Prodigy PHYSICS

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PHYSICS-7

ANSWER KEY

Chapter-1Physical Quantities and Measurement

Quiz Zone (Page 14)

1. False. The displacement method measures volume.
2. False. Capacity is the amount of liquid a container can store.
3. True
4. False. If the volume of an object increases due to heating, its density will decrease.
5. False. Generally, solids are denser than liquids.

A. MCQs

1. (a) Because volume of a unit cube is 1 m × 1 m × 1 m.

2. (b) Volume

3. (c) We can measure its volume by tying it with a stone

4. (c) Surface occupied by it

5. (b) Keeping the eye level near the reading mark

6. (b) The grid paper has grids of smaller size

7. (b) More matter per unit volume

8. (a) Iron will be more than aluminium

9. (d) Density x Volume

10. (a) 45 g

B. Match the three columns :

1. Mass - (iii) Matter contained in a body - (a) Gram

2. Volume - (iv) Space occupied by the body - (b) cm^3

3. Speed - (i) Change of position of a body in unit time - (c) km/hr

4. Area - (ii) Length x Breadth - (d) cm^2

5. Density - (v) Mass per unit volume - (e) g/cm^3

C. State True or False for the following and correct the false statements giving reasons.

1. False. When we look at the world, our perception is three-dimensional

(3-D), not 2-D. We perceive depth, width, and height in our surroundings.
2. False. Equal volume of different substances does not necessarily have the same mass. The mass of a substance depends on its density, which can vary between different materials. Equal volume does not imply equal mass.
3. True
4. False. Equal mass of different substances does not necessarily have the same volume. The volume of a substance depends on its density, which can vary between different materials. Equal mass does not imply equal volume.
5. False. The SI unit of volume is the cubic meter (m^3), not the liter. While the liter is a commonly used unit for volume, the SI unit is the cubic meter.
6. False. The SI unit of speed does exist, and it is meters per second (m/s).

D. Fill in the blanks

1. capacity
2. beam balance
3. 4 degrees
4. square centimeters (cm^2)
5. graduated cylinder
6. multiplying its length, width, and height
7. parallax error
8. greater
9. meters per second (m/s)
10. lower

E. Short answer type questions

1. Area is a two-dimensional measurement, representing the extent of a surface, typically measured in square units (e.g., square meters). Volume, on the other hand, is a three-dimensional measurement, representing the space occupied by an object or substance, typically measured in cubic units (e.g., cubic meters).
2. The capacity of a bottle refers to the maximum amount of liquid or substance it can hold. It is typically expressed in units of volume, such as milliliters (mL) or liters (L).
3. The two blocks will have the same weight. This is because the masses of the block A and B, become equal.
4. One use of a graduated measuring cylinder is to accurately measure the volume of a liquid. It is commonly used in laboratories and various scientific experiments to determine the exact volume of a liquid with high precision.
5. The density of copper is 8.96 g/cm^3 means that in a cubic centimeter (cm^3) of copper, there is an average mass of 8.96 grams. It represents how tightly

packed the particles of copper are, indicating that copper is a relatively dense material.

6. A smaller unit of volume is the cubic centimeter (cm^3). It is often connected to the SI unit of volume, the cubic meter (m^3), as 1 m^3 equals 1,000,000 cm^3.
7. A container with dimensions of 5 cm^3 will hold 5 cubic centimeters (cm^3) of water, which is equivalent to 5 milliliters (mL) of water.
8. The speed of a train that traveled 200 km in four hours is 50 km/h (kilometers per hour). Speed is calculated by dividing the distance travelled by the time taken.
9. To find the speed of a train that traveled 550 km in 10 hours, you would divide the distance by the time:
   Speed (in km/h) = Distance (in km) / Time (in hours)
   Speed = 550 km / 10 hours = 55 km/h
   To convert to meters per second (m/s), you can use the fact that 1 km = 1000 m and 1 hour = 3600 seconds:
   Speed (in m/s) = (55 km/h) * (1000 m/km) / (3600 s/h) ≈ 15.28 m/s
10. If a bicycle moves at 3 m/s, you can calculate the distance it will travel in a certain amount of time by using the formula:
    Distance = Speed x Time
    Distance = 3 m/s x Time (in seconds)
    You'll need to know the time to determine the distance. For example, if the time is 30 seconds, the distance would be 3 m/s x 30s =90meters.

F. Long answer type questions

1. To measure the volume of a regular 3-dimensional object, we can follow these steps with a rectangular prism as an example:
   Example: Measuring the volume of a rectangular prism (a regular 3D object)
   Step 1: Measure the length (l), width (w), and height (h) of the rectangular prism using a ruler or measuring tape. Make sure to use consistent units, like centimeters (cm) or meters (m).
   Step 2: Calculate the volume using the formula for a rectangular prism: Volume = length (l) x width (w) x height (h).
   Step 3: Substitute the measured values into the formula and perform the calculation to find the volume.
   Step 4: The result will be in cubic units, such as cm^3 or m^3, depending on the units used for measurements.
2. To measure the area of an irregular 2-dimensional body, we can use a method known as the grid method. Here are the steps:

- To estimate the area of an irregular cardboard. We need a graph paper of small to medium grid sizes (of known dimension).
- Place the grid paper on a table and secure it so that it doesn't move.
- Put the irregular 2-dimensional object on the grid paper and mark its outline using a pencil carefully.
- The half-filled, more than half filled and completely filled squares of the grid are numbered or counted.
- The number is multiplied by the area of one grid.
  The above system of calculation has reasonable accuracy because in practice the area of the irregular cardboard (as in this case) covering less than half of a grid almost equals the vacant space of grids that are half covered or more than half covered.

3. To measure the density of an irregular body, follow these steps:
   Step 1: Weigh the irregular body using a beam balance to find its mass (m). Record the mass in grams or kilograms.
   Step 2: Measure the volume of the irregular body by using the water displacement method. Fill a graduated cylinder partially with water, note the initial water level (V1), then immerse the irregular body in the water. The water level will rise, and you can note the final water level (V2). The volume of the body is the difference between V2 and V1.
   Step 3: Calculate the density using the formula: Density (ρ) = Mass (m) / Volume (V).

4. Expressions like "as light as a feather" or "as heavy as lead" illustrate that equal volumes of different substances can have varying masses due to differences in density. Density is a measure of how much mass is packed into a given volume. For instance, a given volume of feather (less dense) contains far less mass compared to the same volume of lead (more dense), leading to the difference in perceived weight.
5. To find the volume of an object with a mass of 50 kg and a density of 100 kg/m^3, you can use the formula for density:
   Density (ρ) = Mass (m) / Volume (V)
   Rearrange the formula to calculate the volume:
   Volume (V) = Mass (m) / Density (ρ)
   Substituting the given values:
   $V = 50\ kg / 100\ kg/m^3 = 0.5\ m^3$
   So, the volume of the object is 0.5 cubic meters (m^3).
6. To calculate the density of water and glycerine:

- For water: (Density = Mass / Volume) Density = 500 g / 500 mL = 1 g/mL = 1000 g/L (since 1 mL = 1 cm^3, and 1 L = 1000 mL)
- For glycerine: Density = 625 g / 500 mL = 1.25 g/mL = 1250 g/L
  Glycerine is denser than water by (1250 /1000) = 1. 25 times.

7. Steps to find the volume of a stone:
   Step 1: Fill a graduated cylinder partially with water, note the initial water level (V1), then immerse the stone in the water. The water level will rise, and you can note the final water level (V2).
   Step 2: Calculate the volume of the stone using the water displacement method: Volume = V2 - V1.
8. Speed is a measure of how fast an object is moving. It is defined as movement of a body with respect to time. For example, if a car travels 100 kilometers in 2 hours, the speed of the car can be calculated as:
   Speed = Distance / Time
   Speed = 100 km / 2 hours
   Speed = 50 km/h (kilometers per hour)
   So, the car is moving at a speed of 50 kilometers per hour.
9. To determine who ran faster in a 100 m race, we can compare the time it took for each runner to complete the race. The runner with the shorter time is the faster one. For example, if I, completed the race in 10 seconds, and my friend completed it in 12 seconds, I, ran faster because you finished the race in less time.

G. Application based questions

- If there is no measuring beaker, we can measure the volume of a small rectangular piece of marble by measuring its dimensions using a measuring scale. We can then use a suitable mathematical formula to calculate the volume.

1. When using grid paper for estimating the area of an irregular shape, using paper with smaller grids is more accurate because it provides finer divisions for counting squares. Smaller grids allow to estimate fractional squares more precisely, resulting in a more accurate measurement of the irregular shape's area. This is especially useful when the shape is complex, as it reduces the risk of underestimating or overestimating the area.
2. We use the formula
   Average speed = Total Distance travelled / Total time of travel
   So 100 km was covered while going in 4 hours. On return 100 km was covered in 2 hrs.

So 200 km / 6 hr

Average speed = 33.34 km/hr

3. It is clear from the image that for the particular mass (of iron weights) the volume of potato is much more. Hence, potato has less density than iron.

VALUES AND LIFE SKILLS

1. Attempt yourself
2. Attempt yourself

STEM Project

1. Attempt yourself
2. Attempt yourself

Image based questions

1. To know the speed of the train we must know the time taken for a particular distance travelled.
2. We can lift the containers one by one (without opening). The lighter container will have cotton and the heavier container has sand.

Experiential learning questions

1. (d) Submission
2. The scientific process is applicable in both simple and complex/difficult experiments.

Multi-disciplinary questions

1. People may experience breathing difficulty at hill stations due to the lower density of air at higher altitudes. The air is thinner, containing less oxygen molecules per unit volume making it harder for individuals to inhale an adequate amount of oxygen with each breath.
2. While blood cells, especially red blood cells (RBCs), are denser than plasma, they are still able to move around in our arteries and veins due to the force provided by the pumping action of the heart. The flow of blood and the pressure generated by the heart help propel the blood cells through the circulatory system.

Our Culture

- Attempt yourself

Play and Learn

Attempt yourself

Chapter-2 Motion

Quiz Zone (Page 28)

1. True
2. True (It depends on the points of references available) such as People travelling in a car are in motion with respect to the electric pole on the road. However, the people in the car are at rest relative to each other.
3. False. A ball rolling on the floor has both translatory and rotational motion.
4. False. A falling parachute is an example of random motion, which is not periodic motion. Periodic motion involves repetitive and predictable patterns.
5. True. It is translatory motion along a curved path. Various parts of the Earth travel same distance.

A. MCQs

1. (c) The body should change its position with respect to a stationary object in a span of time.
2. (d) Periodic motion

3. (a) Has all the points of the body moving the same distance along the same path, in the same time.

4. (d) Circulatory and translatory

5. (b) 10.4

6. (b) Rectilinear motion

7. (d) Mass of a body is constant but its weight is not.

8. (c) 66.6 km/hr

B. State True or False and correct the false statements giving reasons.

1. True

2. False. If a ball is falling from a height, it will not fall with a uniform speed; it will accelerate due to gravity.
3. False. Speed = Distance covered/ Time taken
4. True

5. False. In top sporting events, precise time measurement is crucial, so specialized timing equipment like stopwatches or electronic timers, not wristwatches, are used.
6. True
7. True.
8. False. Weight depends on the gravitational pull and can vary, while mass is a constant property of an object.
9. True
10. True

C. Match the column

1. Uniform speed (b) Equal distance covered in equal span of time

2. Unit of mass (d) Kilogram

3. Pendulum (e) To-and-fro motion

4. Rotatory motion (a) Movement of fan

5. Random motion (c) Movement of a footballer

D. Fill in the blanks

1. rotatory
2. oscillatory motion
3. random
4. curvilinear
5. random
6. periodic motion
7. oscillatory
8. rotational motion
9. downward

E. Short answer type questions

1. Two examples of uniform motion are a car moving at a constant speed along a straight road covering equal distances in equal time intervals.
Movement of the fan blades, the motion of the Earth around the Sun, the motion of the pendulum with equivalent amplitude etc.

2. Speed is calculated using the formula: Speed = Distance/Time. In this case, Speed = 240 km / 4 hours = 60 km/h.

3. Time = Distance/Speed. So, Time = 324 km / 18 km/h = 18 hours.

4. Periodic motion is a motion that repeats itself at regular intervals of time. Examples include the motion of a swinging pendulum or the vibrations of a guitar string.

5. The SI units are:

- Speed: meters per second (m/s)
- Mass: kilogram (kg)
- Weight: newton (N)

6. No, mass and weight are not synonymous. Mass is the amount of matter in an object and is constant everywhere, while weight is the force exerted on an object due to gravity and can vary depending on the gravitational field.
7. A body is considered at rest when its position remains constant with respect to a reference point with the passage of time.
8. Average speed is calculated by dividing the total distance traveled by the total time taken.
9. The pedals of a bicycle have circular motion as they rotate around the axis of the pedal crank. This motion is a combination of translatory and rotational motion.

F. Long answer type questions

1.

Motion	Rest
It is the change in position of an object with respect to its surroundings over time.	It is a state where an object remains stationary or does not change its position with respect to its surroundings with the passage of time.

2.

- Translatory motion: Example - A car moving on a straight road.
- Rotatory motion: Example - The Earth rotating on its axis.
- Oscillatory motion: Example - The pendulum of a clock swinging back and forth.
- Rotatory – translatory motion - Movement of drill machine.
- Circular motion - Cyclist on a circular path in an auditorium.
- Periodic motion -movement of pendulum.
- Non-periodic motion - Runner in a race.
- Random motion - Flight of a bird

3.

Periodic motion	Non-periodic motion
It repeats itself at regular intervals of time. Example - Motion of a swinging pendulum.	It does not follow a regular pattern or repeat at fixed intervals. Example Runner in a race who covers unequal distance in same time interval. A falling parachute also covers different distances in equal time interval.

4.

- **Two instruments**: Guitar and Violin.
- **Vibration**: It is a rapid back-and-forth movement of plucked string around their equilibrium position. In musical instruments, the vibration of strings produces sound waves, in air creating music.

5.

Translatory motion	Rotatory motion
Translatory motion involves straight-line movement from one point to another, like a car moving on a road. In translatory motion all the points of the body move through the same distance along the same path, in the same time.	Rotatory motion involves spinning or rotating around an axis, like the Earth rotating on its axis. Rotatory motion means motion around a fixed axis and is defined by torque (rotation causing force). When the blades of a fan move all the points do not move along the same path, however all the points move around a fixed center or the axis of rotation. In rotatory motion different parts of the object cover different distances in the same span of time. Points away from the axis cover larger distances.

6. One can improve average speed by minimizing the time taken for stops or increasing the speed during motion. For example, reducing the time spent at traffic signals or maintaining a higher constant speed on highways.

7.

Uniform motion	Non-uniform motion
The object covers equal distances in equal intervals of time. Example - a car moving with a constant speed.	The object covers unequal distances in equal intervals of time or vice versa. Example - a car accelerating or decelerating.

8. A carpenter's drill involves both rotatory and translatory motions. The drill bit rotates (rotatory motion) while moving up and down (translatory motion), allowing it to penetrate materials.
9.

Mass	weight
1. Mass is a measure of the amount of matter in an object.	1. Weight is the force exerted on an object due to gravity.
2. It is measured by a beam balance It does not vary from place to place. Mass cannot be zero.	2. It is measured by a spring balance It can vary from place to place. Weight can be zero when gravitational force is zero.
3. Mass is measured in kilograms	3. Weight is measured in newtons.

10. To find the total distance covered by the car, you can use the formula:
Total Distance = (Speed1 * Time1) + (Speed2 * Time2)

Total Distance = (60 km/h * 10 min) + (50 km/h * 20 min)

Convert time to hours: 10 min = 1/6 hr, 20 min = 1/3 hr

Total Distance = (60 km/h * 1/6 hr) + (50 km/h * 1/3 hr)

Total Distance = 10 km + 16.67 km

Total Distance = 26.67 km

G. Application based questions

1. The motion of a drill machine is special because it involves both rotational and translational motion. As the drill rotates, it also moves forward into the material being drilled. This combined motion allows the drill to efficiently penetrate and create holes in various surfaces. We call it Rotatory translatory motion.

2. To find the average speed of the car, use the formula: Average Speed = Total Distance / Total Time

Total Distance = 20 km + 30 km = 50 km

Total Time = 1 hour + 4 hours = 5 hours

Average Speed = 50 km / 5 hours = 10 km/h

3. **Different kinds of motion observed on a football ground include:**

a. Translatory Motion: Players running across the field.

b. Rotatory Motion: The ball spinning when kicked or thrown.

c. Oscillatory Motion: Goalkeeper's arm movement while trying to save a goal.

d. Random Motion: Movement of the ball in the field.

Experiential learning questions

1. (b) Accuracy
2. Quartz clocks operate based on the piezoelectric property of quartz crystals. When an electric current is applied to a quartz crystal, it vibrates at a precise frequency. The vibrations are then used to drive the clock mechanism. The stable and consistent oscillations of the quartz crystal contribute to the accuracy of quartz clocks compared to mechanical ones.

Multi-disciplinary questions

1. The factor that makes planetary movements translatory is the gravitational force exerted by the Sun. Planets orbit the sun in curved paths due to the gravitational pull, creating a translatory motion as they move through space. Each part of the planet moves through the same distance.

2. The motion of a bullet changes from rectilinear to curvilinear after a few seconds because of the force of gravity acting on it. Initially, the bullet follows a straight path due to the force applied by the gun. However, as the bullet rises and begins to fall under the influence of gravity, its trajectory becomes curved, resulting in curvilinear motion.

Find the odd option giving reasons

1. **Odd Option**: Rotating fan
   Reason: Not translatory motion
2. **Odd Option**: Movement of pendulum.
   Reason: Only option showing oscillatory motion.
3. **Odd Option**: Pendulum
   Reason: The pendulum oscillates back and forth, exhibiting a regular, repetitive motion, while the other options involve more varied or continuous movements.
4. **Odd Option**: Movement of a car.
   Reason: All other options are periodic motion.

VALUES AND LIFE SKILLS

1. Attempt yourself
2. Attempt yourself

STEM Project

1. Attempt yourself
2. Attempt yourself

Image based questions

1. a) Rotation of the Earth on its axis is rotatory motion.
   b) Revolution of the Earth around the Sun is a circular motion.
   Both these motions are period as well.
2. When two vehicles cross each other (for example on the highway) their relative speed adds up. Hence they appear to cross each other at high speed.

Our Culture

a) Other Jantar Mantar Locations in India:
The Jantar Mantar is an astronomical observatory, and there are five major Jantar Mantars in India. They are located in Delhi, Jaipur, Ujjain, Mathura (destroyed), and Varanasi. Each serves as a historical astronomical site.

b) **Location of the Largest Jantar Mantar:**
The largest Jantar Mantar is located in Jaipur, Rajasthan. This observatory, known as the Jantar Mantar, Jaipur, is a UNESCO World Heritage Site and is renowned for its precision and architectural brilliance.

Play and Learn

Answer yourself. Focus on inertia (of motion) for the liquid inside the unboiled egg.

Chapter-3 Energy

Quiz Zone (Page 45)

1. True
2. False. Work is done when a force is applied to an object, and it results in displacement in the direction of the force. Energy can be spent without doing work, such as holding a heavy object while standing at a place.
3. False. The unit of energy is the joule (J), not newton. Newton is the unit of force.
4. True
5. True

A. MCQs

1. (c) Chemical energy
2. (b) Potential energy
3. (b) Force multiplied by distance moved by the point of application of the force in the direction of the force.
4. (a) Body on the taller building.
5. (b) Muscular energy
6. (c) Kinetic energy of water
7. (b) At the highest point, the ball has maximum potential energy.

B. State True or False for the following and correct the false statements giving reasons.

1. False. For work to be done the point of application of the force should show movement in the direction of the force.
2. True
3. True
4. True
5. False. One calorie is equivalent to approximately 4.184 joules, so the statement is false. The joule is a smaller unit than a calorie.
6. True

C. Match the column

1. Potential energy - (d) Mass × height
2. Kinetic energy - (c) Mass × speed
3. Conservation of energy - (a) Energy cannot be destroyed
4. Food - (e) Chemical energy
5. Photosynthesis - (b) Light energy to chemical energy

D. Fill in the blanks

1. force
2. Joule
3. hydropower
4. chemical energy
5. Chemical
6. elastic

E. Short answer type questions

1. Energy is the ability to do work. Energy primarily exist as either kinetic energy or potential energy. Examples are chemical energy, light energy, heat energy, electrical energy etc. One form of energy can be converted to another form of energy without any loss (of energy).

2. Taking food provides the body with nutrients, primarily carbohydrates, which are converted into energy through metabolic processes. This energy is then used during physical exercise to perform work.

3. Muscular energy is demonstrated when a person lifts a heavy object or performs any physical activity requiring the use of muscles.

4. Sound energy is produced when an object vibrates, creating compressions and rarefactions in the surrounding air. These vibrations are detected by our ears and interpreted as sound.

5. In photosynthesis, plants convert light energy into chemical energy (in the form of glucose) by using carbon dioxide and water. The process of photosynthesis happens in the presence of sunlight and the green pigment chlorophyll.

6. A calorie is a unit of energy. It is defined as the amount of heat energy required to raise the temperature of one gram of water by one degree Celsius. In the context of nutrition, the term "Calorie" (with a capital "C") is often used to represent kilocalories (1000 calories), which is a unit commonly used to measure the energy content of food.

F. Long answer type questions

1. Work and energy are both measured in the same unit that is Joule (J).

Joule (J) is used as standard International System of Units of energy.
1 Megajoule (MJ) is equal to one million Joules.

One calorie is equal to 4.184 joules.

2. Kinetic energy is the energy a body has because of its motion. A moving bullet has a lot of kinetic energy. A moving hammer is also an example of kinetic energy. A moving hammer is able to do its work by overcoming the opposing forces when it strikes something, such as a nail.

Kinetic energy depends on

a) Mass of the body

b) Speed at which the body is moving

3. Water falling from a height can be used to generate electrical energy through hydropower. As water falls, its gravitational potential energy is converted into kinetic energy. This kinetic energy is then used to turn the blades of a turbine. The rotating turbine, in turn, drives a generator, converting the mechanical energy into electrical energy.

4. The unit of work and energy is the joule. This is because work is defined as the transfer of energy when a force is applied over a distance. When work is done on an object, energy is transferred to or from the object, and both are measured in joules.

5. The law of conservation of energy states that the total energy of an isolated system remains constant over time. Energy can neither be created nor destroyed, only transferred or converted between different forms. An example is a swinging pendulum. At the highest point, potential energy is at its maximum, and as it swings down, potential energy is converted into kinetic energy. At any point, the total energy (potential + kinetic) remains constant in the absence of external forces like air resistance.

6. In an oscillating pendulum, energy transfers between potential and kinetic forms. As the pendulum is displaced from its equilibrium position and released, potential energy is converted into kinetic energy as it swings. At the highest point, all energy is potential, and at the lowest point, it is all kinetic. The process repeats, and in an ideal system with no energy losses, the total mechanical energy (potential + kinetic) remains constant.

G. Application based questions

1. The burning of a candle involves multiple energy transformations. The chemical energy of wax is converted into thermal energy (heat) and light energy. The process is essentially a chemical reaction (combustion) where the wax reacts with oxygen to produce carbon dioxide and water vapor, releasing energy in the form of heat and light.

2. A body gains potential energy when it is lifted against the force of gravity. The potential energy is directly proportional to the height to which the body is lifted. For example, lifting a book from the ground to a shelf increases its potential energy. The work done against gravity in lifting the book is stored as potential energy, which can be released if the book is allowed to fall.

3. The principle that energy cannot be created or destroyed is a statement of the conservation of energy. In power plants, energy is not created but rather converted from one form to another. For example, in a coal-fired power plant, the chemical energy stored in coal is converted into thermal energy through combustion. This thermal energy is used to heat water, producing steam. The steam then drives turbines, converting thermal energy into mechanical energy. Finally, generators convert this mechanical energy into electrical energy. While the total energy in the system remains constant, the form of energy changes throughout the process.

Image based questions

1. Simple machines make the application of effort -which is an application of energy more convenient and /or more efficient. The figure shows application of energy to move a very heavy load with the help of a lever.
2. The energy is stored in spring is in the form of potential energy. This energy can be utilized when we release the spring. Potential energy is stored in springs when it is stretched or compressed.
3. At the top the hammer -head has a lot of potential energy. As it begins its movement potential energy begins to be converted to kinetic energy. All the potential energy gets converted to kinetic energy when the hammer head hits the nail.

Experiential learning questions

1. Hot water springs are formed due to the thermal energy of molten rocks inside the Earth. The heat generated by certain radioactive elements deep within the Earth contributes to the temperature of these rocks. As a result, the nuclear energy from these radioactive elements is converted into thermal energy, warming the water and causing it to emerge as hot springs.
2. The statement that is not true about volcanic activity on Earth is:
   (b) Excess heat from sunlight helps in volcanic activity.
   Explanation: Volcanic activity is primarily a result of the heat and pressure generated by molten rocks beneath the Earth's surface. It is not directly related to excess heat from sunlight.

Multi-disciplinary questions

1. During convalescence, the body is still under stress and depletion of energy reserves due to illness. During convalescence the metabolic activity in the body is yet to become normal, hence rest and gradual progression to normal activities is suggested by the doctors. During this period the person is still under some medication and simple easy to digest food is advised. Gradual re-introduction of physical activity, as advised by healthcare professionals, can also help in rebuilding energy levels.
2. Green Hydrogen and Solar energy are promising alternatives to traditional carbon-based energy sources. Green Hydrogen is produced using renewable energy sources like wind or solar power to electrolyze water, yielding hydrogen without carbon emissions. Solar energy harnesses the power of the sun through photovoltaic cells. Both these sources are sustainable, with the potential to reduce carbon footprint and dependency

on finite fossil fuels. However, their widespread adoption requires addressing challenges like storage and efficiency. Continued research and development in these areas are crucial for a cleaner and sustainable energy future.

STEM Project

Do it yourself under guidance.

Values and Life Skills

Do it yourself after discussion.

Our Culture

The use of fireworks in celebrations is deeply ingrained in many cultures and traditions. While fireworks can be visually spectacular and add to the festive atmosphere, there are important considerations and concerns associated with their usage.

1. **Environmental Impact:**

- Fireworks release pollutants and contribute to air and noise pollution. The chemicals used in fireworks can have harmful effects on air quality, especially for individuals with respiratory issues. The noise generated by fireworks can disturb wildlife and pets.

2. **Safety Concerns:**

- Fireworks can pose safety risks, leading to accidents, injuries, and even fires. Improper handling or malfunctioning fireworks can result in serious consequences.

3. **Economic Perspective:**

- The significant expenditure on fireworks, as highlighted in the statistics for the USA and India, raises questions about the allocation of resources.

Play and Learn

When you release the balls without applying extra force, the initial potential energy they have at shoulder height is converted into kinetic energy as they fall. However, as they hit the ground, some of this energy is transferred to the ground in the form of sound and heat, and some is used to deform the ball slightly upon impact.

Since not all the initial potential energy is converted back into kinetic energy for the upward bounce, the balls don't reach the same height from which they were initially released. This loss of energy during the collision with the ground

is a result of various factors, including the elasticity of the ball and the dissipation of energy as heat and sound.

Chapter-4 Light Energy

Quiz Zone (Page 57)

1. False. Shiny surfaces typically reflect more light than they absorb, which is why they appear shiny. They do not absorb more light.
2. False. The images formed by plane mirrors are of the same size, but they are formed at an equal distance behind the mirror as the object is in front of it.
3. True
4. False. Light can be reflected by a set of plane mirrors multiple times. Each reflection produces a new image.
5. True
6. 7 m.

A. MCQs

1. (d) Light moves around the object
2. (c) Direction
3. (b)Of the same size
4. (b) It reflects light of green colour only
5. (a) The angle of reflection
6. (d) The image can be projected on a screen.
7. (c) White
8. (b) Light from the object reaches our eyes
9. (c) Used as a reflector in street lights
10. (c) The reflection from the screen is diffuse reflection.

B. Match the column

1. Colors of the rainbow: (a) VIBGYOR
2. Plane mirror: (d) Upright image
3. Red rose: (e) Reflects only red light
4. Primary colors: (b) Red, Green, Blue
5. Incident angle equals: (c) Angle of reflection

C. State True or False for the following and correct the false statements giving reasons

1. True
2. False. The image formed by a plane mirror is not inverted; it is upright.
3. False. Green leaves appear green because they reflect green light and absorb other colors.
4. True
5. False. Translucent glass allows some light to pass through but is not suitable for use as a mirror, which requires a highly reflective surface.
6. True
7. False. The color of an opaque object is decided by the colors of light it reflects, not the colors of light falling on it.
8. False. Reflected light can be reflected again. Multiple reflections can occur.
9. False. For a point object, the image formed by a plane mirror is of the same size as the object.
10. True

D. Fill in the blanks

1. reflection
2. lateral inversion
3. smooth and polished
4. the reflected ray and the normal
5. intersect or converge
6. they absorb most of the light and reflect very little.
7. the point of incidence
8. very little light
9. in equal proportion
10. dark or black

E. Short answer type questions

1. Reflection of light is the process where light rays strike a surface and bounce back to the same medium.
2. Objects appear bright and shiny because they reflect a significant amount of incident light due to their smooth and polished surfaces.

3. Even though a black object absorbs most of the light, we can still see it because some light may be reflected or scattered, making the object visible.
4. Mirrors form proper images because they have smooth and highly polished surfaces that allow for regular reflection, maintaining the coherence of the reflected rays. Polished rough surfaces scatter light in various directions, preventing the formation of a clear image.
5. In a ray diagram, "Normal" is an imaginary line perpendicular to the surface at the point where the incident ray strikes the surface.
6. While transparent objects allow light to pass through them, some light is reflected from their surface, so as to make it visible.
7. Three characteristics of images formed by a plane mirror are:

- The image is upright.
- The image is of the same size as the object.
- The image is located behind the mirror.

8. Water in a water body also acts as a plane mirror. The image formed is often called water image. These images are formed by inverting an object vertically i.e. upside down. The water image is like the mirror image as if the mirror is put horizontally at the bottom of the figure.
9. The colors of the rainbow are Violet, Indigo, Blue, Green, Yellow, Orange, and Red (acronym: VIBGYOR).
10. The primary colors of subtractive mixing are Cyan, Magenta, and Yellow.

F. Long answer type questions

1. Draw yourself
2. **Laws of Reflection:**

- The incident ray, the reflected ray, and the normal to the surface at the point of incidence all lie in the same plane.
- The angle of incidence is equal to the angle of reflection.

3. Various Uses of Plane Mirrors:

- Personal grooming (e.g., mirrors in bathrooms)
- Periscopes
- Rear-view mirrors in vehicles
- Opticians with smaller clinics use plane mirror to double the distance of viewing
- Kaleidoscopes

4. **Cinema Screens Not Made of Polished Surfaces:**
   Cinema screens are not made of polished surfaces because the images have

to be see by all the audience for which we need diffused reflection. If the screen is made of a polished surface the images will be seen from just one seat.

5. **Ceilings of Rooms Usually Painted White:**
   White ceilings reflect much more light than if it was coloured, this provides better illumination in the room. This helps in distributing light effectively, reducing shadows, and making the room appear brighter.
6. **How We See the Color of an Object:**
   We see the color of an object because it reflects those colour and absorb the other colours. Thus green leaves are green because they reflect green colour and absorb other colours.
7. When the object moves towards the mirror the image also moves closer to the mirror. When the object moves laterally to the left the image also moves in the same direction.
   (Create an image yourself)
8. Conditions for the Formation of a Rainbow:

- Presence of water droplets in the atmosphere
- Sunlight shining from behind the observer
- Observer facing away from the Sun
- The Sun should be lower in the horizon

9. Primary Colors for Mixing:

- Red, Blue, and Green
- Mixing pairs:
- Red + Green = Yellow
- Red + Blue = Magenta
- Blue + Green = Cyan
- Red + Blue + Green = White

10. When there is bright sunshine after rains; one should look at an angle of about 42 degree over the ground, in the direction opposite to the Sun. Lower the sun higher the rainbow in the sky. That is why rainbows rarely happen when the Sun is high in the sky. In the afternoon or morning, the sun is lower in the sky, creating a larger arc of sunlight and increasing the chances of seeing a rainbow.

G. Application based questions

1. The speed at which the image of the tree appears to approach the car in the rear-view mirror is twice the speed of the car. This is because the image in a plane mirror appears to be at the same distance behind the mirror as the

actual object is in front of it. Therefore, when the car is moving backward, the image in the rear-view mirror seems to approach at double the speed of the car.

2. The kind of reflection that enables all the people in a theatre to watch a movie is diffuse reflection. In diffuse reflection, light is scattered in different directions when it strikes a rough or irregular surface. This type of reflection ensures that the light from the movie screen is scattered in various directions, allowing people in different seats and angles to see the reflected light and hence, the movie.
3. Soldiers wear dull, dark clothing and put paint on their faces for camouflage purposes. Dull and dark colors reduce the reflection of light. It makes them less visible in various terrains and environments.

Multi-disciplinary questions

1. **Driving in Rain with Worn-out Tires:**

- Worn-out tires have reduced tread depth, which significantly impairs their ability to maintain traction on wet surfaces.
- The tread on tires is designed to channel water away from the contact patch, preventing hydroplaning. Worn-out tires are less effective in doing so, increasing the risk of hydroplaning during rain.
- Hydroplaning occurs when a layer of water builds up between the tires and the road surface, leading to loss of traction and control. Proper tire tread helps to disperse water and maintain contact with the road.

2. **Sunburn on a Sea Beach:**

- The sea provides a large reflecting surface to sunlight due to the water's smooth and reflective nature.
- Sunburn occurs when the skin is exposed to excessive ultraviolet (UV) radiation from the sun. The sea reflects sunlight, increasing the overall UV exposure on the beach.
- Sand on the beach also reflects and intensifies sunlight. Hence, people on a sea beach receive direct sunlight from above and reflected sunlight from the water and sand, making them more susceptible to sunburn.
- It's crucial to take precautions such as using sunscreen, wearing protective clothing, and seeking shade to reduce the risk of sunburn in such environments with high UV exposure.

Experiential learning questions

1. The water image produced from still water is quite real. (Imagine the situation of the dog and answer the question).

2. The Earth appears much bright on the Moon than the Moon appears on the Earth. This is because the Moon lacks a large reflecting surface of the ocean. (Do your research to find the difference in reflectivity of the Moon and the Earth).

STEM Project

1. **Kaleidoscope**
   Materials:

- Three clean glass slides
- Cardboard
- Sticking tapes
- Bits of broken bangles or any colorful, reflective objects
- Scissors
- Glue

Procedure:

- Cut the cardboard into a rectangular shape, ensuring it's long enough to form a cylinder.
- Attach the glass slides to one end of the cardboard, leaving the other end open.
- Arrange the bits of broken bangles or other reflective objects inside the cardboard, between the glass slides.
- Roll the cardboard into a cylinder and secure it with sticking tape to maintain its shape.
- Ensure that the reflective objects are spread out inside the cylinder.
- Seal the open end of the cardboard cylinder.
- Hold the kaleidoscope up to a light source and rotate it to observe the colorful and symmetrical patterns created by the reflections within.

Explanation:

The functioning of a kaleidoscope is based on the principles of reflection and symmetry. The broken bangles or reflective objects inside the kaleidoscope reflect light in multiple directions when the kaleidoscope is rotated. The arrangement of mirrors (glass slides in this case) inside the cylinder creates symmetrical patterns by reflecting the light in various angles. As the cylinder is rotated, the patterns continuously change, creating a visually appealing and dynamic display.

2. **Periscope**
   Materials:

- Cardboard box
- Two small mirrors
- Utility knife or scissors
- Ruler
- Pencil
- Glue
- Duct tape

Procedure:

- Cut two rectangular holes in the sides of the cardboard box, ensuring they are of equal size and directly across from each other.
- Measure and mark the center of the top inside surface of the box.
- Using the utility knife or scissors, cut a rectangular hole on the top of the box, centered on the mark.
- Glue one mirror inside each of the side holes, angled at 45 degrees, facing each other.
- Close the box and secure the mirrors in place with duct tape.
- Look through the opening on the top of the box, and observe how the periscope allows you to see around corners or obstacles.

Explanation:

A periscope uses mirrors to reflect light and allow the viewer to see objects that are out of direct line of sight. The angled mirrors inside the cardboard box reflect the light coming from one direction to another, effectively enabling the viewer to see around obstacles. This concept is commonly used in submarines and other situations where direct vision is obstructed.

Find the odd option giving reasons

1. Inverted - image characteristic not formed by plane mirror.

2. Yellow --Not a primary colour

3. 'P" - only "P" i forms laterally inverted image

4. Rainbow - It is not formed by reflection

VALUES AND LIFE SKILLS

1. The following are the suggested driving precautions ;
   a) Venture out only if necessary
   b) Keep the windscreen clean
   c) Put headlights on low-beam and drive slowly

2. In everyones life there are good and bad days. What is important is that even on bad days we should try to focus on positives and keep our spirits high. This helps us to bounce-back and proceed towards better results.

Image based questions

1. When seen in the rearview mirror the letters get laterally inverted and AMBULANCE can be clearly read.
2. The egg appears black because it absorbs light of all the colours. The next egg appears red because this egg absorbs light of all the colours except red. The egg appears red because only red light reaches the eye.
3. The small mirror is being used by a dentist to check the inner part of the gums and teeth.

Our Culture

1. **Solar Eclipse and Cultural Significance:**

- In many cultures, a solar eclipse is considered inauspicious due to traditional beliefs and superstitions.
- However, the prohibition against looking directly at the Sun during a solar eclipse is not solely based on cultural beliefs. It is primarily for the protection of the eyes.

2. **Konark Dance Festival:**

- The Konark Dance Festival is an annual event held in December at the Konark Sun Temple, a UNESCO World Heritage site in Odisha, India.
- This festival celebrates various classical dance forms of India, including Odissi, Bharatanatyam, Kathak, and others.
- Renowned dancers and dance troupes from across the country gather at the Konark Sun Temple to showcase the rich cultural heritage of Indian classical dance.

Play and Learn

As depicted in the image, fluorescent ink reflect more light than normal ink. Hence such posters are much more bright.

Chapter-5 Heat

Quiz Zone (Page 86)

1. False. Metals are mostly good conductors, they however, do not support convection currents in them in the solid state. Liquids on the other hand are poor conductors of heat (except mercury).

2. False. When we hammer a metal, it flattens due to mechanical deformation, not because of heat. The property is called malleability.
3. True
4. False. Wearing dark-colored clothes in winter is beneficial. Dark colors absorb more sunlight and heat than light colors. Therefore, dark-colored clothes can help retain more heat, keeping the body warmer in cold weather.
5. True

A. MCQs

1. (c) Always from hot to cold body
2. (b) calorie
3. (c) It is zero in any scale
4. (c) Expansion of substances
5. (b) Convection in nature
6. (d) All the three modes of heat transfer
7. (d) Water and Air
8. (a) Conductors
9. (a) Radiation
10. (c) When there is no heat transfer

B. State True or False for the following and correct the false statements giving reasons

1. False. Heat is a form of energy, but it is not visible (neither is light). We can feel its effects, but it is not something we can see.
2. False. The weight of an object does not change with its temperature. Weight is a measure of the gravitational force acting on an object, and it is independent of temperature.
3. True
4. True
5. False. Sweating is a cooling mechanism. When sweat evaporates from the skin, it absorbs heat from the body, leading to a cooling effect. Therefore, body temperature tends to decrease when sweating.
6. False. In melting, solid substances convert to a liquid, not a gas. Melting occurs when the temperature of a solid is raised to its melting point.
7. True
8. False. Convection of heat requires a medium, usually a fluid (liquid or gas), through which heat is transferred by the movement of the fluid.
9. False. The handles of heating pans are made of insulators.
10. True

C. Fill in the blanks

1. poor, air pockets
2. particles
3. evaporation
4. liquid water
5. mercury
6. radiation
7. fluids
8. layers
9. Land
10. direct sunlight

D. Match the column

1. Sea breeze - (c) Day time
2. Temperature - (d) Kelvin
3. Dark surfaces - (b) Good absorbers of heat
4. Freezing point of water - (e) 273 K
5. Metals - (a) Good conductors of heat

E. Short answer type questions

1. The boiling point of water, 100°C, is equivalent to 212°F on the Fahrenheit scale and 373 K on the Kelvin scale.
2. Cooking utensils must be made of both conducting and insulating material to efficiently transfer heat to the food for cooking in the pan. For easy handling the handle of the pan should be made of insulating material so that hands don't burn while cooking.
3. Deposition is the process where a gas transforms directly into a solid without passing through the liquid phase. Evaporation is the transformation of a liquid into a gas, usually at temperatures below its boiling point.
4. Parallax error is the apparent shift in the position of an object when viewed from different angles, often occurring when taking measurements through instruments like rulers or scales.
5. Evaporation is the transformation of a liquid into a gas, occurring at the liquid's surface, even below its boiling point. Boiling, on the other hand, is the rapid conversion of a liquid into a gas throughout the entire substance, typically at its boiling point.

6. When water in a test tube is heated in the middle, the convection currents rise upwards from the point where heat is applied. Because convection currents are not formed below the point of heat; the water below does not get heated.
7. Radiation from a room heater occurs when the heater emits radiation. We know that in radiation heat transfer takes place as waves and packets of thermal energy called photons from a heat source. Heat transfer occurs when photons are met with an obstacle. The path of movement of photons does not get heated.
8. Two effects of heat on liquids are expansion (increase in volume with temperature rise) and change of state (liquids can turn into gases or solids depending on rise or fall in temperature.
9. Black painted car radiators are helpful as black surfaces are better radiators of heat, facilitating efficient heat transfer from the radiator to the surrounding air.
10. Clean white snow melts slowly because it reflects a significant portion of the incoming sunlight, reducing the absorption of heat and thus slowing down the melting process.

F. Long answer type questions

1. When water is heated in a pan, its temperature rises through the process of convection. The heat energy is transferred from the heat source to the particles at the bottom of the pan. These particles gain kinetic energy, causing them to move upwards. The cooler water molecules from the top move down to take the place of warmer water molecules. Thus a convection current is established. This process continues leading to a rise in temperature.
2. Liquefaction involves the conversion of a substance from a gas to a liquid state or solid to liquid state. Change of state from solid to liquid happens by the process of melting and change of state from gaseous state to liquid state happens by the process of condensation.

   Melting: It is the change of state in which a solid substance changes to its liquid form upon absorbing heat energy. This is known as fusion. The change of state from solid to liquid happens at a particular temperature called the melting point.

Condensation – It is a change of state in which substances change from the gaseous state to liquid state. It happens because of loss of heat or cooling.

3. The Celsius and Kelvin scales are connected by the following relationship: Kelvin temperature (K) = Celsius temperature (°C) + 273.15. The Kelvin scale is an absolute temperature scale starting from 0 K, which corresponds to -273.15°C.
4. Roofs of factory sheds are not painted in black because black surfaces are good absorbers of heat. In sunny conditions, black roofs would absorb a significant amount of heat, leading to increased temperatures inside the factory. To reduce heat absorption and maintain a cooler environment, roofs are often painted in lighter colors with higher reflectivity.
5. Good conductors of heat can be distinguished from bad conductors based on their ability to transfer heat efficiently. Metals, such as copper and aluminum, are good conductors, while materials like wood and rubber are bad conductors.
6. Conduction is the transfer of heat through direct contact between particles. For example, when one end of a metal rod is heated, the heat is conducted through the rod, causing the other end to become warm. In metals conduction of heat is facilitated by the presence of free electrons. When a metal rod is heated, at one end its free electrons get excited and drift towards the cooler part of the metal where their energy is transferred to the metal atoms at that end. Simultaneously the slow moving (colder) electrons drift in the reverse direction.
7. Change of state involves the conversion of a substance from one physical state to another. For instance, when ice (solid) is heated, it undergoes a change of state and becomes water (liquid) at its melting point. When the change of state is happening the temperature in the system remains constant.
8. Convection involves the transfer of heat through the movement of fluids (liquids or gases). Radiation, on the other hand, is the transfer of heat through radiant waves. Convection requires a medium, while radiation does not. In radiation Heat is transferred from a hotter source to a cooler region without contact or movement of the molecules. It occurs in all hot objects solids, liquids and gases. In convection heat is transferred by movement of

the cooler molecules, to the heat source. It occurs in liquids and gases. Heat transfer by convection is faster than conduction but slower than radiation.

9. Draw a diagram .
   Land breeze happens in coastal areas during the night . At might the lands cools quickly whereas the sea remains relatively warm. Warm air above the sea rises up. Cooler air from above the land rushes towards the sea thus setting up a land breeze.
10. A vacuum flask consists of an inner and outer chamber separated by a vacuum. The inner chamber, where the liquid is stored, is made of reflective material to minimize radiation. The vacuum acts as an insulator, preventing heat transfer through conduction and convection. The outer layer is usually made of reflective material to reduce radiation. The entire construction helps in minimizing heat exchange, keeping the contents hot or cold for an extended period.

G. Application based questions

1. People prefer wooden floors to tiled floors in cold places because wood is a poor conductor of heat compared to tiles. Hence when we touch the cold wooden floor there is very little heat transfer from the body to the wooden floor. On the other hand on touching the cold tiled floor the heat loss from the body to the tiled floor is much more.
2. To get a cool breeze, we should keep the sea-facing windows open during the day. This is because, during the day, the land heats up faster than the sea, creating a temperature difference. Air over the sea is cooler, and when you open the windows, the breeze from the sea (sea breeze) flows towards the warmer land, providing a cooling effect. During the night we should keep the land facing window open to catch the land breeze.
   This is because at night the land cools faster and the warm air above the sea rises up and cooler air from land rushes towards the sea (land breeze).
3. When the body temperature has stabilized at 99°F, it indicates a normal body temperature. My friend can gradually start her normal life, but it's essential to monitor her overall health and follow any specific guidelines or recommendations from healthcare professionals.
4. Air-conditioned passenger coaches in trains have double-walled windows to enhance insulation. The double walls, with air between them, reduce heat transfer as air is a bad conductor of heat. This helps in maintaining a more

stable and comfortable temperature inside the coach, improving energy efficiency and providing better insulation against external temperature fluctuations.

5. a) The ice cream cones can be kept in a double jacketed wooden box. This will prevent heat gain by the ice cream. If wooden box is not available atleast it can be covered by an umbrella to prevent heating by the sunrays.
   b) 1. Radiation

      2. Convection currents

      3. Handle made of insulating material

Multi-disciplinary questions

1. The summer months in India heat up the peninsula, creating low-pressure systems over the land. As the land becomes intensely heated, air rises, creating low pressure. This draws in moisture-laden winds from the Indian Ocean. The convergence of these moist air masses over the heated landmass triggers the onset of the monsoon, bringing heavy rainfall to the region.
2. In hot weather, sweating is crucial for the body's cooling mechanism. When sweating stops, the body loses its primary means of dissipating heat. This can lead to a dangerous rise in body temperature, potentially resulting in heat-related illnesses such as heat exhaustion or heatstroke. In severe cases, the lack of effective cooling through sweating can be life-threatening, causing organ failure and other serious complications.

STEM Project

1. **Homemade Thermos Flask**
   Materials:

- Plastic bottle
- Dry paper bags (2 or 3 layers)
- Insulating material (e.g., foam, cotton, or shredded newspaper)
- Adhesive or tape

Procedure:

- Cut the plastic bottle to the desired size for your thermos flask.

- Wrap the plastic bottle with two or three layers of dry paper bags, ensuring they are tightly secured.
- Place insulating material inside the paper bag layers, surrounding the plastic bottle.
- Seal the open end of the paper bag layers with adhesive or tape to maintain insulation.
- Your homemade thermos flask is ready to use.

  Explanation:

  This DIY thermos flask works based on the principle of reducing heat transfer through conduction, convection, and radiation. The layers of dry paper bags act as insulators, preventing the transfer of heat between the inside and outside of the flask. The insulating material further enhances this effect by minimizing heat exchange. As a result, cold water inside the plastic bottle stays cooler for a longer period.

2. **Homemade Icebox**

   Materials:

- Sheets of cardboard
- Wood dust or any insulating material
- Paper
- Adhesive or tape
- Cutter or scissors

  Procedure:

- Cut the cardboard into appropriate pieces for the icebox (box shape with a lid).
- Create the box structure and secure the edges with adhesive or tape.
- Line the interior walls of the box with insulating material such as wood dust or another suitable material.
- Ensure proper insulation by sealing gaps with paper or additional insulating material.
- Create a lid for the box and secure it tightly to trap cold air inside.
- Your homemade icebox is ready for use.

  Explanation:

  The design of this icebox aims to minimize heat transfer, keeping the interior cool. The insulating material (wood dust) lines the interior walls, reducing heat exchange through conduction. The proper sealing of gaps and the use of a lid prevent warm air from entering and cold air from escaping,

minimizing convection. This design follows the principles of insulation to maintain a lower temperature inside the box, effectively preserving the ice or other contents for an extended period.

VALUES AND LIFE SKILLS

1. In summer months, we should not go out during the day unnecessarily. We should cover our head and other body parts as much as possible. We should also wear shades and carry drinking water. In this context the public drinking water facilities are very useful for the people who have to be outdoors on hot days.
2. In winter months, public bonfires are very useful for the people who have to be out on the street on cold days and nights. It protects them from chilly weather.

   At home if we keep the windows closed, covered with curtains there by creating layers of air and cover the floors with carpets heat loss is reduced thereby retaining warmth in the room. Hence there would be lesser need for running room heaters.

Image based questions

1. By puffing their feathers the birds are able to create a layer of air around their body. It prevents heat loss from their body.

2. Umbrella cuts the Sun's radiant heat, thus protecting the person under the umbrella.

3. This is not steam. The water vapour immediately cools down into very small droplets of water. The same happens to our breath on a very cold day.

4. It will go a little longer distance in winter. This is because the fuel which is a liquid would have contracted a little more (than the metal fuel tank). However, the fuel will have a little more hydrocarbons -than it will have in same volume of expanded fuel in summer.

Experiential learning questions

1. Substances contract upon cooling due to a reduction in temperature, causing the space between them decreases.
2. The heating of the rails can occur due to various reasons such as exposure to sunlight, friction from moving trains, or changes in ambient temperature. The source provided for expansion of the rails is a precautionary measure to prevent bending, ensuring safety and avoiding accidents on the railway tracks.

Our Culture

1. Traditional earthen pots cool water through a process called evaporative cooling. The porous nature of the earthenware allows water to seep through the pot's walls. As this water evaporates on the outer surface of the pot, it absorbs heat from the inner water, causing the water inside the pot to cool down. This natural and effective cooling method has been used for centuries in various cultures.

2. The festival celebrated in North India on 13th/14th April is Baisakhi. Write few sentences about the festival celebrated at your home on this day.

Play and Learn

Attempt yourself

Chapter-6 Sound

Quiz Zone (Page 100)

1. False. Sound is produced during the vibration of a body. It is the result of the oscillation of particles in a medium, creating compressions and rarefactions that travel as sound waves.
2. True
3. False. Sound frequencies above 20,000 Hz are called ultrasonic, not infrasonic. Infrasonic frequencies are below the audible range of human hearing.
4. True
5. True

A. MCQs

1. (c) Sound is produced when an object is made to vibrate.
2. (c) Sound travels in transverse waves in air.
3. (a) increase
4. (b) 10,000 Hz
5. (d) 10 Hz
6. (d) In a small room music is not affected by echo formation.
7. (a) High wall made of concrete
8. (b) They can listen to infrasonic sound

B. State True or False for the following and correct the False statements giving reasons

1. True
2. False. Vocal cords of males are typically longer than those of females. Longer vocal cords generally produce lower-pitched sounds.
3. True
4. False. The lower end of the human audible range of sound is typically around 20 Hz, not 5 Hz.
5. True
6. False. Loudness of sound is primarily influenced by amplitude, not frequency. Frequency affects pitch.
7. False. Sound travels faster in solids than in liquids. The speed of sound is highest in solids, followed by liquids, and then gases.
8. True
9. False. The unit of time period is seconds, not hertz. Hertz is the unit of frequency.
10. True.

C. Match the column

1. Frequency - (d) Hertz
2. Vocal cords - (e) Voice box
3. Soundproofing - (c) Carpet and curtains
4. Echo - (a) Reflected sound waves
5. Loud sound - (b) High amplitude

D. Fill in the blanks

1. higher-pitched
2. vacuum
3. amplitude
4. same
5. ultrasonic
6. higher
7. echo
8. gases
9. hertz (Hz)
10. vacuum

E. Short answer type questions

1. Sound is produced when a vibrating object causes the particles in the surrounding medium (usually air) to oscillate, creating compressions and rarefactions that propagate as waves.

2. Longitudinal waves are waves in which the particles of the medium oscillate parallel to the direction of the wave. Sound waves are examples of longitudinal waves.
3. Sound requires a medium (solid, liquid, or gas) for propagation. In vacuum, there is an absence of particles, and thus, there is no medium for sound waves to travel through.
4. Shorter vibrating bodies have higher frequencies, and according to the pitch-frequency relationship, higher frequencies are perceived as shrill sounds.
5. Sound from our throat is produced when the vocal cords, located in the voice box (larynx), vibrate as air from the lungs is forced over them. The pitch and intensity of the sound are controlled by the tension and length of the vocal cords.
6. In a large bare room, sound waves reflect off hard surfaces, creating echoes and reverberations. This can make speech unclear and interfere with communication.
7. Thunder is the sound produced by the rapid expansion of air heated by a lightning bolt. Since light travels faster than sound, there is a delay between seeing the lightning and hearing the thunder. We hear the thunder few seconds later.
8. Soundproofing a room involves adding materials that absorb, dampen, or block sound. This can include using heavy curtains, carpets, acoustic panels, and insulation to reduce sound transmission.
9. Loudness is the perceptual quality of sound that corresponds to its intensity or amplitude. It is what we perceive as the volume of the sound.
10. Echolocation is a biological sonar system used by some animals, such as bats and dolphins, to navigate and locate objects in their environment by emitting sound waves and interpreting the returning echoes.

F. Long answer type questions

1. **Amplitude**: Amplitude refers to the maximum displacement of particles in a wave from their rest position. A larger amplitude corresponds to a louder sound. For example, a gentle tap on a drum produces a soft sound, while a hard hit produces a louder sound.

- **Frequency**: Frequency is the number of oscillations or vibrations per second and is measured in hertz (Hz). Higher frequency corresponds to a higher pitch. For instance, a guitar string vibrating slowly produces a low-pitched sound, while a faster vibration produces a higher-pitched sound.

2. Sound requires a medium for propagation. In water, particles are present, allowing sound waves to travel by causing vibrations among these particles. In a vacuum, there is an absence of particles, so there is no medium for sound waves to transverse. If we ring a bell inside water container such as an aquarium the bell can be heard at the other end. While ring of a cellphone kept in a jar from which air has been sucked out cannot be heard.
3. When we speak into the toy telephone the air in the cup vibrates. The vibrating air makes the molecules of the string vibrate. At the other end the molecules in the string makes the air in the paper cup vibrate that the other person listens. If we put our ear to a wall, or on a table even a faint knocking can be heard clearly.
4. Observe a distant event, like a lightning strike. The flash of light is seen almost instantly, while the corresponding thunderclap is heard with a noticeable delay. This delay indicates that light travels much faster than sound.
5. Sound requires a medium to propagate, and the Moon lacks an atmosphere to transmit sound waves. Therefore, even a massive explosion on the Moon would produce no audible sound; however, it will be seen because light can travel without a medium.
6. We can do a simple experiment with a thermocol ball tied to a string:

   (i)Strike a tumbler with the spoon gently at the top. The sound produced is mild. Now hold the thermocol ball over it so that the ball touches the outer wall of the tumbler. You will see it will bounce off the tumbler.

   (ii)Now hit the tumbler with the spoon with greater force producing a louder sound. Now hold the thermocol ball again touching the tumbler. This time you will notice that the ball bounces to a much greater distance. The greater displacement of the ball is an indication of greater amplitude of vibration of the tumbler.
   It proves that louder sound is produced when amplitude of vibration is more.
7. Uses of ultrasound are:
   - In medical diagnosis
   - In milk preservation
   - To detect cracks in structures
   - To weld metals and to clean machinery
   - To help seeds germinate quickly

- To find depth in oceans and detect movements of submarines

8. In a small room, the time delay between the original sound and the reflected sound (echo) is very short. This brief delay doesn't significantly affect the quality of the sound, and the human ear perceives it as a single sound.
9. Sound absorbers, like acoustic panels, foam, and carpets, reduce the reflection of sound waves, preventing echoes and reverberations. They find applications in auditoriums, recording studios, and offices to improve acoustics.
10. Echo is utilized in measuring distances, as in sonar technology. Sonar (Sound Navigation and Ranging) uses echoes to determine the depth of the sea, locate underwater objects, and map the ocean floor. Echoes are also employed in navigation and communication systems.

G. Application based questions

1. Sound pollution refers to the excessive, unpleasant, or harmful noise that disrupts the normal acoustic environment. It can result from various sources such as traffic, industrial machinery, loud music, and other human activities, negatively impacting health and well-being.
2. Whispering galleries are typically circular or curved structures that focus sound waves toward a common focal point. When a person whispers near one part of the gallery, the curved surfaces guide and reflect the sound waves, allowing them to travel along the gallery's walls to other distant points, making even faint sounds audible.
3. Sound travels because of vibration of particles in a medium. In the case of a solid body, the particles (atoms or molecules) are closely packed, enabling the transmission of sound waves through their vibrational motion. While light requires a transparent medium for transmission, sound can travel through opaque solids due to the mechanical movement of particles.
4. Sound absorbers are materials designed to reduce the reflection of sound waves, preventing echoes and reverberations. They are often used in large auditoriums to enhance acoustics by absorbing sound so that echo is not formed. This improves the clarity of speech and music, providing a more enjoyable and intelligible auditory experience for the audience. Examples of sound absorbers include acoustic panels, curtains, and materials with high absorbent properties.

   Find the odd option giving reasons

   1. Decibel–It is a measure of loudness, other options do not pertain to loudness.

2. Transverse waves– Other options pertain to longitudinal waves.
3. Monitor Earthquakes- It is a use of infrasonic sound. Other options are uses of ultrasonic sound.
4. Air current– Air current does not affect the speed of sound. Other options affect the speed of sound.

VALUES AND LIFE SKILLS

1. Two sources of noise pollution in my locality are vehicular traffic and construction activities. To address this issue, I would discuss with my friends and neighbors to raise awareness about the impact of noise pollution on health and well-being. We could collectively advocate for the implementation of traffic management measures, such as speed limits and no-horn areas and request construction companies to adhere to specific time limits for noisy activities.
2. Yes, playing a favorite song very loudly can be considered noise pollution if it disturbs others in the vicinity. Noise pollution is subjective and depends on the impact of the sound on individuals and their environment. While enjoying music is a personal choice, it's important to be mindful of the volume to avoid causing discomfort or disturbance to others.

Play and Learn

Do it yourself.

Image based questions

1. Yes, such plantations reduce noise pollution. That is why when we have good plantations between our homes and the road; traffic noise is reduced.

2. Dog whistles produce ultrasonic sound which we humans cannot hear. Their range is usually between 23000 Hz and 54000 Hz.

Experiential learning questions

1. (b) Despite similarities, people have different kinds of voices.
2. The factors that can affect the singing of an artist include:

- Thickness and physical features of the vocal cords.
- Variations in the sound-making apparatus, including physical measurements and sizes and shapes of resonant cavities.
- The learned art of speaking or singing.
- The manipulation of the tongue or lips.
- The extent of control over the process of breathing.

STEM Project

Do it yourself.

Multi-disciplinary questions

1. The part of the ear particularly responsible for maintaining physical balance is the vestibular system. This system is located in the inner ear and includes the semicircular canals. The fluid-filled canals detect changes in the head's position and movement, sending signals to the brain to help maintain balance and coordinate movements.
2. Ears are important sense organs for the animals. Many animals such as rabbits have large external ears which can change direction to catch sound waves. Elephants have large ears which they also use to fan themselves in warm and humid environment.

   Our Culture

   Note on Chanting: Soothing Practices Across Cultures

   Chanting is a universal practice found in various cultures, religions, and spiritual traditions around the world. It involves the rhythmic repetition of words, phrases, or sounds, often accompanied by specific intonations or melodies. This age-old practice holds significant cultural and psychological importance, contributing to a sense of calmness, spirituality, and stress reduction.

Chapter-7 Electricity and Magnetism

Quiz Zone (Page 123)

1. False: Permanent magnets have fixed poles, and like poles repel while opposite poles attract. In electromagnets, also like poles repel and unlike poles attract.
2. True
3. True
4. False: Very high resistivity makes a material an insulator, not a conductor. Resistivity is a property that opposes the flow of electric current, and materials with high resistivity impede the flow of electrons, classifying them as insulators.
5. a) Resistance
   b) Battery
   c) Electric cell

d) Switch
e) Electric bulb

MCQs

1. (c) It comes to rest pointing geographic north and south.
2. (c) There is a magnetic field of the magnet
3. (a) Its magnetism is permanent.
4. (b) Negative terminal of the next cell
5. (b) Does not glow
6. (b) An automatic switch
7. (b) They all are rechargeable
8. (b)
9. (a) An electromagnet

6. State True or False for the following and correct the false statements giving reasons

1. False: A freely hanging piece of wood can take any direction.
2. False: Electromagnets are not permanent; their magnetic field is created when an electric current flows through a coil of wire. Once the current is stopped, the magnetism disappears.
3. True
4. True
5. True.
6. False: A closed circuit means the switch is ON. In a closed circuit, the current can flow, while in an open circuit, it cannot.
7. False: Electrons have a negative charge.
8. True.
9. False: Three bulbs connected in parallel circuit will not give dim light. In a parallel circuit, each bulb gets the full voltage, and all can shine brightly.
10. True

Match the column

1. Fuse (b) Safety device
2. Electric cell (a) Chemical to electrical energy
3. Good conductors (e) Bad resistors
4. Closed circuit (c) Switch on
5. Battery (d) Electric cells in series

Fill in the blanks

1. repulsion to a magnet
2. soft iron
3. poor

4. ions
5. circuit
6. dry cell or battery
7. static electricity
8. safety device
9. two or more cells
10. resistor

Short answer type questions

1. A magnetic pole is a region on a magnet where the magnetic force is concentrated. Magnetic poles exist in pairs because when a magnet is each piece still has its own north and south poles. Breaking a magnet results in creating two smaller magnets, each with a north and south pole.
2. The simplest way to test if a piece of iron is a magnet is to see if one of its side repels a magnet.
3. An electromagnet is a temporary magnet that is created by passing an electric current through a coil of wire wound over a piece of soft iron. The magnetic field is induced when the current flows, and it disappears when the current is turned off.
4. The polarity of an electromagnet can be determined by the direction of the current flow in the wire coil. When current direction is anticlockwise -it becomes the south pole, When the current direction is clockwise the end becomes north pole.
5. Electric switches should not be touched with wet hands because water is a conductor of electricity. Wet hands increase the risk of electric shock when touching switches or other electrical devices.
6. An electric circuit is a closed loop or pathway through which electric current can flow. It typically consists of components such as a power source, conductors, resistors, and switches.
7. Two uses of an electromagnet are in electric bells and magnetic cranes.
8. An ion is formed when an atom gains or loses electrons, resulting in a positive or negative charge.
9. A solenoid is a coil of wire often used to create a magnetic field when an electric current is passed through it.
10. Magnetic declination of Earth is the angle between the geographic North Pole and the magnetic North Pole at a specific location on Earth.

F. Long answer type questions

1. **Laws of Magnetism and Testing:**
   The laws of magnetism include the law of poles, stating that like poles repel and opposite poles attract. To test these laws, one can use a simple compass to observe the direction in which the needle aligns when brought

close to a magnet. Like poles of the magnet will repel the needle, while opposite poles will attract it, confirming the laws of magnetism.

2. **Distinguishing Electromagnets and Permanent Magnets:**
   An electromagnet is created by an electric current, while a permanent magnet maintains its magnetic properties without an external electric current. To differentiate, observe if a power source is present—if yes, it's likely an electromagnet; if not, it's a permanent magnet.
3. **Experiment on Like Pole Repulsion:**
   Conduct the following experiment:

- Suspend two bar magnets freely.
- Bring like poles (north-north or south-south) close to each other.
- Observing the repulsion between the like poles will demonstrate this phenomenon.

4. **Enhancing Electromagnet Power:**
   To make an electromagnet more powerful:

- Increase the number of turns in the coil.
- Increase the current flowing through the coil.
- Use a soft iron core inside the coil, as it enhances the magnetic effect.

5. **Primary Cells**:
   Primary cells are non-rechargeable batteries. They generate electrical energy through chemical reactions, producing a one-time use power source. These can be

   a)Liquid cell. The most popular is the Leclanché cell. In this cell zinc rod dipped in ammonium chloride solution acts as the anode. It is kept in a glass jar. There is a carbon rod in the centre kept in a porous container surrounded by a paste of manganese dioxide and carbon black, as the cathode.
   b) Dry cell. These are the most popularly used portable source of electricity. It consists of a zinc container which acts as the negative electrode-the cathode. It has a centrally placed carbon rod which acts as the positive electrode – the anode. The carbon rod is dipped in a mixture of charcoal and manganese dioxide kept in a porous bag. (MnO_2 acts as a depolarizer. It also keeps the solution moist to ensure ion movement). The space between the porous bag and the zinc container is filled with ammonium chloride which acts as an electrolyte. The outer zinc body is insulated by a cover of cardboard, the base is left bare.

6. **Conduction of Electric Current by Good Conductors**:
   Good conductors, like metals, allow electric current due to the presence of free electrons. These electrons can move freely, creating a flow of electric current. Also good conductors as a rule have low resistivity.
7. **Parallel Circuits in House Wiring:**
   Electrical connections in house wiring are done in parallel circuits for safety and efficiency. If one device fails or needs maintenance, it does not interrupt the entire circuit. Each appliance can operate independently. Also in parallel connection each appliance gets the optimum voltage and current supply, hence their function is not impaired.
8. **Working of an Electric Bell:**
   An electric bell works in the following simple steps:
   1. When the push switch of the bell is pressed current flows through the solenoid of the electromagnet and it attracts the armature towards itself. This function makes the hammer hit the gong which produces one ring.
   2. As the hammer hits the gong, electrical contact between the adjusting screw and the springy strip is broken. Hence the electromagnet loses its magnetism and again comes back to its previous position and touches the adjusting screw. This creates a gap between the sounds of two rings of the bell.
   3. This once again completes the electrical circuit and the horseshoe electromagnet becomes magnetic and attracts the armature with its hammer, which hits the gong. So with a gap another ring is produced.

   4. This alternate process of ring and gap continues till the push switch is pressed, producing the ringing sound of the bell.
9. **Series Circuit vs. Parallel Circuit:**

- In a series circuit, components are connected end-to-end, and the same current flows through each.
- In a parallel circuit, components are connected in separate branches, and the voltage across each component is the same. In parallel connection even if one of the bulb or appliance does not work the other appliance continue to work.
  (Draw diagram)

10. Draw yourself

G. Questions based on practical skills

1. Yes, an electromagnet can be employed to separate plastic bags from a garbage heap. The key lies in the fact that plastics are generally non-

magnetic, while many other materials in a garbage heap, such as metal objects, may be magnetic. By activating the electromagnet in the vicinity of the garbage heap, it will attract and separate the magnetic materials (like metal) from the non-magnetic materials (like plastic bags). This process is based on the principle that only materials susceptible to magnetism will be affected by the electromagnetic force, allowing for an efficient and selective separation.

2. A circuit of wire is not always necessary for the conduction of electricity as we see in the following examples:
   Current flows from the clouds to the Earth forming a circuit through air. Normally air does not conduct electricity. However, if there is a large electrical charge in the cloud, it can create charged particles in the air called ions. The ions work like an invisible cable linking the cloud above and the air below. Lightning flows through the air with the help of the ions. Similarly electricity flows through liquids with the help of ions.

3. House wiring is not done in a series pattern due to practical and safety considerations. In a series circuit, the failure of one device interrupts the entire circuit, leading to a blackout. In contrast, a parallel circuit, commonly used in house wiring, ensures that each electrical appliance operates independently. If one device malfunctions or requires maintenance, it does not affect the functioning of others. This parallel arrangement enhances safety and efficiency, allowing for flexibility in using electrical appliances without compromising the entire electrical system.
4. Dealing with electricity requires strict adherence to safety measures. First and foremost, one should always turn off the power source before attempting any electrical work. Insulating materials such as rubber gloves and mats should be used to minimize the risk of electric shock. It is crucial to inspect wires and cables for any damage regularly and replace them if necessary. Avoid overloading circuits, use appropriate fuses or circuit breakers, and ensure that electrical equipment is in good working condition. Furthermore, knowledge of emergency procedures and the location of electrical panels and shut-off switches is essential to respond.

VALUES AND LIFE SKILLS

1. **Reducing Electricity Consumption with Better Appliance Selection:** Responsible and energy-efficient appliance selection is crucial for cutting down electricity consumption. While studying brochures of electrical appliances, one can focus on several key features. Look for appliances with

high energy efficiency ratings, as indicated by labels like ENERGY STAR. Consider the size of appliances to match the actual needs of the household; oversized appliances often waste energy. Regular maintenance and timely upgrades also play a role in ensuring appliances operate at peak efficiency.

2. **Advice on Repeated MCB Trips or Fuse Blows in Neighbor's House:**
   If a neighbor is experiencing repeated Miniature Circuit Breaker (MCB) trips or fuse blows, it could indicate an issue with their house wiring. Firstly, I would advise them to conduct a thorough inspection of the wiring to identify any visible signs of wear, damage, or exposed wires. Loose connections or faulty wiring could be causing short circuits leading to the frequent tripping of the MCB or blowing of fuses. It is crucial to address any electrical issues promptly to prevent potential fire hazards. If the problem persists, seeking the assistance of a qualified electrician is highly recommended. Professional assessment and potential rewiring may be necessary to ensure the safety and reliability of the electrical system.

Play and Learn

1. When you wrap your cellphone in aluminum foil and place it in a metal box:

- **Creating a Faraday Cage:**
  When you wrap your cellphone in aluminum foil and place it in a metal box, you are essentially creating a Faraday cage. A Faraday cage is a conductive enclosure used to block electromagnetic fields.
- **Blocking Electromagnetic Signals:**
  When you make a call to the wrapped phone, the aluminum foil reflects the incoming electromagnetic waves, preventing them from reaching the phone's antenna. This interference essentially isolates the phone from external signals.
- **Signal Interruption:**
  As a result of the Faraday cage effect, the wrapped cellphone becomes effectively unreachable for calls.

Image based questions

1. The bulb does not glow because their is no flow of current. The position of the cells is not correct.

2. Mica can be used as an insulating material and at the same time it is used to transmit heat, as in case of electric press.

3. Solenoid switches are commonly used in automobiles to start and stop engines.

Experiential learning questions

1. b) The filament is heated to a high temperature.
2. **LED technology is a better lighting option today for several reasons:**
   Energy Efficiency: LEDs are highly energy-efficient, converting a large percentage of energy into light. They consume less power compared to traditional incandescent bulbs for the same illumination.
   Longevity: LED bulbs have a longer lifespan than traditional bulbs, reducing the frequency of replacements.
   Environmentally Friendly: LEDs are free of hazardous materials. They also contribute to energy savings, making them environmentally friendly.

STEM Project

- Yes, the described experiment involves magnetizing a paper clip using a permanent magnet and then suspending it with a thread to observe its behavior, similar to a magnetic needle.

1. **Magnetizing the Paper Clip:** Rubbing the permanent magnet on the paper clip magnetizes the paper clip, meaning it acquires magnetic properties.
2. **Suspending the Paper Clip:** The magnetised paper clip aligns itself with the Earth's magnetic field, acting like a small magnetic needle.

Multi-disciplinary questions

1. Decorative lights connected in series have a unique visual effect that is desired for decorative purposes. When one bulb in a series circuit goes off, the entire circuit is broken, and all the bulbs in the series go off. This behavior is often used intentionally for artistic or decorative reasons. For example, in some decorative light arrangements, the sequential turning off of bulbs creates patterns or designs that enhance the visual appeal. The deliberate use of series circuits in decorative lights allows for creative control over the lighting display.
2. Induction heaters use electromagnetic induction to heat objects.

- Ferromagnetic Materials: Induction heaters specifically heat objects made of ferromagnetic materials like iron or steel. These materials have magnetic properties that allow them to efficiently absorb and transform electromagnetic energy into heat. The presence of ferromagnetic elements is crucial for effective heating.

Test Paper–1

A. MCQs

1. (b) Keeping the eye level at the level of the reading mark
2. (b) Aluminium will be more than iron
3. (d) circulatory – translatory
4. (d) Mass of a body is constant but its weight is not.

Match the three columns:

1. Mass - (iii) Matter contained in a body - (a) Gram
2. Volume - (iv) Space occupied by the body - (b) cm^3
3. Uniform speed - (i) Equal distance covered in equal span of time - (c) km/hr
4. Area - (ii) Length x Breadth - (d) cm^2
5. Density - (v) Mass per unit volume - (e) g/cm^3

C. Answer the following in one word or one sentence

1. Cubing the length of one of its sides.
2. The amount it can hold or store.
3. 900 meters.
4. Rotational motion.

D. Give reasons for the following

1. **Reason:** Ice floats on water because it is less dense than water. When water freezes, it forms a crystalline structure that increases its volume, making ice less dense than liquid water.

2. **Reason:** If speed decreases while time is fixed, the distance covered will decrease. This is because distance is directly proportional to the product of speed and time (Distance = Speed x Time).

3. Reason: Mass is a measure of the amount of matter in an object and remains constant regardless of its location. Weight, however, is the force exerted on an object due to gravity and varies with the strength of the gravitational field. Therefore, an object's mass is constant, but its weight can change depending on the gravitational force acting on it.

4. Reason: An object can have two kinds of motion if it undergoes a combination of translational and rotational motion. For example, a spinning top has both rotational motion around its axis and translational motion as it moves across a surface.

E. Answer the following in short

1. It means that one cubic centimeter of copper has a mass of 8.96 grams.

2. It is a cylindrical container with markings to measure the volume of liquids accurately.

3. Pendulum swinging back and forth.

4. When its position remains constant relative to a reference point, with the passage of time.

F. Answer the following in detail

1. Speed is the rate at which an object covers distance. It is a scalar quantity and is often measured in units like meters per second (m/s) or kilometers per hour (km/h). For example, if a car travels 100 kilometers in 2 hours, its speed can be calculated as 50 km/h (Speed = Distance/Time).

2. First we measure the mass of the object by using a beam balance. Then we measure the density of an irregular object, we can use the displacement method. Submerge the irregular object in a known volume of water, measure the volume of water displaced, and then use the formula
Density = Mass/Volume to calculate the density of the object.

3.

Translatory Motion:	**Rotatory Motion:**
Translation means motion along a path and is defined by a net force (the sum of different forces) acting on an object. In translatory motion all the points of the body move through the same distance along the same path, in the same time. It can be a) Rectilinear or linear motion b) Curvilinear motion	Rotatory motion means motion around a fixed axis and is defined by torque (rotation causing force). When the blades of a fan move all the points do not move along the same path, however all the points move around a fixed center or the axis of rotation. In rotatory motion different parts of the object cover different distances in the same span of time. Points away from the axis cover larger distances.

4. To improve the average speed of a vehicle while traveling, one can reduce the time taken for stops or increase the speed during travel. For example, if a person is driving from point A to point B and stops for a meal, reducing the time spent at the stop or opting for faster routes can increase the average speed. If the initial average speed is 50 km/h and the person reduces the time spent at stops, the average speed for the entire journey may increase to 60 km/h.

Test Paper–2

A. MCQs

1. (b) Potential energy
2. (c) Force multiplied by distance moved by the point of application of the force in the direction of the force.
3. (b) At the highest point, the ball has maximum potential energy
4. (d) Red light and the full spectrum of light are reflected respectively
5. (c) Direction

B. Answer the following in one word or one sentence

1. Energy is the capacity to do work or the ability to cause a change in an object or system.

2. Reflection of light is the bouncing back of light waves from a surface, obeying the law of reflection where the angle of incidence equals the angle of reflection.

3. A common use of a plane mirror is in daily personal grooming, such as when combing hair or checking one's appearance.

4. Energy is possessed by a body because of its position refers to potential energy.

C. Give reasons for the following

1. When rubber is stretched, it stores potential energy in the form of elastic potential energy. This energy is the result of the work done in stretching the rubber, and it can be released when the rubber returns to its original state.

2. At the highest point in its trajectory, the ball momentarily comes to a stop before it begins to fall. Kinetic energy is directly related to motion, and at the highest point, the ball has momentarily ceased moving vertically, resulting in zero kinetic energy.

3. The brightness or dullness of an object is determined by its surface properties regarding the reflection and absorption of light. Dull objects tend to absorb more light, reflecting less, while bright objects reflect more light, absorbing less.

4. The speed of light in a medium is inversely proportional to its optical density. Glass has a higher optical density than air, causing light to slow down as it passes through glass. This change in speed is responsible for the bending of light, known as refraction, as it transitions from air to glass.

D. Answer the following in short

1. Kinetic energy

2. Red, orange, yellow, green, blue, indigo, violet (ROYGBIV)

3. The image formed by a plane mirror is virtual, upright, and laterally inverted.

4. Driving at night on a wet road is difficult because the wet surface reflects headlights, causing glare and reducing visibility.

E. Answer the following in detail

1. In a swinging pendulum, energy undergoes several transfers:
Potential Energy to Kinetic Energy: At the highest point of the swing, the pendulum has maximum potential energy. As it descends, potential energy is converted to kinetic energy.
Kinetic Energy to Potential Energy: At the lowest point of the swing, the pendulum has maximum kinetic energy. As it ascends, kinetic energy is converted back to potential energy.

2. While energy is conserved, it can change forms. In the case of a rolling ball, energy is transformed into other forms like heat and sound due to factors like friction between the ball and the surface it rolls on. Eventually, these energy transformations lead to a loss of kinetic energy, causing the ball to stop.

3. Law of Conservation of Energy: The total energy in an isolated system remains constant; it is neither created nor destroyed, only transformed from one form to another.
Example: Consider a swinging pendulum. At the highest point, potential energy is at its maximum. As the pendulum descends, potential energy is converted into kinetic energy. At the lowest point, kinetic energy is at its maximum. The

total mechanical energy (potential + kinetic) remains constant if we neglect energy losses due to factors like air resistance.

4. Draw yourself

5. In lateral inversion, the left and right sides of an object appear to be right. when viewed in a plane mirror. For example, if you raise your right hand in front of a plane mirror, the mirror image appears to raise its left hand, creating the effect of lateral inversion.

Test Paper–3

A. MCQs

1. (c) It is zero in any scale

2. (b) Convection in nature

3. (a) Radiation

4. (c) Sound travels in longitudinal waves only in air.

5. (b) 10,000 Hz

B. Answer the following in one word or one sentence

1. Lack of fluidity or mobility of particles in solids.

2. Wool has trapped air pockets that hinder heat conduction.

3. Ultrasonic.

4. Hertz (Hz).

5. Static electricity.

C. Give reasons for the following

1. Heat flows from a hotter object (hot water) to a cooler object (our hand) due to the temperature difference. Heat transfer occurs until thermal equilibrium is reached.

2. Temperature is a measure of the average kinetic energy of molecules. In hotter objects, molecules have higher kinetic energy, resulting in more vigorous vibrations.

3. Puffing feathers creates an insulating layer of air, reducing heat loss and helping birds stay warm in cold temperatures.

4. To enhance acoustics, auditoriums are designed to minimize sound reflection (echoes) to ensure clear and audible sound for the audience.

5. Large bare rooms lack sound-absorbing materials, leading to sound reflection and echoes, making it difficult to have clear conversations due to interference and noise.

D. Answer the following in short

1. The Celsius and Kelvin scales are related by the equation: Kelvin = Celsius + 273.15.

2. Medical imaging (ultrasound scans) and checking cracks in structures.

3. Loudness is directly proportional to the amplitude of a sound wave; higher amplitude corresponds to greater loudness.

4. a) Symbol (b) used for a battery.

b) While fig in (b) has two connected cells the figure (d) represents just one electric cell.

5. Water is a good conductor of electricity, and wet hands increase the risk of electric shock when touching electrical switches.

E. Answer the following in detail

1. Deposition - It is change of state from gas to solid.

Evaporation - It is change of state from liquid state to gaseous state at any temperature below the boiling point.

a) Radiation, convection, conduction

b) Radiation is the fastest mode of heat transfer.

c) Radiation can happen in vacuum.

2. To make a room soundproof, you can:

- Add Insulation: Use materials like fiberglass or foam panels on walls to absorb sound waves.
- Seal Gaps and Cracks: Seal any gaps or cracks in windows, doors, and walls to prevent sound leakage.
- Use Heavy Curtains or Drapes: Thick curtains can absorb sound and reduce echoes. Add Soft Furnishings: Use carpets, rugs, and soft furniture to absorb sound and prevent it from bouncing around.

- Install Acoustic Panels: These specialized panels can be strategically placed to absorb and diffuse sound waves.
- Double Glazing: Installing double-glazed windows can help reduce external noise.
- Build a False Ceiling or Walls: Creating an extra layer with sound-absorbing material can significantly reduce noise transmission.

3. Sound requires a medium to travel because it propagates through the vibration of particles in that medium. In water, molecules are close together, allowing sound waves to travel through the vibrational motion of these molecules. In a vacuum, however, there are no molecules to vibrate, hence no medium for sound transmission. Therefore, sound does not travel in a vacuum.
4.

Series Circuit	Parallel Circuit
Single Path: In a series circuit, there is only one path for the flow of electric current. In the "series" connection the components are connected end-to-end in a line to form a single path for the current to flow. In this kind of connection if one of the appliance stops working or gets fused the whole circuit is broken.	**Multiple Paths:** In a parallel circuit, there are multiple paths for the flow of electric current. In parallel circuit the appliances (resistors) are connected between the same set of electrically common points. Each individual path is called a branch. In parallel connection even if one of the bulb or appliance does not work the other appliance continue to work. (Draw diagram)