Chapter-1

Plant Systems

1. **Encircle the correct option for each statement.**

   i. Xylem and phloem

   ii. Petiole

   iii. Cortex

   iv. Mesophyll

   v. To carry prepared food only

   vi. Carbon dioxide and water

   vii. Oxygen

   viii. Xylem

   ix. Increase in humidity

2. **Answer the following questions in short.**

   i. Differentiation between root system and shoot system

Root system	Shoot system
The root system of a plant consists of all the roots.	Shoot system consists of leaves, stems, flowers, and fruits.
The root system is found underground.	It is usually found above the ground.

   ii. Parts of internal structure of root.

   There are following parts of internal structure of a root.

   - Epidermis
   - Root hairs
   - Cortex
   - Endodermis
   - Cambium
   - Xylem
   - Phloem

   iii. Word equation for the process of photosynthesis:

   The word equation for photosynthesis is as follows:

Carbon dioxide + water $\xrightarrow[Chlorophyll]{light\ energy}$ Glucose + Oxygen

iv. Transpiration creates a natural rise in water level in plants:

Transpiration produces a force which can pull water to great heights in tall trees. This is because of the low water pressure in the upper parts of the plants because much water transpires from the leaves into the atmosphere. The low pressure exerts a pull on the water which brings the water up from to roots to the leaves.

v. Role of magnesium in plants:

Magnesium is a structural component of chlorophyll. Deficiency of magnesium causes yellowing and wilting of leaves.

3. Extended response questions.

i. Internal structure of a stem with diagram:

Like roots, stem also has a single layer of cells called **epidermis**. It covers the stem and protects the underlying parts. below to epidermis, there is four to five cells thick layer called **cortex**. This layer contains chloroplasts. The innermost layer of the cortex contains single row of cells called **endodermis**.

Below the endodermis, vascular system of the stem is present which consists of xylem and phloem. **Xylem** transports water and, minerals from roots to leaves while **phloem**, transports prepared food to different parts of the plant. In between xylem and phloem there is a strip of thin-walled cells called **cambium**.

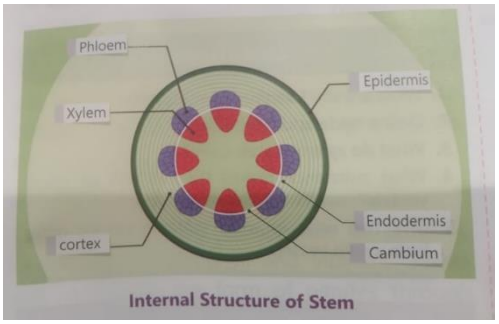


Diagram:

ii. Roles of nitrogen in plants:

Nitrogen is a major component of proteins, nucleic acids, chlorophyll and vitamins. Plants get nitrogen in the form of nitrates through their roots. Plants use these nitrates for making proteins. Deficiency of nitrogen in soil causes the reduced growth in plants.

iii. Adaptations in leaves for photosynthesis:

The structure of leaf is well adapted for photosynthesis because of the following characteristics:

- Most leaves have large blade or lamina to absorb maximum light.
- Stomata in the lower epidermis allows carbon dioxide to enter into the leaf for photosynthesis.
- Network of veins in the leaves contain xylem tissue (carries water and minerals to the leaf from the roots) and phloem (transports food away from the leaf).
- Chloroplasts in the mesophyll cells of leaves have chlorophyll, which absorbs light for photosynthesis.

iv. Respiration in plants:

Definition:

Respiration is the process in which glucose breaks down in the presence of oxygen to form carbon dioxide and water. Energy is released in this process.

Explanation:

This process occurs in both plants and animals. Plants use this energy for various life process e.g. movement. Respiration occurs all the time i.e. during day and night time.

The word equation for respiration is:

$$\text{Glucose} + \text{Oxygen} \longrightarrow \text{Carbon dioxide} + \text{Water} + \text{Energy}$$

Day time:

During day time, due to photosynthesis oxygen is produced which is used in respiration. Similarly, the carbon dioxide produced during respiration is used in photosynthesis.

Night time:

During night, there is no photosynthesis. Plants get oxygen from the environment and release carbon dioxide through stomata in atmosphere.

v. Transpiration in plants:

Definition:

Loss of water in the form of vapours through plant surface is called transpiration.

Explanation:

Roots absorb water form the soil which travels up the stem. The xylem carries the water to the leaves. Only a small amount of water is used by the roots, stems, branches and laves, the extra water is released in the form of water vapours through the stomata of the leaves.

Factors effecting rate of transpiration:

Following are some factors which affect the rate of transpiration.

- Light
- Humidity
- Temperature
- Wind

Light:

The rate of transpiration increases with the increase of light. In daylight the stomata of the leaves are open which allows the water vapours diffuse out into the atmosphere. At night, when the stomata close, transpiration is greatly reduced.

Humidity:

In humid air, the diffusion of water vapours is reduced and the rate of transpiration is low. In dry air or less humid air, the diffusion of water vapours from the leaf will be rapid and the rate of transpiration is high.

Temperature:

The rate of transpiration increases with the rise in temperature. Higher temperature increases the movement of water molecules. In this way, it increases the rate of transpiration. At very high temperature the stomata are closed and transpiration is stopped.

Wind:

Wind carries away water from leaves; therefore, it increases the rate of transpiration. When air is still, the create of transpiration is reduced.

4. Constructed Response Questions

i. Xylem and phloem differ in terms of what they transport:

Xylem and phloem are both vascular tissues found in plants, responsible for transporting essential substances throughout the plant. However, they differ significantly in terms of what they transport.

Xylem:

Xylem is the dead tissue that carries water and minerals from roots to leaves. The cell wall of the xylem is thick and is made of lignin.

Phloem:

Phloem on the other hand, is living tissue that carries food from leaves to all other parts of the plant. The cell wall of the phloem is thin and is made of cellulose.

ii. Structure of leaf support the process of photosynthesis:

The structure of leaf support photosynthesis due to following characteristics:

- Most leaves have large blade or lamina to absorb maximum light.
- Stomata in the lower epidermis allows carbon dioxide to enter into the leaf for photosynthesis.
- Network of veins in the leaves contain xylem tissue (carries water and minerals to the leaf from the roots) and phloem (transports food away from the leaf).
- Chloroplasts in the mesophyll cells of leaves have chlorophyll, which absorbs light for photosynthesis.

iii. Process of respiration relate to the movement of water through the plant:

The rate of transpiration is directly proportional to the absorption of water by the roots. It produces a force which can pull water to great heights in tall trees. This is because of the low water pressure in the upper parts of the plants because much water transpires from the leaves into the atmosphere. The low pressure exerts a pull on the water which brings the water up from to roots to the leaves. In this way transpiration helps in the conduction of water and minerals to upper parts of plants.

Chapter-2

Human Respiratory and Circulatory System

1. **Encircle the correct option for each statement.**

   i. Carbon dioxide and water

   ii. Trachea

   iii. Alveoli

   iv. Vena cava

   v. Veins

   vi. Left atrium

   vii. Aorta to left ventricle

2. **Answer the following questions in short.**

   i. Path of air in human respiratory system:

   Air enters the body through mouth or nose. Air passes through nostrils into nasal cavity. From nasal cavity air enters into the pharynx. After pharynx the air enters into the larynx. From the larynx air passes into the trachea or windpipe. Trachea divides into two branches bronchi, one into each lung. On entering into lungs, bronchi further divide into smaller tubes bronchioles. From bronchioles the air enters into the alveoli.

   ii. Alveoli:

   Bronchioles in the lungs end at many small air-sacs called the alveoli.

   Function:

   Alveoli provide larger surface area for exchange of gases between blood and the air.

   iii. All arteries carry oxygen rich blood and all veins carry carbon dioxide rich blood:

   It is because all arteries carry oxygen rich blood except pulmonary arteries which carry carbon dioxide rich blood from heart to the lungs. On the other hand, all veins carry carbon dioxide rich blood except pulmonary veins that carry oxygen rich blood from lungs to the heart.

   iv. Functions of valves in human heart:

There are two valves in the human heart namely tricuspid valve and bicuspid valve. Tricuspid valve and bicuspid valve prevent the back flow of blood from right ventricle to right atrium and left ventricle to left atrium respectively.

v. Proteins present in blood plasma:

Following are the proteins present in blood plasma:

- Antibodies
- Fibrinogen

vi. Function of heamoglobin:

Heamoglobin is present in red blood cells which transports oxygen to all parts of the body.

3. Extended response questions.

i. Human respiratory system:

The respiratory system is the organ system that helps in breathing.

Structure and function:

Respiratory system of humans consists of air ways and the lung.

Air ways:

Air ways consists of nose, pharynx, larynx, trachea, bronchi, bronchioles and alveoli. Air enters the body through mouth or nose. Normally we take air through nostrils (external opening of nose). Air passes through nostrils into the nasal cavity. Nose or nasal cavity has many hairs and mucous, which filter the dust particles from air. They also moisten and warm the incoming air.

From nasal cavity air enters into the pharynx. **Pharynx** is a muscular passage and is common in both food and air. After pharynx air enters into the larynx. **Larynx** is hollow structure located at the top of trachea. It contains vocal cords which produce sound when air passes through them. At the top of larynx, there is piece of cartilage called **epiglottis**, which closes the traches and prevents the passage of food to enter into trachea, from the larynx, air then passes into the trachea or windpipe.

Trachea divides into two branches called bronchi (singular bronchus), one into each lung. On entering into lungs, **bronchi** further divide into smaller tubes called bronchioles. **Bronchioles** end at many small air-sacs called alveoli. Alveoli provide larger surface area for exchange of gases between blood and the air.

Gas exchange in lungs:

Each alveolus is surrounded by many blood capillaries. Oxygen from the alveoli diffuses to blood capillaries. Blood then carries the oxygen to the cells. Carbon dioxide diffuses from blood to alveoli through blood capillaries. Form here it leaves the body by exhalation.

ii. Difference between inhalation and exhalation:

Inhalation	Exhalation
Taking in of air is called inhalation.	After the gaseous exchange, the air is expelled out by exhalation.
During inhalation, the ribs swing upward and outward.	During exhalation, the ribs move more inwards and downwards.
The diaphragm contracts and moves downwards.	The diaphragm relaxes and moves upwards.
Volume of chest cavity increases and pressure is decreased.	Volume of chest cavity decreases and pressure is increased.
The lungs expand and air from outside the body enters into the lungs.	The lungs become smaller and the air is forced out of them into the surroundings.

iii. Structure and function of human heart:

The heart is a muscular organ. It is located in the chest cavity between the lungs.

Structure and function:

The human heart has four chambers. The upper two chambers are small called the **atria** (singular atrium) and the lower two are larger chambers called the **ventricles**.

The right side of heart receives carbon dioxide rich blood from different parts of body and pumps it to the lungs. In the lungs oxygen is absorbed into the blood. The left side of the heart receives oxygenated blood grom the lungs and pumps it to the rest of the body. The blood inside the heart circulates by double-pump mechanism which is as follows:

Right atrium receives carbon dioxide rich blood from body by the main veins' vena cava. When it contracts it passes this blood to right ventricle. The opening between right atrium and right ventricle is guarded by a valve (**tricuspid**) which prevents the backflow of blood from right ventricle to right atrium.

When right ventricle contracts, the blood is passes to pulmonary artery, which carries blood to lungs. at the base of pulmonary artery, another valve (**pulmonary**) is present which prevents the backflow of blood from pulmonary artery to right ventricle. In the lungs oxygen is absorbed into the blood.

The oxygen rich blood from lungs is carried to left atrium by pulmonary veins. Left atrium contracts and pumps this blood to let ventricle. The opening between left atrium and left ventricle is also guarded by a valve (**bicuspid**) that prevents the backflow of blood from left ventricle to left atrium. When left ventricle contracts, it pumps the blood in major artery aorta,

which carries blood to all parts of body except lungs. At the base of aorta, another valve (**aortic**) is present which prevents the back flow form aorta to left ventricle.

iv. Comparison of blood vessels in human circulatory system:

Characteristics	Arteries	Capillaries	Veins
Function	carry blood away from heart	Allow the exchange of materials between blood and tissues	Carry blood towards heart
Type of blood	Oxygen rich blood except pulmonary artery	Both oxygen rich and carbon dioxide rich	Carib dioxide rich blood except pulmonary vein
Thickness and elasticity	Thick and elastic	Thin walls	Thin and less elastic
Muscles in walls	Thick	No muscles	Thin
Blood pressure	High	Medium	Low
Valves	No valves	No valves	Valves present

v. Main components of blood:

Blood is a body fluid in the circulatory system which transports substances like oxygen and nutrients to the cells and transports waste products for removal from the body. It is a mixture of red blood cells, white blood cells, and platelets in a liquid called plasma.

Plasma:

Plasma is a liquid, mostly consists of water and some proteins like antibodies (help in body's immune system), fibrinogen, (helps in blood clotting) etc. respiratory gases i.e. carbon dioxide and oxygen are also present in plasma.

Red blood cells:

Red blood cells are the most abundant cells in blood. They contain a protein called heamoglobin. Heamoglobin transports oxygen to all parts of the body.

White blood cells:

White blood cells are colourless. They kill germs and protect us against diseases.

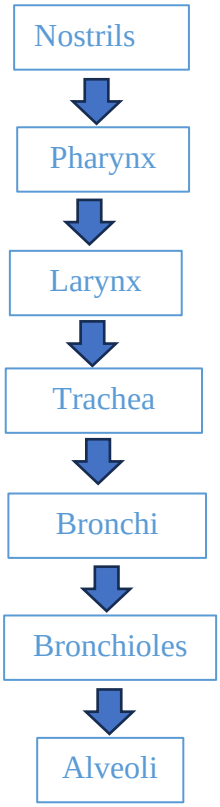
Platelets:

Platelets are not cells, but are pieces of large cells of bone marrow. They help in the clotting blood at wounds and in this way stop the bleeding.

4. Constructed Response Questions

i. Journey of air from nostrils to the alveoli:

The journey of air from nostrils to alveoli in form of flow sheet is as follows:



ii. How Human heart functions as a pump to circulate blood throughout body:

The human heart circulates the blood through the body by double-pump mechanism which is as follows:

Right atrium of the heart receives carbon dioxide rich blood from body by the main veins' vena cava. When it contracts it passes this blood to right ventricle. The opening between right atrium and right ventricle is guarded by a valve (**tricuspid**) which prevents the backflow of blood from right ventricle to right atrium.

When right ventricle contracts, the blood is passes to pulmonary artery, which carries blood to lungs. at the base of pulmonary artery, another valve (**pulmonary**) is present which prevents the backflow of blood from pulmonary artery to right ventricle. In the lungs oxygen is absorbed into the blood.

The oxygen rich blood from lungs is carried to left atrium by pulmonary veins. Left atrium contracts and pumps this blood to let ventricle. The opening between left atrium and left ventricle is also guarded by a valve (**bicuspid**) that prevents the backflow of blood from left ventricle to left atrium. When left ventricle contracts, it pumps the blood in major artery aorta, which carries blood to all parts of body except lungs. At the base of aorta, another valve (**aortic**) is present which prevents the back flow form aorta to left ventricle.

5. **Investigation:**

   Order of structures in which air breaths out:

   Alveolus ⟶ trachea ⟶ bronchus ⟶ nasal cavity

Chapter-3

Immunity and Diseases

1. **Encircle the correct option for each statement.**

   i. Influenza is caused by a:

   (a) Virus (b) Bacterium (c) Protozoan (d) Fungus

   ii. Which of the following disease caused by bacteria?

   (a) Covid-19 (b) Typhoid (c) Measles (d) Malaria

   iii. Which type of immunity is present at birth?

   (a) Innate (b) Adaptive (c) Passive (d) All of these

   iv. Hepatitis is the inflammation of:

   (a) Stomach (b) Liver (c) Kidney (d) Lungs

   v. Vaccine is not available for:

   (a) Typhoid (b) Covid-19 (c) Hepatitis B (d) Dengue

   vi. Dengue fever is caused by a:

   (a) Virus (b) Bacterium (c) Fungus (d) Protozoan

i. (a) Virus
ii. (b) Typhoid
iii. (a) Innate
iv. (b) Liver
v. (d) Dengue
vi. (a) Virus

2. **Answer the following questions in short.**

i. **How do white blood cells defend the body against pathogens?** White blood cells defend the body against pathogens through various mechanisms such as phagocytosis (engulfing and destroying pathogens), producing antibodies to neutralize pathogens, and coordinating immune responses.

ii. **Define immunity. Write the names of its types.** Immunity is the ability of an organism to resist harmful microorganisms or toxins from entering or damaging the body. The types of immunity are:

- Innate immunity
- Adaptive immunity

iii. **Write the names of the parts of the immune system.** The parts of the immune system include:

- White blood cells (such as lymphocytes, macrophages, and neutrophils)
- Lymphoid organs (such as the thymus, spleen, and lymph nodes)
- Antibodies
- Bone marrow

iv. **What type of acid is present in the stomach? How does it act as a barrier for pathogens?** Hydrochloric acid is present in the stomach. It acts as a barrier for pathogens by creating an acidic environment in the stomach, which helps to kill ingested pathogens that may cause infections or diseases.

v. **What are memory cells?** Memory cells are a type of immune cell (primarily B cells and T cells) that are formed after an initial exposure to a pathogen. These cells "remember" the specific pathogen and can mount a faster and stronger immune response upon re-exposure to the same pathogen in the future.

vi. **Write the causes and symptoms of hepatitis.** Hepatitis can have various causes, including viral infections (such as hepatitis A, B, C, D, and E viruses), alcohol abuse, toxins, and autoimmune diseases. Symptoms of hepatitis may include fatigue, jaundice (yellowing of the skin and eyes), abdominal pain, nausea, vomiting, and loss of appetite. The specific symptoms and severity depend on the type and cause of hepatitis.

3. Extended Response Questions

i. **Immune System Parts:** The immune system consists of various components including white blood cells (such as lymphocytes and macrophages), lymphoid organs (like the spleen and lymph nodes), antibodies produced by plasma cells, and the lymphatic system, which transports lymph fluid containing immune cells throughout the body.

ii. **Immune System Strengthening:** Strengthening the immune system involves maintaining a healthy lifestyle by eating a balanced diet rich in vitamins and minerals, engaging in regular physical activity, ensuring adequate sleep, managing stress through relaxation techniques or hobbies, and practicing good hygiene such as handwashing and avoiding contact with sick individuals.

iii. **Dengue:** Dengue fever is caused by the dengue virus transmitted by Aedes mosquitoes. Symptoms include high fever, severe headache, joint and muscle pain, and rash. Diagnosis is based on symptoms and confirmed by blood tests detecting the virus or antibodies. Prevention involves mosquito control measures to reduce breeding sites and avoid mosquito bites.

iv. **Typhoid:** Typhoid fever is caused by the bacterium Salmonella Typhi, usually spread through contaminated food or water. Symptoms include prolonged fever, abdominal pain, and rash. Diagnosis is based on blood and stool tests. Prevention includes vaccination, safe food and water practices, and proper sanitation to avoid contamination.

4. Constructed Response Questions

i. How do antibodies target specific pathogens in adaptive immunity?

ii. How is passive immunity artificially induced, such as through the administration of antibodies?

iii. How does the Aedes mosquito play a role in the transmission of dengue fever?

iv. Besides vaccination what other preventive measures should take to reduce the risk of contracting Covid-19?

Chapter-4

Structure of an Atom

1. Choose and encircle the correct option for each statement.

i) What does “atom” mean?

(a) Divisible (b) Indivisible (c) Visible (d) Invisible

ii) Which one of the following is not the subatomic particle of an atom?

(a) Electron (b) Proton (c) Neutron (d) Photon

iii) Electrons revolve around the nucleus in fixed _____ paths called orbits.

(a) circular (b) zig zag (c) straight (d) square

iv) How many groups are there in the periodic table?

(a) 18 (b) 16 (c) 14 (d) 12

v) The number of _____ present in a nucleus is called atomic number.

(a) protons (b) electrons (c) protons + neutrons (d) electrons + neutrons

vi) The number of electrons in K shell are_____ .

(a) 2 (b) 8 (c) 18 (d) 32

i) (b) Indivisible

ii) (d) Photon

iii) (a) circular

iv) (a) 18

v) (a) protons

vi) (a) 2

2. Answer the following questions in short.

i. a. Proton is a positively charged subatomic particle found in the nucleus of an atom, while an electron is a negatively charged subatomic particle found in orbitals around the nucleus. b. Atomic number represents the number of protons in the nucleus of an atom, while mass number represents the sum of protons and neutrons in the nucleus. c. Periods are horizontal rows in the periodic table, indicating the number of electron shells an atom has, while groups are vertical columns indicating similar chemical properties and the number of valence electrons.

ii. The arrangement of electrons in K, L, and M shells follows the pattern:

- K shell: Maximum of 2 electrons
- L shell: Maximum of 8 electrons
- M shell: Maximum of 18 electrons

iii. Electron configuration refers to the distribution of electrons among the various atomic orbitals. For example:

- Hydrogen: 1s^1
- Carbon: 1s^2 2s^2 2p^2
- Oxygen: 1s^2 2s^2 2p^4

iv. An atom is electrically neutral because the number of protons (positively charged) in the nucleus is equal to the number of electrons (negatively charged) orbiting around the nucleus. The positive charge of the protons is balanced by the negative charge of the electrons, resulting in a net charge of zero for the atom.

3. Extended Response Questions

4. Constructive Response Questions

i. Structure of an Atom: An atom consists of three main subatomic particles: protons, neutrons, and electrons.

1. Protons: Positively charged particles found in the nucleus of the atom. Each proton has a relative charge of +1 and a mass of approximately 1 atomic mass unit (amu).
2. Neutrons: Neutral particles found in the nucleus of the atom. Neutrons have no electric charge (charge of 0) and a mass similar to that of protons, approximately 1 amu.
3. Electrons: Negatively charged particles that orbit the nucleus in specific energy levels or shells. Electrons have a relative charge of -1 and a much smaller mass compared to protons and neutrons.

The nucleus, composed of protons and neutrons, is at the center of the atom, while electrons revolve around the nucleus in distinct energy levels, often referred to as electron shells or orbitals.

ii. Periodic Table: The periodic table is a tabular arrangement of chemical elements organized based on their atomic number, electron configuration, and recurring chemical properties. It consists of rows called periods and columns called groups.

Importance of the Periodic Table:

1. Organization: The periodic table organizes elements in a systematic manner based on their atomic structure and properties. This organization allows scientists to quickly locate and study specific elements.
2. Predictive Tool: By observing the periodic trends within the table, such as atomic size, ionization energy, and electronegativity, scientists can predict the properties and behaviors of elements. This aids in understanding chemical reactions, forming compounds, and designing new materials.
3. Classification: The periodic table classifies elements into metals, non-metals, and metalloids based on their properties. This classification scheme provides insights into the behavior of different types of elements.
4. Discoveries and Patterns: The periodic table has facilitated the discovery of new elements and the identification of patterns in their properties. These patterns have led to the development of theories such as periodic law and periodic trends, which further our understanding of atomic structure and chemical bonding.

In summary, scientists rely on the periodic table as a fundamental tool for understanding the properties, behavior, and relationships of chemical elements, which is essential for various fields including chemistry, physics, biology, and materials science.

Chapter-5

Physical and Chemical Changes

1. Choose and encircle the correct option for each statement.

i. What type of change is observed when a substance changes into different (new) substance?

(a) Physical change (b) Chemical change (c) Liquid change (d) Reversible change

ii. Which of the following is a sign that show a chemical reaction has occurred?

(a) Change in shape (b) Melting (c) Formation of a gas (d) Boiling

iii. Which of the following is not an example of a physical change?

(a) Crumpled paper (b) Pencil sharpening (c) Shrunken clothing (d) Souring of milk

iv. 200 mL of water is left outside in a bowl for two days. When it was checked after 2 days, there was 100 mL of water left in the bowl. What is the reason?

(a) Liquid water changes to a solid; chemical change.

(b) Liquid water changes to a solid; physical change.

(c) Liquid water changes to water vapour (gas); physical change.

(d) Liquid water changes to water vapour (gas); chemical change.

v. Which of the following reaction is correct for combustion?

(a) $CH_4 + 2O_2 \longrightarrow CO_2 + \text{heat}$

(b) $CH_4 + 2H_2O_2 \longrightarrow CO_2 + 2H_2O$

(c) $CH_4 + 2H_2O \longrightarrow CO_2 + 2H_2O$

(d) $CH_4 + 2CO_2 \longrightarrow 2CO_2 + 2H_2O + \text{heat}$

vi. Which of the following is the effect of nitrogen oxide in the environment?

(a) Acid rain (b) Smog

(c) Global warming (d) Localized fog

vii. The chemical weakening of a material, usually a metal is called;

(a) corrosion (b) combustion

(c) tarnishing (d) solubility

viii. A man painted his main gate made up of iron, to

(a) prevent it from rusting. (b) protect it from Sun.

(c) make it look beautiful. (d) make it dust free.

ix. Which of the following is an example of physical change?

(a) Closing the door (b) Turning off the electric light

(c) Cracking an egg (d) Putting the milk back in the fridge

x. Which of the following describes a chemical change?

(a) Freezing (b) Burning

(c) Dew on grass (d) Magnetizing a nail

i. (b) Chemical change
ii. (c) Formation of a gas
iii. (d) Souring of milk
iv. (c) Liquid water changes to water vapor (gas); physical change.
v. (a) $CH_4 + 2O_2 \rightarrow CO_2 + heat$
vi. (a) Acid rain
vii. (a) corrosion
viii. (a) prevent it from rusting.
ix. (c) Cracking an egg
x. (b) Burning

2. Answer the following questions in short.

i. Definitions: a. Rusting: Rusting refers to the corrosion of iron and its alloys, typically resulting in the formation of iron oxides when exposed to oxygen and moisture. b. Reactivity: Reactivity is the tendency of a substance to undergo chemical reactions with other substances, often resulting in the formation of new compounds. c. Flammability: Flammability is the ability of a substance to ignite and burn in the presence of oxygen, producing heat, light, and often other products. d. Melting point: The melting point of a substance is the temperature at which it transitions from a solid to a liquid phase under standard atmospheric pressure. e. Boiling point: The boiling point of a substance is the temperature at which it transitions from a liquid to a gaseous phase under standard atmospheric pressure. f. Solubility: Solubility refers to the ability of a substance (solute) to dissolve in a solvent to form a homogeneous mixture (solution) at a given temperature and pressure. g. Galvanizing: Galvanizing is the process of applying a protective zinc coating to steel or iron to prevent rusting or corrosion.

ii. Properties of Metals:

- High conductivity of heat and electricity
- Malleability: Ability to be hammered or rolled into thin sheets
- Ductility: Ability to be drawn into wires
- Luster: Shiny appearance when polished

- High density
- Tensile strength: Ability to withstand pulling forces without breaking
- Metallic luster
- High melting and boiling points

iii. Uses of Metals:

1. Construction: Metals such as steel, aluminum, and copper are commonly used in construction for structural components, wiring, piping, and roofing.
2. Transportation: Metals like steel and aluminum are used in the manufacturing of vehicles, airplanes, ships, and railway tracks.
3. Electrical appliances: Metals such as copper and aluminum are used in electrical wiring and components due to their high conductivity.
4. Manufacturing: Metals are used in various manufacturing processes to produce machinery, tools, and equipment for industries such as automotive, aerospace, and electronics.

iv. Properties to Compare between Physical and Chemical Properties:

1. Reversibility: Physical properties often revert to their original state after a change, whereas chemical properties typically result in the formation of new substances and may not be easily reversible.
2. Dependency on Composition: Physical properties usually depend on the state or composition of the substance, while chemical properties depend on the substance's ability to undergo chemical reactions.
3. Observability: Physical properties can often be observed without changing the identity of the substance, while chemical properties are often observed through chemical reactions that result in the formation of new substances.

3. Extended Response Questions

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i. Difference between Physical and Chemical Change:

1. Definition:
    - Physical Change: A physical change is a change in the state or appearance of matter that does not result in the formation of new substances. It involves a rearrangement of molecules or particles without altering their chemical composition.
    - Chemical Change: A chemical change is a process in which one or more substances are converted into new substances with different chemical

compositions and properties. It involves the breaking and forming of chemical bonds.

2. Examples:
    - Physical Change: a. Melting of ice: When solid ice (H_2O) melts into liquid water (H_2O), it undergoes a physical change. b. Cutting paper: Cutting a piece of paper into smaller pieces does not change its chemical composition; hence, it is a physical change. c. Dissolving salt in water: When salt ($NaCl$) dissolves in water (H_2O), it forms a homogeneous mixture without changing its chemical composition.
    - Chemical Change: a. Burning of wood: When wood undergoes combustion, it reacts with oxygen to produce carbon dioxide, water vapor, and heat, resulting in the formation of new substances. b. Digestion of food: Digestion involves the chemical breakdown of food molecules into simpler substances (such as glucose, amino acids, and fatty acids) that can be absorbed by the body. c. Rusting of iron: The reaction between iron, oxygen, and water leads to the formation of iron oxide (rust), representing a chemical change.
3. Reversibility:
    - Physical Change: Physical changes are often reversible by simply changing the conditions, such as temperature or pressure, without altering the chemical composition of the substances involved.
    - Chemical Change: Chemical changes are generally irreversible, as they involve the formation of new substances with different chemical properties.

ii. Role of Oxygen in Combustion and Rusting:

- Combustion: Oxygen plays a crucial role in combustion as it acts as an oxidizing agent. During combustion, fuel reacts with oxygen to produce heat, light, and new chemical compounds, such as carbon dioxide and water vapor.
- Rusting: Oxygen also plays a significant role in the rusting of iron. When iron is exposed to oxygen and moisture, it undergoes oxidation, forming iron oxide (rust). The presence of oxygen is essential for the oxidation reaction to occur, leading to the deterioration of iron surfaces.

iii. Impact of Combustion Reaction on the Environment:

- Combustion reactions, particularly those involving fossil fuels, release various pollutants and greenhouse gases into the atmosphere, such as carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter.
- These pollutants contribute to air pollution, smog formation, acid rain, and climate change, leading to adverse effects on human health, ecosystems, and the environment.
- Combustion of fossil fuels also contributes to the depletion of non-renewable resources and exacerbates global warming and climate change due to the release of greenhouse gases, particularly carbon dioxide.

4. Constructive Response Questions

i. Another change where a solid changes to a liquid state that you might observe in your surroundings is the melting of ice. When ice, which is solid water, is exposed to temperatures above its melting point, it transforms into liquid water.

ii. a. Yes, rust is different from iron. Rust is an iron oxide compound, typically hydrated iron (III) oxide ($Fe_2O_3 \cdot nH_2O$), formed when iron reacts with oxygen and moisture in the air over time. b. Rust cannot be directly changed back into iron by simple methods. However, rust can be removed from iron surfaces through various methods such as mechanical abrasion, chemical treatments (e.g., using acids), or electrolysis, but these methods do not reverse the chemical change that occurred to form rust. c. Yes, the formation of rust from iron is a chemical change. It involves a chemical reaction between iron, oxygen, and water, resulting in the formation of a new compound (iron oxide) with different properties than the original iron. d. Two other examples of similar chemical changes include:

- Formation of tarnish on silverware or other metals due to reaction with sulfur compounds in the air.
- Formation of patina on copper or bronze surfaces due to reaction with atmospheric gases and moisture over time.

Chapter-6

Chemical Bonding

1. Choose and encircle the correct option for each statement.

i. The combining capacity of an atom is called;

(a) valency (b) symbol (c) formula (d) none of them

ii. A chemical bond which is formed due to sharing of electrons between atoms is called;

(a) a co-ordinate covalent bond (b) a metallic bond

(c) covalent bond (d) an ionic bond

iii. Cation is positively charged specie, because it has more number of;

(a) electrons (b) protons (c) neutrons (d) shells

iv. Oxygen gain two electrons and form;

(a) cation (b) anion (c) a neutral specie (d) none of them

v. A chemical bond in which one atom loses an electron to form a positive ion and the other atom gains an electron to form a negative ion is a (an):

(a) co-ordinate covalent bond (b) ionic bond

(c) metallic bond (d) covalent bond

vi. If no loss or gain of electrons occur by mixing of two atoms, we say that they may be attached to each other due to;

(a) attraction of protons (b) attraction of neutrons

(c) sharing of electrons (d) opposite charges

vii. The valence electrons of chlorine is located in;

(a) first shell (b) second shell (c) third shell (d) fourth shell

viii. Which of the following element will become stable after losing one electron?

(a) Oxygen (b)Sodium (c) Magnesium (d) Chlorine

ix. Which of the following molecule has covalent bond?

(a) Water (b) Carbon dioxide (c) Nitrogen gas (d) All of them

x. An atom or group of atoms with a charge is called;

(a) an electron (b) symbol (c) a molecule (d) an ion

i. (a) valency
ii. (c) covalent bond
iii. (b) protons
iv. (b) anion
v. (b) ionic bond

vi. (c) sharing of electrons
vii. (b) second shell
viii. (b) Sodium
ix. (d) All of them
x. (d) an ion

3. Answer the following questions in short.

i. An ion is an atom or molecule that has gained or lost one or more electrons, thus acquiring a net electric charge. ii. Ionic bonds typically form between metals and non-metals. iii. Symbol: In chemistry, a symbol is a shorthand representation used to identify an element. It consists of one or two letters, often derived from the element's name. Valency: Valency is the combining capacity of an element, which is determined by the number of electrons an atom gains, loses, or shares to achieve a stable electron configuration. iv. Valency tells us about the number of electrons an atom can gain, lose, or share to achieve a stable electron configuration. It helps predict the type of chemical bond an element is likely to form and the chemical properties of compounds it can create.

4. Extended Response Questions

i. Positive and negative ions combine together to create an ionic compound through electrostatic attraction. Positive ions (cations) are attracted to negative ions (anions) due to their opposite charges. When they come close enough, the electrostatic force of attraction between them causes them to bond together, forming an ionic compound.

ii. Electrons are involved in chemical bonding by either being transferred from one atom to another (ionic bonding) or being shared between atoms (covalent bonding). In ionic bonding, electrons are transferred from the atom that becomes a cation (loses electrons) to the atom that becomes an anion (gains electrons), resulting in the formation of ions. In covalent bonding, electrons are shared between atoms to achieve a stable electron configuration for both atoms involved.

iii. Sharing takes place under conditions where atoms have similar electronegativities, meaning they have similar tendencies to attract electrons. When atoms with similar electronegativities bond together, they share electrons to achieve a more stable electron configuration.

iv. A chemical formula is a symbolic representation of a compound that indicates the types and numbers of atoms present in the compound's smallest unit (molecule or formula unit). Steps for writing a chemical formula of an ionic compound:

1. Identify the ions present in the compound, including their charges.

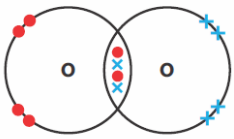
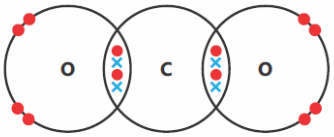
2. Determine the ratio of positive to negative ions needed to balance the charges and make the compound electrically neutral.
3. Write the symbol of the positive ion (cation) followed by the symbol of the negative ion (anion), indicating the subscript numbers to denote the ratio determined in step 2.

v. A chemical bond is a force of attraction between atoms that holds them together in a molecule or compound. Atoms form chemical bonds to achieve a more stable and lower energy state by either gaining, losing, or sharing electrons to attain a full outer electron shell (valence shell) similar to that of a noble gas.

vi. A covalent bond is a type of chemical bond formed by the sharing of electron pairs between atoms. In the formation of a covalent bond, atoms share electrons to achieve a stable electron configuration. This sharing allows both atoms to fill their outer electron shells, resulting in a more stable arrangement than if they were separate. Covalent bonds commonly occur between non-metal atoms.

5. Constructive Response Question

i. Following is the dot and cross model of oxygen and carbon dioxide.

Name	Formula	Dot and cross diagram	Structure
Oxygen	O_2		O=O
Carbon dioxide	CO_2		O=C=O

Analyze the model, and answer the following questions on your notebooks.

a. How many electrons are present in an oxygen atom?

b. How many electrons are present in a carbon atom?

c. How many electrons from both sides are involved in bonding?

d. What type of bond is it?

ii. What holds atoms together?

a. An oxygen atom typically has 8 electrons. b. A carbon atom typically has 6 electrons. c. In the formation of carbon dioxide (CO_2), each oxygen atom shares 2 electrons with the carbon atom, totaling 4 electrons from both oxygen atoms and 4 electrons from the carbon atom. So, a total of 8 electrons are involved in bonding. d. The bond formed between carbon and oxygen in carbon dioxide (CO_2) is a double covalent bond.

ii. Atoms are held together by chemical bonds, which are forces of attraction between the positively charged nucleus of one atom and the negatively charged electrons of another atom. The type of bond formed depends on the sharing or transfer of electrons between atoms. Examples of bonds include covalent bonds, where electrons are shared, and ionic bonds, where electrons are transferred.

Chapter-7

Solutions

1. Choose and encircle the correct option for each statement.

i. Which of the following is not a solution?

(a) lemondae (b) tea (c) lassi (d) sugar

ii. The amount of solute dissolved in a particular amount of solvent is called;

(a) solution (b) solubility (c) dissolution (d) crystallization

iii. Identify which of the following factors do not directly affects solubility;

(a) temperature (b) size of molecules (c) stirring (d) pressure

iv. Encircle the solute from the following pairs.

(a) sugar-water (b) milk-honey (c) salt-water (d) lemon-milk

v. If you want to make a solution more dilute; what will you do;

(a) increase the amount of water.

(b) decrease the amount of water.

(c) neither increase nor decrease the amount of water.

(d) increase the amount of solute.

vi. Concentration is a ratio of:

(a) solvent to solute (b) solute to solution (c) solvent to solution (d) both a & b

i. (d) sugar
ii. (b) solubility
iii. (c) stirring
iv. (c) salt-water
v. (a) increase the amount of water.
vi. (b) solute to solution

4. Answer of the following questions in short.

i. a. Solution: A solution is a homogeneous mixture composed of two or more substances, where one substance (solute) is uniformly dispersed in another substance (solvent). b. Solubility: Solubility is the maximum amount of solute that can dissolve in a given amount of solvent at a specific temperature and pressure, usually expressed in grams of solute per 100 grams of solvent. c. Concentration: Concentration refers to the amount of solute dissolved in a given amount of solvent or solution. It can be expressed in various ways, such as molarity, molality, mass percent, or parts per million.

ii. a. Solute vs. Solvent:

- Solute: The solute is the substance that is being dissolved in a solution. It is present in a smaller amount.
- Solvent: The solvent is the substance that dissolves the solute to form a solution. It is present in a larger amount.

b. Concentrated vs. Diluted Solution:

- Concentrated Solution: A concentrated solution contains a large amount of solute dissolved in a relatively small amount of solvent. Example: Concentrated orange juice, which has a high concentration of orange juice extract.
- Diluted Solution: A diluted solution contains a small amount of solute dissolved in a relatively large amount of solvent. Example: Diluted orange juice, which has added water to decrease its concentration.

c. Saturated vs. Unsaturated Solution:

- Saturated Solution: A saturated solution is a solution in which the maximum amount of solute has been dissolved at a specific temperature and pressure. It cannot dissolve any more solute at that temperature and pressure. Example: Sugar dissolved in water until no more sugar can be dissolved at room temperature.
- Unsaturated Solution: An unsaturated solution is a solution in which more solute can still be dissolved at a specific temperature and pressure. It has not reached its maximum solubility. Example: Water with sugar dissolved in it, where more sugar can still be dissolved.

5. Extended Response Questions

i. Examples of solutions from daily life:

1. Saltwater: A solution of salt (solute) dissolved in water (solvent).
2. Sugar syrup: A solution of sugar (solute) dissolved in water (solvent), commonly used in cooking and beverages.

3. Air: A solution of various gases (such as nitrogen, oxygen, and carbon dioxide) in the atmosphere (solvent).
4. Soft drinks: Carbonated beverages are solutions of carbon dioxide gas (solute) dissolved in water (solvent), along with flavoring and sweetening agents.
5. Vinegar: A solution of acetic acid (solute) dissolved in water (solvent), commonly used in cooking and household cleaning.

ii. Factors affecting solubility: Solubility, the ability of a solute to dissolve in a solvent, is influenced by several factors:

1. Nature of the solute and solvent: Some solutes are more soluble in certain solvents due to their chemical properties. For example, polar solutes tend to dissolve in polar solvents, while nonpolar solutes dissolve better in nonpolar solvents.
2. Temperature: In general, solubility increases with an increase in temperature for most solid solutes in liquid solvents. However, for gases in liquid solvents, solubility typically decreases with an increase in temperature.
3. Pressure: Pressure has a significant effect on the solubility of gases in liquids. According to Henry's law, the solubility of a gas in a liquid is directly proportional to the partial pressure of that gas above the liquid. Therefore, increasing pressure increases the solubility of gases in liquids.
4. Surface area: For solid solutes, increasing the surface area exposed to the solvent can enhance the rate of dissolution and, consequently, the solubility.

iii. Solubility of gases increase with pressure due to Henry's law, which states that the solubility of a gas in a liquid is directly proportional to the partial pressure of that gas above the liquid. When pressure is increased, more gas molecules are forced into the liquid, leading to an increase in the concentration of dissolved gas molecules and thus an increase in solubility.

iv. Preparation of a solution: To prepare a solution, you typically follow these steps:

1. Measure the appropriate amount of solute (solid or liquid) using a balance or measuring device.
2. Place the measured solute into a clean container.
3. Measure the appropriate amount of solvent (usually a liquid) using a measuring device.
4. Pour the solvent into the container containing the solute.
5. Stir or agitate the mixture until the solute completely dissolves in the solvent, forming a homogeneous solution.

Experiment: To demonstrate the preparation of a sugar solution:

1. Measure 100 grams of sugar (solute) using a balance.
2. Pour the measured sugar into a clean container.
3. Measure 200 milliliters of water (solvent) using a graduated cylinder.

4. Pour the measured water into the container containing the sugar.
5. Stir the mixture with a stirring rod until the sugar completely dissolves in the water, forming a sugar solution.

5. Constructive Response Question

i. To make an unsaturated solution into a supersaturated solution using water and sugar, you would typically follow these steps:

1. Start with a solution of sugar and water that is unsaturated at a higher temperature. This means that there is still room for more sugar to dissolve in the water at this temperature.
2. Heat the solution to increase its temperature, allowing more sugar to dissolve in the water due to increased solubility at higher temperatures. Ensure that all the added sugar dissolves completely.
3. Once the solution is fully saturated at the higher temperature, carefully lower the temperature of the solution without disturbing it. This can be done by allowing the solution to cool slowly or by placing it in a cold environment.
4. As the temperature decreases, the solubility of sugar in water decreases. However, the solution remains supersaturated because it contains more dissolved sugar than it would normally hold at the lower temperature. This results in the formation of a supersaturated solution.

ii. If a saturated solution of sugar and water is prepared at room temperature and then the temperature is lowered by 5°C, the solution will likely still be saturated. This is because lowering the temperature usually decreases the solubility of the solute (sugar) in the solvent (water). However, since the original solution was saturated at room temperature, it means that it already contained the maximum amount of dissolved sugar at that temperature. Therefore, even with the decrease in temperature, the solution will remain saturated until some of the sugar crystallizes out of the solution.

iii. Solute and solvent in the given solutions:

- Lemonade: Solute (sugar, flavorings) and solvent (water).
- Chocolate: Solute (sugar, cocoa solids, milk solids) and solvent (cocoa butter, milk).
- Milk: Solute (sugar, proteins, minerals, vitamins) and solvent (water).
- Tea: Solute (flavor compounds, tannins) and solvent (water).
- Sweet: Solute (sugar) and solvent (water).
- Lassi: Solute (sugar, yogurt solids) and solvent (water).
- Milkshake: Solute (sugar, flavorings, ice cream particles) and solvent (milk).

Chapter-8

Force and Motion

1. Choose and encircle the correct option for each statement.

i. A force applied on an object cannot change its:

(a) mass (b) shape (c) speed (d) direction

ii. The total distance travelled is divided by total time

taken to calculate:

(a) average time (b) average speed (c) average distance (d) average force

iii. In a game of tug of war, at a particular stage, team A pulls team

B with a force F & and team B pulls team A with a force F. The tension in the rope is:

(a) F (b) 2F (c) ½ (d) zero

iv. In which of the following do action – reaction forces act?

(a) walking (b) Gun firing (c) Rocket launching (d) All of these

v. Forces always act:

(a) in one direction (b) in opposite directions (c) independent from each other (d) in pairs

vi. Which of the following is not a contact force?

(a) electric (b) friction (c) air resistance (d) tension

vii. What is another way to say "the force due to gravity?

(a) magnetic force (b) normal force (c) weight (d) nuclear force

i. (a) mass
ii. (b) average speed
iii. (d) zero
iv. (d) All of these
v. (d) in pairs
vi. (a) electric
vii. (c) weight

2. Extended Response Question

i. A force is a push or pull acting upon an object as a result of its interaction with another object. It is a vector quantity, meaning it has both magnitude and direction. ii. The unit of force is the newton (N), named after Sir Isaac Newton. One newton is defined as the force required to accelerate a mass of one kilogram at a rate of one meter per second squared. iii. The relation between speed, distance, and time is given by the formula: Speed = Distance / Time iv. Average speed is the total distance traveled divided by the total time taken. The formula for average speed is: Average Speed = Total Distance / Total Time v. A non-contact force is a force that acts on an object without physical contact between the objects involved. An example of a non-contact force is gravitational force, where objects are attracted to each other due to their masses without direct contact. vi. Blowing on an inflated balloon and causing it to move is an example of a non-contact force. The movement of the balloon is due to the force of the air molecules exerted by your breath, which does not involve direct contact with the balloon's surface. vii. a) The needle of a compass pointing north: Non-contact force b) A skydiver falling through the air: Contact force (with air resistance) c) A planet orbiting the Sun: Non-contact force (due to gravitational force)

Chapter-9

Waves and Energy

1. Choose and encircle the correct option for each statement.

i. What does waves transmit from one place to the other?

(a) Amplitude (b) Wavelength (c) Mass (d) Energy

ii. The waves in which material medium is required for their propagation are known as:

(a) Matter waves (b) Mechanical waves

(c) Electromagnetic waves (d) Carrier waves

iii. The particles of the medium vibrate in longitudinal waves:

(a) Perpendicular to the direction of the wave motion

(b) Along the direction of the wave motion

(c) Opposite to the direction of the wave motion

(d) Do not vibrate at all

iv. The waves in which particles of the medium vibrate in the direction of the waves motion are called:

(a) Stationary waves (b) Longitudinal waves

(c) Transverse waves (d) Mechanical waves

v. Water waves are:

(a) Electromagnetic waves (b) Stationary waves

(c) Longitudinal waves (d) Transverse waves

vi. The distance between two troughs or crests is known as:

(a) Period (b) Wavelength (c) Frequency (d) Amplitude

vii. Which type of wave is a light wave?

(a) Electromagnetic wave (b) Transverse wave

(c) Longitudinal wave (d) Mechanical wave

viii. Speed of sound is measured in:

(a) hours (b) decibel (c) joule (d) metre per second

ix. For hearing distinct echoes the minimum distance of the obstacle from the source of sound must be:

(a) 1.72 m (b) 17.2 m (c) 3.40 m (d) 34.0 m

x. The relation between frequency and time period is :

(a) $f = \frac{1}{1}$ (b) $f = T$ (c) $f = \frac{\lambda}{T}$ (d) $f = \frac{v}{T}$

i. (d) Energy

ii. (b) Mechanical waves

iii. (b) Along the direction of the wave motion

iv. (b) Longitudinal waves

v. (d) Transverse waves

vi. (b) Wavelength

vii. (a) Electromagnetic wave

viii. (d) metre per second

ix. (b) 17.2 m

x. (b) f = T

2. Answer the following questions in short.

i. A wave is a disturbance or oscillation that travels through space or matter, transferring energy from one place to another without permanently displacing the particles of the medium. ii. Electromagnetic waves are waves that consist of oscillating electric and magnetic fields and do not require a medium for propagation. They can travel through vacuum. An example of an electromagnetic wave is light. iii. Wavelength is the distance between two consecutive points in a wave that are in phase, such as two consecutive crests or troughs. It is often denoted by the symbol λ (lambda) and is measured in meters. iv. Wave frequency refers to the number of complete oscillations or cycles of a wave that pass a given point per unit time. It is measured in hertz (Hz) and represents the rate at which the wave oscillates. v. Time period is the time taken for one complete cycle of a wave to pass a given point. It is denoted by the symbol T and is measured in seconds. The time period is the reciprocal of the frequency. vi. The pitch of sound refers to the perceived frequency of a sound wave. It is associated with the sensation of highness or lowness of a sound and is related to the frequency of the sound wave. vii. The relation between frequency (f) and time period (T) is inverse. Mathematically, it can be expressed as: $f = 1 / T$ viii. The main difference between a mechanical wave and an electromagnetic wave is that mechanical waves require a medium (solid, liquid, or gas) for propagation, while electromagnetic waves do not. Mechanical waves propagate through oscillations of matter, while electromagnetic waves consist of oscillating electric and magnetic fields. ix. Loudness of sound refers to the subjective perception of the intensity or magnitude of a sound wave. It is related to the amplitude of the sound wave and is measured in decibels (dB). x. The bouncing of a sound wave from a surface is called reflection. Sound waves bounce off hard, smooth surfaces, such as walls, floors, and ceilings, more effectively than soft or irregular surfaces.

Chapter-10

Heat and Temperature

1. Choose and encircle the correct option for each statement.

i. The gap kept between rail lengths on railway tracks is based on the phenomenon of:

(a) Heat gain and heat lost (b) Seismic waves

(c) Condensation (d) Thermal expansion

ii. Thermal insulation keeps the room:

(a) Cool in summer (b) Cool in winter

(c) Hot in summer (d) Either (b) or (c)

iii. The temperature of boiling water is:

(a) 100°C (b) 100 K (c) 100°F (d) 50°C

iv. The average kinetic energy of the molecules in a substance is called:

(a) Heat (b) Temperature (c) Motion (d) Phase charge

v. Why is it possible to reach your hand into the oven without injury, but harmful to touch the pan inside it?

(a) Air is a poor conductor of heat (b) Pan is good insulator of heat

(c) Air is a good conductor of heat (d) Pan is a poor conductor of heat

vi. Heat is transferred from higher to lower temperature through molecular collisions in :

(a) Covection (b) Conduction (c) Radiation (d) Evaporation

i. (d) Thermal expansion
ii. (d) Either (b) or (c)
iii. (a) 100°C
iv. (b) Temperature
v. (d) Pan is a poor conductor of heat
vi. (b) Conduction

2. Extended Response Questions

i. Putting a jar under hot water makes it easier to open the lid because the heat from the hot water causes the metal lid to expand slightly, loosening its grip on the jar. This expansion makes it easier to break the seal and twist off the lid.

ii. Expansion joints are necessary for a bridge to accommodate the expansion and contraction of the bridge structure due to temperature changes. Without expansion joints, thermal expansion and contraction could lead to stress buildup and structural damage, compromising the integrity and safety of the bridge.

iii. Materials expand on heating because heating increases the average kinetic energy of the particles within the material. As the particles gain energy, they vibrate more vigorously and move farther apart, causing the material to expand in volume.

iv. Water boils at 212 degrees Fahrenheit and freezes at 32 degrees Fahrenheit.

v. Some materials that are good conductors of heat include metals such as copper, aluminum, silver, and gold.

vi. Metals are better conductors than other solids because they have free electrons that can move easily through the metal lattice, transferring thermal energy quickly from one part of the metal to another.

vii. When you put ice into a drink, the drink gets cooler because the ice absorbs heat from the surrounding liquid to melt, undergoing a phase change from solid to liquid. This process, called endothermic melting, removes heat from the drink, causing it to cool down. The heat is moving from the warmer drink to the colder ice.

viii. The worst conductor of heat among the options provided is vacuum. This is because vacuum is essentially the absence of matter, so there are no particles to conduct heat. In contrast, air, copper, glass, rubber, and steel all have particles that can transfer thermal energy to some extent.

ix. Three ways in which heat can be transferred from one place to another are conduction, convection, and radiation.

x. Heat is transferred from the Sun to the Earth primarily through radiation. The Sun emits electromagnetic radiation, including visible light and infrared radiation, which travels through the vacuum of space and reaches the Earth. When this radiation interacts with the Earth's atmosphere and surface, it is absorbed, warming the planet.

3. Constructed Response Questions

i) Water is indeed an exception to the general rule that liquids expand on heating. This exception occurs due to the anomalous behavior of water around its freezing point. Below 4 degrees Celsius, water contracts as it cools, reaching its maximum density at around 4 degrees Celsius. As water is cooled further from this point, it expands, eventually freezing into ice. This anomalous behavior is attributed to the hydrogen bonding between water molecules, which causes the molecules to arrange themselves in a hexagonal lattice structure as they freeze, resulting in increased volume.

ii)

- Solids: Generally, solids expand on heating. The expansion of solids is relatively small and regular, with atoms or molecules vibrating more vigorously as temperature increases, leading to an increase in the average distance between particles.
- Liquids: Liquids also expand on heating, but water is an exception near its freezing point, as explained above. Liquid expansion is greater than solid expansion, as the particles in liquids have more freedom to move and slide past each other.
- Gases: Gases expand significantly on heating. Gas particles move freely and randomly, and heating increases their kinetic energy, causing them to move faster and spread out, leading to an increase in volume.

iii) When a gas is completely entrapped in a sealed metallic container and heated, its pressure will increase. This is because heating increases the kinetic energy of gas molecules, causing them to move faster and collide more frequently with the walls of the container, exerting greater pressure.

iv) (a) The decrease in iron temperature does not necessarily equal the increase in water temperature. This is because water has a higher specific heat capacity than iron, meaning it requires more heat energy to raise its temperature by the same amount compared to iron. Therefore, the decrease in iron temperature may be greater than the increase in water temperature. (b) The quantity of heat lost by the iron does equal the quantity of heat gained by the water, according to the principle of conservation of energy. However, since water has a higher specific heat capacity than iron, the temperature change in water will be less compared to the temperature change in iron. (c) The final temperature reached by the iron and water will not be the same. The final temperature will depend on factors such as the masses and specific heat capacities of the iron and water, as well as the initial temperatures of both substances.

v) Kinetic energy is directly related to thermal energy. Thermal energy is the total kinetic energy of all the particles in a substance. As the kinetic energy of particles increases, their motion becomes more vigorous, leading to an increase in temperature and thermal energy.

vi) Heat can be lost from a hot cup of tea through several mechanisms:

- Conduction: Heat can transfer from the hot tea to the colder surroundings through the cup itself.
- Convection: Air currents around the cup can carry away heat energy from the tea's surface.
- Radiation: The cup and tea emit infrared radiation, transferring heat energy to cooler objects or surfaces nearby.

Chapter-11

Technology in Everyday Life

1. Choose and encircle the correct option for each statement.

i. Drip irrigation is the system in which water is slowly applied directly on the:

a) root zone b) stem zone c) leaf zone d) all of these

ii. Drip irrigation is useful, as it saves:

a) water b) fertilizer c) both a and b d) none of these

iii. Refrigeration is the process which

a) speeds up the growth of bacteria b) slows down the growth of bacteria

c) speeds up the growth of viruses d) slows down the growth of viruses

iv. Salting helps to preserve:

(a) fish (b) meat (c) fruits (d) all of these

v. In the making of sanitizer, the ratio of isopropyl alcohol and aloe vera is mostly:

(a) 2:1 (b) 3:1 (c) 4:1 (d) 5:1

i. (a) root zone

ii. (c) both a and b

iii. (b) slows down the growth of bacteria

iv. (d) all of these

v. (a) 2:1

2. Answer the following questions in short.

i. Sprinkler Irrigation System:

- In a sprinkler irrigation system, water is sprayed into the air and allowed to fall onto the soil in droplets resembling rainfall.
- It covers a larger area and is suitable for crops with shallow roots.
- It requires higher water pressure and may lead to water loss due to evaporation and wind drift.

- It is more suitable for areas with good water availability.

Drip Irrigation System:

- In a drip irrigation system, water is delivered directly to the root zone of plants through a network of pipes, tubes, and emitters.
- It provides water slowly and directly to the root zone, minimizing water loss due to evaporation and runoff.
- It is more efficient in water usage and is suitable for areas with limited water availability.
- It can be used for a wide range of crops, including those with deep root systems.

ii. Preservation refers to the process of preventing or slowing down the spoilage of food and extending its shelf life. There is a need for food preservation to:

- Prevent the growth of microorganisms (bacteria, fungi, and molds) that can cause food spoilage and foodborne illnesses.
- Retain the nutritional value, flavor, texture, and appearance of food.
- Reduce food waste by extending the storage life of perishable foods.

iii. Food can be preserved by salting or sugar through methods such as:

- Salting: Salt draws out moisture from food, creating an environment where bacteria and other microorganisms cannot grow. It also enhances flavor and acts as a preservative. Examples include salt-cured meats, pickles, and salted fish.
- Sugaring: Sugar creates an environment with low water activity, making it inhospitable for microbial growth. It also adds sweetness and acts as a preservative. Examples include jams, jellies, and candied fruits.

iv. The use of a stethoscope is to listen to sounds within the body, particularly the heart, lungs, and intestines. It helps healthcare professionals such as doctors, nurses, and paramedics to assess and diagnose various medical conditions by listening to the sounds produced by internal organs and blood flow.

v. The use of alcohol-based hand sanitizer is to disinfect hands and kill or reduce the number of germs, including bacteria and viruses, on the skin. It is particularly useful when soap and water are not readily available, providing a convenient and effective method for hand hygiene.

3. Constructed Response Questions

a) To make a model of a sprinkler irrigation system, you can follow these steps:

1. Gather materials: You will need a plastic bottle or container, small tubes or straws, a small water pump or syringe, and a water source.
2. Prepare the base: Cut holes in the lid or bottom of the plastic bottle/container to insert the tubes/straws. Ensure they are evenly spaced and angled upwards.
3. Attach tubes/straws: Insert the tubes or straws into the holes you created. These will act as the sprinklers.
4. Connect the pump: Connect the water pump or syringe to the water source and attach it to the bottom of the container.
5. Test the model: Fill the container with water and turn on the pump. Water should be pumped through the tubes/straws, simulating a sprinkler irrigation system.

b) Four methods for the preservation of food in daily life include:

1. Refrigeration: Storing food at low temperatures slows down the growth of microorganisms and extends its shelf life.
2. Canning: Heat processing food in sealed containers kills microorganisms and creates a vacuum seal, preventing spoilage.
3. Freezing: Freezing food at low temperatures inhibits microbial growth and maintains food quality.
4. Drying: Removing moisture from food through drying methods such as air-drying, sun-drying, or using dehydrators prevents spoilage and extends shelf life.

c) Method for the preparation of a stethoscope:

1. Gather materials: You will need a flexible tube (such as a rubber or plastic tube), two small funnels, and a listening device (such as a cup or earpiece).
2. Connect the components: Insert one end of the tube into the narrow end of one funnel and secure it with tape or glue. Repeat this step for the other funnel.
3. Use the stethoscope: Place one funnel over the area of interest (such as the chest or abdomen) and place the other funnel against your ear or the listening device. The sound will travel through the tube, allowing you to hear internal sounds.

d) To make a suitable sanitizer, you can follow this recipe for an alcohol-based hand sanitizer:

Ingredients:

- 2/3 cup of isopropyl alcohol (at least 70% alcohol content)
- 1/3 cup of aloe vera gel
- Optional: a few drops of essential oil for fragrance (such as lavender or tea tree oil)

Instructions:

1. In a clean mixing bowl, combine the isopropyl alcohol and aloe vera gel.
2. Stir the mixture until well blended.
3. If desired, add a few drops of essential oil for fragrance and mix again.
4. Transfer the sanitizer into a clean, empty bottle with a dispenser cap.
5. Label the bottle with the contents and date of preparation.

To apply the sanitizer:

- Dispense a small amount (about a dime-sized drop) onto your palms.
- Rub your hands together, covering all surfaces, including between your fingers and under your nails, until the sanitizer evaporates and your hands feel dry.
- Repeat as necessary throughout the day, especially before eating or touching your face.

M

You

Choose and encircle the correct option for each statement. i. The atmosphere is held to the Earth by (a) winds (b) clouds (c) gravity (d) Sun ii. The force which keep planets and moons in their orbit is: (a) air resistance (b) friction (c) magnetic (d) gravity iii. Sun appears to move from east to west around the Earth. This means that Earth rotates from: (a) east to west (b) west to east (c) north to south (d) west to north iv. Which is the season when trees leaves turn colour and drop?" (a) Spring (b) Summer (c) Autumn (d) Winter v. The stars forming a recognizable shape is called: (a) constellation (b) system (c) galaxy (d) asteroids vi. What direction does the Earth revolve around the Sun? (a) Clockwise (b) Anticlockevise (c) Right to left (d) East to west vii. In one day (24 hours), the Earth makes one complete: (a) revolution (b) rotation (c) isolation (d) change of season viii. The season changes because the: (a) Moon is revolving around the Earth (b) Earth is revolving around its axis (c) Earth is revolving around the Sun (d) Earth's axis tilts while revolving around the Sun

Chapter-12

Earth and Space

1. Choose and encircle the correct option for each statement.

i. The atmosphere is held to the Earth by

(a) winds (b) clouds (c) gravity (d) Sun

ii. The force which keep planets and moons in their orbit is:

(a) air resistance (b) friction (c) magnetic (d) gravity

iii. Sun appears to move from east to west around the Earth. This means that Earth rotates from:

(a) east to west (b) west to east (c) north to south (d) west to north

iv. Which is the season when trees leaves turn colour and drop?”

(a) Spring (b) Summer (c) Autumn (d) Winter

v. The stars forming a recognizable shape is called:

(a) constellation (b) system (c) galaxy (d) asteroids

vi. What direction does the Earth revolve around the Sun?

(a) Clockwise (b) Anticlockevise (c) Right to left (d) East to west

vii. In one day (24 hours), the Earth makes one complete:

(a) revolution (b) rotation

(c) isolation (d) change of season

viii. The season changes because the:

(a) Moon is revolving around the Earth (b) Earth is revolving around its axis

(c) Earth is revolving around the Sun

(d) Earth's axis tilts while revolving around the Sun

i. (c) gravity
ii. (d) gravity
iii. (b) west to east
iv. (c) Autumn
v. (a) constellation
vi. (b) Anticlockwise
vii. (b) rotation
viii. (d) Earth's axis tilts while revolving around the Sun

2. Short answer questions:

(i) A few famous constellations include Orion, Ursa Major (the Big Dipper), Cassiopeia, Leo, and Scorpius.

(ii) If gravitational force were not present, planets and moons would no longer be held in their orbits around larger celestial bodies. They would drift off into space in straight lines, leading to chaos and instability in the solar system.

(iii) Seasons change on Earth primarily due to the tilt of the Earth's axis relative to its orbit around the Sun. As the Earth orbits the Sun, different parts of the planet receive varying amounts of sunlight, leading to differences in temperature and weather patterns.

(iv) There are typically two high tides and two low tides in a day. This is caused by the gravitational pull of the Moon and the Sun on Earth's oceans, as well as the rotation of the Earth.

(v) Constellations are used for navigation, astronomy, and cultural identification. They help astronomers locate and study celestial objects, aid navigators in determining directions, and serve as cultural symbols and stories in various societies throughout history.

(vi) Tides are primarily caused by the gravitational pull of the Moon and, to a lesser extent, the Sun, on Earth's oceans. As the Moon orbits Earth, its gravitational force causes a bulge of water to form on the side of the Earth closest to the Moon, creating a high tide. At the same time, there is another high tide on the opposite side of the Earth due to the centrifugal force caused by the Earth-Moon system's rotation. This results in two high tides and two low tides per day in most locations.

4. Constructed Response Questions

(i) The tilting of the Earth's axis has several effects:

- It causes the change of seasons as different parts of the Earth receive varying amounts of sunlight throughout the year.
- It determines the length of daylight hours and the angle of sunlight, affecting climate and temperature patterns.
- It influences the distribution of sunlight and heat across the Earth's surface, leading to differences in weather patterns and ecosystems.

(ii) There is one winter and one summer each year due to the tilt of the Earth's axis relative to its orbit around the Sun. As the Earth orbits the Sun, different parts of the planet receive varying amounts of sunlight. When one hemisphere is tilted towards the Sun, it experiences

summer, characterized by longer days, higher temperatures, and more direct sunlight. Meanwhile, the other hemisphere experiences winter, with shorter days, lower temperatures, and less direct sunlight. As the Earth continues its orbit, the tilt causes the seasons to change, leading to a cycle of summer and winter.

(iii) Tides have several constructive effects on ocean coastlines:

- They help mix ocean waters, redistributing nutrients and oxygen and supporting marine ecosystems.
- They replenish coastal wetlands and estuaries, which are vital habitats for various species and serve as natural buffers against storms and erosion.
- They facilitate sediment transport, shaping coastal landforms and contributing to the formation of beaches, sandbars, and barrier islands.
- They provide opportunities for activities such as surfing, fishing, and recreational boating, which support local economies and tourism.

(iv) Gravity holds the Solar System together through the mutual gravitational attraction between celestial bodies, such as planets, moons, asteroids, and comets, and the Sun. According to Newton's law of universal gravitation, every object with mass exerts a gravitational force on every other object with mass. In the case of the Solar System, the Sun's immense gravitational pull keeps planets in their orbits around it, while the gravitational interactions between planets and moons help maintain their respective orbits. Additionally, the gravitational pull of the Sun affects the motion of smaller celestial bodies, such as asteroids and comets, influencing their trajectories within the Solar System. Overall, gravity acts as the fundamental force governing the structure, stability, and dynamics of the Solar System.