

### 1. Mechanics:

- Question: A car travels at a constant speed of 20 m/s for 10 seconds. What is the distance covered by the car?
- Answer: 200 meters
- Explanation: Distance = Speed  $\times$  Time. Distance = 20 m/s  $\times$  10 s = 200 m.

### 2. Thermodynamics:

- Question: What is the SI unit of temperature?
- Answer: Kelvin (K)
- Explanation: The standard unit for measuring thermodynamic temperature in the International System of Units (SI) is Kelvin.

### 3. Electricity and Magnetism:

- Question: Two charges of +2  $\mu\text{C}$  and -3  $\mu\text{C}$  are placed 10 cm apart. What is the force between them? (Coulomb's constant  $k \approx 9 \times 10^9 \text{ Nm}^2/\text{C}^2$ )
- Answer: 0.54 N (Attractive)
- Explanation: Using Coulomb's law,  $F = k \cdot |q_1 \cdot q_2| / r^2$ .  $F = (9 \times 10^9 \text{ Nm}^2/\text{C}^2) \cdot |(2 \times 10^{-6} \text{ C}) \cdot (-3 \times 10^{-6} \text{ C})| / (0.1 \text{ m})^2 = 0.54 \text{ N}$ . Since the charges have opposite signs, the force is attractive.

### 4. Optics:

- Question: What type of lens is used to correct myopia (nearsightedness)?
- Answer: Concave lens
- Explanation: A concave lens diverges light rays, which helps to focus the image on the retina for individuals with myopia.

### 5. Modern Physics:

- Question: What is the value of Planck's constant (approximately)?
- Answer:  $6.63 \times 10^{-34}$  Joule-seconds (J s)
- Explanation: Planck's constant is a fundamental physical constant that relates the energy of a photon to its frequency.

### 6. Waves and Oscillations:

- Question: The time taken for one complete oscillation of a wave is called its:
- Answer: Time period
- Explanation: The time period is the duration of one complete cycle of a periodic phenomenon.

### 7. Properties of Matter:

- Question: The property of a material to resist changes in its shape or size when an external force is applied is called:
- Answer: Elasticity
- Explanation: Elasticity is the ability of a solid material to return to its original shape and size when the forces causing deformation are removed.

### 8. Mechanics:

- Question: A body of mass 5 kg is moving with a velocity of 10 m/s. What is its kinetic energy?
- Answer: 250 Joules
- Explanation: Kinetic Energy (KE) =  $(1/2) \cdot m \cdot v^2$ , where m is mass and v is velocity.  $\text{KE} = (1/2) \cdot 5 \text{ kg} \cdot (10 \text{ m/s})^2 = (1/2) \cdot 5 \cdot 100 = 250 \text{ J}$ .

9. Thermodynamics:

- Question: The specific heat capacity of water is approximately:
- Answer:  $4200 \text{ J/kg}^\circ\text{C}$
- Explanation: This value represents the amount of heat energy required to raise the temperature of 1 kg of water by 1 degree Celsius.

10. Electricity and Magnetism:

- Question: What is the direction of the magnetic field lines inside a bar magnet?
- Answer: From the South Pole to the North Pole
- Explanation: Magnetic field lines form closed loops. Outside the magnet, they go from the North pole to the South pole, and inside the magnet, they go from the South pole to the North pole.

11. Optics:

- Question: If the angle of incidence is 30 degrees and the angle of refraction is 15 degrees when light passes from one medium to another, the light ray is bending:
- Answer: Towards the normal
- Explanation: When light passes from a rarer medium to a denser medium, it bends towards the normal. Here, the angle of refraction is smaller than the angle of incidence, indicating bending towards the normal.

12. Modern Physics:

- Question: What is the charge of an electron?
- Answer:  $-1.6 \times 10^{-19} \text{ Coulombs}$
- Explanation: An electron carries a fundamental unit of negative electric charge.

13. Waves and Oscillations:

- Question: The frequency of a wave is 5 Hz, and its wavelength is 2 m. What is the speed of the wave?
- Answer: 10 m/s
- Explanation: Speed of a wave ( $v$ ) = frequency ( $f$ )  $\times$  wavelength ( $\lambda$ ).  $v = 5 \text{ Hz} \times 2 \text{ m} = 10 \text{ m/s}$ .

14. Properties of Matter:

- Question: The Young's modulus of steel is higher than that of rubber. This indicates that steel is:
- Answer: More elastic than rubber
- Explanation: A higher Young's modulus means a material requires a larger stress to produce a given strain, indicating a greater resistance to deformation and thus higher elasticity.

15. Mechanics:

- Question: A force of 20 N is applied to an object, and it moves a distance of 5 m in the direction of the force. What is the work done by the force?
- Answer: 100 Joules
- Explanation: Work done ( $W$ ) = Force ( $F$ )  $\times$  displacement ( $d$ )  $\times \cos(\theta)$ . Since the force and displacement are in the same direction,  $\theta = 0^\circ$ , and  $\cos(0^\circ) = 1$ .  $W = 20 \text{ N} \times 5 \text{ m} = 100 \text{ J}$ .

16. Thermodynamics:

- Question: Heat transfer that occurs through the movement of fluids (liquids or gases) is called:
- Answer: Convection
- Explanation: Convection is a mode of heat transfer where heat is transferred by the movement of the heated substance itself.

17. Electricity and Magnetism:

- Question: What is Ohm's law?
- Answer:  $V = IR$
- Explanation: Ohm's law states that the voltage (V) across a conductor is directly proportional to the current (I) flowing through it, provided the temperature remains constant,  
<sup>1</sup> and the constant of proportionality is the resistance (R) of the conductor.

22. Mechanics:

- Question: A ball is dropped from a height of 10 m. Ignoring air resistance, what is its velocity just before it hits the ground? (Assume  $g = 10 \text{ m/s}^2$ )
- Answer: 14.14 m/s (approximately)
- Explanation: Using the equation of motion:  $v^2 = u^2 + 2as$ . Initial velocity ( $u$ ) = 0, acceleration ( $a$ ) =  $g = 10 \text{ m/s}^2$ , and displacement ( $s$ ) = 10 m. So,  $v^2 = 0^2 + 2 * 10 * 10 = 200$ . Therefore,  $v = \sqrt{200} \approx 14.14 \text{ m/s}$ .

23. Electricity and Magnetism:

- Question: If the current flowing through a conductor is doubled, what happens to the power dissipated in the conductor (assuming the resistance remains constant)?
- Answer: The power becomes four times the original value
- Explanation: The Power (P) dissipated in a conductor is given by  $P = I^2R$ , where I is the current and R is the resistance. If the current (I) is doubled to 2I, the new power  $P' = (2I)^2R = 4I^2R = 4P$ .

24. Optics:

- Question: An object is placed at the center of curvature of a concave mirror. Where is the image formed?
- Answer: At the center of curvature
- Explanation: When an object is placed at the center of curvature (C) of a concave mirror, the image formed is real, inverted, and of the same size,  
<sup>1</sup> and it is also located at the center of curvature.