

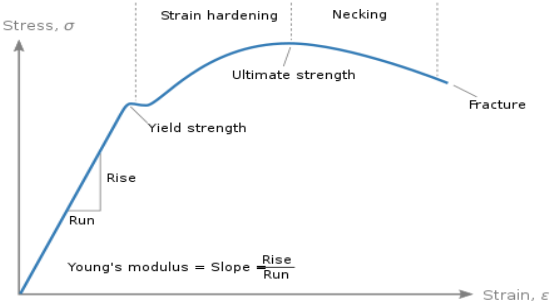
SET	A
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INDIAN SCHOOL MUSCAT  
FINAL EXAMINATION 2023  
SUBJECT: PHYSICS (O42)

CLASS: XI

Max.Marks: 70

MARKING SCHEME			
SET	QN.NO	VALUE POINTS	MARKS
A	1	B	
	2	A	
	3	A	
	4	C	
	5	C	
	6	B	
	7	B	
	8	D	
	9	B	
	10	B	
	11	A	
	12	A	
	13	C	
	14	A, B OR C	
	15	B	
	16	A	
	17	D	
	18	A ,B	
	19	DERIVATION of $v^2 = u^2 - 2as$ GRAPH – Derivation  OR  (a) Velocity =0 Acceleration=9.8m/s <sup>2</sup> (downwards) Yes. Uniform circular motion	$\frac{1}{2}$ $1\frac{1}{2}$  $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}+1/2$
	20.	Initial K.E. = $\frac{1}{2} mu^2 = 1000J$ Final K.E. = 100J $\frac{1}{2} mv^2 = 100$ <b>V = 63.34 m/s</b>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	21.	Formula – $g' = g / (1-h/R)^2$ $m g = mg / (1-h/R)^2$ $W_h = 63 / (1-(h/2)/R)^2$ = 28 N	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

22.	 <p>i) load extension graph (ii) labelling -(a) Hooke's law region (b) Elastic limit (c) Proportional limit (d) Breaking point</p> <p style="text-align: center;">OR</p> <p>(i) Increase in length is halved (ii) Maximum load it can support will remain the same</p>	<p>4 x ½</p> <p>1 1</p>
23.	<p>(a) Statement of Wein's displacement law</p> <p>(b) Water is used as a coolant in automobile radiators, as well as, a heater in hot water bag because high specific capacity of water.</p>	<p>1</p> <p>1</p>
24.	<p>(a) (i) Temperature (ii) Internal energy (b) Statement of second law of thermodynamics</p>	<p>½ ½</p> <p>1</p>
25.	Any Four postulates of kinetic theory of gases.	4 x ½
26.	<p> <math>M \propto V^a</math>  <math>M \propto \rho^b</math>  <math>M \propto g^c</math>  <math>M \propto V^a \rho^b g^c</math>  <math>M L^0 T^0 = [LT^{-1}]^a \cdot [ML^{-3}]^b [LT^{-2}]^c</math>  <math>a = 6</math>  <math>b = 1</math>  <math>c = -3</math>            Showing <math>M \propto V^6</math> </p> <p style="text-align: center;">(OR)</p> <p> <math>T \propto r^a</math>  <math>T \propto M^b</math>  <math>T \propto G^c</math>  <math>T \propto r^a \cdot M^b \cdot G^c</math>  <math>M^0 L^0 T^1 = [L]^a \cdot [M]^b [M^{-1} L^3 T^{-2}]^c</math>  <math>a = 3/2</math>  <math>b = -1/2</math>  <math>c = -1/2</math>            Showing <math>T^2 \propto r^3</math>.         </p>	<p>1 ½ ½ ½ ½</p> <p>1 ½ ½ ½ ½</p>
27.	<p>Obtain an expression for the maximum speed with a vehicle can safely negotiate a curved road banked at an angle <math>\theta</math>.</p> <p>Diagram:</p> <p>Derivation: <math>V =</math> (If two equations from FBD are correct, give 1 mark)</p>	<p>1 2</p>
28.	<p>Elastic collision: A collision between two particles or bodies is said to be perfectly elastic if both the linear momentum and the kinetic energy of the system remains conserved.</p> <p>Derivation for final velocities after 1-dimensional collision</p>	½

		<p><b>Two equations according to law of conservation of energy and law of conservation of momentum, give 1 mark)</b></p> $V_1 = 2m_2u_2 + u_1(m_1 - m_2) / (m_1 + m_2)$ $V_2 = 2m_1u_1 + u_2(m_2 - m_1) / (m_1 + m_2)$	1 1 ½
	29.	<p><b>Centre of mass:</b> Centre of mass of a system or a body is a point where whole of mass of the system were supposed to be concentrated.</p> <p><b>Centre of mass of a system of two particles: Derivation</b></p> <p><b>Diagram</b></p> $R_{c.m.} = (m_1r_1 + m_2r_2 + \dots + m_nr_n) / (m_1 + m_2 + \dots + m_n) \quad 2M$ <p><b>(If derivation is given upto net force in differential form, give 1 mark)</b></p> <p><b>(OR)</b></p> <p><b>Angular momentum:</b> Angular momentum of a particle about an axis of rotation is defined as the product of linear momentum of the particle and the perpendicular distance of the particle from the axis of rotation.</p> <p>Derivation: Relationship between angular momentum and torque.</p> $\tau = dL / dt$ <p><b>(If physical quantities are not written in vector notation, deduct 1 mark)</b></p>	½  ½ 2  1  2
	30.	<p>(a) List two characteristics of simple harmonic motion.</p> <p>(b) The displacement equation for a particle executing simple harmonic motion <math>y = 10\sin(40t + 0.5)</math>. Where y is in centimeter and time in seconds</p> <p>(i) Amplitude = 10cm</p> <p>(ii) Frequency = 6.3Hz</p> <p>(iii) Phase = 0.5</p>	½, ½  ½ 1 ½
	31.	<p>(a) projectile definition: An object thrown with initial velocity and which is then allowed to move under the action of gravity alone is called projectile.</p> <p>Derivation for a maximum height <math>H = u^2 \sin^2\theta / 2g</math></p> <p>(b) Time of flight <math>T = 2u\sin\theta / g = 2 \times 30 \times 0.5 / 9.8 = 3.06 \text{ sec}</math> Horizontal range = <math>u^2 \sin 2\theta / g = 77.85 \text{ m}</math>.</p> <p><b>(OR)</b></p> <p>(a) Derivation for the path followed by a projectile is a parabolic path</p> <p>Diagram</p> <p>Derivation</p> <p>Justification of parabolic path</p> <p>(b) Actual velocity = 288.6kmph Vertical component of the velocity = 44.3 Kmph</p>	1 2  ½ ½ ½ ½  1 1½ ½ 1 1
	32	<p>(a) <b>Orbital velocity:</b> The velocity required to put a satellite into its orbit around the earth is called orbital velocity.</p> <p>Derivation for the orbital velocity of satellite in terms of g</p> <p>(b) <math>g_d = g(1 - d/R)</math> <math>m.g_d = m.g(1 - d/R)</math> <math>W_d = W(1 - d/R)</math> Substitution and calculation = 125 N</p> <p><b>(OR)</b></p> <p>(a) <b>Escape velocity:</b> The minimum speed required to project a body vertically upward from the surface of earth so that it never returns to the surface of earth is escape velocity.</p> <p>Derivation for the escape velocity: <math>V_e = (2gR)^{1/2}</math></p> <p>(b) Percentage decrease in weight of a body = <math>2h / R \times 100</math></p>	½  2½ ½ ½  1  1 2 ½

		$= (2 \times 32 / 6400) \times 100$ $= 1\%$	$\frac{1}{2}$ 1
33.	<p>(a) Statement of Bernoulli's theorem: (Per unit volume / mass is not given, give zero)</p> <p>Proof for Bernoulli's theorem: Diagram Derivation</p> <p>(b)</p> $A_1 = 8\text{cm}^2 = 8 \times 10^{-4}\text{m}^2$ $V_1 = 1.5 \text{ m/minute} = \frac{1.5}{60}\text{ms}^{-1}$ $\text{Area of 40 holes } A_2 = 40\pi(0.5 \times 10^{-3})^2\text{m}^2$ $A_1V_1 = A_2V_2$ $V_2 = \frac{A_1V_1}{A_2}$ $= \frac{8 \times 10^{-4} \times 1.5}{40\pi \times (0.5 \times 10^{-3})^2 \times 60} = 0.636 \text{ ms}^{-1}.$ <p style="text-align: center;">(OR)</p> <p><b>(a)Terminal velocity:</b> When a body is dropped in a viscous fluid, it is first accelerated and then its acceleration becomes zero and it attains a constant velocity called terminal velocity.</p> <p>Derivation of expression for terminal velocity:</p> $V = 2r^2(\rho - \sigma)g / 9\eta$ <p><b>If three acting forces are given with expression, give 1 mark)</b></p> <p>(b) <math>r = 1\text{mm}</math>, <math>v_1 = 5\text{m/s}</math> <math>R = 2\text{mm}</math>, <math>v_2 = 4 \times v_1 = 4 \times 5 = 20\text{m/s}</math></p>	1 $\frac{1}{2}$ $1\frac{1}{2}$  $\frac{1}{2}$ $\frac{1}{2}$  $\frac{1}{2}$  $\frac{1}{2}$    1   2    2	
34.	<p>(i) <math>\mu = 0.5</math></p> <p>(ii) <math>\mu = 0.5773</math></p> <p>(iii) Definition angle of friction.</p> <p style="text-align: center;">(OR)</p> <p>laws of limiting friction. (any two)</p>	1 1 2	
35.	<p>(i) Pressure a scalar quantity because it same value in all direction at certain depth</p> <p>(ii) Height of air column , density of air and value of g ( any two)</p> <p>(iii) passengers are advised to remove the ink from their pens while going up in plane because of less atmospheric pressure w.r.t high pressure in barrel of ink pen</p> <p style="text-align: center;"><b>OR</b></p> <p>It is difficult to stop bleeding from a cut in human body at high altitudes because of less atmospheric pressure w.r.t high BP</p>	1 $\frac{1}{2}$ $\frac{1}{2}$  2	
		<b>THE END</b>	

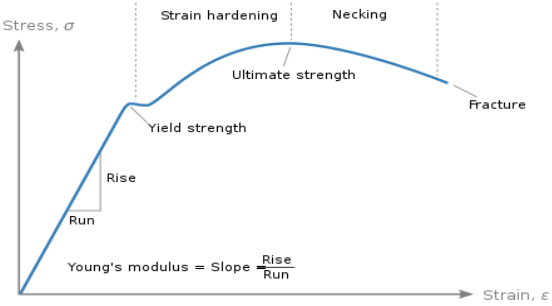
SET	B
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INDIAN SCHOOL MUSCAT  
FINAL EXAMINATION 2023  
SUBJECT: PHYSICS (O42)

CLASS: XI

Max.Marks: 70

MARKING SCHEME			
SET	QN.NO	VALUE POINTS	MAR KS SPLIT UP
A	1	A	1
	2	C	1
	3	B	1
	4	A	1
	5	C	1
	6	B	1
	7	B	1
	8	D	1
	9	B	1
	10	B	1
	11	A	1
	12	A B C	1
	13	B	1
	14	D	1
	15	B	1
	16	A	1
	17	D	1
	18	A B	1
	19	DERIVATION of $v^2 - u^2 = 2as$ GRAPH – Derivation	½ 1½
	20.	Initial K.E. = ½ mu <sup>2</sup> = 1000J Final K.E. = 100J ½ mv <sup>2</sup> = 100 <b>V = 63.34 m/s</b>	½ ½ ½ ½
	21.	Formula – $g' = g (1-d/R)$ 1% of $g = g (1-d/R)$ $1/100 = 1-d/R$ $d = 6336\text{km}$	½ ½ ½ ½

22.	 <p>(i) load extension graph  (ii) labelling -(a) Hooke's law region (b) Elastic limit (c) Proportional limit  (d) Breaking point</p> <p style="text-align: center;">OR</p> <p>(i) Increase in length is halved  (ii) Maximum load it can support will remain the same</p>	<p>4 x ½</p> <p>1 1</p>
23.	<p>(a) Statement of Wein's displacement law</p> <p>(b) Water is used as a coolant in automobile radiators, as well as, a heater in hot water bag because high specific capacity of water.</p>	<p>1</p> <p>1</p>
24.	<p>Statement of the first law of thermodynamics and also</p> <p>Any two limitations.</p> <p style="text-align: center;">(OR)</p> <p>Any four difference between isothermal and adiabatic processes</p>	<p>1</p> <p>1</p> <p>4 x ½</p>
25.	Any Four postulates of kinetic theory of gases.	4 x ½
26.	<p> <math>M \propto V^a</math>  <math>M \propto \rho^b</math>  <math>M \propto g^c</math>  <math>M \propto V^a \rho^b g^c</math>  <math>M L^0 T^0 = [LT^{-1}]^a \cdot [ML^{-3}]^b [LT^{-2}]^c</math>  <math>a = 6</math>  <math>b = 1</math>  <math>c = -3</math>  Showing <math>M \propto V^6</math> </p> <p style="text-align: center;">(OR)</p> <p> <math>T \propto r^a</math>  <math>T \propto M^b</math>  <math>T \propto G^c</math>  <math>T \propto r^a \cdot M^b \cdot G^c</math>  <math>M^0 L^0 T^1 = [L]^a \cdot [M]^b [M^{-1}L^3T^{-2}]^c</math>  <math>a = 3/2</math>  <math>b = -1/2</math>  <math>c = -1/2</math>  Showing <math>T^2 \propto r^3</math>. </p>	<p>1</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p> <p>1</p> <p>½</p> <p>½</p> <p>½</p> <p>½</p>
27.	<p>Obtain an expression for the maximum speed with a vehicle can safely negotiate a curved road banked at an angle <math>\theta</math>.</p> <p>Diagram:</p> <p>Derivation: (If two equations from FBD are correct, give 1 mark)</p>	<p>1</p> <p>2</p>

	<b>28.</b>	<p>Elastic collision: A collision between two particles or bodies is said to be perfectly elastic if both the linear momentum and the kinetic energy of the system remains conserved.</p> <p>Derivation for final velocities after 1-dimensional collision</p> <p><b>Two equations according to law of conservation of energy and law of conservation of momentum, give 1 mark)</b></p> $V_1 = 2m_2u_2 + u_1(m_1 - m_2) / (m_1 + m_2)$ $V_2 = 2m_1u_1 + u_2(m_2 - m_1) / (m_1 + m_2)$	<p>½</p> <p>1</p> <p>1</p> <p>½</p>
	<b>29.</b>	<p><b>Centre of mass:</b> Centre of mass of a system or a body is a point where whole of mass of the system were supposed to be concentrated.</p> <p><b>Centre of mass of a system of two particles: Derivation</b></p> <p><b>Diagram</b></p> $R_{c.m.} = (m_1r_1 + m_2r_2 + ..... + m_nr_n) / (m_1 + m_2 + ..... + m_n) \quad 2M$ <p><b>(If derivation is given upto net force in differential form, give 1 mark)</b></p> <p><b>(OR)</b></p> <p><b>Angular momentum:</b> Angular momentum of a particle about an axis of rotation is defined as the product of linear momentum of the particle and the perpendicular distance of the particle from the axis of rotation.</p> <p>Derivation: Relationship between angular momentum and torque.</p> $\tau = dL / dt$ <p><b>(If physical quantities are not written in vector notation, deduct 1 mark)</b></p>	<p>½</p> <p>½</p> <p>2</p> <p>1</p> <p>2</p>
	<b>30.</b>	<p>(a) List two characteristics of simple harmonic motion.</p> <p>(b) The displacement equation for a particle executing simple harmonic motion <math>y = 10\sin(40t + 0.5)</math>. Where y is in centimeter and time in seconds</p> <p>(i) Amplitude = 10cm</p> <p>(ii) Frequency = 6.3Hz</p> <p>(iii) Phase = 0.5</p>	<p>½, ½</p> <p>½</p> <p>1</p> <p>½</p>
	<b>31.</b>	<p>(a) projectile definition: An object thrown with initial velocity and which is then allowed to move under the action of gravity alone is called projectile.</p> <p>Derivation for a maximum height <math>H = u^2 \sin^2\theta / 2g</math></p> <p>(b) Time of flight <math>T = 2u\sin\theta / g = 2 \times 30 \times 0.5 / 9.8 = 3.06 \text{ sec}</math> Horizontal range = <math>u^2 \sin 2\theta / g = 77.85 \text{ m}</math>.</p> <p><b>(OR)</b></p> <p>(a) Derivation for the path followed by a projectile is a parabolic path</p> <p>Diagram</p> <p>Derivation</p> <p>Justification of parabolic path</p> <p>(b) Actual velocity = 288.6kmph</p> <p>Vertical component of the velocity = 144.3 Kmph</p>	<p>1</p> <p>2</p> <p>½ ½</p> <p>½ ½</p> <p>1</p> <p>1½</p> <p>½</p> <p>1</p> <p>1</p>
	<b>32</b>	<p><b>(a) Orbital velocity:</b> The velocity required to put a satellite into its orbit around the earth is called orbital velocity.</p> <p>Derivation for the orbital velocity of satellite in terms of g</p> <p>(b) <math>g_d = g(1 - d/R)</math> <math>m.g_d = m.g(1 - d/R)</math> <math>Wd = W(1 - d/R)</math> Substitution and calculation = 125 N</p> <p><b>(OR)</b></p>	<p>½</p> <p>2½</p> <p>½</p> <p>½</p> <p>1</p>

		<p><b>(a) Escape velocity:</b> The minimum speed required to project a body vertically upward from the surface of earth so that it never returns to the surface of earth is escape velocity.</p> <p>Derivation for the escape velocity: <math>V_e = (2gR)^{1/2}</math></p> <p><b>(b) Percentage decrease in weight of a body</b> <math>= 2h / R \times 100</math>  <math>= (2 \times 32 / 6400) \times 100</math>  <math>= 1\%</math></p>	<p>1</p> <p>2</p> <p>1/2</p> <p>1/2</p> <p>1</p>
	33.	<p><b>(a) Statement of Bernoulli's theorem:</b> (Per unit volume / mass is not given, give zero)  <b>Proof for Bernoulli's theorem:</b> Diagram  Derivation</p> <p><b>(b)</b>  <math>A_1 = 8\text{cm}^2 = 8 \times 10^{-4}\text{m}^2</math>  <math>V_1 = 1.5\text{ m/minute} = \frac{1.5}{60}\text{ms}^{-1}</math>  <b>Area of 40 holes</b> <math>A_2 = 40\pi(0.5 \times 10^{-3})^2\text{m}^2</math>  <math>A_1V_1 = A_2V_2</math>  <math>V_2 = \frac{A_1V_1}{A_2}</math>  <math>= \frac{8 \times 10^{-4} \times 1.5}{40\pi \times (0.5 \times 10^{-3})^2 \times 60} = 0.636\text{ms}^{-1}</math></p> <p style="text-align: center;"><b>(OR)</b></p> <p><b>(a) Terminal velocity:</b> When a body is dropped in a viscous fluid, it is first accelerated and then its acceleration becomes zero and it attains a constant velocity called terminal velocity.  Derivation of expression for terminal velocity:  <math>V = 2r^2(\rho - \sigma)g / 9\eta</math>  <b>If three acting forces are given with expression, give 1 mark)</b></p> <p><b>(b)</b> <math>r = 1\text{mm}</math>, <math>v_1 = 5\text{m/s}</math>  <math>R = 2\text{mm}</math>,  <math>v_2 = 4 \times v_1 = 4 \times 5 = 20\text{m/s}</math></p>	<p>1</p> <p>1/2</p> <p>1 1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1/2</p> <p>1</p> <p>2</p> <p>2</p>
	34.	<p><b>(i)</b> <math>\mu = 0.5</math>  <b>(ii)</b> <math>\mu = 0.5773</math>  <b>(iii)</b> Definition angle of friction.</p> <p style="text-align: center;"><b>(OR)</b></p> <p>laws of limiting friction. (any two)</p>	<p>1</p> <p>1</p> <p>2</p>
	35.	<p><b>(i)</b> Pressure a scalar quantity because it same value in all direction at certain depth  <b>(ii)</b> Height of air column , density of air and value of g ( any two)  <b>(iii)</b> passengers are advised to remove the ink from their pens while going up in plane because of less atmospheric pressure w.r.t high pressure in barrel of ink pen</p> <p style="text-align: center;"><b>OR</b></p> <p>It is difficult to stop bleeding from a cut in human body at high altitudes because of less atmospheric pressure w.r.t high BP</p>	<p>1</p> <p>1/2 1/2</p> <p>2</p>
		<b>THE END</b>	

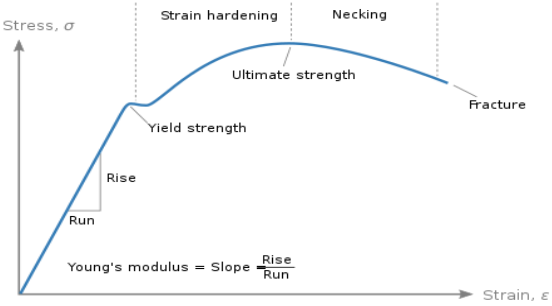
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INDIAN SCHOOL MUSCAT  
FINAL EXAMINATION 2023  
SUBJECT: PHYSICS (O42)

CLASS: XI

Max.Marks: 70

MARKING SCHEME			
SET	QN.NO	VALUE POINTS	MARKS
A	1	A	
	2	A	
	3	B	
	4	C	
	5	C	
	6	B	
	7	C	
	8	D	
	9	B	
	10	B	
	11	A, B AND C	
	12	A	
	13	C	
	14	A	
	15	B	
	16	A	
	17	D	
	<b>18</b>	A B	
	<b>19</b>	DERIVATION of $v^2 = u^2 - 2as$ GRAPH – Derivation  OR  (a) Velocity =0 Acceleration = $9.8 \text{ m/s}^2$ (downwards) Yes. Uniform circular motion	$\frac{1}{2}$ $1\frac{1}{2}$  $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$
	<b>20.</b>	Initial K.E. = $\frac{1}{2} mu^2 = 1000 \text{ J}$ Final K.E. = $100 \text{ J}$ $\frac{1}{2} mv^2 = 100$ <b>V = 63.34 m/s</b>	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	<b>21.</b>	Formula – $g' = g / (1 - h/R)^2$ $m g = mg / (1 - h/R)^2$ $W_h = 63 / (1 - (h/2)/R)^2$ $= 28 \text{ N}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

22.	 <p>i) load extension graph  (ii) labelling -(a) Hooke's law region (b) Elastic limit (c) Proportional limit  (d) Breaking point</p> <p style="text-align: center;">OR</p> <p>(i) Increase in length is halved  (ii) Maximum load it can support will remain the same</p>	<p>4 x ½</p> <p>1 1</p>
23.	<p>(a) Statement of Wein's displacement law</p> <p>(b) Water is used as a coolant in automobile radiators, as well as, a heater in hot water bag because high specific capacity of water.</p>	<p>1</p> <p>1</p>
24.	<p>Statement of the first law of thermodynamics and also Any two limitations.</p> <p style="text-align: center;">(OR)</p> <p>Any four difference between isothermal and adiabatic processes</p>	<p>1 ½ ½</p> <p>4 x ½</p>
25.	Any Four postulates of kinetic theory of gases.	4 x ½
26.	<p> <math>M \propto V^a</math>  <math>M \propto \rho^b</math>  <math>M \propto g^c</math>  <math>M \propto V^a \rho^b g^c</math>  <math>M L^0 T^0 = [L T^{-1}]^a \cdot [M L^{-3}]^b [L T^{-2}]^c</math>  <math>a = 6</math>  <math>b = 1</math>  <math>c = -3</math>  Showing <math>M \propto V^6</math> </p> <p style="text-align: center;">(OR)</p> <p> <math>T \propto r^a</math>  <math>T \propto M^b</math>  <math>T \propto G^c</math>  <math>T \propto r^a \cdot M^b \cdot G^c</math>  <math>M^0 L^0 T^1 = [L]^a \cdot [M]^b [M^{-1} L^3 T^{-2}]^c</math>  <math>a = 3/2</math>  <math>b = -1/2</math>  <math>c = -1/2</math>  Showing <math>T^2 \propto r^3</math>. </p>	<p>1 ½ ½ ½ ½</p> <p>1 ½ ½ ½ ½</p>
27.	<p>Obtain an expression for speed with a vehicle can safely negotiate a curved FLAT road</p> <p>Diagram:</p> <p>Derivation: (If two equations from FBD are correct, give 1 mark)</p>	<p>1 2</p>

	<b>28.</b>	<p>Elastic collision: A collision between two particles or bodies is said to be perfectly elastic if both the linear momentum and the kinetic energy of the system remains conserved.</p> <p>Derivation for final velocities after 1-dimensional collision</p> <p><b>Two equations according to law of conservation of energy and law of conservation of momentum, give 1 mark)</b></p> $V_1 = 2m_2u_2 + u_1(m_1 - m_2) / (m_1 + m_2)$ $V_2 = 2m_1u_1 + u_2(m_2 - m_1) / (m_1 + m_2)$	<p>1/2</p> <p>1</p> <p>1</p> <p>1/2</p>
	<b>29.</b>	<p><b>Centre of mass:</b> Centre of mass of a system or a body is a point where whole of mass of the system were supposed to be concentrated.</p> <p><b>Centre of mass of a system of two particles: Derivation</b></p> <p><b>Diagram</b></p> $R_{c.m.} = (m_1r_1 + m_2r_2 + \dots + m_nr_n) / (m_1 + m_2 + \dots + m_n) \quad 2M$ <p><b>(If derivation is given upto net force in differential form, give 1 mark)</b></p> <p><b>(OR)</b></p> <p><b>Angular momentum:</b> Angular momentum of a particle about an axis of rotation is defined as the product of linear momentum of the particle and the perpendicular distance of the particle from the axis of rotation.</p> <p>Derivation: Relationship between angular momentum and torque.</p> $\tau = dL / dt$ <p><b>(If physical quantities are not written in vector notation, deduct 1 mark)</b></p>	<p>1/2</p> <p>1/2</p> <p>2</p> <p>1</p> <p>2</p>
	<b>30.</b>	<p>(a) List two characteristics of simple harmonic motion.</p> <p>(b) The displacement equation for a particle executing simple harmonic motion <math>y = 10\sin(40t + 0.5)</math>. Where y is in centimeter and time in seconds</p> <p>(i) Amplitude = 10cm</p> <p>(ii) Frequency = 6.3Hz</p> <p>(iii) Phase = 0.5</p>	<p>1/2, 1/2</p> <p>1/2</p> <p>1</p> <p>1/2</p>
	<b>31.</b>	<p>(a) projectile definition: An object thrown with initial velocity and which is then allowed to move under the action of gravity alone is called projectile.</p> <p>Derivation for a maximum height <math>H = u^2 \sin^2\theta / 2g</math></p> <p>(b) Time of flight <math>T = 2u\sin\theta / g = 2 \times 30 \times 0.5 / 9.8 = 3.06 \text{ sec}</math> Horizontal range = <math>u^2 \sin 2\theta / g = 77.85 \text{ m}</math>.</p> <p><b>(OR)</b></p> <p>(a) Derivation for the path followed by a projectile is a parabolic path</p> <p>Diagram</p> <p>Derivation</p> <p>Justification of parabolic path</p> <p>(b) Actual velocity = 288.6kmph</p> <p>Vertical component of the velocity = 144.3 Kmph</p>	<p>1</p> <p>2</p> <p>1/2, 1/2</p> <p>1/2, 1/2</p> <p>1</p> <p>1 1/2</p> <p>1/2</p> <p>1</p> <p>1</p>
	<b>32</b>	<p><b>(a) Orbital velocity:</b> The velocity required to put a satellite into its orbit around the earth is called orbital velocity.</p> <p>Derivation for the orbital velocity of satellite in terms of g</p> <p>(b) <math>g_d = g(1 - d/R)</math> <math>m.g_d = m.g(1 - d/R)</math> <math>Wd = W(1 - d/R)</math> Substitution and calculation = 125 N</p>	<p>1/2</p> <p>2 1/2</p> <p>1/2</p> <p>1/2</p> <p>1</p>

		<p style="text-align: center;"><b>(OR)</b></p> <p><b>(a) Escape velocity:</b> The minimum speed required to project a body vertically upward from the surface of earth so that it never returns to the surface of earth is escape velocity. Derivation for the escape velocity: <math>V_e = (2gR)^{1/2}</math> <b>(b) Percentage decrease in weight of a body</b> <math>= 2h / R \times 100</math> <math>= (2 \times 32 / 6400) \times 100</math> <math>= 1\%</math></p>	1 2 1/2 1/2 1
	33.	<p><b>(a)</b> Statement of Bernoulli's theorem: (Per unit volume / mass is not given, give zero) Proof for Bernoulli's theorem: Diagram Derivation</p> <p><b>(b)</b> <math>A_1 = 8\text{cm}^2 = 8 \times 10^{-4}\text{m}^2</math> <math>V_1 = 1.5 \text{ m/minute} = \frac{1.5}{60}\text{ms}^{-1}</math> Area of 40 holes <math>A_2 = 40\pi(0.5 \times 10^{-3})^2\text{m}^2</math> <math>A_1V_1 = A_2V_2</math> <math>V_2 = \frac{A_1V_1}{A_2}</math> <math>= \frac{8 \times 10^{-4} \times 1.5}{40\pi \times (0.5 \times 10^{-3})^2 \times 60} = 0.636 \text{ ms}^{-1}</math></p> <p style="text-align: center;"><b>(OR)</b></p> <p><b>(a)Terminal velocity:</b> When a body is dropped in a viscous fluid, it is first accelerated and then its acceleration becomes zero and it attains a constant velocity called terminal velocity. Derivation of expression for terminal velocity: <math>V = 2r^2(\rho - \sigma)g / 9\eta</math> <b>If three acting forces are given with expression, give 1 mark)</b> <b>(b)</b> <math>r = 1\text{mm}</math>, <math>v_1 = 5\text{m/s}</math> <math>R = 2\text{mm}</math>, <math>v_2 = 4 \times v_1 = 4 \times 5 = 20\text{m/s}</math></p>	1 1/2 1 1/2  1/2 1/2 1/2  1/2  1  2  2
	34.	<p><b>(i)</b> <math>\mu = 0.5</math> <b>(ii)</b> <math>\mu = 0.5773</math> <b>(iii)</b> Definition angle of friction.</p> <p style="text-align: center;"><b>(OR)</b></p> <p>laws of limiting friction. (any two)</p>	1 1 2
	35.	<p><b>(i)</b> Pressure a scalar quantity because it same value in all direction at certain depth <b>(ii)</b> Height of air column , density of air and value of g ( any two) <b>(iii)</b> passengers are advised to remove the ink from their pens while going up in plane because of less atmospheric pressure w.r.t high pressure in barrel of ink pen</p> <p style="text-align: center;"><b>OR</b></p> <p>It is difficult to stop bleeding from a cut in human body at high altitudes because of less atmospheric pressure w.r.t high BP</p>	1 1/2 1/2  2
		<b>THE END</b>	