# AME CET Physics

## Sample Paper – 10

**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.** A battery has an EMF of $12\,\text{V}$ and is connected to a load resistance of $R = 4\,\Omega$. The terminal voltage across the load is measured to be $10\,\text{V}$. What is the internal resistance $r$ of the battery?

(A) $0.4\,\Omega$

(B) $1.0\,\Omega$

(C) $2.0\,\Omega$

(D) $0.8\,\Omega$

**Q2.** A resistor of $R = 20\,\Omega$ is connected to a $200\,\text{V}$ mains supply for $5$ minutes. What is the total heat energy dissipated?

(A) $1.0 \times 10^4\,\text{J}$

(B) $2.0 \times 10^4\,\text{J}$

(C) $6.0 \times 10^5\,\text{J}$

(D) $2.0 \times 10^5\,\text{J}$

**Q3.** A car moving at $u = 30\,\text{m/s}$ applies its brakes and decelerates uniformly at $a = 6\,\text{m/s}^2$. How long does the car take to come to rest?

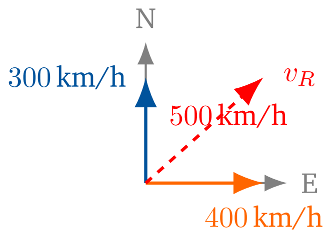
(A) $5\,\text{s}$

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

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

(D) $3\,\text{s}$

**Q4.** An aircraft flies at $300\,\text{km/h}$ toward the north. A crosswind blows at $400\,\text{km/h}$ toward the east. What is the magnitude of the resultant velocity of the aircraft?




(A) $100\,\text{km/h}$

(B) $500\,\text{km/h}$

(C) $700\,\text{km/h}$

(D) $350\,\text{km/h}$

**Q5.** A convex mirror has a focal length of $f = +10\,\text{cm}$. An object is placed at $u = -30\,\text{cm}$ in front of the mirror. Using the mirror formula, what is the image distance $v$?

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

(B) $6\,\text{cm}$

(C) $12\,\text{cm}$

(D) $7.5\,\text{cm}$

**Q6.** A convex lens of focal length $f_1 = +10\,\text{cm}$ is placed in contact with a concave lens of focal length $f_2 = -20\,\text{cm}$. What is the focal length of the equivalent combination?

(A) 10 cm

(B) −20 cm

(C) 20 cm

(D) −10 cm

**Q7.** A circular conducting loop has radius $r = 10\,\text{cm}$ in a uniform magnetic field $B = 0.5\,\text{T}$ perpendicular to the plane of the loop. The radius increases at $dr/dt = 2\,\text{cm/s}$. What is the magnitude of the induced EMF?

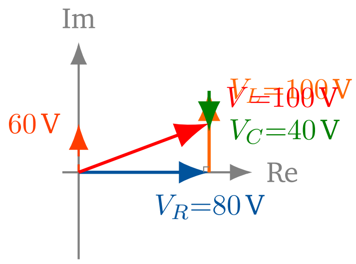
(A) $\pi$ mV

(B) $2\pi$ mV

(C) $0.5\pi$ mV

(D) $4\pi$ mV

**Q8.** In a series LCR circuit, $V_L = 100\,\text{V}$, $V_C = 40\,\text{V}$, and $V_R = 80\,\text{V}$. What is the net supply voltage $V$?




(A) 100 V

(B) 80 V

(C) 220 V

(D) 140 V

**Q9.** A gun of mass $M = 4\,\text{kg}$ fires a bullet of mass $m = 40\,\text{g}$ at a muzzle velocity of $v = 200\,\text{m/s}$. What is the recoil velocity of the gun?

(A) 0.2 m/s

(B) 20 m/s

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

(D) $8\,\text{m/s}$

**Q10.** A block of mass $5\,\text{kg}$ slides along an inclined surface of length $5\,\text{m}$ and height $3\,\text{m}$ (so $\cos\theta = 4/5$). The coefficient of kinetic friction is $\mu_k = 0.2$ and $g = 10\,\text{m/s}^2$. What is the work done by friction?

(A) $-40\,\text{J}$

(B) $-50\,\text{J}$

(C) $-20\,\text{J}$

(D) $-8\,\text{J}$

**Q11.** Two protons are separated by $r = 1 \times 10^{-10}\,\text{m}$. Given $k = 9 \times 10^9\,\text{N·m}^2/\text{C}^2$ and $e = 1.6 \times 10^{-19}\,\text{C}$, what is the electrostatic potential energy?

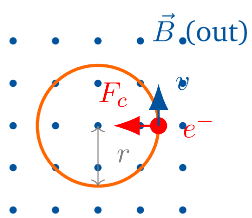
(A) $2.304 \times 10^{-28}\,\text{J}$

(B) $1.44 \times 10^{-9}\,\text{J}$

(C) $2.56 \times 10^{-28}\,\text{J}$

(D) $2.304 \times 10^{-18}\,\text{J}$

**Q12.** An electron ($m = 9 \times 10^{-31}\,\text{kg}$, $e = 1.6 \times 10^{-19}\,\text{C}$) moves in a uniform field $B = 0.5\,\text{T}$ perpendicular to its velocity. What is the time period of the circular orbit?




(A) $3.5 \times 10^{-11}\,\text{s}$

(B) $7.07 \times 10^{-11}\,\text{s}$

(C) $1.41 \times 10^{-10}\,\text{s}$

(D) $2.25 \times 10^{-11}\,\text{s}$

**Q13.** The position of a particle is known to within $\Delta x = 1\times10^{-10}$ m. Using $\Delta x \cdot \Delta p \geq h/(4\pi)$ with $h = 6.6\times10^{-34}$ J·s, what is the minimum uncertainty in momentum?

(A) $6.6\times10^{-24}\,\text{kg}\cdot\text{m/s}$

(B) $1.05\times10^{-24}\,\text{kg}\cdot\text{m/s}$

(C) $5.25\times10^{-25}\,\text{kg}\cdot\text{m/s}$

(D) $2.1\times10^{-25}\,\text{kg}\cdot\text{m/s}$

**Q14.** The mass defect of a nucleus is $\Delta m = 0.001\,\text{kg}$. Using $E = \Delta m\, c^2$ with $c = 3\times10^8$ m/s, what is the binding energy?

(A) $3\times10^5\,\text{J}$

(B) $9\times10^{13}\,\text{J}$

(C) $9\times10^{10}\,\text{J}$

(D) $3\times10^{11}\,\text{J}$

**Q15.** Which of the following is a direct consequence of the **second law of thermodynamics**?

(A) Heat flows spontaneously from a cold body to a hot body.

(B) All natural processes are reversible.

(C) Energy is always conserved in any process.

(D) No heat engine operating between two temperatures can have 100% efficiency.

**Q16.** A transverse wave is described by $y = 0.1\sin(2\pi t - x)$ m. What are the amplitude $A$, frequency $f$, and wavelength $\lambda$?

(A) $A = 0.1$ m, $f = 1$ Hz, $\lambda = 2\pi$ m

(B) $A = 0.1$ m, $f = 2\pi$ Hz, $\lambda = 1$ m

(C) $A = 2\pi$ m, $f = 1$ Hz, $\lambda = 0.1$ m

(D) $A = 1$ m, $f = 0.1$ Hz, $\lambda = 2$ m

**Q17.** A solid sphere ($I = \frac{2}{5}MR^2$) rolls without slipping down an incline from rest through height $h$. What is the speed at the bottom?

(A) $\sqrt{\dfrac{10gh}{7}}$

(B) $\sqrt{2gh}$

(C) $\sqrt{gh}$

(D) $\sqrt{\dfrac{4gh}{3}}$

**Q18.** The inputs to an OR gate are $A = 1$ and $B = 0$. What is the output $Y$?

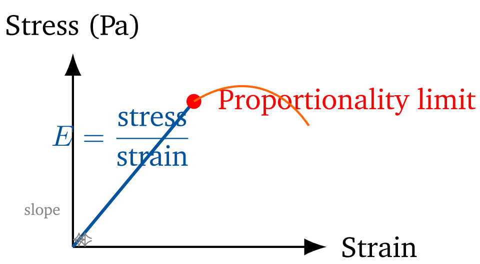
(A) $0$

(B) $1$

(C) $A \cdot B$

(D) $\overline{A + B}$

**Q19.** The graph below shows the stress vs. strain relationship for a metallic wire. What physical quantity does the **slope of the linear portion** represent?




(A) Density

(B) Viscosity

(C) Surface tension

(D) Young's modulus

**Q20.** Using Kepler's third law $T^2 = 4\pi^2 r^3/(GM)$ with $T = 86400\,\text{s}$, $G = 6.67 \times 10^{-11}\,\text{N·m}^2/\text{kg}^2$, and $M = 6 \times 10^{24}\,\text{kg}$, what is the approximate orbital radius of a geostationary satellite?

(A) 6400 km

(B) 6800 km

(C) 42200 km

(D) 384000 km

# Detailed Solutions

## Q1.

**Solution**

**Concept — Internal Resistance:** Terminal voltage $V_T = \varepsilon - Ir$, so $r = (\varepsilon - V_T)/I$.

**Step 1 — Current through load:**

$$I = \frac{V_T}{R} = \frac{10}{4} = 2.5\,\text{A}$$

**Step 2 — Internal resistance:**

$$r = \frac{\varepsilon - V_T}{I} = \frac{12 - 10}{2.5} = \frac{2}{2.5} = 0.8\,\Omega$$

**Why other options are wrong:**

- Option A (0.4 Ω): uses $I = 5$ A (from $\varepsilon/R$, not correct here).
- Option B (1.0 Ω): uses $I = 2$ A.
- Option C (2.0 Ω): uses $I = 1$ A.

**Final Answer:** $r = 0.8\,\Omega \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q1

## Q2.

**Solution**

**Concept — Joule Heating:** $Q = (V^2/R)\,t$.

**Step 1 — Convert time to seconds:**

$$t = 5 \times 60 = 300\,\text{s}$$

**Step 2 — Power dissipated:**

$$P = \frac{V^2}{R} = \frac{200^2}{20} = \frac{40000}{20} = 2000\,\text{W}$$

**Step 3 — Heat energy:**

$$Q = P \times t = 2000 \times 300 = 6.0 \times 10^5\,\text{J}$$

**Why other options are wrong:**

- Option A ($10^4$ J): uses $t = 5$ s (not converted).
- Option B ($2 \times 10^4$ J): uses $t = 10$ s.
- Option D ($2 \times 10^5$ J): uses $t = 100$ s.

**Final Answer:** $Q = 6.0 \times 10^5$ J $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q2

## Q3.

**Solution**

**Concept — Braking Time:** $v = u - at$; for stopping, $t = u/a$.

**Step 1 — Substitute:**

$$t = \frac{u}{a} = \frac{30}{6} = 5\,\text{s}$$

**Why other options are wrong:**

- Option B (2.5 s): uses $a = 12$ m/s$^2$.
- Option C (10 s): uses $a = 3$ m/s$^2$.
- Option D (3 s): uses $a = 10$ m/s$^2$.

**Final Answer:** $t = 5$ s $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q3

## Q4.

**Solution**

**Concept — Velocity Vector Addition (Perpendicular):** $v_R = \sqrt{v_N^2 + v_E^2}$.

**Step 1 — Squares:**

$$v_N^2 = 300^2 = 90000, \quad v_E^2 = 400^2 = 160000$$

**Step 2 — Sum:**

$$v_N^2 + v_E^2 = 250000$$

**Step 3 — Square root:**

$$v_R = \sqrt{250000} = 500\,\text{km/h}$$

(3-4-5 Pythagorean triple scaled by 100.)

**Why other options are wrong:**

- Option A (100): subtracts the components.
- Option C (700): adds arithmetically.
- Option D (350): arithmetic mean of speeds.

**Final Answer:** $v_R = 500$ km/h $\Rightarrow$ $\boxed{\text{B}}$

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

## Q5.

**Solution**

**Concept — Convex Mirror (Mirror Formula):** $1/v + 1/u = 1/f$, with $f = +10$ cm, $u = -30$ cm.

**Step 1 — Rearrange:**

$$\frac{1}{v} = \frac{1}{10} + \frac{1}{30} = \frac{3}{30} + \frac{1}{30} = \frac{4}{30} = \frac{2}{15}$$

**Step 2 — Invert:**

$$v = \frac{15}{2} = 7.5\,\text{cm (virtual, behind mirror)}$$

**Why other options are wrong:**

- Option A (10 cm): assumes object at infinity.
- Option B (6 cm): incorrect formula rearrangement.
- Option C (12 cm): wrong sign applied to $u$.

**Final Answer:** $v = 7.5$ cm $\Rightarrow$ $\boxed{\text{D}}$

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

## Q6.

**Solution**

**Concept — Lenses in Contact:** $1/f_{\text{eq}} = 1/f_1 + 1/f_2$.

**Step 1 — Substitute:**

$$\frac{1}{f_{\text{eq}}} = \frac{1}{10} + \frac{1}{-20} = \frac{2}{20} - \frac{1}{20} = \frac{1}{20}$$

**Step 2 — Invert:**

$$f_{\text{eq}} = 20\,\text{cm (positive = converging)}$$

**Why other options are wrong:**

- Option A (10 cm): ignores the concave lens.
- Option B ($-20$ cm): uses only $f_2$.
- Option D ($-10$ cm): adds power with wrong signs.

**Final Answer:** $f_{\text{eq}} = 20$ cm $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q6

## Q7.

**Solution**

**Concept — Faraday's Law (Changing Area):** $|\mathcal{E}| = B \cdot 2\pi r \cdot (dr/dt)$.

**Step 1 — Substitute ($r = 0.10$ m, $dr/dt = 0.02$ m/s):**

$$|\mathcal{E}| = 0.5 \times 2\pi \times 0.10 \times 0.02 = 2\pi \times 0.001 = 2\pi\,\text{mV}$$

**Why other options are wrong:**

- Option A ($\pi$ mV): omits the factor 2 in circumference.
- Option C ($0.5\pi$ mV): uses $r = 0.05$ m.
- Option D ($4\pi$ mV): uses $dr/dt = 0.04$ m/s.

**Final Answer:** $|\mathcal{E}| = 2\pi$ mV $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q7

## Q8.

**Solution**

**Concept — LCR Net Voltage:** $V = \sqrt{(V_L - V_C)^2 + V_R^2}$.

**Step 1 — Net reactive voltage:**

$$V_L - V_C = 100 - 40 = 60\,\text{V}$$

**Step 2 — Apply phasor formula:**

$$V = \sqrt{60^2 + 80^2} = \sqrt{3600 + 6400} = \sqrt{10000} = 100\,\text{V}$$

(6-8-10 Pythagorean triple.)

**Why other options are wrong:**

- Option B (80 V): uses only $V_R$.
- Option C (220 V): arithmetic sum of all three.
- Option D (140 V): $V_L + V_R$ only.

**Final Answer:** $V = 100$ V $\Rightarrow$ $\boxed{\text{A}}$

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

## Q9.

**Solution**

**Concept — Gun Recoil (Conservation of Momentum):** $MV_{\text{recoil}} = mv$.

**Step 1 — Convert bullet mass:**

$$m = 40\,\text{g} = 0.04\,\text{kg}$$

**Step 2 — Recoil velocity:**

$$V_{\text{recoil}} = \frac{mv}{M} = \frac{0.04 \times 200}{4} = \frac{8}{4} = 2\,\text{m/s}$$

**Why other options are wrong:**

- Option A (0.2 m/s): uses $m = 0.004$ kg.
- Option B (20 m/s): uses $M = 0.4$ kg.
- Option D (8 m/s): forgets to divide by $M$.

**Final Answer:** $V_{\text{recoil}} = 2$ m/s $\Rightarrow$ $\boxed{\text{C}}$

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

## Q10.

**Solution**

**Concept — Work Done by Friction:** $W_f = -\mu_k mg\cos\theta \cdot L$.

**Step 1 — Normal force:**

$$N = mg\cos\theta = 5 \times 10 \times \frac{4}{5} = 40\,\text{N}$$

**Step 2 — Friction force:**

$$f_k = \mu_k N = 0.2 \times 40 = 8\,\text{N}$$

**Step 3 — Work done by friction:**

$$W_f = -f_k \times L = -8 \times 5 = -40\,\text{J}$$

**Why other options are wrong:**

- Option B ($-50$ J): uses $\cos\theta = 1$.
- Option C ($-20$ J): uses $\mu_k = 0.1$.
- Option D ($-8$ J): omits the factor $L$.

**Final Answer:** $W_f = -40$ J $\Rightarrow$ $\boxed{\text{A}}$

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

## Q11.

**Solution**

**Concept — Electrostatic PE:** $U = ke^2/r$.

**Step 1 — Compute $e^2$:**

$$e^2 = (1.6 \times 10^{-19})^2 = 2.56 \times 10^{-38}\,\text{C}^2$$

**Step 2 — $ke^2$:**

$$ke^2 = 9 \times 10^9 \times 2.56 \times 10^{-38} = 2.304 \times 10^{-28}\,\text{J·m}$$

**Step 3 — Divide by $r$:**

$$U = \frac{2.304 \times 10^{-28}}{10^{-10}} = 2.304 \times 10^{-18}\,\text{J}$$

**Why other options are wrong:**

- Option A ($2.304 \times 10^{-28}$ J): is $ke^2$ before dividing by $r$.
- Option B ($1.44 \times 10^{-9}$ J): uses $r = 10^{-9}$ m.
- Option C ($2.56 \times 10^{-28}$ J): is just $e^2$ (no $k$ or $r$).

**Final Answer:** $U = 2.304 \times 10^{-18}$ J $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q11

## Q12.

### Solution

**Concept — Period of Electron in Magnetic Field:** $T = 2\pi m/(eB)$.

**Step 1 — Numerator:**

$$2\pi m = 2\pi \times 9 \times 10^{-31} = 18\pi \times 10^{-31}$$

**Step 2 — Denominator:**

$$eB = 1.6 \times 10^{-19} \times 0.5 = 8 \times 10^{-20}$$

**Step 3 — Divide:**

$$T = \frac{18\pi \times 10^{-31}}{8 \times 10^{-20}} = 2.25\pi \times 10^{-11}$$

**Step 4 — Evaluate:**

$$T = 2.25 \times 3.1416 \times 10^{-11} = 7.07 \times 10^{-11}\,\text{s}$$

**Why other options are wrong:**

- Option A ($3.5 \times 10^{-11}$ s): uses $\pi \approx \pi/2$.

- Option C ($1.41 \times 10^{-10}$ s): doubles the result.
- Option D ($2.25 \times 10^{-11}$ s): omits the factor $\pi$.

**Final Answer:** $T = 7.07 \times 10^{-11}$ s $\Rightarrow \boxed{\text{B}}$

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

## Q13.

### Solution

**Concept — Heisenberg Uncertainty:** $\Delta p_{\text{min}} = h/(4\pi\,\Delta x)$.

**Step 1 — Compute denominator:**

$$4\pi\,\Delta x = 4 \times 3.1416 \times 10^{-10} = 12.566 \times 10^{-10}$$

**Step 2 — Divide:**

$$\Delta p_{\text{min}} = \frac{6.6 \times 10^{-34}}{12.566 \times 10^{-10}} = \frac{6.6}{12.566} \times 10^{-24}$$

**Step 3 — Evaluate:**

$$\frac{6.6}{12.566} \approx 0.525 \Rightarrow \Delta p_{\text{min}} = 5.25 \times 10^{-25}\,\text{kg} \cdot \text{m/s}$$

**Why other options are wrong:**

- Option A ($6.6 \times 10^{-24}$): uses $\Delta p = h/\Delta x$ (omits $4\pi$).
- Option B ($1.05 \times 10^{-24}$): uses $h/(2\pi\,\Delta x) = \hbar/\Delta x$.
- Option D ($2.1 \times 10^{-25}$): uses $\Delta x = 2.5 \times 10^{-10}$ m.

**Final Answer:** $\Delta p_{\text{min}} = 5.25 \times 10^{-25}$ kg·m/s $\Rightarrow \boxed{\text{C}}$

**Answer: (C)** Go Back to Q13

## Q14.

**Solution**

**Concept — Mass-Energy Equivalence:** $E = \Delta m\, c^2$.

**Step 1 — Compute $c^2$:**

$$c^2 = (3 \times 10^8)^2 = 9 \times 10^{16}\,\mathrm{m^2/s^2}$$

**Step 2 — Multiply:**

$$E = 10^{-3} \times 9 \times 10^{16} = 9 \times 10^{13}\,\mathrm{J}$$

**Why other options are wrong:**

- Option A ($3 \times 10^5$ J): uses $E = \Delta m \times c$ (not $c^2$).
- Option C ($9 \times 10^{10}$ J): uses wrong $c = 3 \times 10^5$ m/s.
- Option D ($3 \times 10^{11}$ J): exponent error.

**Final Answer:** $E = 9 \times 10^{13}$ J $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q14

## Q15.

**Solution**

**Concept — Second Law of Thermodynamics (Kelvin-Planck):** No heat engine can convert absorbed heat entirely into work; efficiency must be $< 100\%$.

**Step 1 — Screen each option:**

Option A: heat flowing cold $\rightarrow$ hot spontaneously *violates* the second law.

Option B: natural processes are *irreversible* – contradicts the claim.

Option C: energy conservation is the *first* law.

Option D: directly expresses the Kelvin-Planck statement of the second law.

**Final Answer:** $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q15

## Q16.

**Solution**

**Concept — Wave Parameters:** $y = A\sin(\omega t - kx)$; $\omega = 2\pi f$; $k = 2\pi/\lambda$.

**Step 1 — Amplitude:** $A = 0.1$ m.

**Step 2 — Frequency ($\omega = 2\pi$):**

$$f = \frac{\omega}{2\pi} = \frac{2\pi}{2\pi} = 1\,\text{Hz}$$

**Step 3 — Wavelength ($k = 1$):**

$$\lambda = \frac{2\pi}{k} = \frac{2\pi}{1} = 2\pi\,\text{m}$$

**Why other options are wrong:**

- Option B: reads $\omega$ directly as $f$.
- Option C: confuses $A$ and $\omega$, and $\lambda$ with $A$.
- Option D: misidentifies all three parameters.

**Final Answer:** $A = 0.1$ m, $f = 1$ Hz, $\lambda = 2\pi$ m $\Rightarrow \boxed{\text{A}}$

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

## Q17.

**Solution**

**Concept — Rolling Sphere Energy:** $Mgh = \frac{1}{2}Mv^2 + \frac{1}{2}I\omega^2$; $\omega = v/R$; $I = \frac{2}{5}MR^2$.

**Step 1 — Substitute:**

$$Mgh = \frac{1}{2}Mv^2 + \frac{1}{2}\cdot\frac{2}{5}MR^2\cdot\frac{v^2}{R^2} = Mv^2\left(\frac{1}{2}+\frac{1}{5}\right) = \frac{7}{10}Mv^2$$

**Step 2 — Solve:**

$$v^2 = \frac{10gh}{7} \Rightarrow v = \sqrt{\frac{10gh}{7}}$$

**Why other options are wrong:**

- Option B ($\sqrt{2gh}$): ignores rotational KE.
- Option C ($\sqrt{gh}$): incorrect energy factor.
- Option D ($\sqrt{4gh/3}$): applies to a hollow cylinder.

**Final Answer:** $v = \sqrt{10gh/7} \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q17

## Q18.

**Solution**

**Concept — OR Gate:** $Y = A + B$; output HIGH if at least one input is HIGH.

**Step 1 — Apply:**

$$Y = A + B = 1 + 0 = 1$$

**Step 2 — Verify from truth table:** For $A = 1$, $B = 0$: OR output $= 1$. ✓

**Why other options are wrong:**

- Option A (0): AND output $(1 \cdot 0 = 0)$, not OR.
- Option C $(A \cdot B)$: AND operation.
- Option D $(\overline{A + B})$: NOR output $(\overline{1} = 0)$.

**Final Answer:** $Y = 1 \Rightarrow \boxed{B}$

Answer: (B) Go Back to Q18

## Q19.

**Solution**

**Concept — Stress-Strain Graph Slope:** In the linear elastic region, $\sigma = E\,\varepsilon$, so slope $= \sigma/\varepsilon = E$ (Young's modulus).

**Step 1 — Identify the linear region:** The straight-line portion from the origin to the proportionality limit obeys Hooke's law.

**Step 2 — Slope interpretation:**

$$\text{slope} = \frac{\text{stress}}{\text{strain}} = E \text{ (Young's modulus, Pa)}$$

**Why other options are wrong:**

- Option A (density): mass/volume; unrelated to stress-strain.
- Option B (viscosity): fluid property; not applicable to solids here.
- Option C (surface tension): liquid surface energy; not relevant.

**Final Answer:** Young's modulus $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q19

## Q20.

### Solution

**Concept — Geostationary Orbit Radius:** $r = (GMT^2/4\pi^2)^{1/3}$.

**Step 1 —** $GM \approx 4.0 \times 10^{14}$ **m³/s², $T^2 \approx 7.465 \times 10^9$ s².**

**Step 2 —** $GMT^2 \approx 2.986 \times 10^{24}$ **m³.**

**Step 3 — Divide by** $4\pi^2 \approx 39.48$**:**

$$\frac{GMT^2}{4\pi^2} \approx 7.564 \times 10^{22}\,\text{m}^3$$

**Step 4 — Cube root:**

$$r \approx 4.22 \times 10^7\,\text{m} = 42200\,\text{km}$$

**Why other options are wrong:**

- Option A (6400 km): Earth's radius, not an orbit.
- Option B (6800 km): typical LEO altitude.
- Option D (384000 km): Moon's orbital distance.

**Final Answer:** $r \approx 42200$ km $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q20

# Answer Key

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