AME CET Physics

Sample Paper – 8

Duration: 20 Minutes **Maximum Marks: 80**

Instructions

- This paper contains **20** Multiple Choice Questions (Single Correct Answer), modelled on the Physics section of **AME CET** entrance.
- Each correct answer carries **+4 marks**. Each wrong answer carries -1 **mark**. Unattempted questions carry **0 marks**.
- Only **one** option is correct per question. Choose carefully.
- Syllabus level: **Class 11 and 12 NCERT Physics** (Units & Measurement to Communication Systems).
- Use of mobile phones, calculators, or any electronic gadget is strictly prohibited.

Q1. Three resistors of $4\,\Omega$, $6\,\Omega$, and $12\,\Omega$ are connected in **parallel**. What is the equivalent resistance of the combination?

(A) $2\,\Omega$

(B) $22\,\Omega$

(C) $4\,\Omega$

(D) $6\,\Omega$

Q2. A steady current of $I = 5\,\text{A}$ flows through a conductor for $t = 2$ minutes. What is the total charge that flows through the conductor?

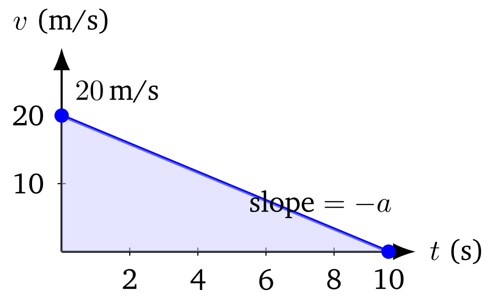
(A) $10\,\text{C}$

(B) $2.5\,\text{C}$

(C) $600\,\text{C}$

(D) $60\,\text{C}$

Q3. The velocity–time graph below shows a particle decelerating uniformly from $v = 20\,\text{m/s}$ at $t = 0$ to rest at $t = 10\,\text{s}$. What is the magnitude of the retardation?



(A) $20\,\text{m/s}^2$

(B) $2\,\text{m/s}^2$

(C) $10\,\text{m/s}^2$

(D) $0.2\,\text{m/s}^2$

Q4. A boat can travel at $5\,\text{m/s}$ in still water. A river flows at $3\,\text{m/s}$. If the boat aims to cross directly perpendicular to the bank and corrects for the current, what is the effective crossing speed?

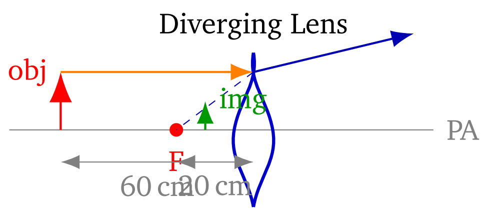
(A) $5\,\text{m/s}$

(B) $3\,\text{m/s}$

(C) $\sqrt{34}\,\text{m/s}$

(D) $4\,\text{m/s}$

Q5. A diverging (concave) lens of focal length $f = -20\,\text{cm}$ forms an image of an object placed at $u = -60\,\text{cm}$. Using the lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$, what is the image distance v?



(A) $-20\,\text{cm}$

(B) $-15\,\text{cm}$

(C) $-60\,\text{cm}$

(D) $+15\,\text{cm}$

Q6. A rainbow is formed due to which combination of optical phenomena in water droplets?

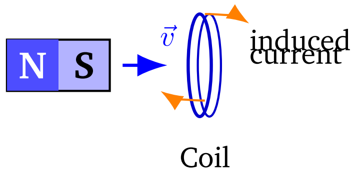
(A) Reflection only

(B) Refraction only

(C) Diffraction only

(D) Dispersion and total internal reflection

Q7. The north pole of a bar magnet is moved toward the face of a circular coil as shown. By Lenz's law, the face of the coil facing the approaching magnet acts as:



(A) South pole

(B) Neutral

(C) North pole

(D) Alternating poles

Q8. In a purely resistive AC circuit, the peak voltage is $V_0 = 200\,\text{V}$ and the peak current is $I_0 = 4\,\text{A}$. What is the average power dissipated?

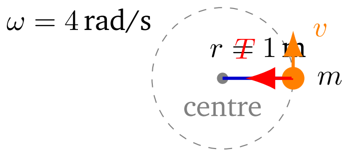
(A) $400\,\text{W}$

(B) $800\,\text{W}$

(C) $200\,\text{W}$

(D) 100 W

Q9. A ball of mass $m = 0.5$ kg is attached to a string and whirled in a horizontal circle of radius $r = 1$ m with angular speed $\omega = 4$ rad/s (top view). What is the tension in the string?



(top view)

(A) 2 N

(B) 4 N

(C) 0.5 N

(D) 8 N

Q10. A pendulum bob is released from rest at a height $h = 0.2$ m above the lowest point of its swing. Taking $g = 10\,\text{m/s}^2$, what is the speed of the bob at the lowest point?

(A) 0.2 m/s

(B) 2 m/s

(C) 4 m/s

(D) $\sqrt{2}$ m/s

Q11. A closed Gaussian surface encloses a charge $q = 4\,\mu\text{C} = 4 \times 10^{-6}$ C. Given $\varepsilon_0 = 8.85 \times 10^{-12}\,\text{C}^2/(\text{N·m}^2)$, what is the total electric flux through the surface?

(A) $4.52 \times 10^{3}\,\text{N·m}^2/\text{C}$

(B) $8.85 \times 10^{5}\,\text{N·m}^2/\text{C}$

(C) $4.52 \times 10^{5}\,\text{N·m}^2/\text{C}$

(D) $1.77 \times 10^{6}\,\text{N·m}^2/\text{C}$

Q12. A long straight wire carries a current $I = 10\,\text{A}$. What is the magnetic field at a perpendicular distance $r = 0.1\,\text{m}$ from the wire? (Take $\mu_0 = 4\pi \times 10^{-7}\,\text{T·m/A}$.)

(A) $2 \times 10^{-5}\,\text{T}$

(B) $4\pi \times 10^{-5}\,\text{T}$

(C) $2 \times 10^{-6}\,\text{T}$

(D) $4 \times 10^{-5}\,\text{T}$

Q13. Light of frequency $f = 8 \times 10^{14}\,\text{Hz}$ falls on a metal surface. The stopping potential is $V_s = 2\,\text{V}$. Given $h = 6.6 \times 10^{-34}\,\text{J·s}$ and $e = 1.6 \times 10^{-19}\,\text{C}$, what is the work function of the metal in eV?

(A) $3.3\,\text{eV}$

(B) $2.0\,\text{eV}$

(C) $5.28\,\text{eV}$

(D) $1.3\,\text{eV}$

Q14. Nitrogen-16 ($^{16}_{7}\text{N}$) undergoes beta-minus (β^-) decay. What is the daughter nucleus produced?

(A) $^{16}_{6}\text{C}$

(B) $^{16}_{8}\text{O}$

(C) $^{12}_{5}\text{B}$

(D) $^{16}_{9}\text{F}$

Q15. Two moles of a monatomic ideal gas are heated at constant volume through $\Delta T = 10\,\text{K}$. Given $R = 8.31\,\text{J/(mol·K)}$ and $C_V = \frac{3}{2}R$, how much heat is supplied?

(A) $249\,\text{J}$

(B) $415\,\text{J}$

(C) $83\,\text{J}$

(D) $166\,\text{J}$

Q16. A sound wave has frequency $f = 440\,\text{Hz}$ and wavelength $\lambda = 0.75\,\text{m}$. What is the speed of sound?

(A) $220\,\text{m/s}$

(B) $440\,\text{m/s}$

(C) $330\,\text{m/s}$

(D) $660\,\text{m/s}$

Q17. A uniform rod of mass $M = 2\,\text{kg}$ and length $L = 1\,\text{m}$ has moment of inertia about its centre $I_{cm} = \dfrac{ML^2}{12}$. Using the parallel axis theorem, what is its moment of inertia about one end?

(A) $\frac{1}{6}\,\text{kg·m}^2$

(B) $\frac{2}{3}\,\text{kg·m}^2$

(C) $\frac{1}{3}\,\text{kg·m}^2$

(D) $1\,\text{kg·m}^2$

Q18. In an NPN transistor, the current gain $\beta = 99$ and the base current $I_B = 0.1\,\text{mA}$. What is the emitter current I_E?

(A) $0.1\,\text{mA}$

(B) $9.9\,\text{mA}$

(C) $99\,\text{mA}$

(D) $10\,\text{mA}$

Q19. A steel ball of radius $r = 1\,\text{mm}$ falls through oil of viscosity $\eta = 1\,\text{Pa·s}$. Given $\rho_{\text{steel}} = 8000\,\text{kg/m}^3$, $\rho_{\text{oil}} = 800\,\text{kg/m}^3$, and $g = 10\,\text{m/s}^2$, what is the terminal velocity of the ball?

(A) $0.032\,\text{m/s}$

(B) $0.004\,\text{m/s}$

(C) $0.016\,\mathrm{m/s}$

(D) $0.8\,\mathrm{m/s}$

Q20. An astronaut has a mass of $60\,\mathrm{kg}$ on Earth. On the Moon, the acceleration due to gravity is $g_M = 1.6\,\mathrm{m/s^2}$. What is the weight of the astronaut on the Moon?

(A) $96\,\mathrm{N}$

(B) $600\,\mathrm{N}$

(C) $60\,\mathrm{N}$

(D) $9.6\,\mathrm{N}$

Detailed Solutions

Q1.

Solution

Concept — Parallel Resistance: For resistors in parallel, $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$.

Step 1 — Write reciprocal sum:

$$\frac{1}{R_{eq}} = \frac{1}{4} + \frac{1}{6} + \frac{1}{12}$$

Step 2 — Common denominator (LCD = 12):

$$\frac{1}{R_{eq}} = \frac{3}{12} + \frac{2}{12} + \frac{1}{12} = \frac{6}{12} = \frac{1}{2}$$

Step 3 — Invert:

$$R_{eq} = 2\,\Omega$$

Why other options are wrong:

- Option B ($22\,\Omega$): This is the series sum $4+6+12$, not the parallel equivalent.
- Option C ($4\,\Omega$): Just R_1 alone — the parallel combination is less than the smallest resistor.
- Option D ($6\,\Omega$): Just R_2 alone.

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

Answer: (A) **Go Back to Q1**

Q2.

Solution

Concept — Charge Flow: $Q = I \times t$, with time in seconds.

Step 1 — Convert time:

$$t = 2\,\text{min} \times 60 = 120\,\text{s}$$

Step 2 — Apply formula:

$$Q = I \times t = 5 \times 120$$

Step 3 — Evaluate:

$$Q = 600\,\text{C}$$

Why other options are wrong:

- Option A ($10\,\text{C}$): Uses $t = 2\,\text{s}$ instead of converting to seconds.
- Option B ($2.5\,\text{C}$): Divides current by time (wrong operation).
- Option D ($60\,\text{C}$): Uses $t = 12\,\text{s}$ or forgets to multiply by I.

Final Answer: $Q = 600\,\text{C} \Rightarrow \boxed{\text{C}}$

Answer: (C) **Go Back to Q2**

Q3.

Solution

Concept — Uniform Deceleration from v–t Graph: The slope of the v–t graph gives acceleration. For deceleration from u to $v = 0$ in time t, retardation $= (u - v)/t$.

Step 1 — Change in velocity:

$$\Delta v = 20 - 0 = 20\,\text{m/s}$$

Step 2 — Time interval:

$$\Delta t = 10\,\text{s}$$

Step 3 — Retardation:

$$a = \frac{\Delta v}{\Delta t} = \frac{20}{10}$$

Step 4 — Evaluate:

$$a = 2\,\text{m/s}^2$$

Why other options are wrong:

- Option A ($20\,\text{m/s}^2$): Takes Δv as the answer, forgetting to divide by Δt.
- Option C ($10\,\text{m/s}^2$): Divides Δv by 2 then by the wrong time.
- Option D ($0.2\,\text{m/s}^2$): Inverts the ratio ($10/20\times$ error).

Final Answer: Retardation $= 2\,\text{m/s}^2 \Rightarrow \boxed{\text{B}}$

Answer: (B) **Go Back to Q3**

Q4.

Solution

Concept — River Boat (Minimum Drift Path): To cross straight across, the boat must angle upstream so the river current cancels the lateral drift. The effective crossing speed is $v_\perp = \sqrt{v_b^2 - v_r^2}$.

Step 1 — Identify components:

$$v_b = 5\,\text{m/s}, \quad v_r = 3\,\text{m/s}$$

Step 2 — Apply Pythagoras:

$$v_\perp = \sqrt{v_b^2 - v_r^2} = \sqrt{25 - 9} = \sqrt{16}$$

Step 3 — Evaluate:

$$v_\perp = 4\,\text{m/s}$$

Why other options are wrong:

- Option A ($5\,\text{m/s}$): Speed in still water, not the effective crossing speed.
- Option B ($3\,\text{m/s}$): River current speed alone.
- Option C ($\sqrt{34}\,\text{m/s}$): Uses $\sqrt{v_b^2 + v_r^2}$ (adds instead of subtracts; applies when boat heads straight across with drift).

Final Answer: Crossing speed $= 4\,\text{m/s} \Rightarrow \boxed{\text{D}}$

Answer: (D) **Go Back to Q4**

Q5.

Solution

Concept — Thin Lens Formula (Diverging Lens): $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$, giving $\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$.

Step 1 — Assign values:

$$f = -20\,\text{cm}, \quad u = -60\,\text{cm}$$

Step 2 — Substitute:

$$\frac{1}{v} = \frac{1}{-20} + \frac{1}{-60}$$

Step 3 — Common denominator (LCD = 60):

$$\frac{1}{v} = \frac{-3}{60} + \frac{-1}{60} = \frac{-4}{60} = \frac{-1}{15}$$

Step 4 — Invert:

$$v = -15\,\text{cm}$$

Negative sign confirms a virtual image on the same side as the object — consistent with a diverging lens.

Why other options are wrong:

- Option A (-20 cm): Treats object as at infinity ($1/u = 0$).
- Option C (-60 cm): Takes $v = u$ (image at object position).
- Option D ($+15$ cm): Wrong sign; a diverging lens cannot form a real image of a real object.

Final Answer: $v = -15\,\text{cm} \Rightarrow \boxed{\text{B}}$

Answer: (B) **Go Back to Q5**

Q6.

Solution

Concept — Rainbow Formation: A rainbow results from sunlight interacting with spherical water droplets via three steps.

Step 1 — Refraction at entry: White light enters the droplet and is dispersed (split by wavelength) because different colours refract at different angles.

Step 2 — Total internal reflection: Inside the droplet, light strikes the back surface beyond the critical angle and undergoes total internal reflection.

Step 3 — Refraction at exit: Light exits with further dispersion, creating the arc of colours.

$$\boxed{\text{Dispersion + Total internal reflection}}$$

Why other options are wrong:

- Option A (reflection only): Does not explain spectral separation.
- Option B (refraction only): Does not explain why light returns to the observer.

- Option C (diffraction): Responsible for diffraction grating patterns, not rainbows.

Final Answer: Dispersion and TIR $\Rightarrow$ $\boxed{D}$

Answer: (D) **Go Back to Q6**

Q7.

Solution

Concept — Lenz's Law: The induced current opposes the change in magnetic flux that causes it.

Step 1 — Identify flux change: As the N-pole approaches, flux through the coil increases in the direction from magnet toward coil (let us call this the positive direction).

Step 2 — Apply Lenz's law: To oppose the increasing flux, the coil must produce a field directed away from the approaching magnet (i.e., toward the magnet).

Step 3 — Determine polarity: A face that repels the approaching N-pole must itself behave as a **north pole** (like poles repel).

$$\boxed{\text{The facing face acts as a North pole}}$$

Why other options are wrong:

- Option A (south pole): Would attract the magnet, aiding the flux — violates Lenz's law.
- Option B (neutral): Implies no induced current.
- Option D (alternating): Occurs only for an oscillating magnet, not a steadily approaching one.

Final Answer: North pole $\Rightarrow$ $\boxed{C}$

Answer: (C) **Go Back to Q7**

Q8.

Solution

Concept — Average Power in AC (Resistive): $P_{\text{avg}} = \frac{V_0 I_0}{2}\cos\phi$. For a purely resistive circuit, $\phi = 0$ so $\cos\phi = 1$.

Step 1 — Apply formula:

$$P_{\text{avg}} = \frac{V_0 I_0}{2}$$

Step 2 — Substitute:

$$P_{\text{avg}} = \frac{200 \times 4}{2} = \frac{800}{2}$$

Step 3 — Evaluate:

$$P_{\text{avg}} = 400\,\text{W}$$

Why other options are wrong:

- Option B ($800\,\text{W}$): Uses peak values directly without dividing by 2 (uses $P = V_0 I_0$).
- Option C ($200\,\text{W}$): Only uses $V_0/2$ without multiplying by I_0.
- Option D ($100\,\text{W}$): Divides the correct answer by 4 (uses $V_0 I_0/8$).

Final Answer: $P_{\text{avg}} = 400\,\text{W} \Rightarrow \boxed{\text{A}}$

Answer: (A) **Go Back to Q8**

Q9.

Solution

Concept — Centripetal Force (Circular Motion): For horizontal circular motion, the string tension provides the centripetal force: $T = m\omega^2 r$.

Step 1 — Compute ω^2:

$$\omega^2 = (4)^2 = 16\,\text{rad}^2/\text{s}^2$$

Step 2 — Substitute:

$$T = m\omega^2 r = 0.5 \times 16 \times 1$$

Step 3 — Evaluate:

$$T = 8\,\text{N}$$

Why other options are wrong:

- Option A ($2\,\text{N}$): Uses ω not squared ($T = m\omega r$).
- Option B ($4\,\text{N}$): Divides the correct answer by 2 (uses $m = 0.25\,\text{kg}$ or $\omega^2 = 8$).
- Option C ($0.5\,\text{N}$): Just the mass m in Newtons (wrong).

Final Answer: $T = 8\,\text{N} \Rightarrow \boxed{\text{D}}$

Answer: (D) **Go Back to Q9**

Q10.

Solution

Concept — Conservation of Energy (Pendulum): Potential energy at height converts to kinetic energy at the bottom: $mgh = \frac{1}{2}mv^2 \Rightarrow v = \sqrt{2gh}$.

Step 1 — Substitute values:

$$v = \sqrt{2 \times 10 \times 0.2}$$

Step 2 — Compute product:

$$2 \times 10 \times 0.2 = 4$$

Step 3 — Take square root:

$$v = \sqrt{4} = 2\,\text{m/s}$$

Why other options are wrong:

- Option A ($0.2\,\text{m/s}$): Uses $v = h$ directly (no formula).
- Option C ($4\,\text{m/s}$): Uses $v = 2gh$ without the square root.
- Option D ($\sqrt{2}\,\text{m/s}$): Uses $v = \sqrt{2g}$ without the factor h.

Final Answer: $v = 2\,\text{m/s} \Rightarrow \boxed{\text{B}}$

Answer: (B) **Go Back to Q10**

Q11.

Solution

Concept — Gauss's Law: Total electric flux through a closed surface: $\Phi_E = q/\varepsilon_0$.

Step 1 — Write the formula:

$$\Phi_E = \frac{q}{\varepsilon_0} = \frac{4 \times 10^{-6}}{8.85 \times 10^{-12}}$$

Step 2 — Divide coefficients:

$$\frac{4}{8.85} \approx 0.452$$

Step 3 — Powers of ten:

$$\frac{10^{-6}}{10^{-12}} = 10^{6}$$

Step 4 — Combine:

$$\Phi_E = 0.452 \times 10^{6} = 4.52 \times 10^{5}\,\mathrm{N{\cdot}m^2/C}$$

Why other options are wrong:

- Option A (4.52×10^3): Wrong power of ten (off by 10^2).
- Option B (8.85×10^5): Uses ε_0 inverted in wrong manner.
- Option D (1.77×10^6): Doubles the correct answer.

Final Answer: $\Phi_E = 4.52 \times 10^{5}\,\mathrm{N{\cdot}m^2/C} \Rightarrow \boxed{\text{C}}$

Answer: (C) **Go Back to Q11**

Q12.

Solution

Concept — Ampere's Law (Long Straight Wire): $B = \dfrac{\mu_0 I}{2\pi r}$.

Step 1 — Substitute values:

$$B = \frac{4\pi \times 10^{-7} \times 10}{2\pi \times 0.1}$$

Step 2 — Cancel π:

$$B = \frac{4 \times 10^{-7} \times 10}{2 \times 0.1} = \frac{4 \times 10^{-6}}{0.2}$$

Step 3 — Divide:

$$B = 20 \times 10^{-6} = 2 \times 10^{-5}\,\text{T}$$

Why other options are wrong:

- Option B ($4\pi \times 10^{-5}$ T): Does not cancel the 2π denominator.
- Option C (2×10^{-6} T): Uses $r = 1$ m instead of 0.1 m.
- Option D (4×10^{-5} T): Doubles the correct answer.

Final Answer: $B = 2 \times 10^{-5}\,\text{T} \Rightarrow \boxed{\text{A}}$

Answer: (A) **Go Back to Q12**

Q13.

Solution

Concept — Photoelectric Equation: $hf = \phi + eV_s$, so $\phi = hf - eV_s$.

Step 1 — Compute hf in joules:

$$hf = 6.6 \times 10^{-34} \times 8 \times 10^{14} = 52.8 \times 10^{-20}\,\text{J}$$

Step 2 — Convert to eV:

$$hf = \frac{52.8 \times 10^{-20}}{1.6 \times 10^{-19}} = \frac{5.28}{1.6} = 3.3\,\text{eV}$$

Step 3 — Compute eV_s:

$$eV_s = 1 \times V_s = 2\,\text{eV}$$

Step 4 — Work function:

$$\phi = 3.3 - 2.0 = 1.3\,\text{eV}$$

Why other options are wrong:

- Option A (3.3 eV): Total photon energy hf, not the work function.
- Option B (2.0 eV): Only eV_s — the maximum KE, not ϕ.
- Option C (5.28 eV): Uses hf in Joules value without converting to eV.

Final Answer: $\phi = 1.3\,\text{eV} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q13

Q14.

Solution

Concept — Beta-Minus Decay: In β^- decay, a neutron converts to a proton; mass number A is unchanged, atomic number Z increases by 1.

$$^{A}_{Z}X \longrightarrow {}^{A}_{Z+1}Y + e^- + \bar{\nu}_e$$

Step 1 — Apply to $^{16}_{7}$N:

$$A : 16\ (\text{unchanged}); \quad Z : 7 + 1 = 8$$

Step 2 — Identify element with $Z = 8$: Oxygen (O).

Step 3 — Daughter nucleus:

$$^{16}_{8}\text{O}$$

Why other options are wrong:

- Option A ($^{16}_{6}$C): $Z - 1$ — this is β^+ decay, not β^-.
- Option C ($^{12}_{5}$B): Wrong A and Z (alpha decay scenario).
- Option D ($^{16}_{9}$F): $Z + 2$ — requires two successive β^- decays.

Final Answer: $^{16}_{8}\text{O} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — Heat at Constant Volume (Monatomic Gas): $Q = nC_V\Delta T$, where $C_V = \frac{3}{2}R$ for monatomic ideal gas.

Step 1 — Compute C_V:

$$C_V = \frac{3}{2} \times 8.31 = 12.465\,\text{J/(mol·K)}$$

Step 2 — Apply formula:

$$Q = nC_V\Delta T = 2 \times 12.465 \times 10$$

Step 3 — Evaluate:

$$Q = 24.93 \times 10 = 249\,\text{J}$$

Why other options are wrong:

- Option B ($415\,\text{J}$): Uses $C_V = \frac{5}{2}R$ (diatomic gas, not monatomic).
- Option C ($83\,\text{J}$): Uses $n = 1$ instead of $n = 2$.
- Option D ($166\,\text{J}$): Uses $C_V = R$ instead of $\frac{3}{2}R$.

Final Answer: $Q = 249\,\text{J} \Rightarrow \boxed{\text{A}}$

Answer: (A) **Go Back to Q15**

Q16.

Solution

Concept — Wave Speed: $v = f \times \lambda$.

Step 1 — Substitute values:

$$v = 440 \times 0.75$$

Step 2 — Compute:

$$440 \times 0.75 = 440 \times \frac{3}{4} = \frac{1320}{4}$$

Step 3 — Evaluate:

$$v = 330\,\text{m/s}$$

Why other options are wrong:

- Option A ($220\,\text{m/s}$): Uses $v = f/2$ (divides instead of multiplies by λ).
- Option B ($440\,\text{m/s}$): Just the frequency value, ignoring λ.
- Option D ($660\,\text{m/s}$): Doubles the correct answer (uses $\lambda = 1.5\,\text{m}$).

Final Answer: $v = 330\,\text{m/s} \Rightarrow \boxed{\text{C}}$

Answer: (C) **Go Back to Q16**

Q17.

Solution

Concept — Parallel Axis Theorem: $I_{\text{end}} = I_{cm} + Md^2$, where $d = L/2$ is the distance from centre to end.

Step 1 — Distance from centre to end:

$$d = \frac{L}{2} = \frac{1}{2} = 0.5\,\text{m}$$

Step 2 — Compute I_{cm}:

$$I_{cm} = \frac{ML^2}{12} = \frac{2 \times 1}{12} = \frac{1}{6}\,\text{kg·m}^2$$

Step 3 — Compute Md^2:

$$Md^2 = 2 \times (0.5)^2 = 2 \times 0.25 = \frac{1}{2}\,\text{kg·m}^2$$

Step 4 — Sum:

$$I_{\text{end}} = \frac{1}{6} + \frac{1}{2} = \frac{1}{6} + \frac{3}{6} = \frac{4}{6} = \frac{2}{3}\,\text{kg·m}^2$$

Why other options are wrong:

- Option A ($\frac{1}{6}\,\text{kg·m}^2$): Only I_{cm}, forgets to add Md^2.
- Option C ($\frac{1}{3}\,\text{kg·m}^2$): Uses $M = 1\,\text{kg}$.
- Option D ($1\,\text{kg·m}^2$): Uses $d = L$ instead of $L/2$.

Final Answer: $I_{\text{end}} = \frac{2}{3}\,\text{kg·m}^2 \Rightarrow \boxed{\text{B}}$

Answer: (B) **Go Back to Q17**

Q18.

Solution

Concept — Transistor Currents: $I_C = \beta I_B$ and $I_E = I_B + I_C$.

Step 1 — Collector current:

$$I_C = \beta \times I_B = 99 \times 0.1 = 9.9\,\text{mA}$$

Step 2 — Emitter current:

$$I_E = I_B + I_C = 0.1 + 9.9$$

Step 3 — Evaluate:

$$I_E = 10\,\text{mA}$$

Why other options are wrong:

- Option A ($0.1\,\text{mA}$): Just I_B.
- Option B ($9.9\,\text{mA}$): Just I_C, forgetting to add I_B.
- Option C ($99\,\text{mA}$): Uses $I_B = 1\,\text{mA}$ instead of $0.1\,\text{mA}$.

Final Answer: $I_E = 10\,\text{mA} \Rightarrow \boxed{\text{D}}$

Answer: (D) **Go Back to Q18**

Q19.

Solution

Concept — Stokes' Law (Terminal Velocity):

$$v_t = \frac{2r^2(\rho_s - \rho_l)\,g}{9\eta}$$

Step 1 — Compute r^2:

$$r^2 = (1 \times 10^{-3})^2 = 1 \times 10^{-6}\,\text{m}^2$$

Step 2 — Density difference:

$$\rho_s - \rho_l = 8000 - 800 = 7200\,\text{kg/m}^3$$

Step 3 — Numerator:

$$2 \times 1 \times 10^{-6} \times 7200 \times 10 = 144000 \times 10^{-6} = 0.144$$

Step 4 — Denominator:

$$9\eta = 9 \times 1 = 9$$

Step 5 — Terminal velocity:

$$v_t = \frac{0.144}{9} = 0.016\,\text{m/s}$$

Why other options are wrong:

- Option A ($0.032\,\text{m/s}$): Uses factor 4 instead of 2 in numerator.
- Option B ($0.004\,\text{m/s}$): Uses $r = 0.5\,\text{mm}$.
- Option D ($0.8\,\text{m/s}$): Uses $\eta = 0.02\,\text{Pa·s}$.

Final Answer: $v_t = 0.016\,\text{m/s} \Rightarrow \boxed{\text{C}}$

Answer: (C) **Go Back to Q19**

Q20.

Solution

Concept — Weight on Moon: Weight $= mg$. Mass is invariant; only g changes.

Step 1 — Write expression:

$$W_M = m \times g_M$$

Step 2 — Substitute:

$$W_M = 60 \times 1.6$$

Step 3 — Evaluate:

$$W_M = 96\,\text{N}$$

Why other options are wrong:

- Option B ($600\,\text{N}$): Uses Earth's gravity $g_E = 10\,\text{m/s}^2$.
- Option C ($60\,\text{N}$): Confuses mass (kg) with weight (N).
- Option D ($9.6\,\text{N}$): Uses $m = 6\,\text{kg}$ instead of $60\,\text{kg}$.

Final Answer: $W_M = 96\,\text{N} \Rightarrow \boxed{\text{A}}$

Answer: (A) **Go Back to Q20**

Answer Key

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