AME CET Technical Aptitude

Sample Paper – 7

Duration: 30 Minutes **Maximum Marks: 120**

Instructions

- This paper contains **30** Multiple Choice Questions (Single Correct Answer), covering **Mechanical & Applied-Physics Aptitude** (Q1–15) and **Electrical, Electronics & Aviation Technical Fundamentals** (Q16–30), in the **AME CET** marking style.
- 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.
- This is a **supplementary technical-aptitude practice set** for AME CET aspirants; pacing is one minute per question, matching the main exam.
- Use of mobile phones, calculators, or any electronic gadget is strictly prohibited.

Part A: Mechanical & Applied-Physics Aptitude

Q1. A horizontal force of 30 N is applied to a 5 kg block resting on a surface. A friction force of 5 N opposes the motion. The acceleration of the block is:

(A) 7 m/s^2

(B) 6 m/s^2

(C) 5 m/s^2

(D) 1 m/s^2

Q2. The momentum of a body changes from 10 kg·m/s to 30 kg·m/s in 4 seconds. The average force acting on it is:

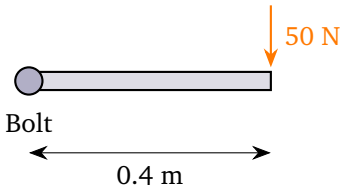
(A) 80 N

(B) 10 N

(C) 40 N

(D) 5 N

Q3. A force of 50 N is applied at the end of a spanner at a perpendicular distance of 0.4 m from the bolt, as shown. The moment (turning effect) of the force about the bolt is:



(A) 20 N·m

(B) 125 N·m

(C) 50.4 N·m

(D) 12.5 N·m

Q4. A friction force of 15 N acts on a box that slides 6 m in the direction opposite to the friction. The work done by friction is:

(A) $+90$ J

(B) -90 J

(C) -21 J

(D) -2.5 J

Q5. A motor delivers a constant power of 250 W. The time it takes to do 2000 J of work is:

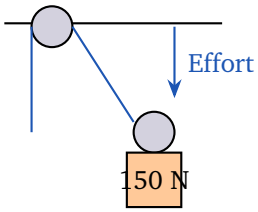
(A) 0.125 s

(B) 500000 s

(C) 8 s

(D) 2250 s

Q6. In the pulley system shown, the load is supported by 3 sections of rope (velocity ratio 3). For an ideal, frictionless system lifting a load of 150 N, the effort required is:



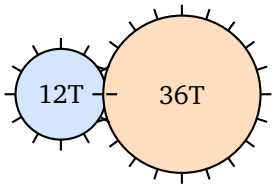
(A) 450 N

(B) 150 N

(C) 75 N

(D) 50 N

Q7. A driver gear with 12 teeth meshes with a driven gear of 36 teeth, as shown. If the driver gear rotates at 600 rpm, the driven gear rotates at:



(A) 1800 rpm

(B) 200 rpm

(C) 600 rpm

(D) 45 rpm

Q8. A wire under load develops a stress of 2×10^8 Pa and a strain of 0.001. The Young's modulus of the material is:

(A) 2×10^5 Pa

(B) 2×10^8 Pa

(C) 2×10^{11} Pa

(D) 2×10^{14} Pa

Q9. The property of a material that measures its ability to resist failure when pulled apart by a stretching (tensile) load is called its:

(A) Malleability

(B) Hardness

(C) Tensile strength

(D) Brittleness

Q10. The SI unit of electrical resistance is the:

(A) Ohm

(B) Volt

(C) Ampere

(D) Watt

Q11. A fuel tank holds 5 litres of liquid. Expressed in cubic metres (using 1 litre $= 10^{-3}$ m^3), this volume is:

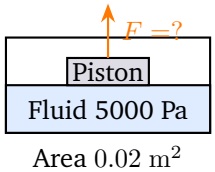
(A) 5 m^3

(B) 5×10^{-3} m^3

(C) 5×10^{3} m^3

(D) 0.5 m^3

Q12. A hydraulic piston of area 0.02 m^2 has a fluid pressure of 5000 Pa acting on it, as shown. The force exerted on the piston is:



Area 0.02 m^2

(A) 250000 N

(B) 5000 N

(C) 2500 N

(D) 100 N

Q13. A liquid has a density of 800 kg/m^3. Taking the density of water as 1000 kg/m^3, the relative density (specific gravity) of the liquid is:

(A) 0.8

(B) 1.25

(C) 800

(D) 1800

Q14. The transfer of heat through empty space from the Sun to the Earth, requiring no material medium, takes place mainly by:

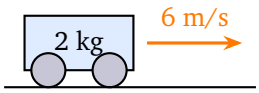
(A) Radiation

(B) Conduction

(C) Convection

(D) Evaporation

Q15. A trolley of mass 2 kg is accelerated from rest to a velocity of 6 m/s in 3 seconds, as shown. The average power developed is:



(A) 12 W

(B) 36 W

(C) 6 W

(D) 24 W

Part B: Electrical, Electronics & Aviation Technical Fundamentals

Q16. A potential difference of 45 V is applied across a resistor of 9 Ω. The current flowing through the resistor is:

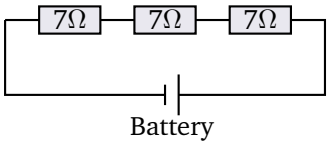
(A) 405 A

(B) 54 A

(C) 5 A

(D) 0.2 A

Q17. Three resistors of 7 Ω each are connected in series, as shown. The total resistance of the circuit is:



(A) 2.33 Ω

(B) 14 Ω

(C) 7 Ω

(D) 21 Ω

Q18. A 12 Ω resistor and a 6 Ω resistor are connected in parallel. Their combined resistance is:

(A) 18 Ω

(B) 4 Ω

(C) 9 Ω

(D) 6 Ω

Q19. A current of 2 A flows through a 10 Ω heating element for 5 seconds. The heat produced is:

(A) 200 J

(B) 100 J

(C) 40 J

(D) 17 J

Q20. A cell of EMF 6 V and internal resistance 1 Ω is connected to an external resistor of 2 Ω. The current in the circuit is:

(A) 6 A

(B) 3 A

(C) 1.5 A

(D) 2 A

Q21. The device that converts light energy (such as sunlight) directly into electrical energy is the:

(A) Transformer

(B) Electric motor

(C) Solar cell

(D) Loudspeaker

Q22. When two bar magnets are brought near each other, the rule governing their magnetic poles is:

(A) like poles attract, unlike poles repel

(B) all poles always attract

(C) all poles always repel

(D) like poles repel, unlike poles attract

Q23. A semiconductor diode conducts current easily (offers very low resistance) only when it is:

(A) reverse biased

(B) forward biased

(C) left unbiased

(D) kept at absolute zero temperature

Q24. The standard frequency of the domestic alternating-current (AC) mains supply in India is:

(A) 50 Hz

(B) 60 Hz

(C) 100 Hz

(D) 0 Hz

Q25. The cockpit instrument that indicates the rotational speed (revolutions per minute) of an aircraft engine is the:

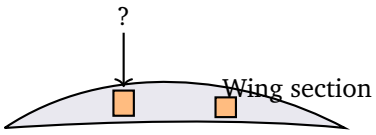
(A) Altimeter

(B) Tachometer

(C) Airspeed indicator

(D) Magnetic compass

Q26. In the wing cut-away shown, the main spanwise structural member that runs the length of the wing and carries most of the bending load is the:



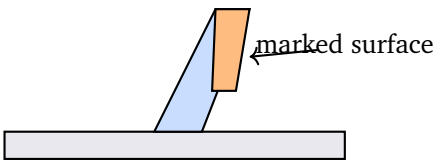
(A) Spar

(B) Rib

(C) Stringer

(D) Cowling

Q27. The hinged control surface marked on the vertical tail fin in the figure deflects left or right to yaw the aircraft about its vertical axis. This surface is the:



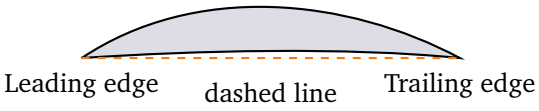
(A) Aileron

(B) Elevator

(C) Rudder

(D) Flap

Q28. On the aerofoil section shown, the straight line drawn from the leading edge to the trailing edge is known as the:



(A) Camber line

(B) Span

(C) Angle of attack

(D) Chord line

Q29. When an aircraft flies straight and level at a steady, constant speed, the forward thrust produced by the engines is exactly balanced by the:

(A) Lift

(B) Drag

(C) Weight

(D) Normal reaction

Q30. The aircraft system that supplies breathable oxygen to the crew and passengers when flying at high altitude is the:

(A) Hydraulic system

(B) Fuel system

(C) Oxygen system

(D) Ignition system

Detailed Solutions

Q1.

Solution

Concept — Newton's second law with friction: The net force is the applied force minus the friction force, and the acceleration is the net force divided by the mass, $a = F_{\text{net}}/m$.

Step 1 — Find the net force:

$$F_{\text{net}} = F_{\text{applied}} - F_{\text{friction}}$$

Step 2 — Substitute $F_{\text{applied}} = 30$ N and $F_{\text{friction}} = 5$ N:

$$F_{\text{net}} = 30 - 5 = 25 \text{ N}$$

Step 3 — Divide by the mass $m = 5$ kg:

$$a = \frac{F_{\text{net}}}{m} = \frac{25}{5}$$

Step 4 — Simplify:

$$a = 5 \text{ m/s}^2$$

Why other options are wrong:

- Option A (7): adds friction to the applied force before dividing.
- Option B (6): divides the full 30 N by 5, ignoring friction.
- Option D (1): subtracts friction but then divides by 25.

Final Answer: 5 m/s^2 $\Rightarrow$ C

Answer: (C) Go Back to Q1

Q2.

Solution

Concept — Force as rate of change of momentum: The average force equals the change in momentum divided by the time taken, $F = \Delta p/\Delta t$.

Step 1 — Find the change in momentum:

$$\Delta p = p_{\text{final}} - p_{\text{initial}}$$

Step 2 — Substitute $p_{\text{final}} = 30$ and $p_{\text{initial}} = 10$:

$$\Delta p = 30 - 10 = 20 \text{ kg} \cdot \text{m/s}$$

Step 3 — Divide by the time $\Delta t = 4$ s:

$$F = \frac{\Delta p}{\Delta t} = \frac{20}{4}$$

Step 4 — Simplify:

$$F = 5 \text{ N}$$

Why other options are wrong:

- Option A (80): multiplies the change in momentum by the time.
- Option B (10): uses the initial momentum value directly.
- Option C (40): uses the final momentum divided by something incorrect.

Final Answer: 5 N $\Rightarrow$ D

Answer: (D) Go Back to Q2

Q3.

Solution

Concept — Moment of a force: The moment (turning effect) about a point equals the force multiplied by the perpendicular distance from the point, $M = F \times d$.

Step 1 — Write the formula:

$$M = F \times d$$

Step 2 — Substitute $F = 50$ N and $d = 0.4$ m:

$$M = 50 \times 0.4$$

Step 3 — Simplify:

$$M = 20 \text{ N} \cdot \text{m}$$

Why other options are wrong:

- Option B (125): divides force by distance instead of multiplying.
- Option C (50.4): adds force and distance.
- Option D (12.5): divides distance by force.

Final Answer: 20 N·m $\Rightarrow$ A

Answer: (A) Go Back to Q3

Q4.

Solution

Concept — Work done by friction: Friction acts opposite to the displacement, so the work it does is negative: $W = -F \times d$.

Step 1 — Write the magnitude of the work:

$$|W| = F \times d$$

Step 2 — Substitute $F = 15$ N and $d = 6$ m:

$$|W| = 15 \times 6 = 90 \text{ J}$$

Step 3 — Apply the negative sign (force opposes motion):

$$W = -90 \text{ J}$$

Why other options are wrong:

- Option A ($+90$): correct magnitude but wrong sign; friction removes energy.
- Option C (-21): adds force and distance instead of multiplying.
- Option D (-2.5): divides force by distance.

Final Answer: -90 J $\Rightarrow$ B

Answer: (B) Go Back to Q4

Q5.

Solution

Concept — Power, work and time: Power is work per unit time, $P = W/t$, so the time is $t = W/P$.

Step 1 — Rearrange the power formula for time:

$$t = \frac{W}{P}$$

Step 2 — Substitute $W = 2000$ J and $P = 250$ W:

$$t = \frac{2000}{250}$$

Step 3 — Simplify:

$$t = 8 \text{ s}$$

Why other options are wrong:

- Option A (0.125): inverts the ratio, using P/W.
- Option B (500000): multiplies work by power.
- Option D (2250): adds work and power.

Final Answer: 8 s $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q5

Q6.

Solution

Concept — Pulley system with several supporting ropes: For an ideal, friction-less pulley system, the mechanical advantage equals the number of rope sections supporting the load, so the effort is the load divided by that number.

Step 1 — State the mechanical advantage:

$$\text{MA} = \text{number of supporting ropes} = 3$$

Step 2 — Relate effort and load:

$$\text{Effort} = \frac{\text{Load}}{\text{MA}} = \frac{150}{3}$$

Step 3 — Simplify:

$$\text{Effort} = 50 \text{ N}$$

Why other options are wrong:

- Option A (450): multiplies the load by 3 instead of dividing.
- Option B (150): assumes no mechanical advantage.
- Option C (75): uses a mechanical advantage of 2, not 3.

Final Answer: 50 N $\Rightarrow$ D

Answer: (D) Go Back to Q6

Q7.

Solution

Concept — Gear speed ratio: For two meshing gears the speed is inversely proportional to the number of teeth: $N_{\text{driven}} = N_{\text{driver}} \times \dfrac{T_{\text{driver}}}{T_{\text{driven}}}$.

Step 1 — Write the relation:

$$N_{\text{driven}} = N_{\text{driver}} \times \frac{T_{\text{driver}}}{T_{\text{driven}}}$$

Step 2 — Substitute $N_{\text{driver}} = 600$ rpm, $T_{\text{driver}} = 12$, $T_{\text{driven}} = 36$:

$$N_{\text{driven}} = 600 \times \frac{12}{36}$$

Step 3 — Simplify the fraction:

$$\frac{12}{36} = \frac{1}{3}$$

Step 4 — Compute:

$$N_{\text{driven}} = 600 \times \frac{1}{3} = 200 \text{ rpm}$$

Why other options are wrong:

- Option A (1800): multiplies by 3 instead of dividing.
- Option C (600): assumes equal gears, ignoring the tooth ratio.
- Option D (45): uses the tooth count as the speed.

Final Answer: 200 rpm $\Rightarrow$ B

Answer: (B) Go Back to Q7

Q8.

Solution

Concept — Young's modulus: Young's modulus is the ratio of stress to strain, $E = \sigma/\varepsilon$.

Step 1 — Write the formula:

$$E = \frac{\sigma}{\varepsilon}$$

Step 2 — Substitute $\sigma = 2 \times 10^8$ Pa and $\varepsilon = 0.001$:

$$E = \frac{2 \times 10^8}{0.001}$$

Step 3 — Divide (dividing by 10^{-3} multiplies by 10^3):

$$E = 2 \times 10^8 \times 10^3 = 2 \times 10^{11} \text{ Pa}$$

Why other options are wrong:

- Option A (2×10^5): multiplies by the strain instead of dividing.
- Option B (2×10^8): leaves the stress unchanged, ignoring the strain.
- Option D (2×10^{14}): uses too large a power of ten.

Final Answer: 2×10^{11} Pa $\Rightarrow$ C

Answer: (C) Go Back to Q8

Q9.

Solution

Concept — Mechanical properties of materials: Tensile strength is the maximum stretching (pulling) stress a material can withstand before it fails.

Step 1 — Match the definition: Resisting failure under a pulling or stretching load is the defining description of tensile strength.

Step 2 — Confirm the property: Materials with high tensile strength, such as steel cables, can carry large pulling loads without breaking.

Why other options are wrong:

- Option A (Malleability): the ability to be hammered into sheets, not to resist pulling.
- Option B (Hardness): resistance to scratching or indentation, not to tension.
- Option D (Brittleness): the tendency to break suddenly without much stretching.

Final Answer: Tensile strength $\Rightarrow$ C

Answer: (C) Go Back to Q9

Q10.

Solution

Concept — SI units: Electrical resistance is measured in ohms, with the symbol Ω, defined as one volt per ampere.

Step 1 — Recall the defining relation:

$$\text{Resistance} = \frac{\text{Voltage}}{\text{Current}} = \frac{\text{V}}{\text{A}}$$

Step 2 — Name the unit:

$$1\ \frac{\text{V}}{\text{A}} = 1 \text{ ohm } (\Omega)$$

Why other options are wrong:

- Option B (Volt): the unit of potential difference, not resistance.
- Option C (Ampere): the unit of electric current.
- Option D (Watt): the unit of power.

Final Answer: Ohm $\Rightarrow$ A

Answer: (A) Go Back to Q10

Q11.

Solution

Concept — Volume conversion: One litre equals 10^{-3} cubic metres, so a volume in litres is converted by multiplying by 10^{-3}.

Step 1 — Write the conversion factor:

$$1 \text{ litre} = 10^{-3}\ \text{m}^3$$

Step 2 — Multiply the given volume:

$$5 \text{ litres} = 5 \times 10^{-3} \text{ m}^3$$

Step 3 — State the result:

$$5 \text{ litres} = 5 \times 10^{-3} \text{ m}^3$$

Why other options are wrong:

- Option A (5 m^3): forgets to apply the conversion factor.
- Option C (5×10^3): multiplies by 10^3 instead of 10^{-3}.
- Option D (0.5): divides by 10 rather than 1000.

Final Answer: $5 \times 10^{-3} \text{ m}^3 \Rightarrow$ B

Answer: (B) Go Back to Q11

Q12.

Solution

Concept — Pressure, force and area: Pressure is force per unit area, $P = F/A$, so the force is $F = P \times A$.

Step 1 — Rearrange for force:

$$F = P \times A$$

Step 2 — Substitute $P = 5000$ Pa and $A = 0.02$ m^2:

$$F = 5000 \times 0.02$$

Step 3 — Simplify:

$$F = 100 \text{ N}$$

Why other options are wrong:

- Option A (250000): divides pressure by area instead of multiplying.
- Option B (5000): leaves the pressure value unchanged, ignoring the area.
- Option C (2500): uses an area of 0.5 instead of 0.02.

Final Answer: 100 N $\Rightarrow$ D

Answer: (D) Go Back to Q12

Q13.

Solution

Concept — Relative density: Relative density (specific gravity) is the density of a substance divided by the density of water.

Step 1 — Write the formula:

$$\text{RD} = \frac{\text{density of liquid}}{\text{density of water}}$$

Step 2 — Substitute 800 kg/m^3 and 1000 kg/m^3:

$$\text{RD} = \frac{800}{1000}$$

Step 3 — Simplify:

$$\text{RD} = 0.8$$

Why other options are wrong:

- Option B (1.25): inverts the ratio, dividing water by the liquid.
- Option C (800): leaves the density value without dividing by water.
- Option D (1800): adds the two densities.

Final Answer: $0.8 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q13

Q14.

Solution

Concept — Modes of heat transfer: Heat travels by conduction (through solids), convection (through moving fluids) and radiation (as electromagnetic waves, needing no medium).

Step 1 — Identify the key condition: The heat crosses the empty space between the Sun and the Earth, where there is no material medium.

Step 2 — Select the matching mode: Only radiation can transfer heat through a vacuum, so the Sun heats the Earth by radiation.

Why other options are wrong:

- Option B (Conduction): needs direct contact through a material, absent in space.
- Option C (Convection): needs a moving fluid such as air or liquid.
- Option D (Evaporation): a phase-change cooling process, not a mode of through-space heat transfer.

Final Answer: Radiation $\Rightarrow$ A

Answer: (A) Go Back to Q14

Q15.

Solution

Concept — Average power from kinetic energy: The average power equals the kinetic energy gained divided by the time taken, $P = \text{KE}/t$, with $\text{KE} = \frac{1}{2}mv^2$.

Step 1 — Compute the kinetic energy gained:

$$\text{KE} = \frac{1}{2}mv^2 = \frac{1}{2} \times 2 \times (6)^2$$

Step 2 — Evaluate the square and simplify:

$$(6)^2 = 36$$

$$\text{KE} = \frac{1}{2} \times 2 \times 36 = 36 \text{ J}$$

Step 3 — Divide the energy by the time $t = 3$ s:

$$P = \frac{\text{KE}}{t} = \frac{36}{3}$$

Step 4 — Simplify:

$$P = 12 \text{ W}$$

Why other options are wrong:

- Option B (36): gives the kinetic energy, not the power, forgetting to divide by time.
- Option C (6): forgets to square the velocity.
- Option D (24): omits the factor of one-half in the kinetic energy.

Final Answer: 12 W $\Rightarrow$ A

Answer: (A) Go Back to Q15

Q16.

Solution

Concept — Ohm's law: The current through a resistor equals the voltage across it divided by its resistance, $I = V/R$.

Step 1 — Rearrange Ohm's law for current:

$$I = \frac{V}{R}$$

Step 2 — Substitute $V = 45$ V and $R = 9\ \Omega$:

$$I = \frac{45}{9}$$

Step 3 — Simplify:

$$I = 5 \text{ A}$$

Why other options are wrong:

- Option A (405): multiplies voltage by resistance.
- Option B (54): adds voltage and resistance.
- Option D (0.2): inverts the ratio, using R/V.

Final Answer: 5 A $\Rightarrow$ C

Answer: (C) Go Back to Q16

Q17.

Solution

Concept — Resistors in series: In a series circuit the total resistance is the sum of the individual resistances.

Step 1 — Write the formula:

$$R_{\text{total}} = R_1 + R_2 + R_3$$

Step 2 — Substitute three resistors of $7\ \Omega$ each:

$$R_{\text{total}} = 7 + 7 + 7$$

Step 3 — Add:

$$R_{\text{total}} = 21\ \Omega$$

Why other options are wrong:

- Option A (2.33): uses the parallel formula by mistake.
- Option B (14): adds only two of the three resistors.
- Option C (7): gives a single resistor value.

Final Answer: $21\ \Omega \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q17

Q18.

Solution

Concept — Two resistors in parallel: For two resistors in parallel, the combined resistance is the product divided by the sum, $R_{\text{p}} = \dfrac{R_1 R_2}{R_1 + R_2}$.

Step 1 — Write the product-over-sum formula:

$$R_{\text{p}} = \frac{R_1 R_2}{R_1 + R_2}$$

Step 2 — Substitute $R_1 = 12\ \Omega$ and $R_2 = 6\ \Omega$:

$$R_{\text{p}} = \frac{12 \times 6}{12 + 6} = \frac{72}{18}$$

Step 3 — Simplify:

$$R_{\text{p}} = 4\ \Omega$$

Why other options are wrong:

- Option A (18): adds the resistors as if in series.
- Option C (9): takes the simple average of the two values.
- Option D (6): uses one resistor value only.

Final Answer: $4\ \Omega \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Heating effect of current: The heat produced in a resistor is $H = I^2Rt$ (Joule's law of heating).

Step 1 — Write the formula:

$$H = I^2Rt$$

Step 2 — Substitute $I = 2$ A, $R = 10\ \Omega$, $t = 5$ s:

$$H = (2)^2 \times 10 \times 5$$

Step 3 — Evaluate the square:

$$(2)^2 = 4$$

Step 4 — Multiply step by step:

$$H = 4 \times 10 \times 5 = 40 \times 5 = 200\ \text{J}$$

Why other options are wrong:

- Option B (100): forgets to square the current.
- Option C (40): leaves out the time factor.
- Option D (17): adds the quantities instead of multiplying.

Final Answer: 200 J $\Rightarrow$ A

Answer: (A) Go Back to Q19

Q20.

Solution

Concept — Current from a cell with internal resistance: The current equals the EMF divided by the total resistance (external plus internal), $I = \dfrac{E}{R + r}$.

Step 1 — Write the formula:

$$I = \frac{E}{R + r}$$

Step 2 — Add the external and internal resistances:

$$R + r = 2 + 1 = 3\ \Omega$$

Step 3 — Substitute $E = 6$ V:

$$I = \frac{6}{3}$$

Step 4 — Simplify:

$$I = 2\ \text{A}$$

Why other options are wrong:

- Option A (6): uses the EMF value directly as the current.
- Option B (3): divides by the external resistance only, ignoring the internal one.
- Option C (1.5): divides the EMF by 4 instead of 3.

Final Answer: 2 A $\Rightarrow$ D

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — Solar cell: A solar (photovoltaic) cell converts light energy directly into electrical energy using the photovoltaic effect in a semiconductor.

Step 1 — Identify the energy conversion: Input is light energy; output is electrical energy.

Step 2 — Match to the device: The device performing light $\rightarrow$ electrical conversion is the solar cell.

Why other options are wrong:

- Option A (Transformer): changes AC voltage levels, with no light input.
- Option B (Electric motor): converts electrical energy into mechanical motion.
- Option D (Loudspeaker): converts electrical signals into sound.

Final Answer: Solar cell $\Rightarrow$ C

Answer: (C) Go Back to Q21

Q22.

Solution

Concept — Law of magnetic poles: The basic rule of magnetism is that like poles repel each other and unlike (opposite) poles attract.

Step 1 — Recall the rule: Two north poles (or two south poles) push apart; a north and a south pull together.

Step 2 — State it correctly: Like poles repel, unlike poles attract.

Why other options are wrong:

- Option A: reverses the rule (like attract, unlike repel).
- Option B: ignores that like poles repel.
- Option C: ignores that unlike poles attract.

Final Answer: like poles repel, unlike poles attract $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q22

Q23.

Solution

Concept — Diode biasing: A semiconductor diode conducts when it is forward biased (p-side to the positive terminal, n-side to the negative) and blocks current when reverse biased.

Step 1 — Identify the condition for easy conduction: Low resistance and free current flow occur only in forward bias.

Step 2 — Match to the option: The diode conducts easily when forward biased.

Why other options are wrong:

- Option A (reverse biased): the diode blocks current and acts almost like an open switch.
- Option C (left unbiased): with no applied voltage there is no driving force for current.
- Option D (absolute zero): temperature is not what turns a diode on; bias polarity is.

Final Answer: forward biased $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q23

Q24.

Solution

Concept — Mains frequency: The domestic AC mains supply in India alternates at a standard frequency of 50 hertz, meaning the current reverses direction 50 complete cycles each second.

Step 1 — Recall the standard value: India (and most of Asia and Europe) uses a 50 Hz supply.

Step 2 — State the answer: The standard mains frequency in India is 50 Hz.

Why other options are wrong:

- Option B (60 Hz): the standard used in countries such as the USA, not India.
- Option C (100 Hz): twice the Indian value, not a mains standard.
- Option D (0 Hz): would mean direct current, which does not alternate.

Final Answer: 50 Hz $\Rightarrow$ A

Answer: (A) Go Back to Q24

Q25.

Solution

Concept — Flight instruments: The tachometer displays the rotational speed of the engine (or rotor) in revolutions per minute (rpm).

Step 1 — Match the function to the instrument: Indicating engine rpm is the job of the tachometer.

Step 2 — Confirm its use: Pilots use it to keep the engine within its safe operating speed range.

Why other options are wrong:

- Option A (Altimeter): shows height above sea level.
- Option C (Airspeed indicator): shows speed through the air.
- Option D (Magnetic compass): shows heading or direction.

Final Answer: Tachometer $\Rightarrow$ B

Answer: (B) Go Back to Q25

Q26.

Solution

Concept — Aircraft wing structure: The spar is the main spanwise (lengthwise) structural member of a wing; it carries most of the bending load created by lift.

Step 1 — Identify the marked member: The strong beam running along the length of the wing is the spar.

Step 2 — Confirm its role: Spars resist the up-and-down bending of the wing in flight and transmit the load to the fuselage.

Why other options are wrong:

- Option B (Rib): runs across the wing to give it its aerofoil shape, not along its length.
- Option C (Stringer): a lighter lengthwise stiffener, not the main load-carrying member.
- Option D (Cowling): a removable cover over an engine, not a wing member.

Final Answer: Spar $\Rightarrow$ A

Answer: (A) Go Back to Q26

Q27.

Solution

Concept — Control surfaces: The rudder is the hinged surface on the vertical tail fin; deflecting it left or right yaws the aircraft about its vertical axis.

Step 1 — Identify the axis of motion: Yawing (nose left or right) is rotation about the vertical axis.

Step 2 — Match the surface: The surface controlling yaw, mounted on the vertical fin, is the rudder.

Why other options are wrong:

- Option A (Aileron): on the wings, controls roll.
- Option B (Elevator): on the horizontal tail, controls pitch.
- Option D (Flap): a high-lift device on the wing, not a yaw control.

Final Answer: Rudder $\Rightarrow$ C

Answer: (C) Go Back to Q27

Q28.

Solution

Concept — Aerofoil geometry: The chord line is the straight line joining the leading edge to the trailing edge of an aerofoil; its length is the chord.

Step 1 — Identify the line drawn: The dashed straight line runs from the leading edge to the trailing edge.

Step 2 — Name it: That straight leading-edge-to-trailing-edge line is the chord line.

Why other options are wrong:

- Option A (Camber line): the curved line midway between the upper and lower surfaces, not straight.
- Option B (Span): the distance from one wingtip to the other, not a line on the section.
- Option C (Angle of attack): the angle between the chord line and the oncoming air, not a line.

Final Answer: Chord line $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q28

Q29.

Solution

Concept — Four forces of flight: In steady level flight the four forces balance in pairs: lift balances weight (vertical), and thrust balances drag (horizontal).

Step 1 — Identify the horizontal pair: Thrust acts forward; drag acts backward, opposing motion.

Step 2 — State the balance: For constant speed, thrust must exactly equal drag.

Why other options are wrong:

- Option A (Lift): a vertical force, balanced by weight, not by thrust.
- Option C (Weight): the vertical force balanced by lift.
- Option D (Normal reaction): a ground-contact force, not present in flight.

Final Answer: Drag $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q29

Q30.

Solution

Concept — Aircraft oxygen system: The oxygen system supplies breathable oxygen to the crew and passengers at high altitude, where the thin air would otherwise cause hypoxia.

Step 1 — Identify the need: At high altitude the cabin air has too little oxygen to breathe safely, so supplementary oxygen is required.

Step 2 — Match to the system: The system that provides this breathing oxygen is the oxygen system.

Why other options are wrong:

- Option A (Hydraulic system): uses pressurised liquid to move landing gear, flaps and brakes.
- Option B (Fuel system): stores and delivers fuel to the engines.
- Option D (Ignition system): provides the spark to start and sustain combustion.

Final Answer: Oxygen system $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q30

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	2	D	3	A	4	B	5	C
6	D	7	B	8	C	9	C	10	A
11	B	12	D	13	A	14	A	15	A
16	C	17	D	18	B	19	A	20	D
21	C	22	D	23	B	24	A	25	B
26	A	27	C	28	D	29	B	30	C