PHYSICS GRADE 10

MID TERM 2 2026
MARKING SCHEME

Question 1

(a) Calculate the acceleration of the car:

• Formula: $a = (v - u) / t$

• Substitution: Given initial velocity $u = 0$ m/s (from rest), final velocity $v = 25$ m/s, and time $t = 8$ s.

$a = (25 - 0) / 8$

• **Answer: $a = 3.125$ m/s²** (2 marks)

(b) Calculate the distance covered during this acceleration:

• Formula: $s = ut + \frac{1}{2}at^2$ OR $v^2 = u^2 + 2as$ OR $s = [(u + v) / 2] \times t$

• Substitution: Using $s = [(0 + 25) / 2] \times 8$

• **Answer: $s = 12.5 \times 8 = 100$ meters** (2 marks)

Question 2

(a) Identify the forces labeled J, K, and L:

• J: Weight / Gravitational Force (W or mg) (1 mark)

• K: Normal Reaction Force / Normal Force (R or N) (1 mark)

• L: Frictional Force / Friction (f) (1 mark)

(b) What is represented by angle M?

• Answer: Angle of inclination / Angle of the inclined plane (1 mark)

(c) Calculate the component of weight parallel to the plane:

• Formula: $W_{parallel} = mg \sin(\theta)$

• Substitution: Given $m = 5$ kg, $\theta = 30°$, and taking $g = 10$ m/s² (or 9.8 m/s²).

$W_{parallel} = 5 \times 10 \times \sin(30°) = 50 \times 0.5$

• **Answer: 25 N** (or 24.5 N if using $g = 9.8$ m/s²) (2 marks)

Question 3

(a) Calculate its potential energy at the initial height:

• Formula: $PE = mgh$

• Substitution: Given $m = 2$ kg, $h = 10$ m, $g = 10$ m/s².

$PE = 2 \times 10 \times 10$

• **Answer: 200 Joules (J)** (2 marks)

(b) Calculate its kinetic energy just before hitting the ground:
• Answer: By the principle of conservation of energy, loss in PE = gain in KE.
KE = 200 Joules (J) (2 marks)

(c) What principle does this demonstrate?
• Answer: The Law of Conservation of Energy (1 mark)

Question 4

Distinguish between elastic and inelastic collisions (3 marks):

Elastic Collision	Inelastic Collision
Both kinetic energy and momentum are conserved.	Momentum is conserved, but kinetic energy is NOT conserved (some energy is transformed into heat, sound, or structural deformation).

Question 5

(a) Label the parts identified as A, B, and C on the diagram:
• A: Wavelength (λ) (1 mark)
• B: Amplitude (1 mark)
• C: Crest (1 mark)

(b) Calculate the wave speed:
• Formula: $v = f\lambda$
• Substitution: Given $f = 2$ Hz, $\lambda = 6.28$ m.
$v = 2 \times 6.28$
• **Answer: 12.56 m/s** (2 marks)

(c) State the difference between a longitudinal and transverse wave:
• Answer: In a transverse wave, particles vibrate perpendicular to the direction of wave propagation. In a longitudinal wave, particles vibrate parallel to the direction of wave propagation. (1 mark)

Question 6

(a) Name the components labeled A, B, C, and D in the circuit:
• A: Battery / DC Source (1 mark)
• B: Resistor (1 mark)

• C: Bulb / Lamp / Indicator (1 mark)
• D: Switch / Key (1 mark)

(b) State the function of component D:
• Answer: To open or close the circuit (to control the flow of current on/off). (1 mark)

(c) Calculate the current in the circuit using Ohm's law:
• Formula: $I = V / R$
• Substitution: Given $V = 12$ V, $R = 4\ \Omega$.
$I = 12 / 4$
• **Answer: 3 Amperes (A)** (2 marks)

Question 7

(a) State Kirchhoff's current law:
• Answer: The total current entering any junction equals the total current leaving that junction ($\Sigma I_{in} = \Sigma I_{out}$), which satisfies the principle of conservation of charge. (2 marks)

(b) Two resistors of 3 Ω and 6 Ω are connected in parallel. Calculate the total resistance:
• Formula: $1/R_p = 1/R_1 + 1/R_2$ OR $R_p = (R_1 \times R_2) / (R_1 + R_2)$
• Substitution: $R_p = (3 \times 6) / (3 + 6) = 18 / 9$
• **Answer: 2 Ω** (3 marks)

(c) Calculate the total current supplied by the battery:
• Formula: $I_{total} = V / R_p$
• Substitution: Given $V = 12$ V and computed $R_p = 2\ \Omega$.
$I_{total} = 12 / 2$
• **Answer: 6 Amperes (A)** (2 marks)

Question 8

(a) Identify the components labeled F, G, H, and I:
• F: Coil / Solenoid / Winding (1 mark)
• G: Battery / DC Power Supply (1 mark)
• H: Soft iron core (1 mark)
• I: Magnetic field lines / Magnetic flux lines (1 mark)

(b) What is the function of component H in the electromagnet?
• Answer: It concentrates and heavily intensifies the induced magnetic field when current flows, and quickly loses its magnetism when the current is turned off. (1 mark)

(c) How would increasing the number of turns in the coil affect the strength of the

electromagnet?
• Answer: It increases the overall magnetic field strength of the electromagnet. (1 mark)

Question 9

(a) State Fleming's left-hand rule:
• Answer: Arrange the thumb, forefinger, and middle finger of the left hand mutually perpendicular to each other. If the Forefinger points in the direction of the Magnetic Field, and the Center finger points in the direction of the Current, then the Thumb indicates the direction of the Thrust / Magnetic Force / Motion. (2 marks)

(b) Calculate the force on the conductor:
• Formula: $F = BIL \sin(\theta)$ (Assuming the conductor is perpendicular to the field, $\sin(90°) = 1$)
• Substitution: Given $B = 0.8$ T, $I = 2$ A, $L = 0.5$ m.
$F = 0.8 \times 2 \times 0.5$
• **Answer: 0.8 Newtons (N)** (3 marks)

Question 10

(a) Identify the angles labeled i and r on the diagram:
• i: Angle of incidence (1 mark)
• r: Angle of refraction (1 mark)

(b) State Snell's law of refraction:
• Answer: The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant for a given pair of media: sin(i) / sin(r) = constant (_1n_2). Alternatively, written as: n_1 sin(i) = n_2 sin(r). (2 marks)

(c) Calculate the angle of refraction:
• Formula: $n_1 \sin(i) = n_2 \sin(r)$
• Substitution: Given $n_1 = 1$, $i = 30°$, $n_2 = 1.5$.
$1 \times \sin(30°) = 1.5 \times \sin(r)$
$0.5 = 1.5 \times \sin(r) \Rightarrow \sin(r) = 0.5 / 1.5 = 1/3 \approx 0.3333$
$r = \sin^{-1}(0.3333)$
• **Answer: $r \approx 19.47°$** (3 marks)

Question 11

(a) Identify the points and distances labeled D and E on the diagram:
• D: Object distance (u) (1 mark)
• E: Focal length (f) (1 mark)

(b) Using the lens formula $1/f = 1/u + 1/v$, calculate the image distance (v):

- Substitution: Given u = 30 cm and f = 10 cm.
  1/10 = 1/30 + 1/v
  1/v = 1/10 - 1/30 = (3 - 1) / 30 = 2 / 30 = 1 / 15
- **Answer: v = 15 cm** (4 marks)

(c) Calculate the magnification of the image:

- Formula: m = v / u
- Substitution: m = 15 / 30
- **Answer: m = 0.5** (2 marks)