



Right Science

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***Teacher's
Resource Book***

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Chapter 1: Human Organ System

Learning Objective:

After this lesson, students will be able to

- list the major organ systems of the human body Like Respiratory and Digestive system
- the body parts associated with each organ system
- the function of each organ system
- The common ailments related to these organ systems

Teacher Starter:

You can start your class with a short activity, tell your students to Breathe in and breathe out. Then tell them that they have successfully operated the respiratory system, give them a brief introduction of respiration is (i-e body's mechanism for gas exchange). Enlighten them the fact that their body automatically breathes. Tell them about the organs involved in the process of respiration.

Then ask the students about their favorite food. Inform them what different foods gives to our body. Turn your mode towards the system which deals with food (i-e digestive system). Tell the students the main job of our digestive system.

Teaching:

Try to make the lesson as convenient and understandable by explaining things mention in the chapter. You may ask questions, in order to understand how much they grasp the concept of the chapter. Inform them about respiratory system, how it works, what are the main organs involved in the process of respiration. What are the difference between respiration and breathing, finally discuss the common ailments related to respiration and how they can be cured and prevented.

Also Inform them about the digestive system. Tell them about the main job of digestive system (i-e to break down food into smaller simpler substances so the nutrients in the food can be released to make energy). Give them an idea of what other ancillary functions our digestive system does. At last, discuss the common ailments related to digestive system and how they can be cured or prevented.

Exercises

Answer the following questions

1. Why do we feel tired after working for some time?
 - Like other living things, we also need energy to do work, so when we work , we consume energy and that's why we feel tired after working.
2. How do we rejuvenate our energy? What are the elements which give energy to our body?
 - We gain energy from the food we eat. Food gives us the necessary nutrients which give us energy.

3. Write detailed notes on the following?

- **Carbohydrates :**

Carbohydrates are present in nearly all type of foods. Carbohydrates metabolize very rapidly and the quickest source of energy. Carbohydrate metabolizes to produce glucose. All body functions require glucose as well as the body needs glucose for all kind of physical activity.

- **Protein:**

Protein are the building blocks of the human body. The human body uses protein to repair and build skin, bones and muscles. Protein works as antibodies to help functioning of the immune system. Protein also help in making hemoglobin, the part of our blood that carries oxygen to all parts of the body.

- **Vitamins:**

Vitamins means 'Vital for life'. vitamins are nutrients that our body needs in order to grow and stay healthy. There are two types of vitamins; Fat soluble and water soluble. Fat soluble vitamins are dissolved in fats and excess amount is stored in the body while excess water-soluble vitamins are excreted. So, they need to be replaced often. Vitamins A, K, E and D are fat soluble while vitamin B and C are water soluble.

- **Minerals:**

Body needs minerals to grow. Every mineral does a specific job . some of them are needed in large amounts; they are known as macro minerals. These include calcium potassium, iron, sodium, magnesium and Sulphur. Minerals needed in small amount are called trace minerals. These include copper, zinc, cobalt and iodine.

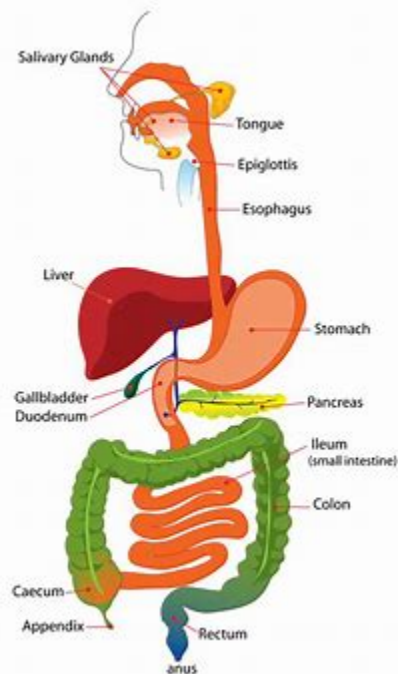
- **Fats:**

Fats not just make food taste better but they also provide energy, help body absorb vitamins and help insulate the body from cold. There are two types of fats; saturated and un-saturated. Unsaturated fats found in fish , nuts, olive and canola oil. Saturated fats are not good for health and are considered unhealthy fats. Eating too much of saturated fats increases cholesterol level.

4. What do understand by the term digestive system? Explain the function of the digestive system with a labelled diagram.

- Digestion is a simple process where large insoluble food particles are broken down into smaller water-soluble molecules so that they can be absorbed by the blood and give energy to the body.

Organs like mouth, stomach, small intestine and large intestine work with each other to digest the food. Together these organs make an organ system call digestive system.



5. Write about the common ailments related to digestion of food in detail?

- Some common problems of our digestive system are stomachache, diarrhea and constipation.

Stomachache: Stomachache alerts us to something that is happening inside us. It mostly happens when we overeat or eat something spicy or greasy, as the food might be hard to digest, this will make your stomach upset and cause pain in stomach.

Diarrhea: this happens when the muscle contractions push the contents of intestines along too quickly, and there is not enough time for water to get absorbed. There are a number of reasons for Diarrhea such as Virus, bacteria and parasites.

Constipation: Constipation is the exact opposite to diarrhea. Waste material stays in the large intestine for so long that too much water is absorbed, and it becomes very difficult for the body to excrete it. you can prevent the constipation by adding fiber containing food in your diet, by drinking a lot of water and by taking your meals at proper intervals.

6. What is the essential function of our body that keeps us alive? Why is it so important to breathe?

- Breathing is the essential function of our body, it keeps us alive. The human body needs oxygen to sustain life. lack of oxygen in the human body can cause death. So it is important to breathe and enable a supply of oxygen into the body.

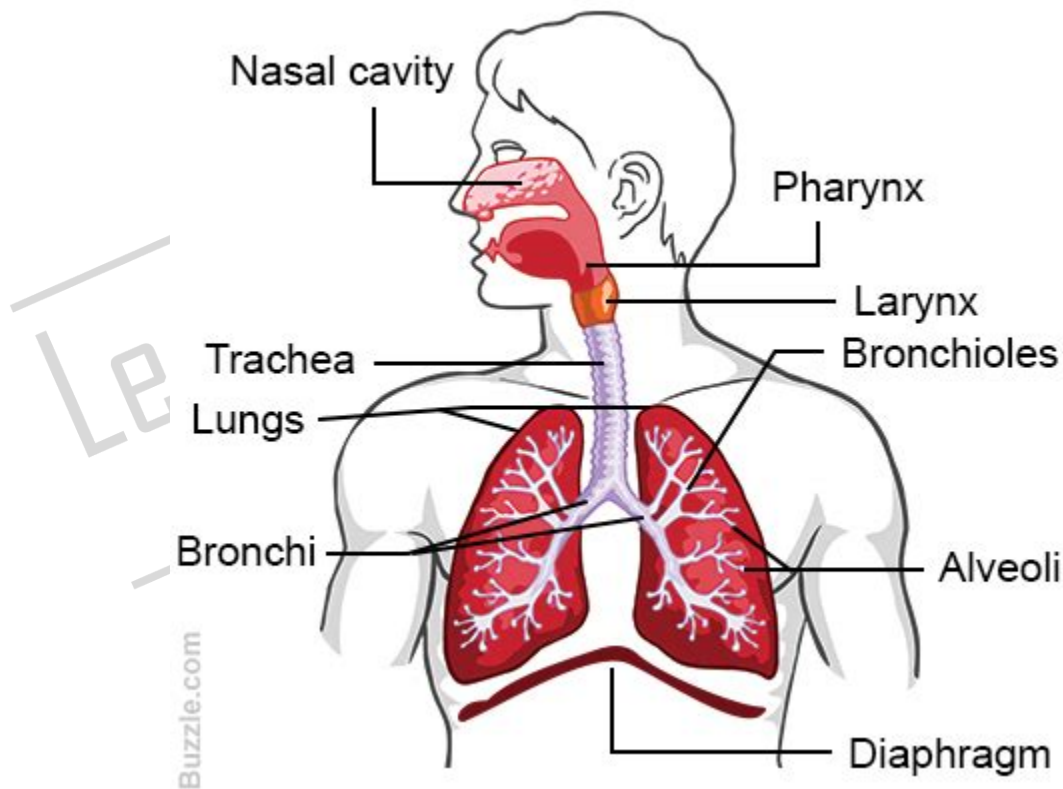
7. What is the difference between breathing and respiration.

- **Breathing:** Breathing is a physical process in which there is an exchange of gases, we inhale oxygen from the surrounding and exhale carbon dioxide. Breathing takes place in lungs

Respiration: Respiration is the chemical process in which body breaks down glucose with

the help of oxygen to release energy and produce carbon dioxide and water. The energy is then used by the body to function. Respiration takes place at cellular level.

8. Describe the respiratory system with a labelled diagram.
- The respiratory system is comprised of a series of organs responsible for taking in oxygen and releasing carbon dioxide. It starts with breathing (inhaling oxygen) the air enters through your nose and passes through the windpipe(trachea). Trachea is then divided into bronchi. The two tubes which carry oxygen into each lung. Bronchi further divided into bronchioles. Bronchioles ends with a tiny balloon named alveoli. This is where the blood absorbs oxygen and releases carbon dioxide. After the blood absorbs oxygen blood transported to heart where the heart pumps the oxygen rich blood throughout the body in order to provide the necessary oxygen to the cells for respiration. After the respiration takes place at the cellular level, carbon dioxide is formed. Blood absorbs this carbon dioxide and carries it back to the lungs. where it is then removed from the body when we breathe-out.



9. Write about some of the common issues of our health regarding breathing.
- Some common issues of our health regarding breathing are Pneumonia, influenza, Asthma and Lungs cancer

Pneumonia: Pneumonia is an infection of alveoli. Mostly caused by bacteria , but sometimes it resulted from viral and fungal infections.

Influenza: The flu is a very common viral infection of the respiratory system caused by the virus named influenza.

Asthma: In Asthma, the patient goes through the periodic episodes of contraction of bronchial tubes. These contraction periods make it more difficult to breathe in and especially breathe out.

Lungs Cancer: Lungs cancer develops when the cells in the lungs multiply abnormally, forming a tumor which grows viciously and disturbs normal tissues. Smoking tobacco is the most common cause of lungs cancer. The smoke of cigarette can affect the non-smokers as well.

Give a Reason:

1. If the enzymes are not produced, we can have many illnesses of the digestion system.
 - Because the enzymes create chemical reaction in the stomach. They actually speed up the rate of a chemical reaction to help support digestion process. The enzymes help in breaking down food particles during digestion.
2. The flu is a very common disease of the respiratory system.
 - Because it is easily transmitted from person to person through the respiratory tract, by such means as inhalation of infected droplets resulting from coughing and sneezing.
3. Your nose, the Guardian of your lungs. Why?
 - The nose contains tiny hairs called cilia protect the nasal passageways and other parts of the respiratory tract, filtering out dust and other particles that enter the nose through the breathed air. This way the nose guards our lungs.

Write the correct answers in the blank spaces:

1. B) 4 mins
2. B) alveoli
3. C) Lung cancer
4. C) Liver
5. A) Egestion
6. B) Mouth to Anus
7. B) Digesting
8. A) Large intestine
9. C) Nutrients
10. A) The body breathing system
11. C) through the mouth and the nose
12. C) to keep dust out of the lung
13. C) trachea
14. A) it branches into two directions
15. C) oxygen is exchanged for carbon dioxide



16. C) small blood vessels in the lungs
17. A) they are exhaled
18. B) the lungs
19. C) the rib cages
20. B) oxygen

Tick the right word:

1. Pancreas, insulin
2. Sugary, gall bladder
3. Very rapidly, quickest
4. Middle, jejunum
5. Proteins, speed up
6. Rectum
7. Throat, stomach
8. Physical
9. Single, epithelial
10. Viral

Chapter 2: Transport in Humans and Plants

Learning Objective:

After this lesson, students will be able to

- The Body's Transport system (i-e circulatory system)
- Major components of Human Circulatory system
- Blood and its components
- Disorders of the circulatory system
- Plants' transport system
- Transpiration and Translocation

Teacher Starter:

You can start your class by reminding them what they have learnt earlier that their body require nutrients in order to work properly. Question them how these nutrients transported throughout body. Relate the human circulatory system with a suitable example (like roads network of the city), and give them the concept of human circulatory system. Now one by one tell them about the major components of our circulatory system by relating each of the component with a suitable example. Tell them that Heart is the engine or center of the circulatory system. But there are a network of arties, veins capillaries and offcourse the blood that courses through them.



Then ask the students about their favorite food. Inform them what different foods give to our body. Turn your mode towards the system which deals with food (i.e. digestive system). Tell the students the main job of our digestive system.

Now Ask them how the circulation of nutrients made possible in plants without the heart . Let them tell what they think of it. make them aware by teaching the process of transpiration and translocation.

Teaching:

Try to make the lesson as convenient and understandable by explaining things mention in the chapter. You may ask questions, in order to understand how much they grasp the concept of the chapter. Inform them about circulation system of Animals, how it works, what are the main organs involved in the process. also discuss the common ailments related to circulatory system and how they can be cured and prevented.

Also Inform them about the transportation in plants. Tell them about the main functions happening in plants. Give them an idea of what actually happening in transpiration and translocation.

Exercises

Answer the following questions

1. What is circulation?
 - The transport of blood, nutrients and oxygen throughout the body is called the circulation, and the system responsible for it is called circulatory system.
2. What chambers of the heart does the blood enter? From which does it exit the heart?
 - The atria (upper chambers) fill with blood and then dump this blood into ventricles (lower chambers). The ventricles then squeeze to pump the blood out of the heart.
3. What is vena cava? What type of blood circulates in vena cava?
 - The blood vessel that brings deoxygenated (oxygen-poor) blood to the heart is called vena cava. Oxygen-poor blood circulates in vena cava
4. Which chamber of the heart does the blood enter first? Where does the blood go after passing through that chamber? What is the name of the valves that separates these chambers? Why is that valve necessary?
 - The blood first enters in atria (upper chambers), The atria then dump this blood into ventricles (lower chambers), the two valves that separates the upper chambers with lower chambers are called **Mitral** and **Tricuspid**. Whereas the other two valves **Aortic** and **pulmonary** maintains the flow as the blood leaves the heart. These valves stop the blood from going in the wrong direction.
5. What are the pulmonary veins?
 - Pulmonary veins carry oxygenated (oxygen-rich) blood from the lungs into the heart.



6. What is the function of the left ventricle?
- Left ventricle contracts and pumps this blood into aorta which carries it to different parts of the body except for the lungs.
7. What type of tissue the heart composed of? How is this tissue oxygenated and supplied with nutrients?
- The heart is basically a pump. The heart is made up of specialized muscle tissue, called the myocardium. Like any pump, the heart requires fuel in order to work. The myocardium requires oxygen and nutrients, just like any other tissue in the body. However, the blood that passes through the heart's chambers is only passing through on its trip through the body -- this blood does not give oxygen and nutrients to the myocardium. The myocardium receives its oxygen and nutrients from the coronary arteries. The coronary arteries lie on the outside of the heart and supply oxygenated blood to the heart tissue.
8. Write a detailed note on transpiration?
- Transpiration is the process where plants absorb water through the roots and then give off water vapor through pores in their leaves.
9. Describe the transport system in plants.
- In plants, food and water are transported by bundles of tubes present in stem called Phloem and Xylem. The main function of xylem is to transport water and dissolved minerals from the roots to rest of the plant body. While, the phloem transports the food manufactured in the leaves to all parts of the plant.
10. Write about some illnesses of heart and blood. Write about their causes.
- Following are some illness of heart and blood.
Anaemia: Anaemia caused by the shortage of blood due to the lack of haemoglobin (the oxygen-carrying part of the red blood cells) which results in the lack of oxygen in the body. Anaemia is treated with medicines containing iron salts as Iron is an important part of haemoglobin and helps in making it.

Haemophilia : Haemophilia is a hereditary disease. In this disease, patient cannot make the chemicals needed for clotting of blood and healing wounds. Even a small scratch or wound can bleed severely unless medical care is given immediately.

Diabetes: Diabetes occurs when sufficient insulin is not produced by the body. Insulin, a hormone, helps control glucose level in blood. It has two jobs- the first is to supply glucose to the body, the second is to store it in the liver. Some people do not make enough insulin and glucose is not stored in their liver. Instead, it is passed out of their body. Diabetes cannot presently be cured, but it can be managed by injections and tablets of insulin or by controlling the diet



Thrombosis: Thrombosis is a process of blood clot forming in a blood vessel. This blood clot can block the blood flow in the blood vessel, as well as cause serious problems if it moves to crucial parts. Sometimes fatty material called cholesterol accumulate in the arteries. Cholesterol in coronary arteries blocks the oxygen and nutrient supply to the heart. This makes the heart weak and it eventually stops beating. This is called the heart failure.

Reasoning questions

1. Plants don't have blood, they transport food through ____
 - Phloem , which transport organic molecules and sugars created through photosynthesis in the leaves throughout the rest of the plant.
2. Disorder of circulatory system causes severe illnesses ____
 - As it creates Interruptions, blockage, or diseases that effect heart or blood vessels and can cause complications such as heart disease or stroke.

Circle the correct answers:

1. How many chambers does the heart have?
 - c) Four
2. The movement of blood through the heart and body is called:
 - a) Circulation
3. The beating sound your heart make comes from
 - b) Valves closing
4. With circulation, the heart provides your body with:
 - d) All of the above
5. The atria are the 'upstairs' chambers of the heart, and these parts are the 'downstairs' chambers:
 - b) Ventricles
6. What wall separates the left and right side of the heart?
 - c) Septum
7. What parts act like doors that control blood flow in the heart?
 - a) Valves
8. What organ removes waste from blood?
 - d) Kidneys
9. You can keep your heart strong by:
 - b) Doing activities like playing outside, riding your bike, and swimming
10. These are tubes that carry blood back to the heart:
 - b) Veins
11. What part of the blood carries minerals, vitamins, sugar, and other foods to the body cells?
 - a) Plasma
12. What is the main job of the red corpuscles in the blood?
 - c) To transport oxygen to the body's cell and carry away carbon dioxide from the cells
13. What would happen to people who have an open wound and whose blood did not clot naturally?



- a) They may bleed to death

Fill in the blanks:

1. The blood from the heart is transported to all parts of the body by the Arteries.
2. Hemoglobin is present in Red Blood cells.
3. Arteries and veins are joined by a network of Capillaries.
4. The rhythmic expansion and the contraction of the heart is called Lub-dub.
5. Water reaches great heights in the trees because of a suction pull caused by Transpiration.
6. Red blood cells, also called RBCs have iron rich protein known as Hemoglobin.
7. The normal pulse rate is 70-100.
8. The term for transport of food from leaves to other parts of the plant is called translocation.
9. Water absorption through roots can be increased by keeping the plants in light.
10. In plants, water is transported through Xylem.
11. The movement in Xylem is just in one way- from the roots up to the stem and leaves.
12. Heart transplant is the last option after the heart Failure.

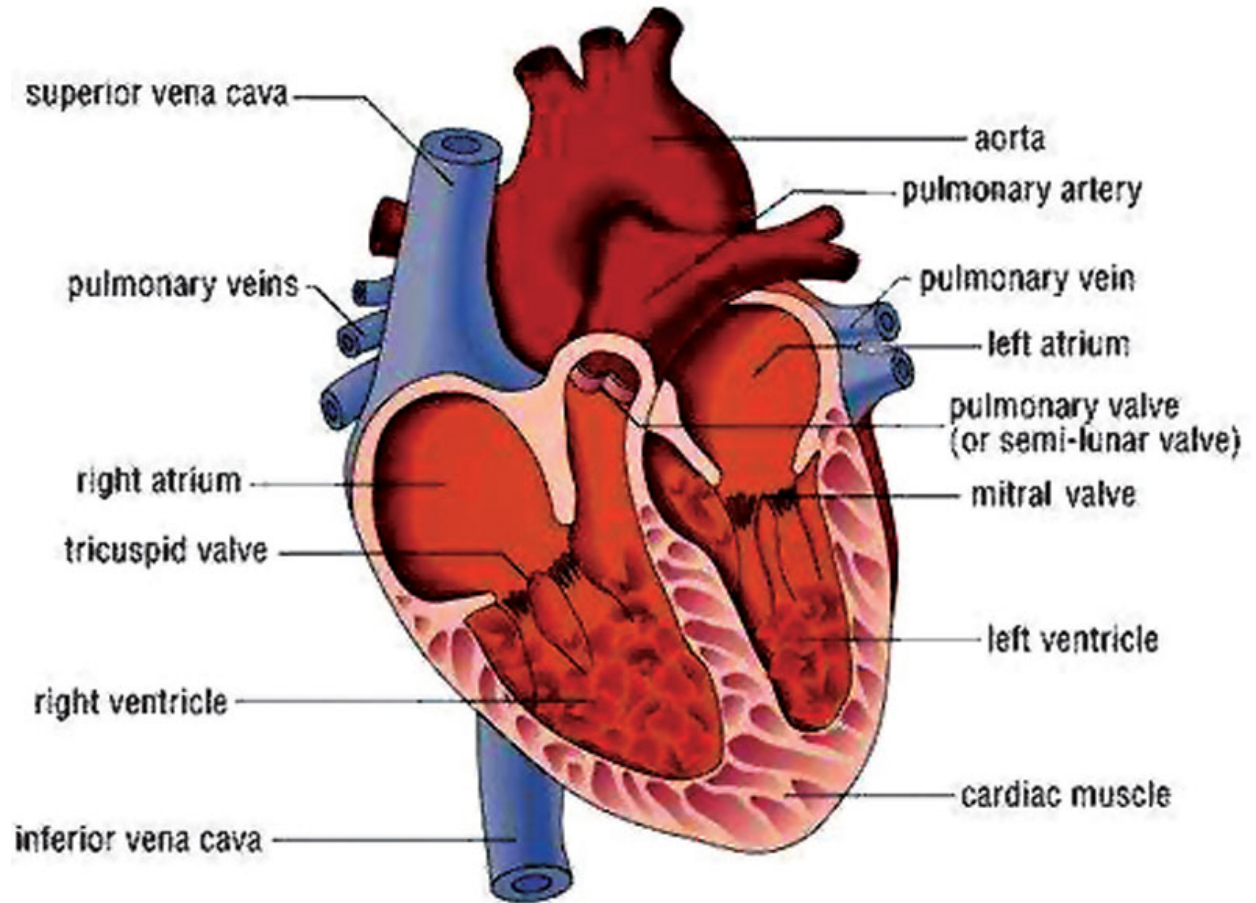
State whether the statement is “True” or “False.”

1. The presence of hemoglobin gives red color to blood. **True**
2. The pulmonary artery is the only artery in the human body that carries carbon dioxide-rich blood. **True**
3. The roots of the plant remain in contact with underground water. **False**
4. Transpiration process helps in eliminating extra water from plant. **True**
5. Phloem vessel transports only water from roots to different parts of the plant. **False**
6. The diffusion of water out of the leaf through the stomata is called transpiration. **True**
7. Transpiration increases in humid conditions. **False**
8. Xylem is made of columns of hollow, dead cells. **True**
9. The position of vascular bundles, is change in different parts of plant. **False**
10. Phloem is made of living cells. **True**

Match definitions of column A with the words in column B (Matched):

Column A	Column B
Blood vessels that carry deoxygenated blood to the heart	Veins
Process of transferring water and minerals from roots to stem and leaves	Transpiration
Hollow tubes made of elongated dead cells.	Xylem
Tiny opening on the leaves	Stomata
Transfer of food to all parts of plant	Translocation
Vessels made of living cylindrical cells.	Phloem
Blood vessels that carry oxygenated blood to all parts of the body	Arteries
Protein found in plasma that helps in cleaning blood	Albumin

Label the Diagram



Chapter 3: Reproduction in Plants

Learning Objectives

In this lesson we will learn about

- Sexual and Asexual Reproduction
- Anatomy of Plants
- Reproduction in Plants
- Pollination
- Germination

Teacher Starter

You can start by asking them how many of them grow a plant, extend your lesson from their crude observations which they share with you. Tell them like other living things plants also die, so they too reproduce in order to extend their species. Enlighten their scope that plants also have male and female parts. Ask their opinion how plants mate as they can not physically move. Then give them the concept of pollination. How plants are able to pollinate.

Teaching

Try to make the lesson as convenient and understandable by explaining things mentioned in the chapter. You may ask questions, in order to understand how much they grasp the concept of the chapter. Try to pick some flowers and inspect in front of students, or some seeds, or a seedling for better understanding of the students. You can also make good use of students' own observations and experiences.

Exercise

Answer the following questions

1. What is meant by reproduction? How many different kinds of reproduction are there? Write in detail.
- Reproduction is the process of producing new organisms. There are two types of reproduction:

Sexual reproduction

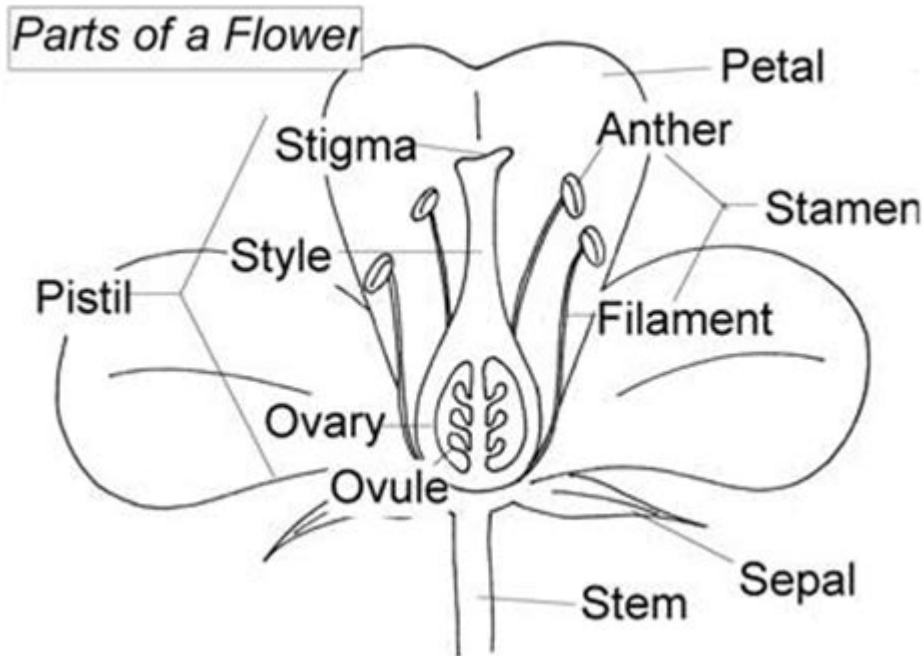
Sexual reproduction occurs with two parents; a male and a female. The male and female sex cells come together to form a zygote. The process is called fertilization. After this, the newly fertilized cell goes on to become a new organism. The offspring inherit the characteristics of their parents. Sexual reproduction creates all human beings, almost all animals and most plants.

Asexual reproduction

Asexual reproduction requires only one parent. Asexual reproduction is common in single cell organisms and some plants.



2. Draw and label the parts of a flower and explain their functions assisting in reproduction
Ans:



Sepals	Outermost green leaf-like structure of a flower which protects the developing bud of a plant.
Petal	It's a protective layer for style and stigma. Brightly colored to attract the pollinators.
Stamen	The male reproductive part of the flower. It consists of anther and filament.
Filament	It is a long tube that supports the anther.
Anther	It produces pollen grains for pollination.
Pistil	It is the female part of the plant. It contains stigma, style, ovary, and ovules.
Style	A tube that supports the stigma
Stigma	The top area of the pistil of the flower which collects pollen grains. It is sticky in nature.
Ovary	The enlarged basal portion of the pistil which produces female sex cells contained in ovules.
Nectar	The bottom area of the female part of the flower which produces nectar to attract insects.

3. What is meant by pollination? How many kinds of pollination are there? Write in detail.

- Pollination is the process in which the pollen from the male part of the plant called the anther, is transferred to the female part of the plant called the stigma. This process fertilizes the plant and makes new baby plants called seedlings.

There are two different ways in which pollination can take place

1. Cross pollination
2. Self-pollination

Cross pollination: When pollen moves from one plant to another, this type of pollination is called cross pollination. It is the most common way for pollination to occur. In some plants, cross-pollination occurs by wind or water. These plants either do not have flowers, or they are designed to be pollinated by wind or water

Cross pollination happens with the help of pollinators. These are the organisms that carry pollen grains from one flower to another. Bees, bats, butterflies, moths, flies, beetles, wasps and animals are all common pollinators. Some crops that cross pollinate are banana, carrot, and cucumber.

Self-pollination: The type of pollination that does not need the help of others is called self-pollination. Self-pollinating plants are fertile on their own, although very few plants have this characteristic. Some crops like tomatoes, wheat, peach, peanut, rice, and soy-bean belong to this category.

4. Write short notes on: 1) Germination 2) fertilization
 - **Germination:** A process controlled by enzymes in which a seed begins to grow into a young plant is called germination.

Fertilization: The process in which pollen grains combine with the egg inside the pistil is called fertilization.

5. What is germination in plants? Write down about different kinds of Asexual reproduction in plants.
 - Asexual reproduction requires only one parent. Since there is only one parent, the offspring are genetically identical to their parent and each other. There are many different kinds of asexual reproduction in plants. They include:

Bulbs: Many plants naturally produce underground food storage organs that later becomes the following year's plant. Potato tubers and daffodil bulbs are an example of such plants.

Runner: Some plants naturally develop side branches with plantlets on them like the spider plant. Other plants, such as strawberry develop runners with plantlets on them.

Rooting branch Bramble plant grows a long, woody branch which later bends down to the ground and when this branch touches the ground, the swollen bud at the end of the branch grows shoots and roots, which later grows into a new bramble plant.

Cutting In some plants like mint a single cutting, such as a stem can give rise to a whole new plant. When you cut a branch from the parent plant and place it in the soil, roots will start



to grow from the branch and eventually produce a new plant. Some plants do not even need to put their cutting in soil. Just putting it in water is all that is need to grow a new plant.

Short Answer Questions

1. Differentiate between:

i) Perfect flowers and imperfect flowers

A flower which has both the male and female reproductive parts is called a 'perfect flower.' A flower which has either male or female part is called an 'imperfect flower.'

ii) Asexual and sexual reproduction

Sexual reproduction

It requires two parents.

Offspring is genetically different from its parents.

Gametes (sex cells) are produced by the parent organisms.

Asexual reproduction

It requires only one parent.

Offspring are genetically identical to their parents.

Gametes are not produced.

iii) Self-pollination and cross pollination

Self-pollination

It is the transfer of Pollen grains from the anther to the stigma of the same flower or another flower of the same plant.

It does not need a pollinator

It can occur even when the flower is closed.

It happens in perfect flowers.

Flowers are neither attractive nor produce nectar.

Cross pollination

It is the transfer of pollen grains from one flower to another flower of a different plant.

It needs a pollinator.

It only occurs when the flower is open.

It happens in imperfect flowers.

Flowers attract pollinators by various means like nectar, fragrance and bright colors

2. How is zygote formed in sexual reproduction?
 - A zygote is the fertilized cell formed by the combination of male and female sex cells that will grow into an embryo.
3. How are plants benefited by seed dispersal?
 - Seed dispersal helps the plant to spread-out its species and allows them to get more nutrients from fresh soil.
4. How can spores survive for a long time?
 - Spores survive for a long time because sac like structure inside which spores are formed. This sac like structure provides a tough coat around the spore that protects it from unfavorable conditions and thus survive long.
5. In vegetative reproduction plants take less time to grow and bear flowers and fruits, than plants produced from seeds? Why?
 - This is because seeds take long time to germinate and nurture.
6. How does the process of fertilization take place in flowers?
 - When Pollen grains combine with the egg inside the pistil the process is called fertilization. After fertilization, the female part of the flower develops into a fruit. The ovules become a seed and rest of the female part becomes the fruit.
7. What is the significance of dispersal of seeds?
 - Plants have limited mobility and consequently rely upon a variety of dispersal vectors to transport their propagules, including both abiotic and biotic vectors in order to put their seeds away from the parent plant.
8. What are the characteristic features of seeds dispersed by water and animals?
 - They have bright colors, lovely smells, beautiful shapes and have nectar which attract animals. They also produce pollens in large quantities.
9. Differentiate between stamen and pistil.
 - The main difference between stamen and pistil is that stamen is the male reproductive organ which produces pollens, while pistil is the female reproductive organ which produces ovules.

Write the correct answers in the blank spaces:

1. d) Asexual
2. a) A male and female
3. c) Unite to form a zygote
4. b) Stamen
5. d) carpel
6. a) Pistil
7. a) Petals
8. d) Sepals
9. a) Cross-pollinated
10. b) Stigma
11. c) Anther
12. c) Scent
13. d) Photosynthesis
14. c) outside
15. c) fertilized
16. d) Ovule
17. a) fruit
18. d) Cross pollination
19. c) base
20. c) seeds
21. a) insects, birds and animals

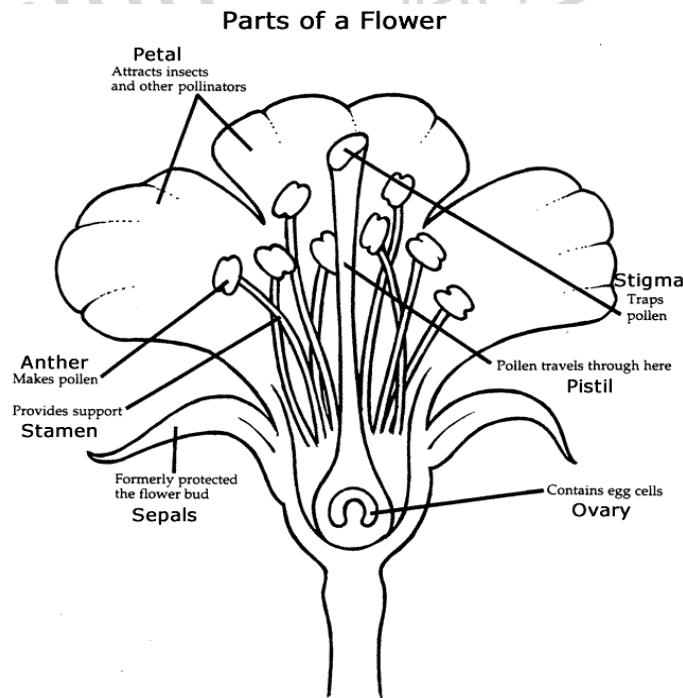


Fill in the blacks:

1. In Asexual reproduction, a new plant body is formed by a single parent.
2. A small bulb like structure found in yeast is called Budd.
3. The male gamete on the stigma reaches the female gamete inside the ovary through pollination.
4. Male cells are present in the anther, and the female cells are present in the stigma.
5. After fertilization of the egg, the ovary becomes fruit and ovules become seed.

Name the following:

1. Two organisms which reproduce by budding.
Ans: Strawberry and tulips
2. The method by which moss and ferns reproduce
Ans: wind pollination
3. The type of flower which has both the male and the female reproductive parts?
Ans: perfect flower
4. A plant which multiplies by fragmentation,
Ans: Alga

Label the parts of flower

Chapter 4: Environment and feeding relationship.

Learning Objectives

In this lesson we will learn about

- environment and its interaction
- the components of environment
- biotic and abiotic factors
- components of biotic factor i.e. producer, consumer and decomposer
- the food chain and its importance to carry lives
- the components of abiotic factors
- Interaction of different Organisms
- the ecosystem

Teacher Starter

You may start the lesson by asking children where they live and with whom they live. Upon the answers of children, ask them how many non-living components surrounds them. What is their routine interaction with these non-living components?

Then enlighten them about the environment and its features, also give an idea how important an environment is, letting them tell you what they think about food chain. Brief them how the food chain keeps the balance.

By giving some examples, give them a basic idea of environmental features for different animals. Give them the concept of a habitat, develop their understanding that animals and human need certain environmental features or habitat to live. Discuss the various types of habitat, components of habitat, and adaptations in class.

Teaching

Thoroughly read the chapter in the class and make it as understandable and convenient for the kids to understand well. Ask different questions during or by the end of the topic in order to ensure that each and every concept should be clear to the students. Emphasize more on environment, food chain and habitats and adaptations. Tell students about habitat, its types, and its components. Point to the pictures given in the unit.

Exercise

Answer the following questions

1. What is meant by habitat? Why are they important for the living things?
 - Ans: A Habitat is the natural environment in which an organism lives, or the physical environment that surrounds a species population. All living things need a living place where they can live, find food and flourish.
2. Why do animals have to adapt to their habitats? Support your answer with examples of animals and plants.
 - Ans: Adaptation is a way in which an animal and a plant develop certain characteristics to survive in its environment. It takes many generations to undergo these adaptations entirely. A few examples of animals and plants that have adapted to extreme environment.



Penguins

Penguins live in extremely cold places, such as Antarctica. To stay warm, they have multiple resources; first, they have thick skin with a substantial layer of fat under it, second; their dark colored back absorbs sunlight to keep them warm, third; their tightly packed feathers overlap to prevent loss of heat. They also huddle together to stay warm.

Camel

Camels live in deserts where the weather is dry and hot in the day and cold at night. They have bushy eyelashes and hair lined nostrils to stop sand getting into their eyes and nose. Their thick eyebrows shield eyes from sunlight. Camel's body temperature ranges from 93°F to 107°F, so they do not need to sweat very often and can save water this way. Their large feet spread the load on the sand and make it easier for them to walk. Camels store fat in their humps, not water. As a camel goes without eating food, its hump starts to shrink. If it remains hungry long enough, the hump will disappear.

Cactus

Cactus have long, spreading roots to find water beneath the ground and absorb as much as they can. Their stems can store a large amount of water. Cactus have long spines instead of leaves to avoid water losses and to protect from animals that might eat the plant. Cactus flower after rain and make seed quickly before the next dry season starts. Their flowers only open on cooler nights and stay closed during the hot midday.

Fish

Fishes also need oxygen to breathe. They have gills to absorb oxygen that is dissolved in water. Their streamlined body makes it easier for them to move in the water. They have fins to help them swim through the water and a tail to control the direction of their movement. Their overlapping body scales keep the water out. Fish are often colored to match their background, and some of them can change their color and blend in with their surroundings to avoid predators.

3. Why do habitats change? Write in detail about different changes occur and on which basis?

- Habitats change due to nature and food chains.

There are three types of changes that may occur in a habitat;

1. Daily changes
2. Seasonal changes
3. Human made changes

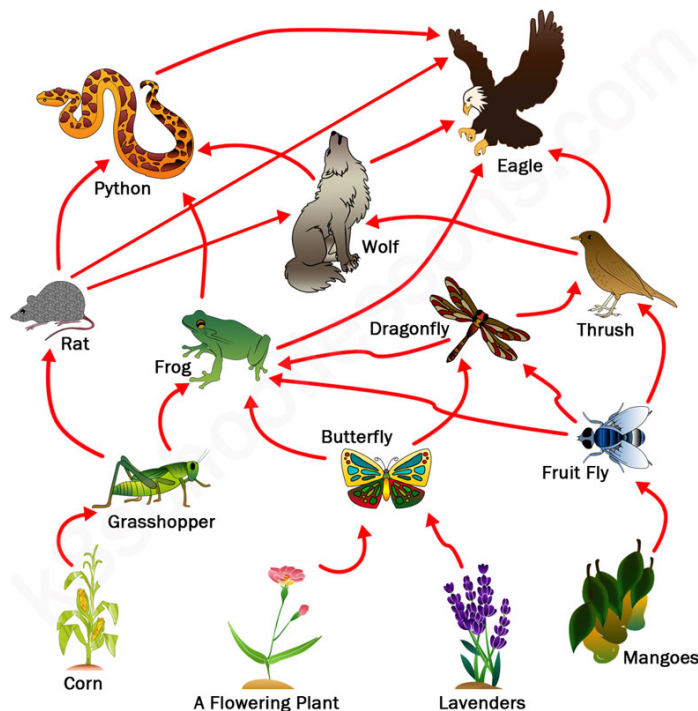
Daily changes Some changes to a habitat happen daily. Daily changes to the habitat include the change from light and heat to dark and cold as the night falls. Flowers open in the morning to get pollinated by the insects and close at night for protection. Animals that live in deserts hide during the day time to avoid the hot weather and come out at night to feed when it is cooler. Some animals like mice and rabbits get out only at night to avoid being eaten by the predators.

Seasonal changes Habitats also change over a longer time scale, with seasons. Animals and plants are adapted to the seasonal changes that occur in their habitat. Some animals and birds move to a warmer place in search of food and shelter. This is called migration. Some animals and plants store food for the winter. Some insects like butterfly spend their winters in a protective case called pupa. Some animals go to sleep for the duration of winter. This is called hibernation. Some animals develop a coat during winter.

Human Made Changes People build their home in habitats where plants and animals lived. The clearing of area involves uprooting trees and plants, removing rocks and soil and filling in ponds.

4. What is ecosystem and what are the special features of it?
 - When two or more habitats combine, they form an Ecosystem. The ecosystem could be any size from a small pool of water to hundreds of square miles of desert. An ecosystem is how plants, animals and non-living things in an environment interact with each other. The non-living things include temperature, soil, earth, the sun, and climate.
5. Draw the food web and define producers and consumers and what is the importance of food chain?
 - Food chains describe the energy transfer between different organisms but since, animal and birds eat a variety of food, so food webs are more accurate way to portray energy transfer in an ecosystem.

A Food Web



6. How is the energy transferred in a food web?
- Energy flow in an ecosystem starts with the sun which produces all the energy needed for living organisms. After the sun, come the producers. They convert energy into glucose or sugar. Producers obtain 100% of the energy they produce. The primary consumers who eat producers get the next most energy in the food chain, which is only 10% of the original energy producers have. Then the secondary consumers eat primary consumers and obtain 1% of the original producer's energy. Tertiary consumers, at the top of food chain, eat both the primary and secondary consumers and obtain the least amount of energy which is only 0.1%. At every level of energy pyramid, organisms only get 10% of the energy from the previous level.

Short Answer Type Questions

1. Classify the following habitats into terrestrial and aquatic type.
 - Grassland, Rice field (terrestrial)
, pond, ocean, (aquatic)
2. Using the following words, write the habitat of each animal:
 - Grassland (Zebras), mountain (Ibex) , desert (snake) , pond (frog) , river (fish)
3. Mention one adaptation present in these animals:
 - a) In camels to keep their bodies away from the heat of the sand.
 - Long legs
 - b) In frogs to enable them to swim.
 - webbed feet
 - c) In dolphins and whales to breathe in the air when they swim near the surface of the water.
 - Nostrils located on top of their heads

Write the correct answers in the blank spaces:

1. Energy
2. Sun
3. Food chain
4. Season
5. Habitats
6. Producers
7. Eco system
8. Prey
9. Gills
10. both a and b
11. Water
12. Survive
13. Producer



14. both a and b
15. Plants and phytoplankton

Fill in the blanks:

1. The place that an organism lives is called its Habitat.
2. At every level of energy pyramid, organisms only get 10% of the energy from the previous level.
3. Humans are at the end of the food chain. They consume both the producers and consumers.
4. The presence of a specific feature, which enables a plant or an animal to live in a particular habitat is called adaptation.
5. The habitats of the plants and animals that live in the land are called terrestrial habitat.
6. The habitats of plants and animals that live in water are called aquatic habitat.
7. Soil, water, and air are the non-biotic factors of a habitat.
8. Fish have _____ shaped body that helped them to move inside water.

State whether the statement is “True” or “False.”

1. If one part of an ecosystem is altered then the whole ecosystem will be affected. **True**
2. Nutrients are only found in rocks and atmosphere. **False**
3. Bacteria and fungi are decomposers in an ecosystem. **True**
4. Carnivores are primary consumers. **False**
5. Herbivores are always at the base of the food chain. **False**
6. Ecosystems can vary in size. **True**
7. Many food chains make a food web. **True**
8. All food chains start with the sun. **True**
9. Plants can survive without light. **False**
10. A habitat can recover from flood. **True**

Make a food chain on land. Plants, even the tiniest once are the start of all food chains. Look at this example of a food chain and draw animals in the circles to make your own

- DO as directed.

Chapter 5: Water, The amazing liquid

Learning Objectives:

After this lesson, students will be able to:

- define water
- explain the role of water for humans and plants
- discuss and explain the water cycle
- methods of purification (i-e filtration and distillation)



Teacher Starter

You may start the lesson by asking children what is single most important thing for life, Upon the answers of children, ask them how vital water is for their living. How frequently and importantly they consume water, apart from that tell them almost all of the things require water?

Enlighten them about the Water and its features, tell them Water makes up major portion of mass of most organisms, also let them know that Water is a universal solvent which means it can easily dissolve other substances and this property of water makes it so vital component.

Teaching

Engage yourself effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners. You can start by reading the chapter and make the chapter understandable and convenient by explaining things mention in the chapter. You may ask questions, in order to understand how much they grasp the concept of the chapter.

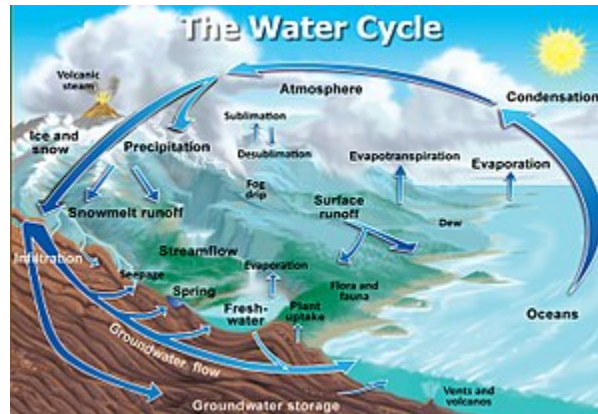
Exercise**Answer the following questions**

1. Write down the importance of water.
 - Water is the most important natural resource in the world.
Without it, life would not exist as all living things need water to keep their body functions going and stay alive.
Water makes up major portion of mass of most organisms. About 70% of the human body consists of water.
Water is a universal solvent which means it can easily dissolve other substances. It allows water to transfer nutrients to living cells, and transfer waste material away from them.
2. What do you know about the industrial use of water? Write in detail.
 - Water is used for the production process, for washing and cleaning purposes as well as for employee use.
Industries that produce chemicals, medicines, fabric, polymers, paper, food and most other products, all use water in some step of their production processes.
Machinery needs water to cool it down to the temperature suitable for the process.
The mining industry uses water to wash off the unwanted material that has been brought up from the underground.
Most of the electricity we use is generated through water
Thermoelectric power plants use water to produce steam for making electricity.
Hydroelectric power plants convert the energy of falling water into electricity by passing it through turbines.
Water is also used as a coolant or cooling agent. Power plants need water to cool down steam and turn it back into water.



3. What is water cycle? Elaborate with illustrations.

- The water cycle, also known as the hydrological cycle is a continuous cycle: Water on the ground warms up and rises into the air, this process is called evaporation. As the molecules go high in the atmosphere, they cool down and become a cloud; this is called condensation. When the wind blows, these clouds move onto the land, rise and cool down. The clouds become heavy with water, and this water falls to Earth as rain, and then evaporates again. This happens again and again in a never-ending cycle.



4. Why do we need to store water?

- We need a consistent supply of water, fresh water has limited resources, so to ensure uninterrupted supply we need to store water for domestic and industrial use, as well as to use in agriculture.

5. What is sedimentation? Why do we use it?

- Sedimentation is water treatment process using gravity to remove suspended solids from water. Solid particles can be removed naturally by sedimentation in the still water.

6. Why do we need to purify water before drinking?

- Water contains microscopic organisms and bacteria that can cause serious illness. So we need to purify water to removing these impurities and making it safe to drink

7. How can we save water and why should we save water?

- We can save water by simple steps.
 - Turn off the tap when you are brushing your teeth, this can save 6 litres of water per minute.
 - Check your pipes for leakage. Fixing leaky pipes mean big water savings.
 - Take shorter showers. A four-minute shower uses almost 100 to 200 liters of water.

- Do not let the water run while you clean vegetables or wash dishes.

Water is the most important component for living. We need fresh water to live, yet only 3% of Earth's water is fresh from which only 1% is available for us to use. As global population grows, we are sharing this limited resource with more and more people. Therefore, we need to conserve water and use it wisely.

Give the reasons

- a) Industrial used water cannot be used for normal use
- Because:
 - Current tests cannot accurately detect all contaminants,
 - Current wastewater treatments cannot remove or deactivate all contaminants, and
 - The risk to human health from a constant mix of water contaminants is unknown.
- b) When we dig the ground deep, the water came out
- Because there is water present underground. When the sprouts above, the earth soaks the water and it goes in deep.
- c) When rain falls onto the ground, the water does not stop moving
- As Some of it flows along the land surface to streams or lakes, some is used by plants. Some evaporates and returns to the atmosphere. And some seeps underground, into pores between sand, clay and rock formations called aquifers

Fill in the blanks

1. The process by which water continually changes its form and circulates between ocean, atmosphere, and land is called the Water cycle
2. During daytime seawater is boiled to evaporate water.
3. Fractional distillation is a process to separate pure liquid from a mixture of liquids.
4. The Sediment cake formed in the settlement tank is pumped out and dewatered for use as fertilizer.
5. In water treatment plants, we use chemicals like alum and lime to make all the sediment or solid suspended particles stick with each other in a process called sedimentation.
6. Waste water is treated to remove contaminants.
7. The human made lakes are used as a place to store water and are called reservoirs.
8. The process of water molecules moving up into the air is called evaporation.
9. Thermoelectric plants use water to produce steam for making electricity.
10. All living things need water to stay alive.
11. three-quarters of our earth is consists of water, and remaining one-quarter of the earth is land.
12. Some organisms have 95% water, while others contain more than 50% water in them. The human body consists of about 70% water



Tick the correct answers:

1. 71%
2. Salty
3. Rain
4. Three forms
5. Distillation
6. only pure water without minerals
7. Evaporation
8. Hydraulic cycle
9. Condensation
10. The water cycle has no beginning and no end
11. 97%
12. Runoff
13. Chlorination
14. Coagulation

Chapter 6: Structure of an Atom**Learning Objectives**

In this lesson we will learn about

- structure of atoms,
- the masses, electrical charges, and locations of protons, neutrons, and electrons.
- identify that protons determine an element's identity.

Teacher Starter

Start by asking children what is the smallest part of matter? Take your lesson from their answers. explain what an atom is, then put the question in their minds that even atom has sub-particles and question them about the three main parts of an atom, and Where are these parts located in an atom. Also let them aware how an atomic particle gets its charge. Give them examples of some elements and their atomic composition, ask students if they notice any patterns. Also, introduce atomic mass.

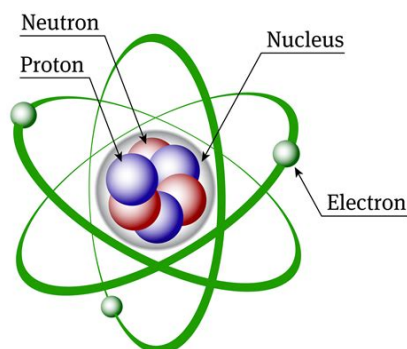
Teaching

Describe the students about atoms, about their structures, including their mass, electrical charge, and location of sub atomic particles. (proton, electron, neutron). Also identify that it is the proton which determines any element's identity. The teacher will help to clear any misconceptions about atoms. A major misconception is students may think atoms are two-dimensional by using this model.



Exercise**Answer the following questions**

1. What is an atom? Who discovered it and how?
 - A Greek philosopher, Democritus developed the idea of an atom. Atom, means indivisible in Greek, so An atom is the smallest indivisible constituent of matter.
2. Describe the structure of an atom with the diagram in detail.

Atom structure

- Atoms are made of tiny subatomic particles, electrons, protons, and neutrons. At the center of an atom is a nucleus. Electrons surround the nucleus of an atom. Protons and neutrons are present in the nucleus. Both electrons and protons are electrically charged. Electrons are negatively charged, and protons are positively charged. Neutrons are neutral that is they have no charge on them. The total number of electrons is always the same as the number of protons present in the nucleus. This means that an atom has no charge as the positive charge of protons cancels the negative charge of electrons.
3. What is meant by atomic and mass number? Write in detail.
 - The number of protons present in an atom is called the atomic number of that atom. For example, the atomic number of Lithium is 3. It means it has 3 protons. Since the number of protons is same as the number of electrons present in an atom, therefore, lithium atom also has 3 electrons in it. Atomic number is also called proton number. The atomic number of an element is denoted by symbol Z .
The mass number of an atom is the sum of the number of neutrons and protons present in it. It is denoted by symbol A . The mass number of an atom is never smaller than its atomic number. It can be the same but is normally bigger.
 4. Write short notes on the following topics:
 - a) Ions
 - b) Valency
 - c) Chemical formula
 - d) Radioisotopes
 - **Ions**
Atoms are only stable when their shells are completely filled with electrons. They become unstable when they have incomplete shells. So, they complete their shells by stealing electrons from other atoms. When an atom steals an electron it gains a negative charge and the one who got stolen from gains a positive charge. These charged particles are called ions.

Valency :

The capacity of an atom to combine or bond with other atoms is called its valency. For metals, the total number of electrons present in their outer shell is equal to their valency. The noble gases such as helium, argon, and krypton are non-reactive. Their outer most shells are completely filled and they have zero valences.

Chemical formula A chemical formula is a chemist's way of describing a molecule. A formula consists of the symbols of atoms present in the chemical compound as well as their numbers, written in the form of the subscript. For example, the formula for water molecule is H_2O , where H is the symbol for hydrogen, O is for oxygen and a small 2 after H tells you that it has two hydrogen atoms. Notice that we do not write number 1 if there is only one atom.

Radioisotopes The nuclei of some isotopes are unstable. They can split up or decay and release energy in the form of radiations. Such isotopes are called radioactive isotopes or radioisotopes.

5. What are the uses of radioisotopes? Write in detail with examples.

- **Uses of Radioisotopes**

Medical uses Radioisotopes are extensively used in medicine to analyse and treat illness. They are useful in radiation therapy and in locating tumours in a patient's body.

Agriculture use In agriculture, radioisotopes are used to kill insects by sterilization. This helps in controlling pests.

Industrial use Many industries such as paper, steel, and oil use radioisotopes. These industries use radioisotopes to control the thickness of pipes, paper, and plastic, and to give uniformity to their products.

6. What is the difference between atoms and elements?

- Elements are considered to be pure substances that cannot be split or broken into simpler substances. An element is made up of one kind of atom.

An atom can be considered as the smallest amount of an element. When atoms combine or bind together via a chemical means, they form molecules. When only like atoms combine, they form elements, so technically, elements can be composed of molecules.

7. How do you find the number of protons, electrons, and neutrons that are in an atom of an element?

- The number of electrons in a neutral atom is equal to the number of protons. So an atomic number will tell us the number of electrons and protons. Whereas, the mass number of the atom (M) is equal to the sum of the number of protons and neutrons in the nucleus. So, the number of neutrons is equal to the difference between the mass number of the atom (M) and the atomic number (Z).

8. If you have 11 protons and 12 neutrons this is an atom of which element?
- Sodium
9. How many electrons fit in each shell around an atom?
- Each shell can contain only a fixed number of electrons: The first shell can hold up to two electrons, the second shell can hold up to eight ($2 + 6$) electrons, the third shell can hold up to 18 ($2 + 6 + 10$) and so on. The general formula is that the n^{th} shell can in principle hold up to $2(n^2)$ electrons.

Short Answer Questions

a) What is ion?

- **Ions**

Atoms are only stable when their shells are completely filled with electrons. They become unstable when they have incomplete shells. So, they complete their shells by stealing electrons from other atoms. When an atom steals an electron it gains a negative charge and the one who got stolen from gains a positive charge. These charged particles are called ions.

b) Write the symbols of tungsten and iron.

- W = Tungsten, Fe = Iron

c) Define atomic numbers.

- Atomic Number is the number of protons in the nucleus of an atom, which is characteristic of a chemical element and determines its place in the periodic table.

d) What is meant by cation and anion?

- Negatively charged ion is called an anion. positively charged ion is called a cation.

Write the correct answers in the blank spaces:

1. b) 18
2. b) sub-atomic particles
3. b) molecular formula
4. a) 6
5. b) Velocity
6. b) Neutron
7. d) all of them
8. a) isotopes
9. b) nucleon number
10. a) Atom
11. a) No electric charge
12. c) Positive charges
13. c) Negative charges
14. d) Atom



15. d) 2

Fill in the blanks:

1. An element is made up of only one kind of atoms.
2. A molecule of nitrogen is consists of 2 atoms of the element nitrogen.
3. An atom is the smallest particle of an element that can take part in a chemical reaction.
4. An element is the smallest particle of a substance (element or compound) which has an independent existence.
5. The attractive force between the molecule is called bonding.
6. In a chemical reaction, an element reacts with the other to form a compound.
7. Valency is the combining capacity of an element.

Match the Columns (Matched)

Column 1	Column 2
A molecule of an element.	N ₂
A molecule of a compound.	SO ₂
An atom of a metal.	Na
An atom of a nonmetal.	C
A molecule of triatomic gas.	O ₃

Find number of Neutrons in the following:

Na=12 B=6 Ca=20 O=8

Write the chemical formulas of the following:

1. Sodium Oxide = Na₂O
2. Silver chloride = AgCl
3. Magnesium bicarbonate = Mg(HCO₃)₂
4. Silver oxide = Ag₂O
5. Zinc carbonate = ZnCO₃

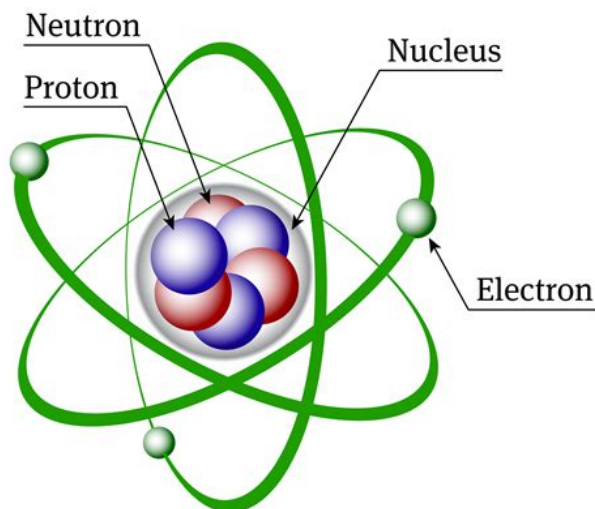
State whether the statements are 'true' or 'false'.

1. Atom is an indivisible particle. **True**
2. Neutron has a positive charge. **False**
3. Nucleus of an atom contains the mass of the atom. **True**
4. Loss of electron by an atom gives rise to a positively charged ion. **True**
5. All the atoms of an element are similar in properties. **True**
6. Combining capacity of aluminum is 3. **True**

Give one word for the following group of words or statements.

1. Union of the atoms of the same kind. **Molecule of Element**
2. Union of the atoms of different kinds. **Molecule of Compound**
3. Positively charged atom or atoms. **Cation**
4. The total numbers of protons and neutrons in the nucleus. **Mass Number**
5. The combining capacity of an element. **Valency**



Label the diagram**Atom structure****Chapter 7: Chemical and Physical Changes****Learning Objectives**

In this lesson we will learn about

- Matter
- The States of matter
- The change in state of matter
- The physical change
- The Chemical change
- Classify change as either physical or chemical.
- The differences between physical and chemical changes

Teacher Starter

Recall what they have learnt earlier, that matter cannot be created nor destroyed, only change. Let them aware that impact of temperature and pressure led the matter to change. You can explore suitable examples surrounds them, that are evident for this change. Let them investigate, identify and determine if these changes are either physical or chemical.

Teaching

Thoroughly read the chapter in the class and make it as understandable and convenient for the kids to understand well. Ask different questions during or by the end of the topic in order to ensure that each and every concept should be clear to the students. Ensure that students will

able to identify two kinds of changes in matter, physical and chemical. Define and explain the difference. Later on, ask your students to create a foldable in their interactive notebook to define each change.

Exercise

Answer the following questions

- Q1. Explain the physical and chemical processes along with examples.
 - Matter is constantly changing states. Some changes happen in the physical appearance of a substance, (like the melting of ice) such changes are called physical changes. Others happen in the chemical composition of the substance, (such burning of wood) . This is called chemical change.
- Differentiate between physical and chemical reactions.
 - Physical Change**
 - In a physical change, the structure or nature of the substance remains the same.
 - physical change only changes the arrangement of particles in a substance,
 - the nature of substance will stay the same.
 - Physical changes can be reversed at any point
 - Physical change can be done by melting, boiling, freezing, condensing, sublimation
 - Chemical Change:**
 - Chemical changes convert a substance into a different substance.
 - Chemical changes take place as a result of formation or breakage of a bond between atoms or molecules.
 - Chemical changes cannot be undone.
 - Example of Chemical changes baking, frying, rusting etc
- Explain the formation of crystal of copper sulphate.
 - When blue solid hydrated copper (II) sulphate is heated. It turns into white anhydrous copper (II) sulphate. By adding few drops of water, it again turns into blue crystals of hydrated copper (II) sulphate. Heating actually removed that water molecule stuck in hydrated copper (II) sulphate and turned it into anhydrous copper (II) sulphate. Adding water make it hydrated copper (II) sulphate again.
Hydrated means having water molecules stuck in it. Anhydrous means without water.
Hydrated copper (II) sulphate \longrightarrow Anhydrous copper (II) sulphate + water (steam)
Anhydrous Copper (II) sulphate + water \longrightarrow hydrated copper (II) sulphate
- Why chemical changes are very important in our life?
 - Chemical reactions are important because they are the basis of all life on earth. All basic tasks of day to day life are performed via the aid of chemical reactions. These include everything from digesting your food, starting your car, or even thinking of doing something.



5. Burning of any substance is the chemical change. Discuss.
- Burning is a chemical change as new substances emerged which cannot be changed back (e.g. carbon dioxide) are formed. For example, if wood is burned in a fireplace, there is not wood anymore but ash. Chemical reactions cannot be undone.
6. State four characteristics which are included in the physical properties of matter.
- It includes color, length, volume, and density.

7. What are the different processes which help in changing states of matter? Write in detail with examples and illustrations.

- Physical changes could be brought about in any substance through four different ways and means. These are,

Boiling When a liquid is heated its particles absorb energy and start to move faster and further apart. This allows liquid to expand. At a certain temperature, the particles break free from the little force of attraction they had between them and become a gas. This temperature is called the boiling point.

Melting When a solid substance is heated its particles absorb heat energy and begin to vibrate faster and faster. This allows the solid to expand. At a certain temperature, the particles vibrate so much that the ordered structure of solid breaks down and solid becomes a liquid. The temperature at which solid becomes a liquid is called melting point.

Condensation Condensation is the process in which gas changes into liquid. When gas is cooled down its particles lose their energy and come closer to each other. Thus, gas then becomes a liquid.

Freezing It is the opposite of melting. When a liquid is cooled its particles lose their energy and their movement slows down. As their movement decreases and they come close to each other, the force of attraction between them increases and the liquid becomes a solid.

8. What are plastics? What is their importance in daily life? Write about the commonly used plastics.
- Plastics are long chains made by connecting together small molecules of different chemicals. The process of molecules connecting together to form long chains of plastics is called polymerization. These chains may contain thousands of atoms and have high molecular weight. In most plastics, molecules are connected together by the carbon atom.

Plastics are moldable material made by man, which can be drawn into almost any shape. They are able to withstand damages caused by water, electricity and different chemicals. There are different kinds of plastics in all types of colors and properties. Some commonly used plastics are

Polyvinyl Chloride (PVC) Polyvinyl chloride is the most commonly used plastic in the world.

Polyvinyl chloride is prepared by the polymerization of vinyl chloride. In order to obtain a flexible product PVC is heated and mixed with substance called a plasticizer. Later colors are added.

PVC is used in window frames, toys, plumbing, raincoats, flooring for hospitals, and electric cables etc. PVC is a light weight, high strength, low reactivity, thermoplastic polymer composed



of 57% chlorine and 43% carbon. Thermoplastic means it softens when heated. The chlorine present in PVC gives it excellent fire resistance.

Polyethylene is created by the polymerization of ethylene (i.e. ethane). The ethylene molecule C_2H_4 ($CH_2=CH_2$) is obtained from light oil called naphtha which is extracted from crude oil by the process of fractional distillation. Many ethylene molecules then join together to form long chains of polyethylene.

9. What are reversible and irreversible changes? Explain in detail.

- A reversible change is a change that can be undone or reversed. If you can get back the substances you started the reaction with, that's a reversible reaction. Examples of reversible reactions include dissolving, evaporation, melting and freezing.

A change is called irreversible if it cannot be changed back again. In an irreversible change, new materials are always formed.

Short Answer Questions

1. What is the most commonly used plastic in the world?

Ans: **Polyvinyl Chloride (PVC)**

2. Define chemical properties of matter.

- Chemical properties are any of the properties of matter that may only be observed and measured by performing a chemical change or chemical reaction. Chemical properties cannot be determined by touching or viewing a sample;

Classify the following processes as physical or chemical change.

- a) Photosynthesis Chemical
b) Burning of coal Chemical
c) Melting of wax Physical
d) Beating aluminum to make aluminum foil Physical
e) Digestion of food Chemical

Tick the correct answers.

1. a) Fuel
2. a) Physical change
3. a) Reversible
4. a) milky
5. b) chemical change
6. a) Iron sulphate
7. c) Magnesium oxide
8. c) brilliant white light
9. b) Physical Change
10. a) Chemical change
11. c) Water boiling
12. b) Composition stays the same



13. c) Bread is baked
14. c) Change in energy
15. d) large molecules

Fill in the blanks:

1. When carbon dioxide is passed through lime water, it turned milky due to the formation of calcium carbonate.
2. The chemical name for baking soda is Sodium bicarbonate or sodium hydrogen carbonate.
3. Changes in which only physical properties of a substance change are called physical changes.
4. Polyvinyl Chloride (PVC) is the most commonly used plastic in the world.
5. Plastics are long molecules made by connecting together small molecules of different chemical.
6. Nutrients help plants to grow because they provide the minerals that plants need to grow healthy.
7. Ammonia is water soluble, colorless gas with choking smell.
8. Condensation is the process in which gas changes into a liquid.
9. The process of molecules connecting together to form long chains of plastics is called polymerisation.
10. All three states of matter solids, liquids and gases are phases.

State whether the statement is “True” or “False.”

1. Cutting a log of wood into pieces is a chemical change. **False**
2. Formation of manure from leaves is a physical change. **False**
3. Iron pipes coated with zinc do not get rusted easily. **True**
4. Iron and rust are the same substances. **False**
5. Condensation of steam is not a chemical change. **True**
6. Changing the size and shapes of pieces of wood would be a chemical change. **False**
7. In a physical change, the makeup of matter is changed. **True**
8. Evaporation occurs when liquid water changes into a gas. **True**
9. Breaking up concrete is a physical change. **True**
10. Sand being washed out to sea from the beach is a chemical change. **False**
11. When ice cream melts, a chemical change occurs. **False**
12. Catalyst facilitates a chemical reaction without being used itself. **True**



Match the definition in column A with the words in column B (Matched)**Column A**

Change in the state of matter
 Chemical reaction that needs heat to proceed
 Process in which gas changes into liquid
 Chemical reaction that produces heat
 A chemical that helps plants grow
 Change that converts a substance into a new substance

Column B

Physical change
 Endothermic
 Condensation
 Exothermic
 Fertilizer
 Chemical change

Chapter 8: Heat**Learning Objectives**

In this lesson we will discuss about

- The concept of heat as a form of energy.
- Identifying kinetic, electrical and chemical sources of heat energy.
- The concept of heat transference.
- Which materials are the best thermal conductors?
- Which materials are the best thermal insulators?
- What is heat Convection?
- What is heat radiation?

Teacher Starter

With an introduction to the ideas of heat energy, explore prior knowledge and understanding of heat among students, tell them that heat is also a form of energy, and like any other energy, it also has some source, discussing different sources of heat by giving examples of their surroundings help the students classify these sources as kinetic, electrical and chemical sources of heat energy. Also enlighten them about heat transference and how heat is transferred.

Teaching

Letting the students aware about the basics of heat, let the students explore the concept of heat as a form of energy. Also talk about what are the different sources of heat energy. Give them the concept of heat transference. Giving them suitable examples help them understand which materials are the best thermal conductors, and which one of these are thermal insulators. Also tell them heat can also be transferred by other means, you give them the

example of Sun, where heat is transferred neither by conduction nor by convection, but by radiation.

Exercise

Answer the following questions:

1. What is heat and why it is so important for us?
 - Heat is a form of energy. It is also called thermal energy. It is the difference in temperature. Heat is important for life.
2. What happened when something is heated up?
 - We know that everything on the earth is made of molecules and these molecules are always moving. The more excited they are, the more they move. When molecules gain more energy than they had before, they become excited and move faster and touch other molecules heating them up and making them excited too. This sharing of heat energy continues until all molecules are equally excited.
3. Give two examples of each of Conductors and Insulators of heat.
 - Iron, Copper (Conductors)
Plastic, Wood (Insulators)
4. What are the different processes through which the heat is transferred? Write them in detail with examples.
 - Heat transfers from hot objects to cold objects in three different ways;
 1. Conduction
 2. Convection
 3. Radiation

Conduction Conduction takes place when objects having different temperatures come in contact with each other. It is the flow of heat due to the collision of molecules. The fast-moving molecules of hot object bump into the slow-moving molecules of cold object and transfer some of their heat to the slow-moving molecules. These slow-moving molecules after gaining energy begin moving faster and collide with the other slow-moving molecules of cold object transferring some of their heat to them. This activity continues until heat from the hot object is equally divided throughout the cold object.

Heat transfer by conduction happens in solid materials. Between two solid objects or within a solid material. Some materials are better at conducting heat and some are bad. Materials that let heat pass through them are called heat conductors or thermal conductors. Metals are good conductors of heat. Materials that do not, let heat pass through them are called heat insulators or thermal insulators. Insulators are good at keeping heat out and keeping heat in.

Convection Convection is the most efficient way of heat transfer in liquids and gases. Liquids and gases are fluids. Their particles can move from one place to another. Convection happens when particles of liquid or a gas with a lot of heat energy move and take the place of particles with low heat energy. As this happens, particles with low energy move and take



the place of high energy particles. This cycle results in a continuous flow pattern of heat from hotter to cooler areas. In this way, convection current that transfer heat from one place to another are set up. Convection occurs in liquids and gases but not in solids.

Radiation Radiation is a way of heat transfer that does not depend upon any type of medium or contact between the heat source and the heated object as is the case with convection and conduction. It is the transfer of heat in the form of thermal radiations, often called infra-red radiations. Infra-red radiation is a type of electromagnetic radiations that involves waves. We cannot see these infra-red radiations because they are not visible but we can feel them.

All objects are radiating heat all the time in all directions. The energy that every object emits in the form of infra-red radiations is called heat energy or thermal energy. Radiations coming from a hotter object are more powerful than the radiations coming from a cooler object. These radiations move in the form of waves. No particles are involved in heat transfer by radiation, unlike conduction and convection. This means that heat energy transfer by radiation can even take place in the vacuum of space, but conduction and convection cannot. One very common example of radiation heat transfer is the sun.

5. Q5. What is temperature and how do we measure it?
 - Temperature is a physical quantity expressing hot and cold. It is measured with a thermometer calibrated in one or more temperature scales. The most commonly used scales are the Celsius scale (formerly called centigrade) (denoted °C), Fahrenheit scale (denoted °F), and Kelvin scale (denoted K).
6. Q6. How are heat and temperature of a substance related to each other?
 - Heat is energy in transition. Whereas temperature is the measure of coldness or hotness. Heat transfer/flow occurs due to temperature difference. Temperature is a physical quantity, which is fixed and can be measured for that particular state. Heat and temperature are not related, but heat transfer and temperature difference are interrelated.
7. Look at the figure. Mark where the heat is being transferred by conduction, convection and radiation.
 - Do as directed.
8. Which property of liquids is used in making thermometer?
 - Liquid expands proportionally with the increase in temperature. For this property, Liquids are used in making thermometer
9. Write a note on vacuum flask.
 - The vacuum flask also known as Thermos flask was invented by a Scottish scientist named James Dewar in 1892. It is designed to reduce heat transfer. We know heat transfers in three different ways i.e. conduction, convection and radiation. The vacuum flask is designed to reduce all of these.

A vacuum flask consists of a metal or plastic container inside which are two thin silver lined glass bottles fitted one inside the other. The vacuum is created between the two bottles by



sucking out air during the construction. The plastic or cork lid is placed on the mouth of the bottle. Each part of vacuum flask helps in reducing the heat transfer.

Plastic lid at the mouth reduces conduction as plastic is a good insulator of heat. It also blocks convection currents and prevents evaporation of hot fluid by trapping it inside. Silver lined glass bottles reduce conduction and radiation. Glass is a bad conductor of heat and the silver lining on its surface reflects infra-red radiations back into the liquid preventing radiation heat transfer. The vacuum created between the two bottles reduces both the conduction and convection. That's because both the Conduction and convection need particles for heat transfer.

Tick the correct answers.

1. Melting point
2. Radiation
3. b) As the temperature increased during the day, the particles in the pavement moved faster and the thermal energy increased.
4. Conduction
5. Heat
6. Thermal insulator
7. b) Conduction
8. d) Conduction, convection and radiation
9. c) Increase, increases
10. d) 1 gallon of hot water
11. b) Condensing
12. c) Thermal conductor
13. b) Boiling point
14. b) 100
15. b) Melting point



Draw your own example of each of three types of heat transfer in the boxes below and describe why it demonstrates that type of heat transfer.

- Students will draw the pictures by themselves

Conduction	Radiation	Convection
Touching a stove and being burned	Heat from the sun warming your face	Hot air rising, cooling, and falling (convection currents)
Ice cooling down your hand	Heat from a lightbulb	When we heat water, Hot water rises above and cooler water moves down to replace it, causing a circular motion.
Boiling water by thrusting a red-hot piece of iron into it	Heat from a fire	In hot air balloons, heater inside the balloon heats the air, so the air in the balloon moves upward, making the balloon moves upward.
	Heat from anything else which is warmer than its surroundings.	

State whether the statement is “True” or “False.”

1. Cold always moves to hot. **True**
2. It is not possible to create or destroy energy. **True**
3. A snowman has more thermal energy than a burning match. **False**
4. If the particles of an object are moving fast, it means that the object has less thermal energy, or is cooling off. **False**
5. Only very hot materials, like the lava from a volcano, are capable of transferring thermal energy through the process of radiation. **False**
6. Heat transfer needs thermal contact. **True**
7. Things contract when heated because molecules move more. **False**
8. Stored Energy is called kinetic energy. **False**
9. A vacuum flask is designed to keep hot things hot and cold things cold. **True**

Complete the following Table.

Sources of heat

Items Observed	Does it produce heat?	If so, What is the energy source.
Candle	Yes	Burning of Wax
Jacket	No	
Rubbing hands together	Yes	Friction
Lamp	Yes	Burning of Filament
Hair dryer	Yes	
Sand paper and wood	Yes	Friction
Blanket	No	

Find the following words in the grid below

- Do as directed.

Chapter 9: Dispersion of Light**Learning Objectives**

In this chapter we will learn about

- Refraction
- Refraction of light
- Dispersion of light
- Prism

Teacher Starter

Start your class by identifying how light responds to objects in the classroom. Tell the students to look around the room to find examples of items (mediums) that transmit, reflect, refract, and absorb light.

You can also put few items (like mirrors, glass, lenses, prisms) in the room. Let the students observe how light behaves with each of the items.

Teaching

Start with reading of chapter and translate them in what language they can understand well. Later on ask each and every student to read the chapter and understand carefully. Make sure that each and every concept should be clear to all students. Tell your students about importance of light and its reaction after interact with different materials. Point to the picture given in the chapter. Tell them about mirror and brief that why they are able to see themselves in the mirror. Ask them that are they able to touch or exchange anything with the image of him? Why? Briefly discuss mirror and all its types with little experiments with magnifying glass.



Exercise**Answer the following questions**

- What is light? Why it is important for us and how it travels?
 - Light is a type of energy, a form of electromagnetic radiation of a wavelength which can be detected by the human eye. Light always travels in a perfectly straight path from one place to another. Objects that give off light are called luminous objects.
Light is everywhere, we need light to see. Sun is the major natural source of light for earth. Plants depend on sunlight for production of food by photosynthesis. Without light plants would not be able to make their food and animals and humans dependent on plants for food couldn't survive too.
- What is meant by refraction of light? Support your answer by explaining law of refraction.
 - Light travels at different speed through different mediums. As light moves from lighter to a denser medium like it slows down, the change in speed causes it to bend. This bending of light is called refraction. This bending has a pattern and Snell discovered this law in 1621. The law of refraction helps us in predicting how much light bends in various mediums. The laws of refraction state that;
 - The incident ray, the refracted ray and the normal ray all lie in the same plane.
 - The ratio between the sin of angle of incidence and the sine of angle of refraction is a constant.
- What is refractive index?
 - The ratio between the speed of light in vacuum and the speed of light in the medium is called refractive index. It is denoted by 'n'.
Index of refraction (n) = $\frac{\text{speed of light in vacuum}}{\text{speed of light in the medium}}$
 $n = \frac{c}{v}$
- What do you know about mirages?
 - A mirage is an image that is twisted by the atmosphere such that it looks real but is not really there. It is formed by the layers of air having different temperatures and thickness. This difference in layers of air causes light to bend.
- Write three characteristics of light.
 - Some characteristics and properties of light are:
 - It moves in straight line
 - It bends when passed from one medium to other.
 - It's speed decrease or increase when go from one medium to other medium.
 - It reflects back after hitting an opaque object
 - The angle of reflection is equal to the angle of incidence.
- State Snell's law. Write its uses.
 - The Snell's law state that;



The incident ray, the refracted ray and the normal ray all lie in the same plane.

The ratio between the sin of angle of incidence and the sine of angle of refraction is a constant.

Snell's law;

$$\frac{n_1}{n_2} = \frac{\sin(\text{incident})}{\sin(\text{refraction})}$$

$$\frac{n_1}{n_2} = \frac{v_1}{v_2}$$

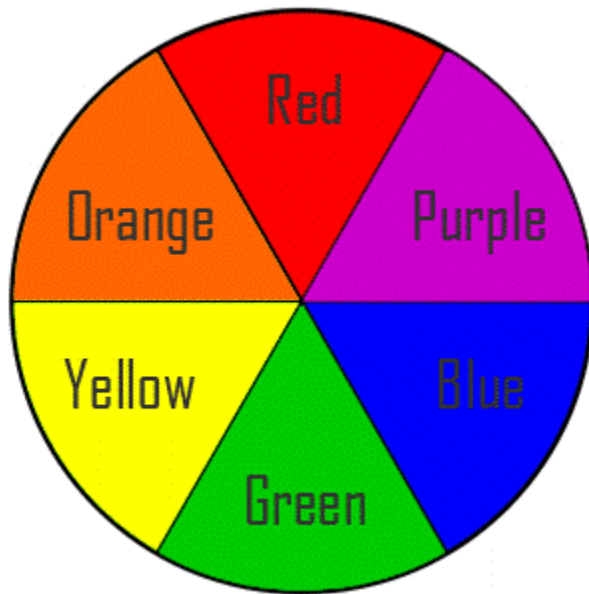
n_1 is the refractive index of first medium, n_2 is the refractive index of second medium, v_1 is the speed of light in first medium and v_2 is the speed of light in second medium.

This law is used in ray tracing to compute the angles of incidence or refraction, and in experimental optics to find the refractive index of a material.

7. State the condition at which total internal reflection occurs.
 - For total internal reflection to occur, these two conditions must be met:
 1. The index of refraction must decrease across the boundary in the direction of light refraction.
 2. The angle of incidence of the light ray must exceed the critical angle of the interface.
8. How the rainbow formed? Show it with diagram.
 - Rainbows happen when light combines with water in a certain way. When the sunlight passes through a single drop of rain, the rain drops acts as a tiny prism and splits it up into a series of colors. Each color of a rainbow has a different angle because each color slows down at different speed when it enters a raindrop. The light exits the rains drop in one color depending on the angle it came in. So only one color comes out from each rain drop. Light coming through millions of rain-drops at different angles form a rainbow that we see. From outside to inside the colors of rainbow are red, orange, yellow, green blue, indigo and violet.



9. Draw a color wheel and show how the colors are related to each other to form light.



Light has three primary colors; red, green and blue. Primary colors of light combine together to make secondary colors; magenta, cyan and yellow. For example, if you mix red and green you get yellow color. When all three-primary light colors are mixed together they form the white light.

Reasoning Questions

1. An object seen through a prism appears colored.
 - We can see this because the prism has the capacity to hold the any color. means that when the any light is passed through the prism then the light is absorbed in prism. and when if is absorbed then it is converted in many colors.
2. What happens when a ray of light falls normally on the surface of a mirror?
 - When a ray of light falls normally on the surface of a plane mirror , the following things happen:
 1. Incident ray is reflected back along the same path.
 2. Angle if incidence is zero and angle of reflection will be zero [according to laws of reflection] .
3. Why the pupil dilates in the dark?
 - The pupil dilates in order to allow as much light as possible to enter the eye. The opposite occurs during the day. When the Sun is shining bright, the iris narrows and the pupil constricts, or gets smaller.
4. Why the sky is blue in colour?
 - This happens due to the fact that blue is scattered more than any other colors because of smaller waves. This is why we see a blue sky most of the time.

5. During sunny day, a pool of water appears to lie on the road some distance ahead. Why is it called an illusion? What causes it?
- The phenomenon is called Mirage. The responsible effect is the dependence of the refractive index of air on the density of air, which, in turn, depends on the temperature of the air.
6. We can see objects when the light reflected from the objects falls upon our eyes. Why can't walls act as mirror even the light is reflected through walls and reach our eyes?
- A wall cannot act as a mirror because there is a difference between the surfaces of the wall and the mirror.
 In a mirror, the surface is very smooth so it can reflect the rays of light as it is and so we are able to see objects as they are.
 In a wall, the surface is rough and irregular so the reflected rays are scattered and it does not reflect it as it is so a wall cannot act as a mirror

Tick the correct answers.

1. b) Transparent
2. c) Translucent
3. a) Opaque
4. a) shape diamonds
5. c) is dispersed in the droplet
6. c) Medium
7. c) angle of reflection
8. b) would reflect back
9. a) all the colors except green
10. c) three colours
11. c) Deserts
12. b) enters our eyes
13. a) Sun is hidden behind clouds
14. c) seven colours
15. b) passes through it slower
16. a) Vacuum
17. c) transmits
18. b) Retina
19. b) electromagnetic

Fill in the blanks

1. Red, blue and green are primary colours of light.
2. Red light + Green light = Yellow light.
3. Splitting of white light into its component colours is called dispersion
4. Angle of incidence is the angle between incident ray and the normal.
5. Speed of light in vacuum is 300000 km/s.
6. A color wheel shows how the colors are related to each other.
7. The bigger the value of refractive index the slower the light travels in that medium.



8. An optic fiber is a thin rod made of high quality glass and quartz having a diameter slightly thicker than the human hair.
9. The total internal reflection reflection is the cause of the brightness of the diamond.

State whether True or False

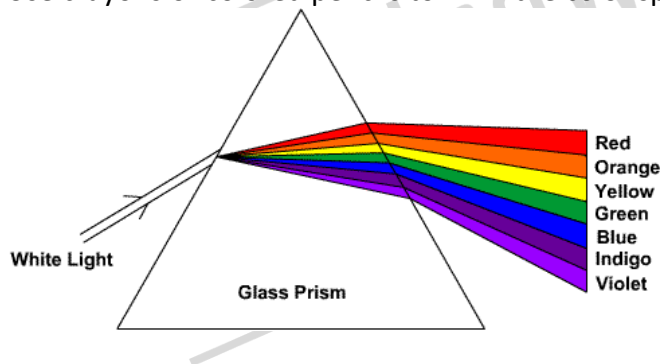
1. Ultraviolet light is dangerous for the eyesight. **True**
2. The angle of incidence is always equal to angle of refraction. **False**
3. People who cannot differentiate the colors are called color defected. **False**
4. White light is the combination black light and white light. **False**
5. Light travels in straight line. **True**
6. Electromagnetic waves move at the speed of light. **True**
7. Bending of rays of light in passing through a medium is called dispersion of light. **False**
8. Sir Issac Newton discovered that light is composed of seven colours. **True**

Write what is shown in figure

- Reflection of light.

The Prism

White light appears white, it is made up of the colors of the rainbow. The colors can be separated by shining light through a prism, or a triangular glass object. This separation is called dispersion. This can be observed in a rainbow, when sunlight is refracted by drops of water. Use crayons or colored pencils to fill in the color spectrum below



Match the definition in column A with the word in column B (Matched)

Column A

- An image twisted by the atmosphere
- Bending of light as it passes from one medium to another
- Colors that we cannot make by mixing other colors
- A block of glass having triangular cross section
- Straight path of light
- Thin rod made of glass and quartz

Column B

- Mirage
- Refraction
- Primary colors
- Prism
- Ray
- Optical fibre

Chapter 10 : Sound Waves

Learning Objectives

In this chapter we will discuss about

- Sound
- How sound travels
- Speed of sound
- Different characteristics of sound
- Human ear and how it works

Teacher Starter

Start by asking children how can they imagine a world without sound? Tell them the importance of sound in our everyday life. Ask them what they know about the sound and how many types of sound they have heard before. Ask them that ever they experience some unpleasant sound? How it feels? Do a little experiment in your class room. Ask all students to close their eyes and just try to listen voices around them. Then ask them what voices they heard? Also differentiate voice and noise.

Teaching

Start with reading of chapter and translate them in what language they can understand well. Later on ask each and every student to read the chapter and understand carefully. Make sure that each and every concept should be clear to all students. Tell your students about sound and its speed, feature and characteristics. Point to the picture given in the chapter. Tell students about the human ear and its autonomy. There is little experiment in this chapter too, a joyful experiment. Student will learn and enjoy with this experiment. Every child must be involved in this experiment.

Exercise

Answer the following questions

1. What is sound? How do we hear sounds?
 - Sound is a form of energy and it is all around us. Sound is produced when something vibrates. These vibrations travel in the form of waves called sound waves. These particles vibrate and hit other particles close to them which make them vibrate too causing them to hit more air particles. This procedure of sound moving through particles is what makes a sound wave.
2. Can we hear the sound in vacuum? Prove with an experiment.
 - Sound need medium to propagate. Sound cannot be heard in vacuum. The Bell in a jar experiment is used to show that sound needs a medium to travel from one place to another and it cannot travel through vacuum. A bell jar is a laboratory equipment to create vacuum inside a jar. The jar is connected to a vacuum pump that sucks the air out of the jar creating vacuum inside it.

While there is air inside the bell jar, the bell can be easily heard outside the bell jar. This is because the ringing bell vibrates, making the air particles inside the jar vibrate and vibrating air particles make the walls of jar vibrate, which in turn makes the air particles outside the jar vibrate, enabling us to hear the sound of bell.

Once the vacuum pump is turned on, it slowly sucks all the air from the bell jar, as it happens the sound of the ringing bell gets quiter until eventually it cannot be heard. This is because as the air is removed, sound has no medium to travel through.

3. How many kinds of sound waves are there? Write in detail.
 - There are two types of waves according to the way they transmit energy
 1. Longitudinal waves
 2. Transverse waves

Longitudinal waves Longitudinal waves are waves in which the vibration of particles of medium is in the direction of the waves. Sound waves moving through air are an example of this type of waves. Another very common example of longitudinal wave is that of a stretched spring.

Transverse waves Transverse waves are waves in which vibration of particles is perpendicular to the direction of the waves. They transmit energy through solid and liquid mediums but not through gases. Transverse waves have high points called crest and low points called trough. Radio waves, micro waves, x-rays, light waves and ocean waves are all examples of transverse waves.

4. How sound travel and how can we measure its speed?
 - Sound waves require medium to travel. They can travel through solids, liquids and gases but cannot move through vacuum. Speed of sound is not always the same; it varies with the nature of medium. Sound travels better through some material than others. In a medium like solid, where molecules of medium are closely packed together, sound moves fastest. While in a medium like air where molecules are far apart, it is very difficult for sound to travel. That's why sound travels fastest in solids, faster in liquids and slowly in air.

5. Write short notes on the following topics.

- **Echolocation**

The method of locating objects by determining the time for an echo to return and the direction from which it returns, is called echolocation.

Frequency

The number of waves produced by the sound source per second is called its frequency. It is also the number of waves that pass through a fixed point per second. Frequency is measured in units of the hertz (Hz).

Pitch

Pitch is defined as the measure of the frequency of a sound. The higher the frequency the smaller the wavelength and the higher the pitch. High frequency sounds produce high pitched notes and low frequency sounds produce low pitched notes. A whistle, siren, fire



alarm and a scream all are high pitched sounds while a bass drum, a canon shot and a chemical explosion are examples of low-pitched sounds.

6. . Differentiate between high-pitch and low-pitch.

- A low pitch has a lower frequency. A high pitch has a higher frequency. A lower pitch has a longer wavelength and a higher pitch has a shorter wavelength.

7. Define these terms.

- **Vibration**

Vibration is a periodic back-and-forth motion of the particles of commonly resulting when almost any physical system is displaced from its equilibrium condition and allowed to respond to the forces that tend to restore equilibrium.

- **Echo**

Echo is a reflection of sound that arrives at the listener with a delay after the direct sound. The delay is directly proportional to the distance of the reflecting surface from the source and the listener.

- **Oscilloscope**

An oscilloscope is a laboratory instrument commonly used to display and analyze the waveform of electronic signals.

- **Longitudinal waves**

Longitudinal waves are waves in which the displacement of the medium is in the same direction as, or the opposite direction to, the direction of propagation of the wave.

8. Describe an experiment to prove that

- a) That sound travels faster in solids than in liquids
- You can do that by doing a simple experiment.
- b) Sound travels faster in solids than in gaseous medium.
- You can do that by doing a simple experiment. keep your wrist watch on a table and place your ear flat on the table far from the watch. Listen to the clock ticking. Do the same while being in air.

Give reasons for the following:

1. Sound cannot reach us from space.
 - Because the sound requires a medium to propagate, and it cannot be transferred in vacuum.
2. A fighter airplane is seen before hearing its sound.
 - Because the speed of light is much more than the speed of sound.
3. Bats can locate objects in dark.
 - Bats use echolocation to find their way around very quickly in total darkness.
4. Echoes can be produced in mountains or valleys.

- An echo is a sound that is repeated because the sound waves are reflected back. Sound waves can bounce off smooth, hard objects
In the mountains there is a solid enough surface that your voice is reflected off of it, and in its bouncing off and returning when you hear your own voice.

Tick the correct answers:

1. d) noise
2. b) sound does not travel in vacuum
3. b) absorb sound
4. c) Vibration
5. d) wavelength
6. a) Longitudinal and transverse
7. c) The maximum distance moved by the medium particles on either side of the mean position
8. a) Mass
9. d) Properties of the medium
10. b) Wavelength
11. b) Obey the laws of reflection
12. c) Echolocation

Fill in the blanks:

1. Every source of sound is a vibrating body.
2. Sound travel faster in liquids than in gases.
3. Sound requires a medium for propagation.
4. The reflected sound is called echo.
5. The sound produced by an object vibrating with a high frequency is called _____ sound
6. Only vibrating bodies produce sound.
7. Pitch increases with the increase in the frequency of vibrating bodies.
8. The pitch of a sound depends upon the amplitude of vibrating strings.
9. The unit of frequency is Hertz.
10. Sonar is an instrument used for finding the depth of sea.
11. The to and fro motion of a vibrating body about its mean position is called vibration.

State whether the statement is “True” or “False.”

1. The range of sonic vibrations is between 20Hz to 20,000Hz. **True**
2. The sound can travel in vacuum. **False**
3. Amplitude is the maximum magnitude of a particle from its mean position. **True**
4. The speed of sound in air is 5100m/s. **False**
5. The number of vibrations produced by a vibrating particle in one second is called frequency. **True**
6. The more the amplitude of a vibrating body, the more is the loudness. **True**
7. With the increase in frequency of a vibrating body, the sound becomes shrill.



8. Sound travel faster in gases than in water. **False**
9. Material medium is not is not necessary for the propagation of sound. **False**
10. The characteristic of sound which distinguishes between a sharp sound and dull sound is called pitch. **True**
11. We hear echoes only in the mountains. **False**
12. The sounds produced by different whistles are the same. **True**
13. The denser a material is the slower sound will travel through it. **False**

Match the following (Matched)

Column A	Column B
Reflection of sound	Echo
A source producing sound of constant pitch	Tuning fork
Unpleasant sound	Noise
Unit of loudness of sound	Decibel
Movement of vibrations through particles	Waves
Distance between two peaks of a wave	Wavelength
Sound having frequency more than 20,000Hz	Ultrasound
Measure of how high or low a sound is	Pitch

Chapter 11: Circuits and Electric Current

Learning Objectives

In this chapter we will discuss about

- electricity
- types of electricity (static & current)
- conductors or insulators of electricity
- circuits & circuit diagrams
- types of circuits (series & Parallel)
- Fuse & circuit breakers
- Heating, Chemical & Magnetic Effect of Electricity
- How Electricity reaches to our homes

Teacher Starter

Start by asking students about what is the most important thing in their routine, try to link it with electricity. As most of the things we use are electrical equipment. Give them a brief background about electricity, its historical discovery, about Ben Franklin and Thomas Edison. Also, aware students about the basic principle behind the electricity. Its working in an electrical circuit. Then introduce some examples of conductors and insulators of electricity from their surroundings.



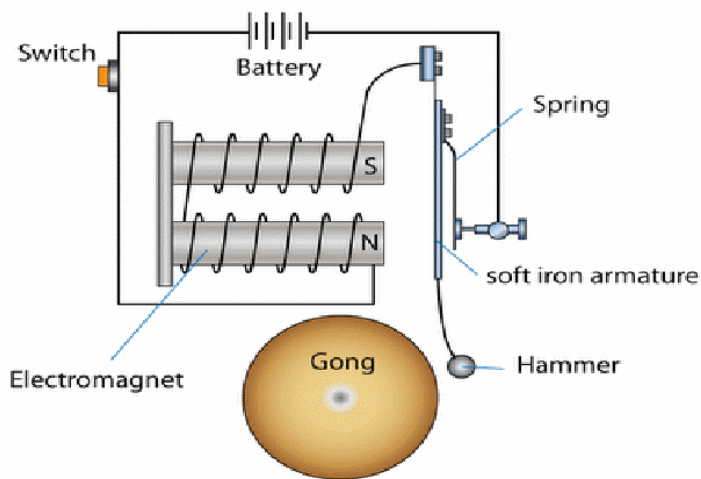
Teaching

Make sure each and every student engage in the discussion in the classroom, you can link the importance of electricity from their daily lives. Let them aware about the famous and very dangerous kite flying experiment by Ben Franklin. Tell them about Thomas Edison, the inventor of Electricity and Electric Bulb. Enlighten them about the basic principles of electricity. Develop an understanding of electrical current.

Exercise

Answer the following questions

- How does the magnetic effect of electric current help in the working of an electric bell?
Explain with the help of a diagram.
- Ans:



When you press the button of an electric bell, current passes through the circuit, electromagnet present inside the bell creates a magnetic field. The electromagnet pulls the springy metal arm towards itself, which then hits the gong and makes the sound. The circuit breaks because the arm is out of place. The electromagnet turns off and arm moves back to its original position. This process continues.

- Why is electric fuse required in all electrical appliances?
 - Ans: An electric fuse is a safety device used to limit the current in an electric circuit. ... A fuse is a short piece of wire made up of a material of high resistivity and of low melting point, So that it may easily melt due to overheating due to the excessive flow of electric current.
- What is electricity and explain its types in detail.
 - Ans: Electricity is the secondary source of energy which means that we gain electricity by the conversion of other sources of energy such as coal, water, wind, oil, natural gas and other natural sources. Electricity is neither renewable nor non-renewable form of energy. There are two types of electricity.

1. Static electricity
2. Current electricity

Static Electricity: When some particular objects are rubbed together, they become electrically charged. The friction between the two objects removes electron from one object and adds it to the other object. This type of electric charge is called static because it stays on the object and the electricity produced is called static electricity.

Current Electricity: Electricity produced due to the flow of electrons through different materials is called current electricity. When you turn on a bulb, electricity flows through wire into the bulb and make it glow. This flow of electricity is the flow of electrons and the flow of electrons is called electric current.

4. What are conductors and insulators? Define with examples.
 - Ans: Some materials allow electric current to pass through them; such materials are called electrical conductors. Metals are good **conductors**.
Insulators are the opposite of conductors. They do not let electric current pass through them. Plastic, wood, glass and rubber are some very good insulators of electricity.
5. What is a circuit and why do we need a circuit?
 - Ans: An electrical circuit is a path around which electrons flow. It must contain a power source such as a battery, conducting material such as metal wires to connect the positive and negative terminals of the battery creating a circuit.
6. Draw the symbols to represent the following components of electric circuits. Connecting wires, switch in the 'off' position, battery
7. Draw the circuit diagram to represent the circuit shown at right.
 - Do as directed
8. The bulb in the circuit shows in the figure does not glow. Can you identify the problem?
 - Make necessary changes in the circuit to make the bulb glow.
9. Write some electrical safety tips.
 - Ans: Here are some electrical safety tips.
 - Never put fingers or other objects in an outlet.
 - Keep metal objects out of toasters.
 - Never use anything with a cord or plug around water.
 - Never pull a plug out by its cord.
 - Stay away from substations and power lines.
 - Don't climb on power poles.
 - Never fly kites near power lines.

Short answer questions

a) What is a circuit diagram?

Ans: A circuit diagram is a graphical representation of an electrical circuit.

b) What is the SI unit of electric current?

Ans: Ampere

c) Name the instrument used to measure electric current.

Ans: Ammeter

Choose the correct answers:

1. b) Ohm
2. c) Switch
3. c) Sound energy
4. c) Filament
5. c) Plastic
6. d) Graphite
7. a) Converts chemical energy into electrical energy
8. a) closed circuit
9. a) a conductor
10. a) Bakelite
11. c) metal wire
12. d) plastic

Match the items under Column A with Column B. (Matched)

Column A	Column B
A device which produces electricity	Cell
A combination of cells	Battery
Allows electricity to pass through it	Conductor
Does not allow electricity to pass	Insulator
Either breaks or completes a circuit	Switch
Converts electricity into light	Bulb
Glows when electricity passes in it	Filament
Is a path of electricity	Circuit

Fill in the blanks:

1. The safety device based on the heating effect of electric current is called a fuse.
2. A Fuse also uses magnetic effect of current to protect circuits.
3. The process of coating layer of desired metal onto another metal is called electrodeposition.
4. Solutions and liquids that can conduct electric current is called an electrolyte.
5. If there are branches in a circuit then it's called a Parallel and if there are no branches then it is called a Series.
6. Electricity is neither Renewable nor Non-Renewable form of energy.



7. A Filament is consisting of a thin conducting wire of metal present inside a casing.
8. Resistors are added to the electric circuit to control the amount of current that flows through the circuit.
9. Electricity will only travel through a complete Circuit.
10. The amount of electrical energy provided by the battery or cell is called electric potential energy.
11. Resistance is denoted by Ω or $K\Omega$, it is measured in units called Ohms or KiloOhms.
12. Conductor provide the path for the flow of electrons.

State whether the statement is “True” or “False.”

1. Electric current can flow through metals. **True**
2. Instead of metal wires, a jute string can be used to make a circuit. **False**
3. Electric current can pass through a sheet of thermocol. **False**
4. When current flows through a circuit, the circuit is called an open circuit. **False**
5. An electric bulb has one terminal. **False**
6. All materials do not allow electricity to pass through them. **True**
7. When the electric current from the fuse exceeds a certain limit, the fuse wire melts and breaks. **True**
8. An electromagnet does not attract a piece of pin. **False**
9. An electric bell has an electromagnet. **True**
10. Electroplating is one of the heating effects of electric current. **True**

Find the following words in the grid below

- do as directed

Chapter 12: Investigating Space

Learning Objectives

In this lesson we will learn about

- Our Galaxy (The Milky Way)
- Other Galaxies
- Sun and the Solar System
- The stars and how stars formed
- The life and death of a star
- The Constellations
- The Beginning of Universe (The Big Bang)
- components of solar system like planets, moons, asteroids, meteoroids, comets etc

Teacher Starter & Teaching

You can start by asking the students about their prior knowledge about our Planet, our Moon, other Planets and our Sun. ask them what they see on the sky at night. Enlighten them about



the fact that, there are planets, stars and even galaxies lurking in our skies. This whole thing is called the observable universe. Tell them this universe also begins at some point the scientists call it 'Big Bang'. You can also make them aware about the life cycle of a star and what are the possible consequences when stars die out (either it turns into a supernova or a blackhole), try to involve your students and make them things as much understandable by using information presented in the book and find other relevant sources on the internet.

Exercise

Answer the following questions

1. What is space and why it is important to know about it?
 - Space is everything we observe in our surroundings (the boundless three-dimensional extent in which objects and events have relative position and direction). Space exploration is important for the following reasons.
 - To promote Science Education
 - For exploring new Natural Resources
 - For Environmental Research
 - To explore new avenues (planets & other habitats)to solve the problem of over Population
 - Expanding our perspective and broadening our scope of understanding
2. What do you know about universe and how it came into being?
 - We don't know, nobody knows. However, we do have some evidence that the universe begun with a big bang. Scientist believe that the universe began in a big bang 14 billion years ago. At that time, all the universe was condensed into an infinitesimally small point. It was hotter and denser than anything we can imagine. One day the point exploded and the universe that we know was born. From that moment, time, space and matter all began. The moment when this point exploded is called the big bang.
3. Jot down some information about the birth of the sun.
 - The Sun was born 5 billion years ago from a great cloud of gas and dust in the space when slowly this cloud became smaller and pulled it self together under its own gravity becoming hotter and denser. All the gas in the cloud crowded into a fuzzy ball at the center of the cloud. Deep in the center of the ball temperature rose high enough for fusion reaction to start and hydrogen began to convert into helium. When this happened, the sun started to make its own light and heat.
4. What is a galaxy? Do we also have a galaxy? Write a note about our galaxy.
 - A galaxy is an enormous collection of dust, gas and billions of stars and their solar systems held together by gravity. Our solar system, the sun, eight planets including the earth we live in, are all part of a large spiral galaxy called the Milky Way. It is called Milky Way because across the night sky it has a milky appearance.

Our Milky Way looks like a huge whirlpool. Its shape is called a barred-spiral galaxy because there is a stellar bar present at its center. It is very difficult for us to see this center because gases and dust block our view. Milky Way completes one rotation about its axis in about 200 million years.



Milky Way is about 13 billion years old and is made up of more than 200 billion stars, as well as dust and gas. It is so big that it takes almost 100,000 years for light to travel from one side of the Milky Way to the other.

5. Write short notes about the following:

- **Constellations**

A group of visible stars that form a pattern are called constellations. Long time ago, people divided bright stars into constellations. And they named these constellation after mythical beings. In reality, these patterns bear resembles to the beings they are named after. The people of Greece knew about 48 constellations. In 1930, astronomers divided the whole sky into 88 different constellations, including 48 constellations listed by Greek astronomer Ptolemy and 40 new constellation. The old constellations names now refer to these eighty eight areas instead of ancient mythical beings.

- **Stars**

Stars are balls of super-hot gas (mostly hydrogen and helium) and plasma, a superheated sate of matter made of subatomic particles. Stars emit all sorts of rays. Each star emits different mixture of visible and invisible light rays into the space. Stars are the objects that give light and heat to the other planets of a system. Some stars are smaller in size while some are very big. Some stars found in our solar system are 100 or 200 times bigger than the sun while some old stars are smaller than earth.

6. How a star is born?

- The birth place of a star is an enormous cold cloud of dust and gas called 'nebula'. Nebula is made of 97% hydrogen and 3% helium. With the passage of time, gravity causes these clouds to condense and collapse under their own weight. As the cloud gets smaller, it breaks into clumps. These clumps eventually becomes so hot and dense that the nuclear fusion starts. When the temperature rises to 10 million °C, the clump turns into a new star.

7. What is black hole? How it is formed?

- A black hole is a region which exhibits such strong gravitational effects that nothing, not even light can escape from inside it.

At the core, millions of tonnes of hydrogen are being converted into helium every second, releasing gamma radiation. This fusion process is an exothermic reaction, meaning it releases more energy than it requires.

As the star consumes the last of its hydrogen, it switches to the stockpiles of helium that it has built up. After it runs out of helium, it switches to carbon, and then oxygen. Since the star continues to pump out radiation, it balances out the gravitational forces trying to compress it. Stars with about 5 times the mass of our Sun continues further up the periodic table to silicon, aluminum, potassium all the way to iron. No energy can be produced by fusing iron atoms together. It's the stellar equivalent of ash.

After that, the radiation from the star turns off. Without that outward pressure from the radiation, gravity wins out and the star implodes. An entire star's mass collapses down into a smaller and smaller volume of space. The velocity you would need to escape from the star goes up, until not even light is going fast enough to escape. This is how a black hole forms.



Short answer question

1. What the conjecture of the explosion of point is called?
 - Ans: The Big Bang
2. What are white dwarfs?
 - When Red giants collapses, they form very dense bodies called white dwarfs.
3. What are small stars called after birth?
 - tiny red dwarfs
4. How much part of the universe is still not discovered?
 - around 96% is still not discovered.
5. What the older large stars are called?
 - Red Giants

Choose the correct answers in the blank spaces:

1. a) Helium
2. b) Gravity
3. a) 14 billion
4. c) 97%
5. a) 150
6. c) Cooler
7. a) Observable
8. c) Constellations
9. b) Neutron
10. b) Nebula
11. b) very low
12. a) spiral galaxies
13. d) Milky Way galaxy
14. b) centre
15. d) red supergiant
16. c) stars
17. d) zillions of miles away
18. c) our eyes
19. c) 100,000
20. c) 200 billion

Fill in the blanks:

1. Our solar system seems big to us but it is a tiny part of a massive universe.
2. Our solar system, the sun, eight planets including the earth we live in, are all part of a large spiral galaxy called the Milky way.



3. The constellations help us identify the stars by dividing the sky into more manageable bits.
4. Just like living organisms, stars have a life cycle.
5. The people of Greece knew about 48 constellations.
6. As the stars grow older, much of their Hydrogen has been converted into helium.
7. The gravitational force around the black hole is so powerful that it can swallow anything that comes near it.
8. Stars emits all sorts of light rays.
9. A star's core is the hottest place because this is where the nuclear fusion reaction takes place.
10. Each star emits different mixture of visible and invisible light rays into the space.
11. All galaxies which are neither spiral nor elliptical are irregular galaxies.
12. Group of stars that forms a pattern in the sky that looks like a familiar object or character Constellation.

State whether the statement is “True” or “False.”

1. The idea of explosion of the ball is called big bang theory. **False**
2. Our Milky Way looks like a huge whirlpool that completes one rotation in about 500 million years. **False**
3. Our galaxy is called Milky Way because across the night sky it has a white appearance. **True**
4. Light year is the distance light travels in five years and one light year is equal to 9.5 billion kilometres. **False**
5. Some areas on the surface of sun are hotter than others, these areas look darker and are called sunspots. **False**
6. Constellations rotate every season. **True**
7. Shooting stars are not actually stars. **True**
8. Small stars live for a very long time, more than 100 billion years. **True**
9. The birth place of a star is an enormous cold cloud of dust and gas called 'nebula. **True**
10. There are three main types of galaxies. **True**



Un-jumble the following Jumbled Words and write three things about each

Un.jumbled Words	Jumbled Words	3 Things I know about it
mteero	Meteor	Also called shooting star A meteor is the streak of light that you see on the sky A meteor is a small celestial body that enters the atmosphere of the earth
glayax	Galaxy	Collection of dust , gas and stars Our galaxy is called milky way. it looks like a whirlpool.
ruijtp	Jupiter	Largest planet Have dozens of moons Its atmosphere made up of hydrogen and helium
rats	Star	Very hot Glowing gas, hydrogen and helium. Have their own light
tmoce	Comets	Snowballs of frozen gases, rock and dust When frozen, they are the size of a small town. When it close to the Sun, it heats up and spews dust and gases
nelpat	Planet	Large celestial body Orbit the sun Has remove debris
aurnstosat	Astronauts	A person who is trained to travel in a spacecraft. The word "astronaut" comes from the Greek words "astron nautes", which means "star sailor." Astronauts have special gear called a spacesuit
oalesocntlin	Constellation	A group of stars Forms an imaginary outline on the celestial sphere

Draw a picture of Milky Way.

- Do as directed.