

Teacher's Hand Book 6th Physics

EXERCISE - 1

I. Choose the correct answer:

1. The unit used to measure length is _____. **Ans:** (a) Feet
2. Mile is a unit of _____. **Ans:** (c) Distance
3. The biggest unit among the given units is _____. **Ans:** (a) Kilometer
4. A kilometer is of _____ meters. **Ans:** (b) 1000
5. The distance between one city to another is measured by using _____. **Ans:** (a) Kilometer
6. The distance between two astronomical objects is measured by _____. **Ans:** (b) Light Year
7. The short cut for Astronomical Unit is _____. **Ans:** (b) AU
8. An astronomical Unit is equal to _____. **Ans:** (a) The average distance between the sun and earth
9. The area of a square of side 2 cm is _____. **Ans:** (b) 4 cm²
10. In a rectangle when the length is multiplied with the breadth the output is its _____. **Ans:** (b) Area
11. Which among these is a unit to measure area? _____ **Ans:** (b) Acre
12. The _____ of a thing is its quantity of space it occupies. **Ans:** (a) Volume

II. Say True or False:

1. One cm = 10 millimeter. **Ans: True**
2. Very large distance in the universe is measured in yards. **Ans: False**
3. The distance between the earth and the sun is always same. **Ans: False**
4. Hecto is the unit to measure volume. **Ans: False**
5. The volume of a cuboid is Length × Breadth × Height. **Ans: True**

III. Match the following:

1. Millimeter - c. Small unit to measure length
2. Light year - e. Large unit to measure length
3. Year - b. Unit of time
4. Litre - a. Unit of volume
5. Ton - d. Unit of mass

IV. Concept Questions:

1. Write any two units to measure length.

Ans: Meter, Kilometer

2. Which unit do you use to measure area?

Ans: Square meter (m²) / Acre

3. Write any two units to measure mass.

Ans: Kilogram, Gram

V. Which unit is used to measure the distance between the given pair?

1. House to School **Ans:** Km
2. Earth to Sun **Ans:** AU
3. Earth to Proxima Centauri **Ans:** Light Year
4. Chennai to Delhi **Ans:** Km
5. Earth to Jupiter **Ans:** AU

VI. What do you measure using the given measuring units?

1. **Ans:** Mass
2. **Ans:** Volume
3. **Ans:** Length
4. **Ans:** Time
5. **Ans:** Mass

VII. Multi Correct Choice Type

1. Area can be measured in _____ **Ans:** (b) Hectare, (c) Square meter
2. Which among these are units of distance? _____ **Ans:** (b) Light year, (c) Km
3. Which among these are not units of time? _____ **Ans:** (b) Light year, (c) Gallon
4. Which among these are used to measure volumes of liquid? _____ **Ans:** (a) Litre, (b) Gallon, (c) cm^3
5. What do you measure using an inch tape? _____ **Ans:** (a) Width of a book, (c) Length of a table

VIII. Reasoning Type Questions

1. **Statement-1** : Ton is used to measure mass.
Statement-2 : Mass of heavy objects can be measured by Ton.
Ans: (a) Both statements are correct and statement-2 is the correct explanation of statement-1.
2. **Statement-1** : Distance from Hyderabad to Bangalore is measured in kms.
Statement-2 : The distance between any two cities can be measured in kms.
Ans: (a) Both statements are correct and statement-2 is the correct explanation of statement-1.
3. **Statement-1** : Hour is a bigger unit of time than minute.
Statement-2 : 1 Hour = 60 sec.
Ans: (c) Statement-1 is true & statement-2 is false.
4. **Statement-1** : Parsec is used to measure distance.
Statement-2 : 1 parsec is equal to 3.3 light years.
Ans: (a) Both statements are correct and statement-2 is the correct explanation of statement-1.
5. **Statement-1** : Light moves very fast.
Statement-2 : The speed of light is 300000 km per sec.
Ans: (a) Both statements are correct and statement-2 is the correct explanation of statement-1.

IX. Odd Man Out

1. **Ans:** (c) Kiloliter – others are units of length
2. **Ans:** (c) Light Year – others are units of time
3. **Ans:** (b) Litre – others are astronomical or volume-related but not all liquid-specific
4. **Ans:** (c) Month – others are units of distance
5. **Ans:** (c) Gallon – others are units of mass

Application Skill Achiever

1. Find the area of a rectangle whose length is 5 m and breadth is 3m.
Ans: Area of a rectangle = Length $\times$ Breadth = 5 m $\times$ 3 m = 15 m^2
2. Find the volume of a cuboid whose length is 2 m, breadth is 3 m and height is 7m.
Ans: Volume of a cuboid = L $\times$ B $\times$ H = 2 $\times$ 3 $\times$ 7 = 42 m^3
3. Lavanya's house is 2.5 km from school. Kamal's house is 380 meter from school. Sridhar's house is 20 km from school. Whose house is closest to school?
Ans: Kamal's house (380 m) = 0.38 km. So, Kamal's house is closest to the school.
4. The height of Jagan, Gopi & Madhu is 1.5 meter, 130 cm and 160 cm respectively. Who is the tallest among the three?
Ans: Convert all to cm:
1.5 m = 150 cm
So, Madhu (160 cm) is the tallest.

5. The necklace of Sita is broken into 4 parts of length 20 mm, 13 cm, 4 cm, 50 mm. What was the total length of her necklace?

Ans: Convert all to mm:

$$20 \text{ mm} + 130 \text{ mm} + 40 \text{ mm} + 50 \text{ mm} = 240 \text{ mm} = 24 \text{ cm}$$

6. The length of a square garden is 8 meter. What is its area?

Ans: Area of square = $\text{side}^2 = 8^2 = 64 \text{ m}^2$

7. The radius of a circle is 7 m. What is its area?

Ans: Area of circle = $\pi r^2 = 3.14 \times 7^2 = 3.14 \times 49 = 153.86 \text{ m}^2$

8. The base of a right angled triangle is 12 cm, its height is 10 cm. What is its area?

Ans: Area of triangle = $\frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 12 \times 10 = 60 \text{ cm}^2$

9. The length of a rectangular paper is 12 cm, its width is 14 cm. The paper is divided into two equal parts. What is the area of each part?

Ans: Area = $12 \times 14 = 168 \text{ cm}^2$

$$\text{Each part} = 168 \div 2 = 84 \text{ cm}^2$$

10. The length of a cubic dice is 1 cm. What is its volume?

Ans: Volume of cube = $\text{side}^3 = 1 \times 1 \times 1 = 1 \text{ cm}^3$

11. A boy has three batteries for his cell phone. The first battery lasts for 2 hours and 30 min, the second for 80 minutes and the third for 130 minutes. Which battery lasts for longest duration?

Ans: 2 hr 30 min = 150 min

So: 150, 80, 130 $\rightarrow$ First battery lasts the longest.

12. The radius of a cylinder is 4 cm. Its height is 14 cm. Find its volume.

Ans: Volume of cylinder = $\pi r^2 h = 3.14 \times 4^2 \times 14 = 3.14 \times 16 \times 14 = 702.72 \text{ cm}^3$

13. The radius of a cone is 6 cm and its height is 7 cm. What is its volume?

Ans: Volume of cone = $(\frac{1}{3})\pi r^2 h = (\frac{1}{3}) \times 3.14 \times 6^2 \times 7 = (\frac{1}{3}) \times 3.14 \times 36 \times 7 = 263.76 \text{ cm}^3$

14. The radius of a sphere is 7 cm. The side of a cube is 5 cm. If both are made of same material, which one is heavier?

Ans: Volume of sphere = $(\frac{4}{3})\pi r^3 = (\frac{4}{3}) \times 3.14 \times 343 = 1436.03 \text{ cm}^3$

$$\text{Volume of cube} = 5^3 = 125 \text{ cm}^3$$

$\rightarrow$ Sphere is heavier.

15. Kamal mixed four canes of paints to make a mixture. The volume of each cane is 270 ml. What is the total volume of the mixture in litre?

Ans: Volume = $4 \times 270 \text{ ml} = 1080 \text{ ml} = 1.08 \text{ litre}$

EXERCISE - 2

I. Choose the correct answer.

1. In physics, motion is a change in _____ of an object with respect to time. **Ans:** (a) Position
2. A body which does not move is said to be _____. **Ans:** (b) Stationary
3. The concept that says "The total momentum of a body in a closed system does not change" is called _____. **Ans:** (c) Laws of conservation of momentum
4. Motion along a straight line is called _____ motion. **Ans:** (a) Rectilinear
5. In _____ motion, the particles of the body describe concentric circles about the axis of motion. **Ans:** (b) Rotator
6. The _____ is an example of periodic motion. **Ans:** (a) Pendulum Clock
7. The momentum of a body is proportional to its _____ and velocity. **Ans:** (b) Mass
8. Speed of a body is the distance travelled by the body in _____. **Ans:** (a) Unit time
9. The average speed of an object is related to its total distance travelled and _____. **Ans:** (b) Total time taken
10. Displacement can be measured in _____. **Ans:** (b) Meter

II. Say True or False:

1. The motion of earth around its axis is a periodic motion. **Ans:** True
2. An object's motion cannot change unless it is acted upon by a force. **Ans:** True
3. Motion along a curved path is called curvilinear motion. **Ans:** True
4. The change of phase of the moon is periodic. **Ans:** True
5. Periodic motion is called as oscillatory motion. **Ans:** False

III. Match the following.

1. Moving a bus on a curved road → d. Curvilinear motion
2. Rotation of the blades of a mixer → e. Rotatory motion
3. Moving of earth around sun → c. Periodic motion
4. Moving of pendulum → a. Circular motion
5. Moving a bus on a straight road → b. Rectilinear motion

IV. Concept questions:

1. Write an example of Rectilinear motion.

Ans: A car moving in a straight line.

2. Write an example of oscillatory motion.

Ans: A swinging pendulum.

3. What is speed?

Ans: Speed is the distance traveled by an object per unit time.

4. What type of motion is exhibited by the blades of a mixer?

Ans: Rotatory motion.

5. A man runs 10 kms in 30 minutes. What is his speed?

Ans: Distance = 10 km

Time = 0.5 hour

$V = s/t$

Speed = $10 \text{ km} / .5 \text{ hr} = 20 \text{ km/hr}$

V. Multi Correct Choice Type.

1. A body which does not move is said to be at _____. **Ans:** (a) Rest, (b) Stationary
2. Which among these move in a circular motion?
Ans: (a) Planets around Sun, (b) Satellites around earth, (c) Electrons around nucleus
3. Which among these are examples of a periodic motion? **Ans:** (a) Pendulum, (c) Vibrating string
4. Speed is measured in _____. **Ans:** (a) M/sec, (b) Km/hour
5. The momentum of a body is directly related to its _____. **Ans:** (a) Mass, (b) Velocity

VI. Reasoning Type Questions.

1. **Statement-1** : The bus moving on a straight road, is moving in rectilinear motion.
Statement-2 : Moving along a straight line is called rectilinear motion.
Ans: (a) Both statements are correct and statement-2 is the correct explanation of statement-1.
2. **Statement-1** : A body which does not move is said to be at rest.
Statement-2 : Oscillatory motion is periodic.
Ans: (b) Both statements are correct but statement-2 is not the correct explanation of statement-1.
3. **Statement-1** : Speed of a body is the distance traveled by the body per unit time.
Statement-2 : The SI unit of displacement is liter.
Ans: (c) Statement-1 is true & statement-2 is false.

VII. Odd Man Out.

1. **Ans:** (d) Moving of bus (Others are oscillatory motions)
2. **Ans:** (c) Movement of light in space (Others are circular motions)
3. **Ans:** (d) Falling of apple from tree (Others are rotational motions)
4. **Ans:** (d) Motion of car on road (Others are wave motions)
5. **Ans:** (d) Constant (Others describe states of motion/rest)

APPLICATION SKILL ACHIEVER

1. A boy travels 12 km in 4 hours. What is his speed?

SOL: Speed = Distance ÷ Time
 $\Rightarrow 12 \text{ km} \div 4 \text{ hr} = 3 \text{ km/hr}$
Ans: 3 km/hr

2. A car's speed is 80 km/hr. How far can it travel in 2 hr 30 min?

SOL: Convert time: 2 hr 30 min = 2.5 hr
Distance = Speed × Time
 $\Rightarrow 80 \text{ km/hr} \times 2.5 \text{ hr} = 200 \text{ km}$
Ans: 200 km

3. A train moves 80 km in 2 hours. What is its speed?

SOL: Speed = Distance ÷ Time
 $\Rightarrow 80 \text{ km} \div 2 \text{ hr} = 40 \text{ km/hr}$
Ans: (a) 40 km/hr

4. Parvati (12 km/hr) vs Savitri (30 m/min). Who is faster?

SOL: Convert Savitri's speed: $30 \text{ m/min} \times (60 \text{ min/hr}) \div (1000 \text{ m/km}) = 1.8 \text{ km/hr}$
 $\Rightarrow 12 \text{ km/hr} > 1.8 \text{ km/hr}$
Ans: (a) Parvati

5. Train speed 90 km/hr. Distance in 4.8 hours?

SOL: Distance = Speed $\times$ Time
 $\Rightarrow 90 \text{ km/hr} \times 4.8 \text{ hr} = 432 \text{ km}$

Ans: (b) 432 kms

6. Boy walks 3 km/hr. What is his speed per minute?

SOL: Convert: $3 \text{ km/hr} \div 60 \text{ min/hr} = 0.05 \text{ km/min} = 50 \text{ m/min}$

Ans: (b) 50 m

7. School commute: 24 km each way at 12 km/hr and 8 km/hr. Average speed?

SOL: Total distance: $24 + 24 = 48 \text{ km}$
Time to school: $24 \div 12 = 2 \text{ hr}$
Time home: $24 \div 8 = 3 \text{ hr}$
Total time: $2 + 3 = 5 \text{ hr}$
Average speed: $48 \div 5 = 9.6 \text{ km/hr}$

Ans: (d) None of these (since 9.6 km/hr isn't an option)

8. Uday crosses bridge in 30 sec at 4 km/hr. Bridge length?

SOL: Convert speed: $4 \text{ km/hr} \times (1000 \text{ m/km}) \div (3600 \text{ s/hr}) \approx 1.111 \text{ m/s}$
Distance: $1.111 \text{ m/s} \times 30 \text{ s} \approx 33.33 \text{ m}$

Ans: (a) 33.33 m

9. Spring oscillates 42 times in 2 seconds. Frequency?

SOL: Formula: Frequency = Oscillations $\div$ Time
 $\Rightarrow 42 \div 2 = 21 \text{ Hz}$

Ans: (c) 21 Hz

10. Oscillator at 480 Hz. Oscillations in 4 seconds?

SOL: Formula: Oscillations = Frequency $\times$ Time
 $\Rightarrow 480 \times 4 = 1920 \text{ oscillations}$

Ans: (a) 1920

EXERCISE - 3

I. Choose the correct answer.

- The force of attraction between the sun and the earth is called _____. **Ans:** (a) Gravitational force
- The North pole of a magnet _____. **Ans:** (b) Attracts the South pole of another magnet
- Unlike poles of magnets exert _____ force towards each other. **Ans:** (b) Pull
- The unit of Force is _____. **Ans:** (c) Newton
- Friction is a _____. **Ans:** (a) Force
- Heavenly bodies like the Sun, the earth the moon etc pose _____ energy. **Ans:** (b) Gravitational
- The _____ force always oppose the motion of an object. **Ans:** (c) Friction
- When two forces of same magnitude is applied to an object from opposite direction then the resultant force is _____. **Ans:** (c) 0
- The symbol of Newton is _____. **Ans:** (c) N
- The force that exists between the protons and the electrons of an atom is _____. **Ans:** (a) Electrical force

II. True or False Questions

- Magnetic force is a contact force. **Ans:** False
- The Sun attracts the planets. **Ans:** True
- The gravitational force of the earth F is equal to $M \times g$. **Ans:** True
- Two forces can be applied to one object at a time. **Ans:** False
- When two forces of same magnitude is applied to an object in opposite directions then the resultant force is zero. **Ans:** True

III. Matching Questions

1. Friction → c. Contact force
2. Magnet → d. Magnetic force
3. Heavenly body → a. Gravitational force
4. Spring → e. Spring force
5. Between proton and electron → b. Electric force

IV. Concept Questions

1. Write the name of any two magnetic materials.

Ans: The name of any two magnetic materials: Iron, Nickel

2. What do you call the force that is exerted by earth to other objects?

Ans: The force that is exerted by Earth to other objects is called Gravitational force.

3. By what force the electrons of an atom are attracted by the protons in the nucleus?

Ans: The electrons of an atom are attracted by the protons in the nucleus by Electrical force.

4. By which force the heavenly bodies like moon, sun and earth attracts each other?

Ans: The heavenly bodies like moon, sun and earth attracts each other by Gravitational force.

5. Find the gravitational force that acts on a body of mass 100 kgs.

Ans: 980 N

Application Skill Achiever

1. Find the force of gravitation on a body of mass 12 kg.

SOL: The gravitational force (weight) is calculated using: $F = m \times g$
Where: $m = 12 \text{ kg}$; $g = 9.8 \text{ m/s}^2$ (acceleration due to gravity)
 $F = 12 \times 9.8 = 117.6 \text{ N}$

Ans: 117.6 N

2. The weight of a body is 980 N. Find its mass.

SOL: Using the formula:

$$F = m \times g$$

$$\Rightarrow m = F/g$$

$$\text{Given: } F = 980 \text{ N}; \quad g = 9.8 \text{ m/s}^2$$

$$\Rightarrow m = 980/9.8 = 100 \text{ kg/m}$$

Ans: 100 kg

3. A wooden duster is placed on a table. A horizontal force of 2 N is applied. Find the friction force if the coefficient of friction is 0.2.

SOL: Friction force (F_{friction}) is given by:

$$F_{\text{friction}} = \mu \times F_{\text{normal}}$$

Here:

- $\mu = 0.2$ (coefficient of friction)
- $F_{\text{normal}} = \text{Weight of the duster}$

Assuming the duster is stationary (no vertical motion), $F_{\text{normal}} = m \times g$. However, since mass is not given, we consider the applied horizontal force as the normal reaction (simplified assumption).

$$F_{\text{friction}} = 0.2 \times 2 = 0.4 \text{ N}$$

Ans: 0.4 N

4. The mass of a body is 10 kg. What is its weight?

SOL: Weight is calculated as:

$$W = m \times g$$

- Given:
- $m = 10 \text{ kg}$
 - $g = 9.8 \text{ m/s}^2$

$$W = 10 \times 9.8 = 98 \text{ N}$$

Ans: 98 N

5. The mass of a book is 1.5 kg, and the mass of a pencil box is 0.5 kg. What is the total weight of both?

SOL: Total mass = $1.5 + 0.5 = 2 \text{ kg}$

$$\text{Total weight: } W = 2 \times 9.8 = 19.6 \text{ N}$$

Ans: 19.6 N

6. The weights of two objects are 750 N and 640 N. What is the difference in their masses?

SOL: First, find their masses:

$$m_1 = 750/9.8 = 76.53 \text{ kg}$$

$$m_2 = 640/9.8 = 65.31 \text{ kg}$$

Difference:

$$\text{Difference in mass} = 76.53 - 65.31 = 11.22 \text{ kg}$$

Ans: $\approx 11.22 \text{ kg}$

7. The mass of a brick is 2 kg. The weight of a stone is 1.9 N. Which one is heavier?

SOL: Convert the stone's weight to mass:

$$\text{Mass of the stone} = 1.9/9.8 = 0.194 \text{ kg}$$

- Compare:
- Brick = 2 kg
 - Stone = 0.194 kg

Ans: The brick is heavier.

8. The mass of a boy is 14 kg. What is his mass on the Moon?

SOL: Mass is constant (does not change with location). **Ans:** 14 kg

9. The weight of a box is 240 N. What is its weight on the Moon?

SOL: Moon's gravity = $1/6$ of Earth's gravity.

$$\text{Weight on Earth (g)} = 240 \text{ N}$$

$$\text{Weight on moon} = \frac{1}{6} \times g = \frac{240}{6} = 40 \text{ N}$$

Ans: 40 N

10. Two forces of 7 N and 8 N are applied in the same direction. What is the total force?

SOL: Forces in the same direction add up:

$$F_{\text{total}} = 7 + 8 = 15 \text{ N}$$

Ans: 15 N

EXERCISE - 4

I. Multiple Choice Questions

1. The kinetic Energy of a moving object is _____. **Ans:** (a) $\frac{1}{2} mv^2$
2. The _____ energy of an object is related to its position. **Ans:** (c) Potential
3. A moving object possesses _____ energy. **Ans:** (a) Kinetic
4. The energy stored in a bow by means of pulling the rope is _____. **Ans:** (a) Potential energy
5. In a Thermal power plant, the _____ energy is converted into electricity. **Ans:** (a) Heat
6. Which among these is a unit of energy? **Ans:** (b) Joule
7. The _____ is the most important source of energy. **Ans:** (b) Sun
8. Which among these is correct about energy? **Ans:** (a) Energy can't be created and can't be destroyed
9. _____ is needed to run a hydro-electric power plant. **Ans:** (b) Water
10. The potential energy of an object changes by changing its _____. **Ans:** (c) Shape

II. True or False

1. Springs store elastic potential energy when compressed/stretched. **Ans:** True
2. Energy can be converted from one form to another. **Ans:** True
3. Hydroelectric plants use kinetic energy of falling water. **Ans:** True
4. Electricity is the most popular and flexible energy. **Ans:** True
5. Light energy enables photography. **Ans:** True

III. Matching Questions

1. Unit of energy → b. Joule
2. Kinetic energy → d. $\frac{1}{2}mv^2$
3. Potential energy → a. mgh
4. Chemical potential energy → c. Photosynthesis
5. Light energy → e. Mass of the object

IV. Concept Questions

1. Three devices that transform energy into work:

- Ans:**
- Electric motor (electrical → mechanical)
 - Solar panel (light → electrical)
 - Steam engine (heat → mechanical)

2. Three factors affecting potential energy:

- Ans:**
- Mass of the object – heavier objects have more potential energy
 - Height above the ground – higher objects have more potential energy
 - Gravity – more gravity means more potential energy

3. Two uses of light energy:

- Ans:**
- Used by **plants for photosynthesis**
 - Solar power generation

4. Two uses of heat energy:

- Ans:**
- Cooking food
 - Generating electricity in thermal plants

V. Multi Correct Choice Type:

1. Which among these transform energy into work?

- Ans:** (b) Cars, (c) Gas stoves

2. Which among these are correct about energy?

- Ans:** (b) To do work we need energy, (c) Sun provides light energy

3. Which among these are correct about photosynthesis?

- Ans:** (b) Green plants make photosynthesis, (c) Light energy is used in photosynthesis

4. The Gravitational potential energy of an object is related to _____.

- Ans:** (b) Its mass, (c) Its height from earth

5. Which among these has kinetic energy?

- Ans:** (b) Speedy car, (c) Rolling stone

VI. Reasoning Type Questions:

1. **Statement-1** : Energy is measured in joule.

Statement-2 : We burn energy in our body.

- Ans:** (b) Both statements are correct but statement-2 is not the correct explanation of statement-1.

2. **Statement-1** : Energy can exist in various forms.

Statement-2 : Kinetic energy is called as potential energy.

Ans: (c) Statement-1 is true & statement-2 is false.

3. **Statement-1** : Kinetic energy $E = \frac{1}{2}mv^2$

Statement-2 : If the velocity of an object increases, its kinetic energy also increases.

Ans: (a) Both statements are correct and statement-2 is the correct explanation of statement-1.

4. **Statement-1** : Potential energy $E_p = mgh$

Statement-2 : If the distance of an object changes, the potential energy also changes.

Ans: (b) Both statements are correct but statement-2 is not the correct explanation of statement-1.

5. **Statement-1** : Electricity is a form of energy.

Statement-2 : Electricity can be formed by spinning magnets in between coils.

Ans: (a) Both statements are correct and statement-2 is the correct explanation of statement-1.

VII. Odd Man Out:

1. **Ans:** (b) Cow

Explanation: Battery, Sun, Fuel are energy sources but Cow is a living organism, not an energy source.

2. **Ans:** (b) Generator

Explanation: Car, Aeroplane, Boat are vehicles for transportation but Generator is a device to produce electricity.

3. **Ans:** (c) Energy

Explanation: Heat, Light, Sound are forms of energy. But Energy is the broader category (not a specific form).

4. **Ans:** (b) Stationary stone

Explanation: Speeding car, Falling rock, Moving aeroplane are objects in motion (have kinetic energy). But Stationary stone has no motion/kinetic energy.

5. **Ans:** (d) Kinetic energy

Explanation: Gravitational, Elastic, Chemical PE are types of potential energy. But Kinetic energy is energy of motion (not potential).

Application Skill Achiever

1. An object is located on a height of 240 meters. It's mass is 48 kg. What is its potential energy?

Ans: $PE = m \times g \times h = 48 \times 9.8 \times 240 = 112,896 \text{ J}$

So, the potential energy is 112,896 joules.

2. Find the kinetic energy of an object with mass 2 kg, moving with a velocity 40 m/sec.

Ans: $KE = \frac{1}{2} \times m \times v^2 = \frac{1}{2} \times 2 \times (40)^2 = 1 \times 1600 = 1600 \text{ J}$

So, the kinetic energy is 1600 joules.

3. Find the kinetic energy of an object of mass 2 kg, moving at a speed of 10 m/sec.

Ans: $KE = \frac{1}{2} \times m \times v^2 = \frac{1}{2} \times 2 \times (10)^2 = 1 \times 100 = 100 \text{ J}$

So, the kinetic energy is 100 joules.

4. The speed of an object is 20 m/sec. What is its kinetic energy if its mass is 200 gm?

Ans: Convert 200 gm to kg = 0.2 kg

$KE = \frac{1}{2} \times 0.2 \times (20)^2 = 0.1 \times 400 = 40 \text{ J}$

So, the kinetic energy is 40 joules.

5. A stone of 14 kg is moving at a speed of 20 m/s. If the kinetic energy of the stone is equal to the potential energy of a rock of same mass, find at what height the rock is located?

Ans: $KE = \frac{1}{2} \times 14 \times (20)^2 = 7 \times 400 = 2800 \text{ J}$
Since $KE = PE = m \times g \times h \Rightarrow 2800 = 14 \times 9.8 \times h$
 $\Rightarrow h = 2800 / (14 \times 9.8) = 2800 / 137.2 = 20.4 \text{ m}$
So, the height is 20.4 meters.

6. The mass of a stone is 21 kg. If its potential energy is 617.4 J, how far is the stone from Earth?

Ans: $PE = m \times g \times h \Rightarrow 617.4 = 21 \times 9.8 \times h$
 $\Rightarrow h = 617.4 / (21 \times 9.8) = 617.4 / 205.8 = 3 \text{ m}$
So, the stone is 3 meters above the ground.

7. The kinetic energy of an object is found 6400 joule. If its mass is 8 kg, what is its speed?

Ans: $KE = \frac{1}{2} \times m \times v^2 \Rightarrow 6400 = 4 \times v^2$
 $\Rightarrow v^2 = 6400 / 4 = 1600 \Rightarrow v = \sqrt{1600} = 40 \text{ m/sec}$
So, the speed is 40 meters per second.

8. The potential energy of an object is 1654 J. If the object is moved down by half of its distance, what will be its potential energy?

Ans: If it's moved down by half the height, the new height = $\frac{1}{2} h$
So, new $PE = \frac{1}{2} \times 1654 = 827 \text{ J}$
So, the new potential energy is 827 joules.

EXERCISE - 5

I. Choose the correct answer:

- | | |
|--|--|
| 1. A body that emits its own light is called ____. | Ans: (a) Luminous |
| 2. The ____ object does not allow light to pass through it at all. | Ans: (b) Opaque |
| 3. Light passes through ____ objects. | Ans: (a) Transparent |
| 4. A collection of parallel rays is called a ____. | Ans: (a) parallel beam of light |
| 5. The image in a pinhole camera is ____. | Ans: (d) None of these (it's inverted) |
| 6. Correct statement about shadows: | Ans: (a) Formed opposite the light source |
| 7. ____ medium allows partial light transmission. | Ans: (b) Translucent |
| 8. Darker inner part of a shadow is called ____. | Ans: (a) Umbra |
| 9. Correct about umbra and penumbra: | Ans: (c) Umbra is darker than penumbra |
| 10. Mirrors change light direction due to ____. | Ans: (b) Reflection |

II. Say True or False:

- | | |
|--|-------------------|
| 1. Non-luminous objects emit light in darkness. | Ans: False |
| 2. Light passes partially through translucent objects. | Ans: True |
| 3. A shadow is a dark area. | Ans: True |
| 4. Object distance = Image distance in plane mirrors. | Ans: True |
| 5. Plane mirrors distort images. | Ans: False |

III. Match the following:

- | | |
|-------------------------|---|
| 1. Opaque material | $\rightarrow$ d. Wood |
| 2. Transparent | $\rightarrow$ a. Clear glass |
| 3. Luminous body | $\rightarrow$ c. Sun |
| 4. Natural light source | $\rightarrow$ e. Fluorescent lamps |
| 5. Shadow | $\rightarrow$ b. Opposite to light source |

IV. Concept Questions:

1. Write the name of any two sources of light.

Ans: Two light sources: Sun, Electric bulb

2. What is a transparent medium?

Ans: A transparent medium is a material that allows light to pass through it completely.
Example: Clear glass or clean water.

3. Write the three conditions required for the formation of a shadow.

Ans: Shadow formation conditions:

- o There must be a source of light.
- o There must be an opaque object to block the light.
- o There must be a surface on which the shadow is formed.

4. Write the two laws of reflection.

Ans: Laws of reflection:

- o Angle of incidence = Angle of reflection.
- o Incident ray, reflected ray, and normal lie in the same plane.

5. When the sun is at 45° , the shadow of a pole is 10 m. What is its height?

Ans: Height of pole (45° sun, 10m shadow):

At 45° , the height of the object = length of the shadow.

So, the height of the pole = 10 meters.

V. Multi Correct Choice Type:

- | | |
|---|---|
| 1. Which among these are sources of light? | Ans: (a) Torch, (b) Glow worms |
| 2. Which among these are luminous icon? | Ans: (b) Sun, (c) Star |
| 3. Which among these are non luminous body? | Ans: (a) Moon, (c) Saturn |
| 4. Which among these are opaque body? | Ans: (a) Bricks, (b) Graphite |
| 5. Which among these are correct about light? | Ans: (a) Moves straight, (c) Shadows block light |

VI. Reasoning Type Questions:

1. **Statement-1** : Pages are non-luminous.

Statement-2 : Non-luminous objects don't emit light.

Ans: (a) Both correct; Statement-2 explains Statement-1.

2. **Statement-1** : Transparent medium transmits light.

Statement-2 : Sun is transparent.

Ans: (c) Statement-1 true; Statement-2 false (Sun is luminous).

3. **Statement-1** : Iron/wood are opaque.

Statement-2 : They block light.

Ans: (a) Both correct; Statement-2 explains Statement-1.

4. **Statement-1** : Light travels straight.

Statement-2 : Shadows prove this.

Ans: (a) Both correct; Statement-2 explains Statement-1.

5. **Statement-1** : Beam of light has direction.

Statement-2 : Divergent beams spread out.

Ans: (b) Both correct but not explanatory.

VII. Odd Man Out:

1. **Ans:** (c) Book (Non-luminous vs. light sources).
2. **Ans:** (b) Wood (Opaque vs. transparent materials).
3. **Ans:** (b) Shadow (Effect vs. light beams).
4. **Ans:** (c) Sun (Luminous vs. planets).
5. **Ans:** (c) Shadow (Not an optical device).

Application Skill Achiever

1. **An object moves at 2 m/s towards a mirror. What is the image's speed relative to the object?**

Ans: The image appears to move at double the speed of the object.

So, speed of image = $2 \times 2 = 4$ m/sec

2. **A plane mirror has dimensions 20 cm × 30 cm. For a 30° angle of incidence, what is the angle of reflection?**

Ans: According to the law of reflection:

Angle of reflection = Angle of incidence

So, angle of reflection = 30°

3. **In a reflection, the sum of the angle of incidence and reflection is 90°. What is the angle of reflection?**

Ans: Let angle of reflection = r ; angle of incidence = i

Given: $i + r = 90^\circ$

But $i = r \Rightarrow r + r = 90^\circ \Rightarrow 2r = 90^\circ \Rightarrow r = 45^\circ$

4. **The angle of incidence is 65°. What is the angle of deviation?**

Ans: Angle of deviation = $2 \times \text{angle of incidence} - 180^\circ$

→ But in simple mirror reflection:

Deviation = $2 \times i = 2 \times 65^\circ = 130^\circ$

5. **The angle of deviation is 45°. What is the angle of reflection?**

Ans: In mirror reflection,

Angle of deviation = $2 \times \text{angle of reflection}$

$\Rightarrow 45^\circ = 2r \Rightarrow r = 22.5^\circ$

6. **If the angle of incidence equals the angle of deviation, what is the angle of reflection?**

Ans: If angle of incidence = angle of deviation

And deviation = $2 \times \text{reflection}$

Then, $i = 2r$

Also, $i = r$ (in normal cases)

This is only possible if angle = 0° . So, angle of reflection = 0°

7. **The angle of deviation is 60°. What is the angle of reflection?**

Ans: Angle of deviation = $2 \times \text{angle of reflection}$

$\Rightarrow 60^\circ = 2r \Rightarrow r = 30^\circ$

8. **Gopal's height is 3 feet. What is the minimum mirror height needed to see his full image?**

Ans: To see full image, only half of the height is needed.

So, minimum size of mirror = $3 / 2 = 1.5$ feet

9. **An object moves at 3 m/s away from a mirror. What is the image's speed relative to the object?**

Ans: Relative speed = object speed + image speed = $3 + 3 = 6$ m/sec

10. **The incident ray direction is 30°. If the mirror rotates by 40°, how much does the reflected ray rotate?**

Ans: Reflected ray rotates twice the angle of rotation of mirror.

$\Rightarrow 2 \times 40^\circ = 80^\circ$

11. What is the angle of deviation if the angle of reflection equals the angle of incidence?

Ans: If angle of reflection = angle of incidence = x

Then deviation = $2x$

So, angle of deviation = $2 \times$ angle of reflection

EXERCISE - 6

I. Choose the correct answer.

- | | |
|---|--|
| 1. Electric cell converts _____ energy to Electricity. | Ans: (b) Chemical |
| 2. The Cell that is mostly used in cars and automobiles is _____. | Ans: (a) Lead Acid battery |
| 3. Electricity is _____. | Ans: (c) Flow of electrons |
| 4. Materials that allow to pass electricity easily is _____. | Ans: (a) Conductor |
| 5. _____ are poor conductors of electricity. | Ans: (a) Insulators |
| 6. A _____ can be used as a circuit breaker. | Ans: (c) Fuse |
| 7. An _____ measures the rate of flow of charge. | Ans: (a) Ammeter |
| 8. Plastic is _____. | Ans: (b) a bad conductor of electricity |
| 9. Which among these is a not metal? _____. | Ans: (a) Graphite |
| 10. Which among these is a insulator? _____. | Ans: (c) Glass |

II. Say True or False.

- | | |
|--|-------------------|
| 1. Electricity always passes through a closed loop. | Ans: True |
| 2. A primary cell can be recharged. | Ans: False |
| 3. A secondary cell is a rechargeable cell. | Ans: True |
| 4. Ultra capacitor is a secondary cell. | Ans: False |
| 5. Nano-wire lithium-ion battery are mostly used in laptops. | Ans: True |

III. Match the following.

- | | |
|--------------------------|---------------------------|
| 1. Proton | - b. Positively charged |
| 2. Electron | - e. Negatively charged |
| 3. Nucleus | - d. Protons and Neutrons |
| 4. Neutrons | - c. Uncharged |
| 5. Movement of electrons | - a. Electric current |

IV. Concept Questions:

1. Write the name of any two types of electric cell.

Ans: Name of any two types of electric cell: Alkaline dry cell and Lithium-ion battery

2. Write the name of any two insulators.

Ans: Name of any two insulators: Plastic and Rubber

3. Write the name of any two electrical conductors.

Ans: The name of any two electrical conductors: Copper and Silver

4. What is the use of electric fuse?

Ans: An electric fuse is a safety device that protects electrical circuits from excessive current by melting and breaking the circuit when the current exceeds a safe limit.

5. What is the use of Ammeter?

Ans: An ammeter is used to measure the electric current flowing through a circuit.

V. Multi Correct Choice Type.

1. Which among these are rechargeable cell?

Ans: (b) Nickel cadmium cell, (c) Lead acid battery

2. Which among these are correct about dynamo?

Ans: (b) It converts mechanical energy to electric energy, (c) It generates electricity

3. Which among these are qualities of sodium sulfur batteries?

Ans: (A) Large capacity, (C) High efficiency

4. Which among these are correct about current?

Ans: (b) Dry cells supply electric current, (c) Dynamo forms electrical current

5. Which among these are correct about electric fuse?

Ans: (a) It is used in electric circuits, (c) It is a safety device

VI. Reasoning Type Questions.

1. **Statement-1** : Electricity is a form of energy.

Statement-2 : Electric cell is a device that stores electric energy.

Ans: (b) Both statements are correct but statement-2 is not the correct explanation of statement-1.

2. **Statement-1** : Some types of cells can be recharged.

Statement-2 : Mercury cells are used in pocket calculators.

Ans: (b) Both statements are correct but statement-2 is not the correct explanation of statement-1.

3. **Statement-1** : Lithium-ion batteries are used in laptops.

Statement-2 : Lithium-ion batteries do not contain mercury in it.

Ans: (b) Both statements are correct but statement-2 is not the correct explanation of statement-1.

4. **Statement-1** : Fuse is used in electric circuits.

Statement-2 : Fuse is a safety device.

Ans: (a) Both statements are correct and statement-2 is the correct explanation of statement-1.

5. **Statement-1** : Glass is a common electrical insulator.

Statement-2 : Glass does not allow electricity to pass through it.

Ans: (a) Both statements are correct and statement-2 is the correct explanation of statement-1.

VII. Odd Man Out.

1. **Ans:** (d) Silver oxide cell (Others are more commonly used in everyday applications.)

2. **Ans:** (c) Alkaline dry cell (Others are rechargeable batteries, while alkaline cells are typically not rechargeable.)

3. **Ans:** (d) Plastic (Others are conductors, while plastic is an insulator.)

4. **Ans:** (d) Electric current (Others are measuring devices or power sources, while electric current is a flow of charge.)

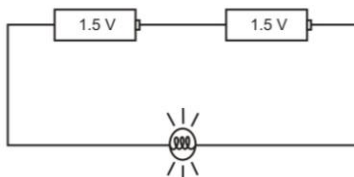
5. **Ans:** (c) Silver (Others are insulators, while silver is a conductor.)

Application Skill Achiever

1. Two AA cells of 1.5 volt are connected in series. What is the total voltage across the cells?

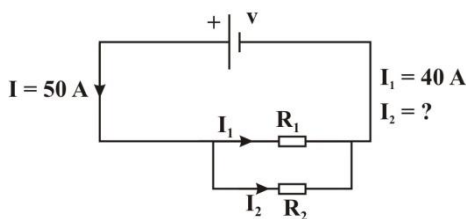
Ans: Total voltage = $1.5\text{ V} + 1.5\text{ V} = 3\text{ V}$

2. What voltage of bulb is used in the given circuit?



Ans: The bulb is connected to two 1.5 V cells in series, so the voltage across the bulb is 3 V.

3. Find the value of I_2 in the given circuit.

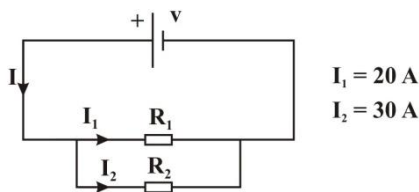


Ans: In the given circuit

$$I = I_1 + I_2$$

$$50\text{ A} = 40\text{ A} + I_2 \Rightarrow I_2 = 50\text{ A} - 40\text{ A} = 10\text{ A}$$

4. Find the value of I in the given circuit.



Ans: In the given circuit

$$I = I_1 + I_2 \Rightarrow I = 20\text{ A} + 30\text{ A} = 50\text{ A}$$

EXERCISE - 7

I. Choose the correct answer:

1. A substance that is attracted by a magnet is called _____. **Ans:** (c) Magnetic
2. The force of attraction of a magnet is greater at its _____. **Ans:** (a) Poles than in the middle
3. A magnet has _____ poles. **Ans:** (a) Two
4. _____ among these is a magnetic material. **Ans:** (a) Cobalt
5. _____ is non-magnetic material. **Ans:** (b) Copper
6. Which among these is correct about magnet? **Ans:** (b) Magnets attract objects of iron, cobalt and nickel.
7. Hammering of magnets makes _____. **Ans:** (a) Demagnetization
8. A _____ should be kept in between two magnets in a magnetic keeper. **Ans:** (b) Soft iron
9. Electrically generated magnetic field is called by _____. **Ans:** (a) Passing electricity in a solenoid (coil)
10. When a non-magnetized magnetic material is brought near to a magnet, the material becomes _____. **Ans:** (b) Weak magnet

II. Say True or False:

1. Magnetic lines of force start from the North Pole and end at the South Pole. **Ans:** True
2. Magnetic field passes through space and air. **Ans:** True
3. Solenoid is a coil of wire. **Ans:** True
4. When a magnet is broken into pieces, the smallest part become non-magnet. **Ans:** False
5. Magnets are used in speakers. **Ans:** True

III. Match the following:

1. Opposite poles of magnets - d. Attraction
2. Same pole of magnets - a. Repulsion
3. Iron, Nickel, Cobalt - e. Magnetic materials
4. Iron near magnet - c. Induced magnetism
5. Electricity through coil - b. Electromagnetic field

IV. Concept Questions:

1. Write the name of any two magnetic materials.

Ans: The name of any two magnetic materials: Iron and Nickel

2. Write any two properties of a magnet.

Ans: Any two properties of a magnet:

- o A magnet has two poles: North and South.
- o Like poles repel, and unlike poles attract.

3. Write any two ways to create a magnet.

Ans: Any two ways to create a magnet:

- o Single touch method: Stroking a magnetic material (e.g., iron) with a magnet in one direction.
- o Electrical method: Passing electric current through a solenoid wrapped around a magnetic material.

4. Why shouldn't we preserve two magnets side by side?

Ans: Storing two magnets side by side without a magnetic keeper (soft iron) can cause them to lose their magnetism over time due to mutual repulsion/attraction forces.

5. Write any one way to demagnetize a magnet.

Ans: Heating a magnet to a high temperature disrupts its atomic alignment, causing demagnetization.

V. Multi Correct Choice Type:

1. A natural magnet attracts _____. **Ans:** (b) Cobalt, (c) Nickel

2. The north pole of a magnet _____. **Ans:** (a) Attracts the south pole of another magnet, (b) Repels the north pole of another magnet

3. Which among these are non-magnetic materials? **Ans:** (a) Copper, (b) Aluminum

4. Which among these are methods of magnetization?

Ans: (a) Single touch method, (c) Double touch method

VI. Reasoning Type Questions:

1. **Statement-1** : Iron is a magnetic material.

Statement-2 : Materials that are attracted to a magnet are called magnetic materials.

Ans: (a) Both statements are correct, and Statement-2 explains Statement-1.

2. **Statement-1** : North pole of a magnet repels the north pole of another magnet.

Statement-2 : Same poles of two magnets repel.

Ans: (a) Both statements are correct, and Statement-2 explains Statement-1.

3. **Statement-1** : Copper, zinc, and aluminum are ferromagnetic substances.

Statement-2 : Water is ferromagnetic.

Ans: (e) Both statements are false (they are paramagnetic/diamagnetic).

4. **Statement-1** : Solenoid is a coil of wire.

Statement-2 : Cobalt is attracted by a magnet.

Ans: (b) Both statements are correct but unrelated.

5. **Statement-1** : Permanent magnets can be demagnetized.

Statement-2 : A solenoid is a permanent magnet.

Ans: (c) Statement-1 is true (via heating/hammering), but Statement-2 is false (solenoids are temporary electromagnets).

VII. Odd Man Out:

1. **Ans:** (b) Silver (Others are magnetic materials; silver is not.)

2. **Ans:** (d) Chemical method (Others are magnetization methods; chemical processes do not magnetize.)

3. **Ans:** (d) Magnetic keeper (Others are devices using magnets; a keeper is a storage tool.)