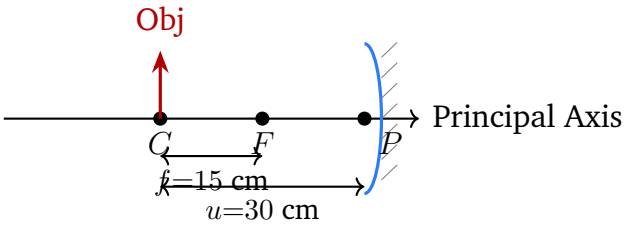
JEECUP Group-A Physics Sample Paper – 21

Duration: 45 Minutes **Maximum Marks: 100**

Instructions

- This paper contains **25** Multiple Choice Questions (Single Correct).
- Each correct answer carries **+4 marks**. Incorrect and unattempted questions carry **0** marks.
- Only **one** option is correct for each question.
- Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.

Q1. A concave mirror has a focal length of $15\,\text{cm}$. An object is placed $30\,\text{cm}$ in front of it, as shown. The image formed is:



(A) At $30\,\text{cm}$ in front of the mirror, real and inverted

(B) At $30\,\text{cm}$ behind the mirror, virtual and erect

(C) At $15\,\text{cm}$ in front of the mirror, real and inverted

(D) At infinity

Q2. A ray of light travels from glass (refractive index $n = 1.5$) into air. The critical angle for total internal reflection is approximately:

(A) 30°

(B) 42°

(C) 60°

(D) 90°

Q3. A convex lens has a focal length of $25\,\text{cm}$. Its power is:

(A) $0.04\,\text{D}$

(B) $0.4\,\text{D}$

(C) $4\,\text{D}$

(D) $40\,\text{D}$

Q4. According to the laws of reflection, the angle of incidence is:

(A) Always greater than the angle of reflection

(B) Always less than the angle of reflection

(C) Always equal to 90°

(D) Equal to the angle of reflection

Q5. Which of the following correctly describes the image formed by a plane mirror?

(A) Virtual, erect and of the same size as the object

(B) Real, erect and of the same size as the object

(C) Virtual, inverted and smaller than the object

(D) Real, inverted and magnified

Q6. A wire has a resistance of $10\,\Omega$. If the potential difference across it is $5\,\text{V}$, the current flowing through it is:

(A) $50\,\text{A}$

(B) $0.5\,\text{A}$

(C) $2\,\text{A}$

(D) $0.2\,\text{A}$

Q7. Three resistors of $2\,\Omega$, $3\,\Omega$ and $5\,\Omega$ are connected in series. The equivalent resistance of the combination is:

(A) $0.97\,\Omega$

(B) $5\,\Omega$

(C) $10\,\Omega$

(D) $30\,\Omega$

Q8. An electric bulb is connected to a $220\,\text{V}$ supply and draws a current of $0.5\,\text{A}$. The power consumed by the bulb is:

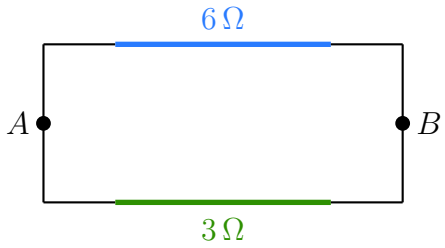
(A) $440\,\text{W}$

(B) $22\,\text{W}$

(C) $220\,\text{W}$

(D) $110\,\text{W}$

Q9. Two resistors of $6\,\Omega$ and $3\,\Omega$ are connected in parallel between junctions A and B as shown. The equivalent resistance between A and B is:



(A) $2\,\Omega$

(B) $4.5\,\Omega$

(C) $9\,\Omega$

(D) $18\,\Omega$

Q10. The heating effect of electric current is utilised in which of the following devices?

(A) Electric motor

(B) Electric iron

(C) Electric fan

(D) Transformer

Q11. A car starts from rest and attains a velocity of $20\,\mathrm{m\,s^{-1}}$ in 4 seconds. The acceleration of the car is:

(A) $80\,\mathrm{m\,s^{-2}}$

(B) $2\,\mathrm{m\,s^{-2}}$

(C) $5\,\mathrm{m\,s^{-2}}$

(D) $0.2\,\mathrm{m\,s^{-2}}$

Q12. "A body continues to remain in its state of rest or of uniform motion in a straight line unless acted upon by an external unbalanced force." This statement is:

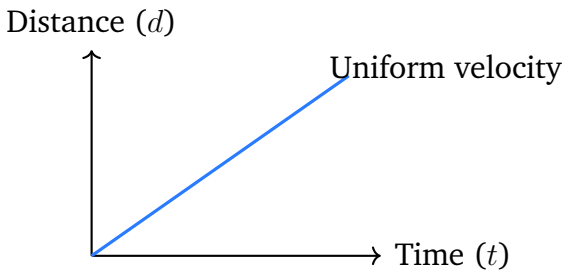
(A) Newton's Second Law of Motion

(B) Law of conservation of momentum

(C) Newton's Third Law of Motion

(D) Newton's First Law of Motion

Q13. A body moves with uniform velocity. The distance–time (d–t) graph for such motion is shown below. Which option correctly identifies the shape of the graph?



(A) A straight line with constant positive slope

(B) A parabola

(C) A horizontal straight line (zero slope)

(D) A curve with increasing slope

Q14. When a gun is fired, the gun recoils backward. This phenomenon is an application of:

(A) Newton's First Law of Motion

(B) Newton's Third Law of Motion

(C) Newton's Second Law of Motion

(D) Law of conservation of energy

Q15. A force of $10\,\mathrm{N}$ acts on a body and displaces it by $5\,\mathrm{m}$ in the direction of the force. The work done by the force is:

(A) $2\,\mathrm{J}$

(B) $15\,\mathrm{J}$

(C) $50\,\mathrm{J}$

(D) $500\,\mathrm{J}$

Q16. A body of mass $2\,\mathrm{kg}$ is moving with a velocity of $4\,\mathrm{m\,s^{-1}}$. Its kinetic energy is:

(A) $4\,\mathrm{J}$

(B) $8\,\mathrm{J}$

(C) $32\,\mathrm{J}$

(D) $16\,\mathrm{J}$

Q17. Which of the following statements correctly expresses the law of conservation of energy?

(A) Energy can neither be created nor destroyed; it can only be converted from one form to another

(B) The total kinetic energy of an isolated system always remains constant

(C) Energy can be created from nothing under special circumstances

(D) Potential energy and kinetic energy of a body are always equal

Q18. The specific heat capacity of water is $4200\,\mathrm{J\,kg^{-1}\,^{\circ}C^{-1}}$. The heat energy required to raise the temperature of $2\,\mathrm{kg}$ of water by $5\,^{\circ}\mathrm{C}$ is:

(A) 840 J

(B) 42000 J

(C) 4200 J

(D) 21000 J

Q19. Which mode of heat transfer does not require any material medium and can take place even in vacuum?

(A) Conduction

(B) Convection

(C) Radiation

(D) Both conduction and convection

Q20. A bimetallic strip bends on heating because:

(A) Both metals in the strip expand equally

(B) The metal on the inner (concave) side expands more

(C) Metals contract uniformly on heating

(D) The two metals have different coefficients of thermal expansion

Q21. In which of the following media is the speed of sound the greatest?

(A) Steel

(B) Water

(C) Air

(D) Vacuum

Q22. A sound wave has a high frequency. Which of the following properties does it have?

(A) Low pitch and high loudness

(B) High pitch

(C) Large wavelength

(D) Low speed of propagation

Q23. Alpha (α) particles emitted during radioactive decay are:

(A) High-speed electrons

(B) High-energy photons (gamma rays)

(C) Helium nuclei carrying charge $+2e$

(D) Uncharged neutrons

Q24. The process in which a heavy nucleus (such as uranium) splits into two lighter nuclei with the release of a large amount of energy is called:

(A) Nuclear fusion

(B) Radioactive decay by alpha emission

(C) Pair production

(D) Nuclear fission

Q25. According to Archimedes' Principle, the buoyant (upward) force experienced by an object submerged in a fluid is equal to:

(A) The weight of fluid displaced by the object

(B) The weight of the object measured in air

(C) The density of the fluid multiplied by the volume of the container

(D) The pressure exerted at the bottom of the container

Detailed Solutions

Q1.

Solution

Concept — Mirror Formula: For a concave mirror with sign convention (distances measured from the pole), f and u are negative (object and focus in front of mirror). Formula: $\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$.

Step 1 — Known values: $f=-15\,\text{cm}$, $u=-30\,\text{cm}$.

Step 2 — Find image distance: $\frac{1}{v}=\frac{1}{f}-\frac{1}{u}=\frac{1}{-15}-\frac{1}{-30}=-\frac{2}{30}+\frac{1}{30}=-\frac{1}{30}$, so $v=-30\,\text{cm}$ (real image in front of mirror).

Step 3 — Magnification: $m=-\frac{v}{u}=-\frac{-30}{-30}=-1$. Negative means inverted; $|m|=1$ means same size.

Final Answer: Image at $30\,\text{cm}$ in front of mirror, real and inverted $\Rightarrow \boxed{(A)}$

Answer: (A) Go Back to Q1

Q2.

Solution

Concept — Critical Angle: At the critical angle c, the refracted ray grazes the boundary (angle of refraction $=90°$). Snell's law gives $n\sin c=1$, so $\sin c=1/n$.

Step 1: $\sin c=1/n=1/1.5=2/3\approx 0.667$.

Step 2: $c=\sin^{-1}(0.667)\approx 41.8°\approx 42°$.

Step 3 — Check options: $30°$ gives $\sin 30°=0.5\neq 0.667$; $42°$ gives $\sin 42°\approx 0.669\approx 2/3$. (*Note:* total internal reflection occurs for angles of incidence $>c$, i.e., $>42°$.)

Final Answer: Critical angle $\approx 42°\Rightarrow \boxed{(B)}$

Answer: (B) Go Back to Q2

Q3.

Solution

Concept — Lens Power: The power of a lens $P=1/f$, where f must be in metres. A convex lens has positive power.

Step 1: Convert focal length: $f=25\,\text{cm}=0.25\,\text{m}$.

Step 2: $P=1/0.25=4\,\text{D}$ (dioptres).

Step 3 — Common error: Option D ($40\,\text{D}$) results from using f in cm directly without conversion. Option A ($0.04\,\text{D}$) inverts the formula incorrectly.

Final Answer: Power $=4\,\text{D}\Rightarrow \boxed{(C)}$

Answer: (C) Go Back to Q3

Q4.

Solution

Concept — First Law of Reflection: Both angles are measured from the normal to the reflecting surface at the point of incidence.

Step 1: First Law of Reflection: $\angle i = \angle r$ (angle of incidence equals angle of reflection).

Step 2: This holds for all types of mirrors (plane, concave, convex) and for all angles of incidence.

Step 3 — Incorrect options: Options A and B describe inequality relationships that do not exist. Option C ($= 90^\circ$) is only true for normal incidence and even then $\angle i = \angle r = 0^\circ$, not 90°.

Final Answer: Angle of incidence equals angle of reflection $\Rightarrow \boxed{(D)}$

Answer: (D) Go Back to Q4

Q5.

Solution

Concept — Plane Mirror Characteristics: A plane mirror forms an image that is virtual (behind the mirror), erect (same orientation), and of the same size as the object. The image is laterally inverted but not top-to-bottom inverted.

Step 1: The image is *virtual* because no real rays converge; the diverging reflected rays appear to come from behind the mirror.

Step 2: The image is *erect* (not upside down) and has the same magnification $|m| = 1$.

Step 3 — Incorrect options: Option B (real) is wrong — a plane mirror cannot form a real image. Option C (inverted) is wrong. Option D (magnified) is wrong.

Final Answer: Virtual, erect, same size $\Rightarrow \boxed{(A)}$

Answer: (A) Go Back to Q5

Q6.

Solution

Concept — Ohm's Law: Ohm's Law states $V = IR$, so current $I = V/R$.

Step 1: $I = V/R = 5\,\text{V}/10\,\Omega = 0.5\,\text{A}$.

Step 2 — Check options: Option A ($50\,\text{A}$) results from multiplying instead of dividing (5×10). Option C ($2\,\text{A}$) uses $R/V = 10/5$. Option D ($0.2\,\text{A}$) comes from $R/(V \times 10)$.

Final Answer: $I = 0.5\,\text{A} \Rightarrow \boxed{(B)}$

Answer: (B) Go Back to Q6

Q7.

Solution

Concept — Series Combination: For resistors in series, $R_{\text{eq}} = R_1 + R_2 + R_3 + \cdots$ The same current flows through all.

Step 1: $R_{\text{eq}} = 2\,\Omega + 3\,\Omega + 5\,\Omega = 10\,\Omega$.

Step 2 — Parallel formula check: Option A ($\approx 0.97\,\Omega$) would result from the incorrect use of parallel formula $1/R = 1/2 + 1/3 + 1/5$. Resistors are in *series* here, not parallel.

Step 3: In series, equivalent resistance is always greater than any individual resistor. $10\,\Omega > 5\,\Omega$ ✓.

Final Answer: $R_{\text{eq}} = 10\,\Omega \Rightarrow \boxed{(C)}$

Answer: (C) Go Back to Q7

Q8.

Solution

Concept — Electric Power: $P = VI$, where V is voltage and I is current.

Step 1: $P = VI = 220\,\text{V} \times 0.5\,\text{A} = 110\,\text{W}$.

Step 2: Alternative check using resistance: $R = V/I = 220/0.5 = 440\,\Omega$; $P = I^2R = (0.5)^2 \times 440 = 0.25 \times 440 = 110\,\text{W}$ ✓.

Step 3 — Common errors: Option A ($440\,\text{W}$) results from $P = V \times 2I$ (doubling current). Option C ($220\,\text{W}$) ignores the current ($I = 1$ assumed).

Final Answer: $P = 110\,\text{W} \Rightarrow \boxed{(D)}$

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Parallel Combination: For two resistors in parallel: $\dfrac{1}{R_{\text{eq}}} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$, so $R_{\text{eq}} = \dfrac{R_1 R_2}{R_1 + R_2}$.

Step 1: $\dfrac{1}{R_{\text{eq}}} = \dfrac{1}{6} + \dfrac{1}{3} = \dfrac{1}{6} + \dfrac{2}{6} = \dfrac{3}{6} = \dfrac{1}{2}$.

Step 2: $R_{\text{eq}} = 2\,\Omega$.

Step 3: In parallel, equivalent resistance is always *less* than the smallest individual resistor ($< 3\,\Omega$). $2\,\Omega < 3\,\Omega$ ✓. Options C ($9\,\Omega$) and D ($18\,\Omega$) are larger than individual resistors — impossible for parallel.

Final Answer: $R_{\text{eq}} = 2\,\Omega \Rightarrow \boxed{(A)}$

Answer: (A) Go Back to Q9

Q10.

Solution

Concept — Joule Heating (Heating Effect of Current): When current flows through a resistance, electrical energy is converted to heat. This is Joule's Law: $H = I^2Rt$.

Step 1: Devices that use the heating effect: electric iron, electric toaster, electric kettle, electric heater, incandescent bulb filament.

Step 2 — Incorrect options:

- Electric motor: converts electrical energy to mechanical energy (not heat).
- Electric fan: uses an electric motor (mechanical energy).
- Transformer: transfers electrical energy between circuits with minimal heat loss (ideally).

Step 3: The electric iron uses Joule heating to heat its metallic plate for pressing clothes.

Final Answer: Electric iron $\Rightarrow \boxed{(B)}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — Uniform Acceleration: Acceleration $a = \dfrac{v-u}{t}$, where u = initial velocity, v = final velocity, t = time.

Step 1: $u = 0$ (starts from rest), $v = 20\,\text{m s}^{-1}$, $t = 4\,\text{s}$.

Step 2: $a = (20-0)/4 = 20/4 = 5\,\text{m s}^{-2}$.

Step 3 — Common errors: Option A ($80\,\text{m s}^{-2}$) comes from $v \times t$. Option B ($2\,\text{m s}^{-2}$) uses t/v. Option D ($0.2\,\text{m s}^{-2}$) uses $1/(v/u)$ type error.

Final Answer: $a = 5\,\text{m s}^{-2} \Rightarrow \boxed{(C)}$

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Newton's Laws Identification: Newton's First Law (Law of Inertia) describes an object's tendency to maintain its state of motion unless an external force acts.

Step 1: The given statement — "a body continues in its state of rest or uniform motion unless acted upon by an external force" — is the exact statement of Newton's First Law.

Step 2 — Other laws: Newton's Second Law: $F = ma$ (relates force to acceleration). Newton's Third Law: action and reaction are equal and opposite. Conservation of momentum: total momentum is constant in absence of external forces.

Step 3: The concept of "inertia" is central to the First Law. Option A (Second Law) and C (Third Law) describe different principles.

Final Answer: Newton's First Law of Motion $\Rightarrow \boxed{(D)}$

Answer: (D) Go Back to Q12

Q13.

Solution

Concept — Distance–Time Graphs: The slope of a d–t graph gives the velocity. For *uniform* (constant) velocity, the slope is constant, producing a straight line.

Step 1: If velocity $v = \text{const}$, then $d = vt$ — a linear equation. The d–t graph is a straight line through the origin with slope $= v$.

Step 2 — Other graph shapes:

- Parabola (Option B): $d = \frac{1}{2}at^2$ — uniform acceleration, not uniform velocity.
- Horizontal line (Option C): $d = \text{const}$ — body at rest, not moving.
- Increasing-slope curve (Option D): non-uniform acceleration.

Step 3: The diagram shown in the question confirms a straight line with constant positive slope.

Final Answer: Straight line with constant positive slope $\Rightarrow \boxed{(A)}$

Answer: (A) Go Back to Q13

Q14.

Solution

Concept — Newton's Third Law of Motion: For every action there is an equal and opposite reaction. The two forces act on different objects.

Step 1: When the gun fires, it exerts a forward force on the bullet (action). By Newton's Third Law, the bullet exerts an equal and opposite backward force on the gun (reaction) — causing it to recoil.

Step 2: This is also related to conservation of momentum: initial momentum $= 0$; final momentum of bullet (forward) + gun (backward) $= 0$.

Step 3 — Incorrect options: First Law (inertia) would predict the gun stays at rest, which is wrong. Second Law relates to $F = ma$ (not directly applicable here as a naming question).

Final Answer: Newton's Third Law of Motion $\Rightarrow \boxed{(B)}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — Work Done by a Force: $W = F \times d \times \cos\theta$, where θ is the angle between force and displacement. When force and displacement are in the same direction, $\theta = 0^\circ$, so $W = Fd$.

Step 1: $W = F \times d = 10\,\text{N} \times 5\,\text{m} = 50\,\text{J}$.

Step 2: The SI unit of work is the joule (J), where $1\,\text{J} = 1\,\text{N} \cdot \text{m}$.

Step 3 — Common errors: Option A ($2\,\text{J}$) uses F/d instead of $F \times d$. Option D ($500\,\text{J}$) multiplies by an extra factor of 10.

Final Answer: $W = 50\,\text{J} \Rightarrow \boxed{(C)}$

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Kinetic Energy: $KE = \frac{1}{2}mv^2$, where m is mass and v is speed.

Step 1: $KE = \frac{1}{2} \times 2\,\text{kg} \times (4\,\text{m s}^{-1})^2 = \frac{1}{2} \times 2 \times 16 = 16\,\text{J}$.

Step 2: Note that $v^2 = 4^2 = 16$, not $4 \times 2 = 8$. Option B ($8\,\text{J}$) forgets to square the velocity. Option C ($32\,\text{J}$) omits the $\frac{1}{2}$ factor.

Final Answer: $KE = 16\,\text{J} \Rightarrow \boxed{(D)}$

Answer: (D) Go Back to Q16

Q17.

Solution

Concept — Law of Conservation of Energy: This is one of the most fundamental laws in physics, applying to all forms of energy.

Step 1: The Law states: energy can neither be created nor destroyed; it can only be transformed from one form to another. The total energy of an isolated system remains constant.

Step 2 — Incorrect options: Option B (only kinetic energy is conserved) is wrong — the law covers *total* energy including potential, thermal, etc. Options C and D are factually incorrect statements.

Step 3: Example: a falling ball converts potential energy (mgh) to kinetic energy ($\frac{1}{2}mv^2$); total energy remains constant.

Final Answer: Energy cannot be created or destroyed, only converted $\Rightarrow \boxed{(A)}$

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Heat Equation: $Q = mc\Delta T$, where m = mass, c = specific heat capacity, ΔT = temperature rise.

Step 1: $m = 2\,\text{kg}$, $c = 4200\,\text{J}\,\text{kg}^{-1}\,^\circ\text{C}^{-1}$, $\Delta T = 5\,^\circ\text{C}$.

Step 2: $Q = 2 \times 4200 \times 5 = 42000\,\text{J}$.

Step 3 — Common errors: Option A ($840\,\text{J}$) uses only $c \times \Delta T/25$ (confusion). Option C ($4200\,\text{J}$) forgets to multiply by m and ΔT. Option D ($21000\,\text{J}$) uses $m = 1$ or $\Delta T = 2.5$.

Final Answer: $Q = 42000\,\text{J} \Rightarrow \boxed{(B)}$

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Modes of Heat Transfer: Conduction and convection require a material medium (solid or fluid). Radiation is the transfer of heat in the form of electromagnetic waves (infrared), which requires no medium.

Step 1: *Conduction*: heat transfer through direct contact in solids; needs a medium.

Step 2: *Convection*: heat transfer through fluid (liquid/gas) currents; needs a medium.

Step 3: *Radiation*: heat transfer by infrared electromagnetic waves; travels through vacuum at the speed of light. Example: heat from the Sun reaches Earth through the vacuum of space.

Final Answer: Radiation $\Rightarrow \boxed{(C)}$

Answer: (C) Go Back to Q19

Q20.

Solution

Concept — Bimetallic Strip: A bimetallic strip consists of two metals bonded together. When heated, each metal expands according to $\Delta L = L_0 \alpha \Delta T$, where α is the linear expansion coefficient. Different α values cause unequal expansion and bending.

Step 1: Metal with higher α expands more $\Rightarrow$ becomes the outer (convex) side. Metal with lower α becomes the inner (concave) side.

Step 2: The strip bends *toward* the less-expanding metal (lower α).

Step 3 — Incorrect options: If both metals expanded equally (Option A), the strip would not bend. Metals expand on heating, not contract (Option C is false).

Final Answer: Different coefficients of thermal expansion $\Rightarrow \boxed{(D)}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — Speed of Sound in Different Media: Sound travels as a mechanical wave through elastic media. Approximate speeds: steel $\approx 5100\,\mathrm{m\,s^{-1}}$; water $\approx 1500\,\mathrm{m\,s^{-1}}$; air $\approx 340\,\mathrm{m\,s^{-1}}$. Sound cannot travel in vacuum.

Step 1: Solids $>$ Liquids $>$ Gases (in order of sound speed). This is because solids have the highest intermolecular force and bulk modulus.

Step 2: Steel (a solid) has the highest speed. Option D (vacuum) is incorrect because sound requires a material medium.

Step 3: Practical example: railway workers used to listen for an approaching train by placing their ear on the rail (sound through steel arrives much earlier than through air).

Final Answer: Speed of sound is maximum in steel $\Rightarrow \boxed{(A)}$

Answer: (A) Go Back to Q21

Q22.

Solution

Concept — Pitch and Frequency: Pitch is the subjective perception of how high or low a sound appears. It is directly related to frequency: higher frequency $\Rightarrow$ higher pitch.

Step 1: Frequency and pitch are directly proportional. A whistle (high frequency $\approx 4000\,\text{Hz}$) has a high pitch; a bass drum (low frequency $\approx 60\,\text{Hz}$) has a low pitch.

Step 2 — Incorrect options:

- Option A: loudness depends on amplitude (not frequency), and pitch is not low.
- Option C: wavelength and frequency are inversely related ($\lambda = v/f$); high $f \Rightarrow$ small λ.
- Option D: speed of sound in a given medium is independent of frequency.

Final Answer: High frequency gives high pitch $\Rightarrow \boxed{(B)}$

Answer: (B) Go Back to Q22

Q23.

Solution

Concept — Types of Radioactive Emissions: Alpha (α), beta (β), and gamma (γ) are three types of radioactive decay products with different natures and penetrating powers.

Step 1: An α-particle is identical to the nucleus of a helium-4 atom: it contains 2 protons and 2 neutrons, giving a charge of $+2e$ and mass number 4.

Step 2 — Other options: High-speed electrons are β^- particles (Option A). High-energy photons are γ-rays (Option B). Uncharged neutrons are neutrons, not α-particles (Option D).

Step 3: Alpha particles have the lowest penetration power (stopped by a sheet of paper) but the highest ionising ability.

Final Answer: Helium nuclei with charge $+2e \Rightarrow \boxed{(C)}$

Answer: (C) Go Back to Q23

Q24.

Solution

Concept — Nuclear Reactions: Nuclear fission and fusion are two types of nuclear reactions that release enormous amounts of energy.

Step 1: *Nuclear fission*: a heavy nucleus (e.g., $^{235}_{92}\mathrm{U}$) absorbs a neutron and splits into two medium-mass nuclei, releasing 2–3 neutrons and energy ($\sim 200\,\mathrm{MeV}$). Used in nuclear reactors.

Step 2: *Nuclear fusion*: two light nuclei (e.g., hydrogen isotopes) combine to form a heavier nucleus, releasing energy. This is the source of solar energy (Option A is fusion, not fission).

Step 3 — Incorrect options: Alpha emission (Option B) is radioactive decay, not the process of a nucleus splitting by bombardment. Pair production (Option C) is a quantum phenomenon involving photon-to-particle conversion.

Final Answer: Nuclear fission $\Rightarrow \boxed{(D)}$

Answer: (D) Go Back to Q24

Q25.

Solution

Concept — Archimedes' Principle: Stated by Archimedes (c. 287–212 BC): when a body is partially or fully submerged in a fluid, it experiences an upward (buoyant) force equal to the weight of the fluid displaced.

Step 1: Buoyant force $F_b = \rho_{\text{fluid}} \times V_{\text{displaced}} \times g$, which equals the *weight* of fluid displaced.

Step 2: An object floats when its weight equals the buoyant force, i.e., when it displaces a volume of fluid whose weight equals its own weight.

Step 3 — Incorrect options: Option B (weight of object in air) is the object's own weight, not the buoyant force. Options C and D are not statements of Archimedes' Principle.

Final Answer: Weight of fluid displaced $\Rightarrow \boxed{(A)}$

Answer: (A) Go Back to Q25

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	B	3	C	4	D	5	A
6	B	7	C	8	D	9	A	10	B
11	C	12	D	13	A	14	B	15	C
16	D	17	A	18	B	19	C	20	D
21	A	22	B	23	C	24	D	25	A