covering of a seed
Endosperm	a nutritive tissue in seed plants formed with in the embryo sac by division of the endosperm nucleus
Embryo	a human or animal in the early stages of development before is born, hatched etc
Cotyledons	the first leaf or one of the first pair of leaves developed by the embryo of a seed plant or some lower plants
Monocot	a sub class of angiospermous that produce an embryo with one cotyledon
Dicot	a sub class of angiospermous plants that produce an embryo with two cotyledons



Xylem	a complex tissue in the vascular system of higher plants that consists of vessels and tracheids
Vessels	a conducting tube in the xylem of a vascular plant formed by the fusion and loss of end walls of a series of cells
Veins	one of the thin lines that can be seen on the surface of a leaf
Cuticle	a thin fatty or waxy film on the external surface of many higher plants that consists of chiefly of cutin
Stomata	a small opening on the leaf to enable the exchange of gases
Petals	one of the soft, colourful part of a flower
Tap roots	the large main root of a plant from which smaller roots grow
Fibrous	containing, made of or resembling fibres

Chapter 6: Materials

Matter, Mass and Weight 6.1

Learning objectives:

- In this lesson we will learn about matter and states of matter.
- We will learn about Solid, Liquid and Gas.
- We will learn that matter can be transformed from one state to another.
- We will learn that the mass is the quantity of matter present in an object.
- We will learn the difference between mass and weight.

Teacher Starters:

Start by asking students that what is matter made of? Also ask them what are the different states of matter? As they answer, tell them there are three common states of matter; solid, liquid and gas. Discuss how changes occur in matter. A simple example of ice turning into water and then water evaporating into air can be given. Also explain the difference between mass and weight.

Teaching:

Stress on how matter changes its form and how mass and weight are similar but different things. Tell students about matter and its states. Explain them about the change in the states of matter through processes like heating and cooling. Tell them about mass and weight in detail.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. <http://en.m.wikipedia.org>
2. www.ducksters.com
3. www.thoughtco.com

Test Your Knowledge**A. Matter matters!**

Match the following vocabulary words with the given definition

- | | |
|------|------|
| 1. c | 5. d |
| 2. e | 6. h |
| 3. g | 7. a |
| 4. f | 8. b |

B. Read the following sentences and write 'true' or 'false'.

1. False
2. True
3. True
4. True
5. False
6. False

C. Explain the difference between a solid, liquid, and gas. Draw and label a concept map using the following terms:

Solid	Liquid	Gas
1) In this state atoms are closely packed.	In this state atoms are not fixed in place.	In this state atoms are not connected to each other.
2) They cannot move.	They can move around.	They can move around freely.
3) It has fixed shape.	It do not have fixed shape	It does not have fixed shape.

Choose the correct word from the box

- | | |
|-----------------------|-----------------|
| 1. solid, liquid, gas | 2. atoms |
| 3. space | 4. Matter |
| 5. container | 6. Gasses |
| 7. Liquids | 8. solids |
| 9. chairs, ice | 10. Milk, juice |
| 11. oxygen, helium | |

Think and Write**A. Answer the following questions:**

1. How do we define matter?



- Answer. Anything that has weight and occupies space is called matter. Everything around us from the water we drink, the air we breathe, the earth we live on, the shining stars, the moon, the sun, all plants etc are made of matter. Matter is made up of tiny particles called atoms.
2. What do you understand by the term states of matter? Elaborate with examples.
- Matter takes on different forms depending upon the arrangement of a atoms. These atoms of matter are known as “States of matter”. There are three common states of matter.
 - i) Solid:** In the solid state of matter, atoms are very closely packed. They cannot move. The tight arrangement of atoms gives solids a definite shape and volume. A solid always looks the same and occupies the same amount of space. It can be different in colours and texture for e.g. an apple, a car, a chair, a book etc.
 - ii) Liquid:** In liquid state, atoms are not fixed in place. They stay connected but can move around each other. This loose arrangement of atoms allows liquid to flow. Liquids do not have fixed shape. They can take the shape of the container they are in. they have a fixed volume and always take up the same amount of space. It can be different in coloured thickness. For e.g. tea, water, juice, milk, etc
 - iii) Gas:** In the gas state, atoms are not connected to each other, so they can move around freely. This arrangement of atom allows gases to float. It is lighter state of matter. They do not have their own shape. They float to take the shape of a container. It does not always weigh the same or take up the same volume. Most gases are colourless so we cannot see them. For e.g. oxygen, carbon dioxide, helium, steam etc.
3. What held the particles of a solid together?
- The kinetic energy of the particles in a solid is small enough that the forces of attraction between them are sufficient to hold the particles close together.
4. Using a particle model, describe two differences between a solid, liquid and gas.
- (Image is on page no. 63)

Solid	Liquid	Gas
They are rigid	They are not rigid	They are not rigid
They have fixed shape and volume	They have no fixed shape but have fixed volume	They have no fixed shape and volume

5. Since you can pour sand into a cup, why isn't it a liquid?
- Sand is a collection of very tiny partials. Each particle has definite shape. It can be poured because of the small size of the particles but it comes in the category of solid.
6. You can't usually see gases in the air. How can you observe gases without seeing them?
- Most gases are colour less and do not have their own shape so we cannot see them in the air. We can observe gases by air movement such as waving flag or turning windmill. We can

also observe temperature and humidity changes in the air. We can feel the wind blow without seeing them.

MCQ's

1. d) matter
2. d) an object
3. d) force of gravity
4. a) weigh less than on the earth
5. c) balance scale
6. c) the force gravity exerts on a body of mass
7. c) the force of attraction between 2 bodies having mass
8. c) weight
9. a) earth
10. c) the Earth has more mass
11. a) Newtons per kilogram (N/Kg)
12. b) Kilograms (Kg)
13. a) Newtons per kilogram (N/Kg)
14. d) Mass= gravity/weight
15. c) The moon's gravitational pull is weaker
16. a) it expands
17. a) sublimation
18. c) 32 degree F
19. c) evaporation
20. a) 0 °C

Learning New Words:-

Words

Meanings

Matter	the thing that forms physical objects and occupies space
Particles	anyone of the very small parts of matter (such as molecules, atom or electron)
Atoms	the smallest particle of a substance that can exist by itself or be combined with other atoms to form a molecule
Solid	firm or hard, not having the form of a gas or liquid
Liquid	capable of flowing freely like water not a solid or a gas
Gas	a substance (such as oxygen and hydrogen) that is like air and has no fixed shape
Oxygen	a chemical that is found in the air that has no colour, taste or smell and that is necessary for life
Carbon dioxide	a gas that is produced when people and animals breathe out Or when certain fuels are burned that is used by plants for energy
Substances	a material of a particular kind
Melting point	the temperature at which something melts
Freezing point	the temperature at which a liquid freezes
Boiling point	the temperature at which a liquid begins to boil



Evaporation	to change from a liquid to gas
Condensation	the process by which a gas cools and becomes a liquid
Mass Newton	to form and gather into a large group in the meter-kilogram second system

Chapter 7 : Energy and Forces

Understanding Sound 7.1

Learning objectives:

- In this lesson we will learn about sound in detail.
- We will learn that sound is all around us and we hear different sounds with the help of hearing.
- We will learn that sound waves produced by vibrations need a medium to travel.
- We will learn about the properties of sound.

Teacher Starters:

Start by asking students that how the sound is produced? Also ask them how they recognize sounds and what are the basic properties of sound. Tell them the medium used to create sound. Discuss how to recognize sounds, properties of sound, loudness, pitch, pleasant and unpleasant sound and echo.

Teaching:

Get the lesson read in class and point to the pictures given in the unit as they demonstrate the various ways in which sound works. Tell students that sound is all around us, and that sound waves are produced by vibrations and they need medium to travel. Tell them about basic properties of sound. Give them related examples.

Extended Teaching

Resources at www.learningwell.pk

Log on to your personal account at www.learningwell.pk to view electronic print of this lesson and a full-length video lecture or animation pertaining to the lesson. You will also find extended exercises or MCQ-based tests based on the lesson to help your students improve their learning. Additional teaching resources are also available at www.TeachingWell.pk

Web Resources:

For further information visit these sites and links:

1. www.soundproofingcompany.com
2. www.behindthemixer.com
3. <http://ilearn.careerforce.org.nz> **Test Your Knowledge**



A. Complete the given diagram.**Label all the parts of the Ear.**

- (Image is given on page no. 71) Do as directed.

B. Fill in the blanks:

1. Frequency
2. high-frequency
3. low-frequency
4. Intensity, pitch and tone
5. Unpleasant
6. differentiate
7. pleasant
8. sound
9. echo
10. ear drum
11. Inner ear

Think and Write

1. What type of movement sets up a sound wave?
 - A sound wave sets up by vibrations need a medium to travel. They cannot travel without a medium. Every medium is made up of particles. These particles help sound waves travel from one source to our ears.
2. In what units are the following measured?
 - a) Frequency is measured in hertz (Hz)
 - b) Wavelength is measured in angstroms and nanometers.
 - c) Loudness is measured in decibels.
3. Why does sound travel faster in a solid than in a gas or liquid?
 - Sound travel faster in a solid than in a gas or liquid because they are so close, can collide very quickly. It takes less time for a molecule of the solid to bump. In solids atoms are closely packed together tighter than liquids and gases, hence sound travels faster in solids. The distances in liquids are shorter than in gases but longer than in solids.
4. What happens when a sound wave hits the eardrum?
 - When a sound wave hits the ear drum, it vibrates. When the ear drum vibrates, it moves the tiny ossicles which help in sending these vibrations to the inner ear. From the inner ear, our brain receives signals produced by cochlea through the auditory nerve. Then the brain processes these signals and helps us to understand and respond.
5. Define these terms.
 - **Pitch:** It help us to differentiate between a shrill or heavy and grave or deep sound. Pitch of sound helps us to differentiate between a male and a female voice. It depends upon the frequency of sound.



Loudness: It helps us to differentiate between a faint sound such as whisper and the loud sound such as the sound of a jet engine. The loudness of sound tells us how loud or soft the sound is. If you hit an object hardly its particles vibrate faster and the object produces a loud sound. Whereas when you hit an object softly its particles vibrate slowly and produce a soft sound.

Echo: When sound waves hit a surface, they reflect. This reflected sound wave is called an echo. When you speak or shout in an empty room or a valley you hear the echo of your voice. It is the sound effect which is heard when sound waves hit a surface and then reflect back.

6. How can you make a drum sound louder?
 - We can make a drum sound louder by striking harder which makes big vibrations. The pitch of a drum depends on how tight its skins are. If the skin is tight the drum makes a loud sound, if it is slack it makes a low sound.
7. How can you make a guitar string sound higher? (2 methods)
 - We can make a guitar string sound higher by;
 - 1) Tighten up the strings
 - 2) Making thinner strings
8. Why should we not stand too close to the band at an outdoor event?
 - We should not stand too close to the band at an outdoor event because the sound is very high which is not in our normal hearing range of ear. The sound waves' loudness and amplitude is high which are produced due to irregular vibrations. Louder sounds are harmful to us and can damage our hearing skill.
9. How can we distinguish between pleasant and unpleasant sounds?
 - a) Pleasant Sound: We feel good when we hear them such as the sound of a piano playing. They are produced because of a regular or fixed pattern of vibrations. A pleasant sound is called musical sound.
 - b) Unpleasant Sound: We feel irritated when we hear them such as the horn of a car. They are produced due to irregular vibrations. The unpleasant sound is called noise.

MCQs

1. a) the outer, middle and inner
2. c) fluid and tiny hairs
3. b) echo
4. d) an area of dry air
5. a) the energy that travels in waves through vibrating matter
6. c) louder
7. b) eardrum
8. b) ultrasound
9. b) because there is no air on the moon and so the sound cannot travel
10. c) because very loud sounds can damage your ears



Learning New Words:-**Words****Meanings**

Sound source	something in good condition that provides what is wanted or needed
Sense of hearing	the sense through which a person or animals is aware of sound
Loudness	the attribute of a sound that determines the magnitude of the auditory sensation produced, that depends on the amplitude of the sound wave involved
Echo	a sound that is produced when sound waves bounce off a surface (such as a wall)
Pitch	it differentiate between a heavy and deep sound
Pleasant sound	a sound causing a feeling of happiness or pleasure
Unpleasant sound	a sound causing discomfort or pain

Striking Light 7.2**Learning objectives:**

- In this lesson we will learn about striking light.
- We will learn that light is a form of energy. It is made up of very tiny particles called photons.
- We will learn about transparent, translucent and opaque objects.
- We will learn about natural sources of light and artificial sources of light.
- We will learn the properties of light: Speed, Reflection, and Refraction.

Teacher Starters:

Start by asking students about light and its sources. You can tell the basic sources of light, including natural light from the sun. Tell them that light has many properties for e.g. Speed, Reflection and Refraction. Perform any experiment related to light, in science lab so it will be easy for them to understand the topic.

Teaching:

Get the lesson read in class focusing on the topic with as many examples as possible. Point to the pictures given in the unit so that students are able to relate various forms of light in their surroundings as well. Tell them that light is a form of energy. It is made up tiny particles called photons. Tell students about light, its sources and its properties in detail. Discuss two major sources of light, Natural sources of light and artificial sources of light.

Extended Teaching

Resources at www.learningwell.pk

Log on to your personal account at www.learningwell.pk to view electronic print of this lesson and a full-length video lecture or animation pertaining to the lesson. You will also find extended



exercises or MCQ-based tests based on the lesson to help your students improve their learning. Additional teaching resources are also available at www.TeachingWell.pk

Web Resources:

For further information visit these sites and links:

1. www.collinsdictionary.com
2. www.cinematography.com

Test Your Knowledge

A. Attempt the given questions

1. Draw and explain to what happens to the path of light as it hits a piece of black paper, a glass mirror, and a glass of water.
 - Black paper: As the light hits a piece of black paper, light does not pass through it.
Pic→ This is called an opaque substance.
A glass mirror: As the light hits a glass mirror, some of the light passes through it.
Pic→ This is called a translucent.
A glass of water: As the light hits a glass of water, light pass through it.
Pic→ This is called a transparent object.
2. Explain why the light behaves the way it does as it hits each object.
 - a) absorbed
 - b) reflected
 - c) refracted
3. Arrange the following materials from most transparent to most opaque.
 1. glass window: it is transparent object, we can view outside through it.
 2. paper towel: it is soft and translucent object, we can see a little bit through it.
 3. bubble wrap: it is a shiny paper but it is an opaque object so we cannot see through this.
 4. frying pan: it is a solid hard object which is opaque so light cannot pass through this.

B. Fill in the blanks

1. reflection
2. translucent object
3. refraction
4. Medium
5. reflection

Think and Write

1. Your car side view mirror says that "Objects may be closer than they appear". Explain what type of lens this mirror has and why that warning label is on the mirror
 - Your car side view mirror is actually a safety warning is printed or engraved on passenger's side mirror. It means the objects are actually closer than they appear to be in the mirror. You must have observed many times, when you look at the image of an object in the side mirror and then turn backwards you will find that the object is much closer than it appeared



in the mirror. A convex mirror is used as a side mirror that bulges towards us. It has a slightly curved surface which reflects light differently and consequently displays images in a different manner.

2. What is light? Write its importance for us?

- Light is a form of energy. It is made up of very tiny particles called photons. We can see all the things around us. When light hits an object, it reflects back and enters into our eyes. Then our eyes send a signal to our brain which processes the signals and tells us what we are seeing.

3. How many kinds of light sources are there? Write in detail.

- There are two major sources of light;

a) Natural sources of light:-

It includes the sun, the stars, the fire and the electricity in the storm. Sun is the major source of light on our planet earth. It provides us with the light and heat. Plants use sunlight to make their food by the process called photosynthesis. During photosynthesis, they release oxygen that we need to breathe. People burn wood to get light energy so that they can see in the dark. Animals like jellyfish and fireflies can make their own light.

b) Artificial sources of light:-

They are human made sources of light. Tube light, bulbs, lantern, flashlights and neon sign are artificial sources of light. All artificial sources of light require an energy source such as electricity or battery to produce light.

4. Write some of the properties of light?

- Light has many properties, some of them are;

a) Speed: Light is the fastest thing that has been observed to move, in vacuum or space. It travels very fast, with a speed of 300 million meters per second. It takes 8 minutes and 20 seconds for sunlight to reach the earth. When light passes through any other medium such as air, water, liquid or any other medium, its speed decreases depending upon the nature of the medium.

b) Reflection: When light rays from a source hit an object they bounce back, this phenomenon is called the reflection of light. There are two types of reflection of light.

i) Regular reflection and ii) Irregular reflection

c) Refraction: Light rays when entering from one medium to another, change their speed and directions, this phenomenon is called the refraction of light. Because of this property of light things appear different in size and shape- lenses use refraction of light to help us see things.

5. Define these terms with detail and diagrams: Reflection Refraction

- Reflection: When light rays from a source hit an object they bounce back, this phenomenon is called the reflection of light. There are two types of reflection of light.

i) Regular reflection: When light hits a smooth or regular surface like a mirror, it bounces back in a parallel and fixed direction, this is called the regular reflection of light. In regular reflection, the angle of which light hits the surface is always equal to the angle at which it bounces back.

ii) Irregular reflection: When light hits an irregular surface such as fabric or rock, it gets scattered and spreads in different directions, this is called the irregular reflection of light. In irregular reflection, the angle of which light hits the surface is different than the angle at which it bounces back.

Refraction: Light rays when entering from one medium to another, change their speed and direction, this phenomenon is called the refraction of light. Because of this property of light things appear different in size and shape. For e.g. straw in your juice glass appears bend from where it enters the juice. Prisms use refracts light into its components.

Lenses use refraction of light to help us see things. Telescope helps us see distant objects and microscopes help us see small objects. Magnifying glass uses a lens to refract the light and shows a larger image of the object.

C. MCQs

1. a) Reflection
2. proton
3. b) refraction
4. a) White light
5. d) prism
6. c) Prism
7. d) reflect light
8. e) light is reflected as it moves from air to water

Learning New Words:-

Words	Meanings
Transparent objects	able to be seen through an object
Translucent objects	an object which is not completely clear or transparent but clear enough to allow light to pass through
Natural light	a light existing in nature and not made or caused by people
Artificial light	not happening or existing naturally, light which is created or caused by people
Reflection	something that shows the effect, existence or character of something else
Refraction	the action of distorting an image by viewing through a medium
Opaque substance	a substance that do not letting light through



Electromagnetism 7.3

Learning objectives:

- In this lesson we will learn about electromagnetism in detail.
- We will learn that a magnet is a piece of metal, able to attract or pull other materials towards it.
- We will learn that magnet has two ends; North Pole and South Pole.
- Further we will learn about types of magnets; bar magnet, horseshoe magnet, ring magnet, cylinder magnet, rod magnet, magnet tape and magnet sheet.

Teacher Starters:

Start by asking students about magnet, its function and its types. Ask them what they know about electromagnetism? Also ask them about two poles of a magnet. As they answer, tell them more details about various types of magnet we come across in daily routine. Discuss magnetism through electricity and application of electromagnetism. Also discuss how electricity works through magnetism and generators.

Teaching:

Get the lesson read in class and keep the focus on how electromagnetism acts as a fundamental part of all machines such as fan, vehicles etc. Tell students about magnet and magnetic field. Explain the types of magnets like bar magnet horseshoe magnet, ring magnet, cylinder magnet, rod magnet, magnet tape and magnet sheet. Point to the pictures given in the unit. Also tell students that interaction between electricity and magnetism is known as electromagnetism.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. www.britannica.com
2. <https://en.m.wikipedia.org>
3. www.factmonster.com

Test Your Knowledge

A. Make an electromagnetic by following this picture and write your observations in your journal.

- Image is on page no. 85)
We can make an electromagnet by wrapping a wire around the nail. Connect one end the wire with the positive and the other wire end with the negative terminal of the battery,



when we pass an electric current through wire the nail will act as an electromagnetic. It will attract paper clips and pins.

Think and Write

A. Answer the following questions:

1. Have you ever played with a magnet? So what do you think what is a magnet?
 - Yes, to play with a magnet is fun. A magnet is a piece of metal able to attract or pull other material towards itself. But a magnet only attract or pull other materials that are made of iron, cobalt and nickel means some metals. It also attracts or repels other magnets. A magnet has two ends; North Pole and South Pole. The opposite poles two magnets will attract each other while the same poles of two magnets will repel each other.
2. What is meant by a magnetic field? Support your answer with a diagram.
 - Every magnet creates an area of magnetism all around it. This area is called the magnetic field. The magnetic field is the magnetic force that attracts and pushes objects. We cannot see the magnetic field but it is the reason that objects or magnets attract or repel. Larger magnets have bigger magnetic fields while small magnets produce a smaller magnetic field.
3. How many types of magnets are there? Draw their pictures also.
 - There are three main types of magnets;
 - i) Temporary magnets: Magnets whose magnetic field can be turned on and off are called temporary magnets. We can turn a temporary magnet to attract or repel objects anytime we want.
 - ii) Permanent magnets: Magnets that always have an active magnetic field are called permanent magnets. They always attract or repel other objects.
 - iii) Electromagnets: It is a magnet that only works when electricity passes through it. They are used when a very strong magnet is necessary.Some common shapes of magnets are;
 1. bar magnet
 2. horseshoe magnet
 3. ring magnet
 4. rod magnet
 5. cylinder magnet
 6. magnet tape
 - 7 magnet sheet
4. What is meant by electromagnetism? Can you identify some things from your surrounding which work with electromagnetism?
 - Electric field and magnet field are very closely connected. A magnet can produce electricity, and an electric current can produce magnetism. This interaction between electricity and magnetism is known as electromagnetism. Electromagnetism can cause an object to act as a magnet, but it only turns ferromagnetic substance into an electromagnet. Things around us which work with electromagnetism are fridge, door bells, computer, T.V, microwave oven, MP3 player, mobile phones etc.



5. Write an experiment after making a nail into magnet through electricity.
- You can turn a nail into a magnet. Wrap a wire around the nail. Connect one end of the wire with the positive and the other wire end with the negative terminal of the battery, when an electrical current passes through the wire, the nail will act as an electromagnet. It will attract paper clips, the more the coils in the wire, the stronger the magnetic field.
6. Can we produce electricity through a magnet? Give an example.
- When a wire is moved in a magnet field, electric current is produced and start flowing through the wire. If you move magnet inside a coil of wire, the same thing happens and current starts flowing through the wire. This phenomenon indicated that magnetism could also produce electricity.
For e.g. take a bar of the magnet and move it inside the coil of wire. An electric current is produced and starts flowing through the wire turning the bulb on.

MCQs

- b) They can push or pull objects they are not touching
- d) it must be connected to an electrical source
- a) they repel
- a) electromagnet
- c) attract each other
- b) the piece of iron will be attracted to the magnet
- b
- d) permanent magnet
- a) magnetic
- d) wetted with water
- a) repel
- a) a material that shows strong magnetic effects
- a) magnetic field lines

Learning New Words:-

Words

Electromagnetism

Magnetic field

Ferromagnetic

Electric current

Generators

Electrical energy

Meanings

a magnetic field that is produced by a current of electricity

the portion of space near a magnetic body or a current carrying body

relating to substances with an abnormally high magnetic permeability

happening and existing with electricity

a machine that produces electricity

strength produced by electricity that allows you to run things



Forces 7.4

Learning objectives:

- In this lesson we will learn about forces in detail.
- We will learn that forces are in action all around us and pull and push things.
- We will learn about types of forces; Friction force and Gravitational force.

Teacher Starters:

Start by asking students about the various every day experiences in which they see force in action, such as in applying brakes on a bicycle, movement of a car etc. As they answer, ask them to identify whether the force is pull or push. You can elaborate the topic through related examples in daily life. Tell them that everything we do requires force. Discuss the types of forces with them.

Teaching:

Get the lesson read in class and emphasize on how push and pull forces help us move, relocate and stop things. Point to the pictures given in the unit. Tell the mechanism of how force works and how we can measure it. Explain them the two basic types of forces; friction force and gravitational force. Also tell them that there are various types of forces which are just different ways of pulling and pushing objects.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. www.physicsclassroom.com
2. www.physics4kids.com
3. <https://physics.info>

Test Your Knowledge

A. Answers the questions

1. 1. Smooth surface 2. Lubricant
2. 1. Wedges 2. Fulcrum
3. 1. Car 2. Clocks

Think and Write

A. Answer the following questions:

1. What do you understand by the term forces? Relate them to the everybody life.

- Forces are in action all around us. Force has two powers; it can pull things and it can push things. We cannot see a force but we can see the effects it produces. When forces act on object they start to move, change their direction, speed up, slow down or stop moving. Everything we do requires force. If we want to enter our house, we either push the door or pull it open. Same as if we feel thirsty, we open the fridge and bring out a juice pack and drink it. When we are finished drinking we throw the can in the dustbin. Your actions require force to open, shut, lift, drink and move.
2. What is the measure of measuring forces?
- We use instrument called a spring balance to measure force. It consists of a spring connected with a metal hook. The SI unit of force is Newton (N). Name after the scientist who first discovered the force, Isaac Newton.
3. How many kinds of forces are there? Elaborate with examples.
- **i) Friction force:**
Friction force stops object from moving easily. When you roll a ball on the ground it moves for some distance then stops. The friction force exerted by the ground stops it from moving. Without it objects may keep moving. When two objects run against each other, they cause friction force. It always acts in the opposite direction of movement. Smooth surfaces exert less friction produces heat. It also heats up machine parts that are moving over one another. To avoid it we lubricate and grease these parts to make the surface slippery and reduce the friction between the sliding machine parts.
 - **ii) Gravitational force:**
Gravitational force is caused by massive objects. We cannot see gravity, but we can feel it. The gravitational force depends upon two things; the mass of the object and the distance between the objects. Sun has a strong gravitational force that keeps all the planets in their orbits revolving around it. More distance between objects results in weaker gravitational force. If we want to pull objects around us, we need a huge mass. For e.g. the gravitational force on earth is greater than on the moon, because the mass of the earth is greater than on the moon.
4. What is the role of frictional force in our daily life? Support your answer with examples.
- Friction force helps us in our daily life. It helps us to walk without slipping, friction between the car wheels and the road allows cars to move forward without slipping. We cannot fix a nail in the wall or wood without friction, it's frictional force which holds the nail.
5. What is a gravitational force? Is it the most powerful force in the earth?
- The force with, which the objects pull each other or the earth pulls everything towards its centre, is called gravitational force. Gravity is the force by which every object falls to the ground when you throw it and does not float in the direction you throw it. It is the most powerful force in the earth because earth is a big body, so it pulls everything present on it towards its centre. Force of gravity increases with the masses of the object.

MCQs

1. c) friction
2. c) gravity
3. b) stop an object from moving
4. d) stay still until a force is applied to it
5. c) the object will weigh less
6. d) in a straight line
7. d) a person drops the ball, and it falls to the ground
8. b) weight
9. c) force

Learning New Words:-**Words****Meanings**

Push	to use force to move something forward or away from you
Pull	to move something in a particular direction and especially toward yourself
Friction force	the force that causes a moving object to slow down when it is touching another object
Gravitational force	the natural force that causes things to fall towards the earth
Lubricants	a substance (such as grease or oil) that causes something (such as a machine part) to be slippery and to move more
Streamlining	to make something (such as a boat or car) with a smooth shape which makes motion through water or air easier

Chapter 8: Planets**The Soil 8.1****Learning objectives:**

- In this lesson we will learn about Soil and layers of soil.
- We will learn that soil is composed of various materials, air, minerals, water, remains of dead organisms and weathered rocks.
- We will learn the importance and uses of soil in this unit.
- We will learn about the types of soil; sand, silt and clay.

Teacher Starters:

Start by asking students about how they have seen difference in soil during any plantation drive they have participated in? Ask them to identify various types of soil found on the surface of the earth? Tell them that soil is composed various parts based on which they can have different uses.

Teaching:

Ensure that the students are aware about the various types of soil and fundamental differences between them. For example, they should be clear that silt is good for plants while clay is good for making pottery. Point to the pictures given in the unit. Tell students that earth is made up of layers of soil called soil horizons. Top-soil, sub-soil and bedrock are the three layers. Discuss the types of soil; sand, silt and clay.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. <https://en.m.wikipedia.org>
2. <https://study.com>

Test Your Knowledge**A. Write True or False:**

1. True
2. False
3. False
4. True
5. False

B. Fill in the blank.

1. Humus
2. Soil
3. Three
4. Sub-soil
5. Layers
6. Top-soil
7. Plant
8. Clay
9. Silt
10. Humus

Think and Write**A. Answer the following questions:**

1. What is soil? Where can we find it?

- Answer. The material found on the surface of the earth is called soil. It is the skin of the earth. It is composed of various useful materials; air, minerals, water, remains of dead organisms and weathered rocks. Soil holds the plants, help them grow, store their food and provides essential nutrients to them. Soil is important for all living beings. They get nutrients from it. Soil is also the home to many animals. We can find soil almost everywhere on earth. Some places have a lot of soil while some rocky places have very little soil.
2. What is humus? Elaborate.
- Answer. The most important component of soil is humus. Humus is the partially decomposed organic matter rich in nutrients. Decayed plants and remains of dead animals mix with the soil to form humus. Manure plant leaves and other such things increase the humus in soil. Humus is important for the fertility of the soil. Fertility is how much productive and fruitful the soil is. You can tell how much organic matter is present in the soil by its colour. Soil rich in organic matter is darker in colour than the soil having less concentration of organic matter.
3. Write about profile of soil? Why is the soil important for us?
- Earth is made up of layers of soil called soil horizons. There are three main layers in the soil. They are;
1) Top-soil:
The top most layer of soil is called the top-soil. It is about 25 cm deep. It is soft and contains humus which provides essential nutrients to the plants. It is mainly made of sand, silt and clay. Due to the presence of humus, the colour of top soil varies from dark brown to yellow. It is the layer where plants grow and animals, earthworms, bacteria and other microorganisms live.
2) Sub-soil:
The layer of soil present just below the top soil is called sub soil. This layer is thick, full of sand and gravel. It is rich in minerals such as iron, clay, aluminium, carbonate and organic matter that are moved down from top soil. Sub-soil is light coloured layer. It may be reddish yellow or brown in colour. Roots of big trees end in this layer.
3) Bedrock:
It is the deepest layer of soil present below the sub-soil. It is made of solid mass of rocks. Rock type found here includes sandstone, granite rocks, limestone and basalt.
The soil is important for us because we get nutrients from it. All the fruits and vegetables we eat, the cotton we use for making clothes, the tree which provides us with wood and paper all grow in soil. We get milk, butter, eggs, meat, cheese, wool and leather from animals which eat plants that grow in soil. Most importantly we get oxygen we breathe from plants that also grow in soil.
4. How many types of soil are there? Write in detail with pictures.
- There are three main types of soil;
1) Sand:

This type of soil is made from big particles of rocks that we can easily see. Its particles are fine and hard. It is light in colour and gritty in texture. Its particles are big and loose so that water can easily drain through it. It may be easy to wash but it is bad for growing plants. That's because sand cannot hold water and nutrients essential for plants growth. So plants wilt and die in sand. (Picture is on page no. 94)

2) Silt:

This type of soil is finer than the sand. It is smooth in texture like flour. It is made of tiny rock particles and can hold water and other nutrients better than the sand. Its particles stick together when they are wet. Silt soil is ideal for growing plants and cultivating crops. (Picture is on page no. 94)

3) Clay:

This type of soil is made of finest rock particles. Its particles are so small that we cannot see them. Its particles can hold nutrients and water very well. It is very sticky when wet and can be easily molded it into any shape. When it dries, it is rock hard. The space between clay particles is very small, so it does not allow plant roots to grow. Insects and micro organisms do not live in clay as they also need air to breathe and there is no space between clay particles for air to get in. (picture is on page no. 94)

5. What can you make with clay?

- We can make various things with clay. Some of them are:
 - 1) house
 - 2) flower
 - 3) fish
 - 4) birds
 - 5) tools
 - 6) pots
 - 7) balls
 - 8) bowls
 - 9) jewelry
 - 10) key chains

B. MCQs

1. d) soil
2. d) loam
3. d) humus
4. a) loam
5. a) clay
6. a) topsoil
7. a) potting soil
8. c) topsoil, subsoil, bedrock
9. b) loam
10. a) fertilizers
11. c) flooding it

Learning New Words:-

Words

Meanings

Humus	a brown or black material in soil that is formed when plants and animals decay
Organic matter	something that is made without the use of artificial chemicals
Sub-soil	the layer of soil that is under the top soil
Top-soil	the upper layer of soil in which plants have most of their crops



Silt	sand, soil, mud etc that is carried by flowing water and that sinks to the bottom of a river
Clay	a heavy, sticky material from the earth that is made into different shapes and that becomes hard when it is dried or baked

Deep into the Earth 8.2

Learning objectives:

- In this lesson we will learn about Earth and its structure.
- We will learn that our planet earth is made up of three concentric layers.
- We will learn about the layers of earth; the crust, the mantle and the core.
- We will learn that the earth's core is divided into two zones; the outer core and the inner core.

Teacher Starters:

Start by asking students about earth and its structure. Ask them to identify layers of a coconut and then relate the answer with the layers of earth, the surface, the crust, the core etc. Tell them that each layer has a different structure through a diagram.

Teaching:

A simple strategy for this lesson is to create a ball-like model to depict various inside layers of earth. The model could be built by students or the teacher using cotton or rubber sheets. Explain the structure of earth with the help of the model. Alternatively, you can draw a diagram on the board and label various layers. Also explain the thickness of each layer.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. www.smithsonianmag.com
2. <https://science.howstuffworks.com>

Test Your Knowledge

A. Label the different layers of the earth:

- | | |
|-----------------|---------------|
| 1. Crust | 4. Outer core |
| 2. Upper mantle | 5. Inner core |
| 3. Lower mantle | |



B. Write the word true or false for each sentence.

1. False
2. False
3. True
4. False
5. True

Think and Write**A. Answer the following questions:**

1. What do you know about the structure of Earth?
 - The structure of earth is very familiar with the structure of an apple. If you cut an apple in half, you will see it has three parts. Similarly if you cut the earth in half you will see our planet earth is made up of three concentric layers. These layers get closer and denser as we move down towards the centre of the earth. Earth has a thin crust, a mantle where all the earth's mass is concentrated and a core in the middle.
2. What are the two main metals in the earth's core?
 - Iron and nickel are the two main metals in the earth's core.
3. Which is hotter, the centre of the earth or surface of the sun?
 - The centre of the earth is hotter than the surface of the sun. It is the hottest part of the earth with the temperature of about 5000°C- 6000°C. It is made up of solid iron and nickel.
4. Define the following with pictures.
 - **crust:**
It is the outer most layer of earth. It is thinner than the other two layers. It is the layer we live on. It is made up 90 known useful elements. Some of them are; silicon, aluminium, iron, oxygen magnesium and variety of rocks. It is divided into large chunks of lands called "Tectonic Plates". These plates are made of two different types of crust. They are;
 - 1) The continental crust.
 - 2) The oceanic crust.

The Mantle:

It is the second layer of earth. It is the thickest layer of earth. It is about 2,900 Km thick. It makes up nearly 80% of volume of the earth. Tectonic plates float on top of the mantle. Earth's mantle is mainly composed of semi-molten rocks called magna. These semi-molten silicate rocks contain more magnesium and iron. Earth's mantle has a different temperature of different depths. The temperature is the lowest just beneath the crust and increase with the depth. The temperature is highest where the mantle connects with the outer core. The rocks in the upper part of the mantle are cool and hard while the rocks in the lower parts are hot and soft.

The Core:

It is the inner layer of the earth. It is the very hot part of the earth. The core is like a small ball present in the centre of the earth just like the seed in the middle of an apple. Earth's core is divided into two zones; the outer core and the inner core.

5. What are outer core and inner core? Write in detail.

- **outer core:**

It is 5, 150 km deep. It is composed of liquid iron and nickel. It is very hot about 3500°C - 4000°C. The outer core flows around the inner core of the earth. The movement of metals creates the earth's magnetic field.

- **The inner core:**

It is a huge metal ball. It is the hottest part of the earth with the temperature of about 5000°C – 6000°C. It is as hot as the surface of the sun. It is made up of solid iron and nickel. The inner core is so deep inside the earth and is under immense pressure that even though the temperature is very high, the metals cannot melt. It is like the engine room of the earth.

6. Which layers of the Earth are made mostly of metals?

- The inner and outer cores of the earth are both made up of over 90% of metals.

7. What are Tectonic Plates? What causes the plates to move?

- Earth's crust is divided into large chunks of lands called "Tectonic Plates". There are around 7 large and 12 small tectonic plates, which float on top of the second layer of the earth. Earth quakes occur when tectonic plates collide with each other. These plates are made up of two different types of crust.
 - a) The continental crust, which carries land and it is about 8 to 70 Km thick. It is composed of sedimentary rocks, granite and metamorphic rocks.
 - b) The oceanic crust, which carries ocean and it is about 8 Km thick. It is composed of iron, oxygen, silicon, aluminium and magnesium.

B. MCQs

1. a) composition
2. a) sea-floor topography
3. d) mantle
4. d) oxygen and silicon
5. d) it covers the outer surface of the egg
6. a) core
7. b) magnetic forces from the inner core convection currents in the mantle
8. d) iron
9. d) the outer core
10. a) 10-12km

Learning New Words:-

Words	Meanings
Concentric	having the same center
Layer	a covering piece of material or a part that lies over or under another
Crust	the outer part of a planet (such as earth or moon)
Tectonic plate	relating to changes in the structure of the earth's surface with the flat piece of metal
Continental crust	the outer part of the continent which carries land
Oceanic crust	the outer part of the ocean which carries water
Mantle	it is the second layer of earth which is beneath the crust and above the core
Core	the central part of a celestial body (such as the earth or sun) usually having different properties

Planets and the Solar System 8.3**Learning objectives:**

- In this lesson we will learn about planets and our solar system.
- We will learn that our solar system has eight planets that revolve around the sun.
- We will learn that sun is the biggest object in our solar system. It is present at the centre of our solar system. It gives life to our planet earth.
- We will learn about Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.
- We will learn that Earth is the only planet that contains water and oxygen. It has only one moon.

Teacher Starters:

The students by this grade are already familiar with the various names of planets. Start by asking students about planets and their names. Also ask them about solar system, the center of all planets. Tell them that the solar system has many objects other than planets, called the dwarf planets, asteroids, stars, moons, dust and gases. Discuss each planet in detail, giving particular focus on how earth differs from every other planet with respect to its suitability for life.

Teaching:

The point of the lesson is to elaborate to the students that solar system is a natural system of matter, force and energy in the form of a star, the sun, and related bodies orbiting it. Point to the pictures given in the unit and make it clear to your students that all planets revolve around the sun in a circular path called an orbit. Briefly elaborate on the structure, size and place of inner circle planets Mercury, Venus, Earth, Mars and outer circle planets of Jupiter, Saturn, Uranus and Neptune.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. www.space.com
2. www.theplanetstoday.com
3. www.skyandtelescope.com

Test Your Knowledge**A. Activity Design a planets**

- Students will do by themselves with the help of teacher.

B. Riddles**Solar System Question Game**

1. Sun
2. Mercury
3. Venus
4. Earth
5. Moon
6. Asteroid
7. Jupiter

B. Label the solar system:

Students will do by themselves with the help of teacher

Think and Write**A. Answer the following questions:**

1. What is meant by the solar system?
 - Our solar system is elliptical in shape. It came into being billion of years ago. It has many objects including planets, asteroids, stars, moons, dust, gases and other amazing objects. Our solar system has eight planets including our planet earth. All these planets revolve around the sun, which is the giant star of our solar system. There are 140 moons in our solar system. They do not revolve around the sun; they only revolve around the planet they are nearest to.



2. Write down the different between star and planet?

Star	Planet
1. A star has its own light.	A planet has no light of its own.
2. Made up of hydrogen, helium and other light element.	Made up of solid, liquid or gases, or a combination there on.
3. Their position remains unchanged.	They change position.
4. It has very high temperature.	They have low temperatures.
5. There is only one star in the solar system (Sun).	There are eight planets in our solar system.

3. How many planets are there in our solar system? Elaborate.

- There are eight planets in our solar system. They are;

1) Mercury:

It is the nearest planet to the sun. It is small rocky planet very similar to our moon. It is 43 million miles away from the sun. During the day its surface temperature reaches to 430°C and at night it drops to -170°C. Mercury does not have any moon around it. It takes 88 days to complete one rotation around the sun.

2) Venus:

It is the second planet from the sun. It is covered with a thick yellow blanket of clouds made from sulphuric acid. It is the hottest planet in our solar system and its temperature is about 400°C due to its acidic atmosphere. Its atmosphere traps the heat of the sun and stays hot. Venus has no moon. It is similar to our planet earth that sometimes we call it Earth's sister planet.

3) Earth:

It is the third planet from the sun and the fifth largest planet of our solar system. It is the only planet that contains water and oxygen to support a variety of life. It has only moon. It takes 365 days to complete one rotation around the sun. This duration is considered as one year on the earth.

4) Mars: It is the fourth planet from the sun. The soil on Mars is made mostly of iron and reacts with the atmosphere to produce rust which is red in colour. That is why Mars appears like a red ball and is also called the red planet. Mars is located at 141.6 million miles from the sun. It has two moons; Phobos and Deimos. It takes about 687 days to complete one rotation around the sun.

5) Jupiter:

It is the fifth planet from the sun. It is the biggest planet of our solar system. It is 318 times bigger than our planet earth. It has no solid surface because it is made of 90% hydrogen gas and 10% helium gas. It has four faint rings around it. It takes 4,330 days to complete its one rotation around the sun. It has 16 moons.

6) Saturn:

It is the sixth planet from the sun and second largest planet of our solar system. It is made of 75% hydrogen gas and 25% helium gas. It has a set of four bright bands around it. Its

rings are made of water ice, but they also contain rocky particles. It takes 10,755.7 days to complete its one rotation around the sun. It has 62 moons.

7) Uranus:

It is the seventh planet from the sun and third largest planet of our solar system. It has bands of clouds around it that are very faint. Uranus spins differently than other planets. It seems to be tilted sideways instead of right way up. It takes 30,687 days to complete one rotation around the sun. It has 27 moons.

8) Neptune:

It is the last and fourth largest planet of our solar system. Neptune has five rings around it, it appears blue in colour because of the methane gas present in its atmosphere. It takes 60,190 days to complete its one rotation around the sun. It has 14 moons.

4. Which is the biggest star of our universe? Write down its importance with a diagram.
 - Sun is the biggest star of our universe. It is present at the centre of our solar system. Sun is 4.5 billion years old and it was born from a huge hot cloud of gas and dust. All the planets of the solar system revolve around the sun because it possesses a strong gravitational force. It is the closest star to our planet. The distance between the earth and the sun is about 149.6 million kilometers. Sun is a burning ball of gas consists of hydrogen and helium gas. The light from the sun takes 8 minutes and 20 seconds to reach the earth. Its surface temperature is about 5000°C while its center is even hotter than the surface having a temperature of about 15.5 million °C. The diameter of the sun is about 1 million kilometers. It is so big that it takes 99% of our solar system. Sun is important to our planet earth because it gives heat and light to stay warm and to grow food. Without the sun there would be absolutely no life on earth.
5. How many moons does the earth have?
 - The earth has only one moon.
6. Which planet is your favourite planet and why?
 - My favourite planet is earth because it contains water and oxygen to support a variety of life. All living organisms live on earth. Earth is very close to sun. Sun gives us heat and light to stay warm and to grow food on earth.
7. Which of these phrases would be a useful way to remember the names and order of the eight planets, listed from nearest to the sun to the farthest to the sun?
 - a
8. If you passed between Mars and Jupiter and saw an area with rocks of different sizes floating through space together, what would they most likely be?
 - You passed between Mars and Jupiter and saw an area with rocks of different sizes floating through space together, they would most likely be asteroid, because asteroid belt is located between the orbits of Mars and Jupiter.

B. MCQs

1. b) Sun
2. a) outer planets
3. c) Mars
4. a) Saturn
5. a) Jupiter
6. a) 1 year
7. c) Venus
8. a) Phobos
9. d) Jupiter
10. c) 16
11. a) Jupiter
12. c) Pluto
13. b) Earth
14. c) Neptune
15. b) Venus
16. a) Uranus
17. b) Sun

Learning New Words:-**Words****Meanings**

Solar system	our sun and the planets that move around it
Giant star	a star of great luminosity and of large mass
Planets	any of the eight celestial bodies which have motions of their own among the fixed stars
Mercury	the planet that is closest to the sun
Venus	the planet that is second in order from the sun
Earth	the planet on which we live
Mars	the planet that is fourth in order from the sun
Jupiter	that planet is fifth in order from the sun and it is the largest planet
Saturn	the planet that is sixth in order from the sun and that is surrounded by large rings
Uranus	the planet that is seventh in order from the sun
Neptune	the planet that is eight in order from the sun
Asteroid	any one of thousands of small planets that circle around the sun
Orbit	to travel around (something such as a planet or moon) in a Curved path

Chapter 9: Earth and the atmosphere

Pollution in Environment 9.1

Learning objectives:

- In this lesson we will learn about environment and pollution.
- We will learn that everything around you is your environment. It includes all the living things and non-living things.
- We will learn that the waste we produce every day is divided into two major categories; Biodegradable waste and Non- biodegradable waste.
- We will learn about four types of pollution; air pollution, water pollution, noise pollution and land pollution.

Teacher Starters:

Start by asking students about earth and its atmosphere. Also ask them, what is pollution? And how many types of pollution are there? You can tell them further about various types of pollution including land pollution, air pollution, water pollution and noise pollution. Also tell them that breathing in the contaminated air can cause breathing problems such as asthma, cough and bronchitis.

Teaching:

Get the lesson read in class and explain to your students about the hazards from Air pollution, Land pollution, Water pollution and Noise pollution in detail. Give them some related examples to help them understand the topic easily. For example, you can tell them that blowing horns in traffic is a form of noise pollution while waste material and smoke from factories causes the oceans to pollute. The focus should be also made on the coping strategies to combat pollution.

Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. www.sciencedirect.com
2. www.toppr.com
3. www.britannica.com



Test Your Knowledge**Fill in the blanks:**

- 1) waste, harmful, health, breathing, hazardous chemical
- 2) brushing, leaving, diseases
- 3) drinking, clean
- 4) gas
- 5) water
- 6) land pollution
- 7) microorganisms
- 8) non-biodegradable
- 9) waste
- 10) biodegradable

B. True/False

1. False
2. True
3. False
4. True
5. True
6. False

Think and Write**A. Answer the following questions:**

1. What do you understand by pollution?
 - Some waste materials which cannot decompose into useful nutrients are called non-biodegradable material. Plastic waste, glass, ceramic cups, electronic device, metal waste and foams are some common examples of non-biodegradable waste that does not decompose. It fills the earth's surface and causes pollution. These non-biodegradable materials are called pollutants. They are piled up in big mounds and do not look pleasant at all. They also cause diseases and are harmful to the health of all living beings. We are polluting our environment by producing a lot of waste.
2. Name the four kinds of pollution?
 - The four kinds of pollution are;
1) Air pollution 2) Land pollution 3) Water Pollution 4) Noise pollution
3. Describe the different types of pollution?
 - The different types of pollution are;
1) Air pollution:
The air around us is a mixture of useful gases that we need to survive. It has 21% oxygen, 79% nitrogen and some other gases in a small amount. Any human activity that disturbs the composition of air causes air pollution. Air pollution is when toxic gases contaminate the air.



Harmful smoke generated from factories and burning of fossil fuel such as coal, gas and oil are also contaminates our air. It is very harmful to the health of all living beings. Breathing in contaminated air can cause breathing problems such as asthma, cough and bronchitis in humans.

2) Land pollution:

Solid and liquid waste that we throw on the ground dirties our land and causes land pollution. Some of the stuff that we throw is very toxic and contains harmful chemicals that can leak into the ground and pollute the soil. Plants absorb these toxic chemicals from soil. Herbivores then eat these plants. Herbivores are then eaten by carnivores and humans. These way harmful chemicals are being transferred from one living being to another and are causing serious diseases.

3) Water pollution:

Water keeps us alive and it is very important for us to have clean water. Water pollution happens when chemicals and harmful substances are introduced into the water. Humans are polluting water directly or indirectly. Ships carrying oil have accidents and they spill toxic oil into the ocean, industrial waste water, using fertilizers and pesticide are some causes of water pollution. Water pollution is harmful to us because drinking contaminated water can cause diseases like cholera, typhoid and diarrhea. It can cause dangerous problems for the animals and plants as well.

4) Noise pollution:

Noise is an unwanted sound which produces unpleasant effects and discomforts on the ears. Noise is produced by house hold gadgets, big trucks vehicles and motor bikes on the road, jet planes and helicopters hovering over cities, loud speakers etc. not only humans who are affected by noise pollution water animals are also subjected by submarines and big ships on the ocean. Chain-saw operations by timber companies also create extreme noise to animals in the forest.

4. What are the main causes of air and water pollution?
 - Smoke produced by vehicles and burning of fossil fuel such as coal, gas and oil are major causes of air pollution untreated human sewage and industrial waste water are main causes of water pollution.
5. How is noise pollution harmful to us?
 - Noise is any disturbing or unwanted sound, and noise pollution affects people's health and quality of life. ... Prolonged high levels of noise can cause hearing loss and stress-related illnesses

B. Short answer question

1. A lot of dry leaves are collected in a school ground and are burnt every day. Do you think this is right to do? What should be done to dispose of the leaves?

- No, it is not right. We should recycle them to feed the plants. Leaves are a great source of nutrients and insulation for plants. The easiest way to recycle them is to leave them alone, up to an inch or two of leaves can be moved and left to break down. It will add nutrients and a bit of much to your plant.
2. How many types of waste are there?
 - There are two types of waste.
 - a) Biodegradable waste
 - b) Non-biodegradable waste
 3. List the causes of water pollution.
 - Water pollution causes when chemicals and harmful substances are introduced into the water.
Water pollution also causes when ships spill toxic oil into the ocean.
 4. What are some pollutants found in water?
 - Some pollutants found in water are;
 - a) toxic oil b) untreated human sewage c) using fertilizers
 - d) industrial waste water e) pesticide
 5. How is soil pollution caused?
 - Some of the stuff that we throw is very toxic and contains harmful chemicals that can leak into the ground and pollute the soil.
 6. Discuss the health hazards associated with the pollution.
 - The pollution can cause lung diseases such as asthma, bronchitis etc. It increases susceptibility to respiratory infections. It may also cause heart attacks and arrhythmias in people with heart disease.

MCQs

1. d) recycling
2. a) biodegradable
3. b) nylon
4. c) Radioactive substances
5. b) microscopic animals
6. c) windmill
7. d) Scooty
8. a) noise
9. d) A and C both
10. a) biodegradable materials
11. a) ozone
12. b) air pollution
13. d) all of the above

Learning New Words:-

Words	Meanings
Pollution	substances or process of making land, water, air etc dirty and not safe to use
Environment	the condition that surround someone or something that affect growth, health, progress etc of something
Biodegradable waste	waste which is capable of being slowly destroyed and broken down into very small parts by natural processes
Non-biodegradable waste	waste which is not capable of being broken down
Water pollution	the action or process of making water dirty and not suitable for use
Air pollution	the action or process of making air impure or contaminated and not suitable to breathe in
Noise pollution	a loud and unpleasant sound which is harmful
Land pollution	the action or process which makes the solid surface of the earth dirty

Greenhouse Effect and the Global Warming 9.2**Learning objectives:**

- In this lesson we will learn about greenhouse effect and the global warming.
- We will learn about earth's atmosphere. The atmosphere is a layer of different gases that surrounds our planet.
- We will learn that the troposphere, stratosphere, mesosphere, the thermosphere, the exosphere are the layers of atmosphere.
- We will learn that global warming is the reason that our planet is becoming hot.

Teacher Starters:

Start by asking students that, what makes up the earth's atmosphere? Ask them about global warming, such as hotter summers due to deforestation. Tell them more about this topic with examples aimed at coping strategies for global warming. Tell them that the atmosphere is a layer of different gases that surrounds our planet. Explain them, layers of atmosphere in detail.

Teaching:

Get the lesson read in class and clearly explain how greenhouse effect and global warming is making life difficult on the plant. Tell your students that atmosphere has different layers; troposphere, stratosphere, mesosphere, thermosphere, and exosphere with the help of a diagram. Tell students that many gases make up the earth's atmosphere, like nitrous oxide, methane and carbon dioxide and an imbalance of these gases can worsen the problem of global warming.



Extended Teaching

Resources at www.learningwell.pk

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Web Resources:

For further information visit these sites and links:

1. www.livescience.com
2. <https://svs.gsfc.nasa.gov>
3. www.niwa.co.nz

Test Your Knowledge**A. Complete the worksheet.**

Add the following labels to the correct box on the diagram.

2. Gasses in atmosphere trap some out-going long wave radiation, heating the atmosphere.
4. Short wave radiation from the sun.
1. Some long wave radiation leaves the atmosphere.
3. Earth emits long wave radiation.

Think and Write**A. Answer the following questions:**

1. Briefly, summaries the greenhouse Gases story.
 - Many gases such as nitrous oxide, methane and carbon dioxide that make up the earth's atmosphere are known as green house gases. These three gases keep our earth warm. Greenhouse gases are good when they are in the right amount. Too much green houses gases in the atmosphere will trap more amount of sun rays which will increase the temperature of the earth. Certain human activities are also increasing the number of green house gases in the atmosphere; this process is called global warming. Human activities which are producing greenhouse gases in the atmosphere are burning fossil fuels, cutting forest, industrial processes, vehicles (transport), aerosol cans etc.
2. How do green house gasses affect the temperature on earth?
 - Greenhouse gases affect the temperature on earth when sunlight enters the earth's atmosphere; green house gases during the day trap some of the rays and spread them in the atmosphere to keep the earth warm. Without greenhouse effect earth's climate would be too cold for us to live in. If there are too much green house gases in the atmosphere, they will trap more amounts of sun rays which will increase the temperature.
3. What do energy sources like coal and petrol release into the atmosphere?
 - An activities such as burning fossil fuels (coal and petrol) have increased the amount of carbon dioxide in the atmosphere.



4. What impact could increase temperatures have on the planet?
- If there are too much greenhouse gases in the atmosphere, then they will trap more amounts of sun rays which will increase the temperature on the planet. Increasing temperature affects the oceans, weather patterns, snow and ice, and plants and animals.
5. How do trees help reduce the amount of carbon dioxide in the atmosphere?
- Younger trees absorb carbon dioxide quickly when they are growing. They use sunlight to absorb carbon dioxide from the atmosphere through photosynthesis and store it as carbon in the form of wood. Growing more plants or trees help to reduce the amount of carbon dioxide in the atmosphere.
6. What can people do to help reduce the number of greenhouse gases in the atmosphere?
- There are many ways to reduce the number of greenhouse gases in the atmosphere. Such as;
1) Drive less 2) Fly less 3) Reduce, reuse, recycle 4) Plant a seed
5) Use less electricity 6) Eat less meat
7. What do you think is meant by global warming?
- Certain human activities are increasing the number of greenhouse gases in the atmosphere. As a result, our atmosphere is trapping more and more sun rays increasing the temperature of the earth. This process of increase in earth's temperature is called global warming.
8. List all the things you can think of that give off greenhouse gases – e.g. cars.
- Lists of things that give off greenhouse gasses are;
1) Aeroplane 2) Helicopter 3) Rickshaw 4) Truck 5) Buses 6) Aerosol
7) Industrial processes 8) Burning fossil fuels
9. What is atmosphere? How many layers it has?
- The atmosphere is a layer of different gases that surround our planet earth. It's a lot like a big blanket. It is 500 km thick. Its main job is to cover and protect our planet earth harmful rays of the sun. The atmosphere is often called air. It is divided into several layers and is referred to as spheres. They are;
- 1) The troposphere:**
It is the lowest layer of atmosphere and it interacts with the surface of the earth. It contains the gases that we breathe every day. Earth's weather, clouds and wind all are present in the troposphere.
- 2) Stratosphere:**
It is above the troposphere. Ozone layer that protects earth from sun's ultraviolet radiation is in the layer.



3) Mesosphere:

It starts just above the stratosphere. It burns the space objects called meteoroids hurtling towards the earth.

4) The Thermosphere:

It is just above the mesosphere. This layer is completely cloudless and free of water vapours. It is where the aurora and satellites occur.

5) The Exosphere:

It is the uppermost layer of the atmosphere. It consists of mostly hydrogen and helium gas.

B. MCQs

1. b) gases are trapped in the earth's atmosphere and warm the earth
2. b) gases that trap heat in the atmosphere
3. d) oxygen
4. a) carbon
5. a) carbon dioxide
6. c) stratosphere
7. a) greenhouse effect
8. b) five

Learning New Words:-**Words****Meanings**

Earth's atmosphere	the whole mass of air surrounds the earth
Troposphere	the lowest densest part of the earth's atmosphere in which most weather changes occur
Stratosphere	the part of the earth's atmosphere which extends from the top of the troposphere which increase the temperature
Thermosphere	the part of the earth's atmosphere that is characterized by steadily increasing temperature with height
Exosphere	the outer fringe region of the atmosphere of the earth
Greenhouse effect	warming of the surface and lower atmosphere of a planet that in caused by conversion of solar radiation
Global warming	the increase in the world's temperature caused by the increase of certain gases (such as carbon dioxide)
Climate change	a region with particular weather with changing patterns or conditions