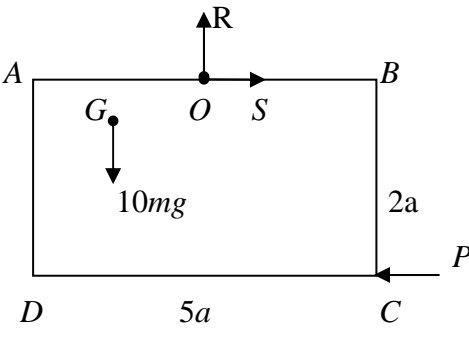




Question Number	Scheme	Marks
4.	<p>(a) <math>M(B), N 2a \cos \theta = W a \cos \theta + \frac{1}{4} W \frac{3a}{2} \sin \theta</math></p> <p><math>N = \frac{7W}{8}</math></p> <p>(b) <math>R = \frac{1}{4} W; \quad F + N = W</math></p> <p><math>F \leq \mu R</math> or <math>F = \mu R</math></p> <p><math>\frac{1}{2} \leq \mu</math> * (exact)</p> <p>(c) It does not bend</p> <p>Or has negligible thickness</p>	<p>M1 A2 (-1 e.e.)</p> <p>dep. M1 A1 (5)</p> <p>B1; B1</p> <p>M1</p> <p>A1 c.s.o. (5)</p> <p>B1 (1)</p> <p style="text-align: right;"><b>(10 marks)</b></p>
5.	<p>(a) <math>2ut = 735</math></p> <p><math>0 = 3ut - \frac{1}{2} gt^2</math></p> <p>eliminating <math>t</math></p> <p><math>u = 24.5</math> *</p> <p>(b) <math>t = \frac{735}{49} = 15</math></p> <p>(c) Initially: <math>v^2 = (2u)^2 + (3u)^2</math></p> <p>(7803.25)</p> <p><math>\frac{1}{2} mv^2 - \frac{1}{2} m 65^2 = mgh</math></p> <p><math>h = 180</math> m (183 m)</p> <p>OR <math>v_y^2 = 65^2 - (2u)^2</math> (1824)</p> <p><math>v_y^2 = (3u)^2 - 2gh</math></p> <p><math>h = 180</math> m (183 m)</p>	<p>M1 A1</p> <p>M1 A1</p> <p><b>dep.</b> M1</p> <p>A1 (6)</p> <p>M1 A1 (2)</p> <p>M1</p> <p>M1 A1</p> <p>A1 (4)</p> <p>M1</p> <p>M1 A1</p> <p>A1 (4)</p> <p style="text-align: right;"><b>(12 marks)</b></p>

(ft = follow through mark; cao = correct answer only; \*) indicates final line is given on the paper)

Question Number	Scheme	Marks
6. (a)	$u \rightarrow \rightarrow 0$ CLM: $mu = mv_1 + 3mv_2$ $m \quad 3m$ NIL: $eu = -v_1 + v_2$ $v_1 \rightarrow \quad v_2 \rightarrow$ solving, $v_2 = \frac{u}{4}(1+e)^*$	B1 M1 A1 dep. M1 A1 (5)
(b)	Solving for $v_1$ : $\left  \frac{u}{4}(1-3e) \right $	M1 A1 (2)
(c)	$\frac{1}{2} m \frac{u^2}{16} (1-3e)^2 + \frac{1}{2} 3m \frac{u^2}{16} (1+e)^2 = \frac{1}{6} mu^2$ $e^2 = \frac{1}{9}$ $e = \frac{1}{3}$	M1 A1 f.t. A1 dep. M1 A1 A1 (6)
(d)	$v_1 = \frac{u}{4} (1 - 3 \times \frac{1}{3}) = 0 \Rightarrow$ at rest.	A1 c.s.o. (1)  <b>(14 marks)</b>

Question Number	Scheme	Marks
7. (a)	$AD: 10m\bar{x} = 3m \frac{5a}{2} + 3m \times 5a$ $\bar{x} = 2.25a^*$	M1 A1 A1 (3)
(b)	$AB: 10m\bar{y} = 2m \times 2a + 3m \times a$ $\bar{y} = 0.7a$	M1 A1 (2)
(c)	$\tan \theta = \frac{2.5a - \bar{x}}{\bar{y}}$ $\theta = 20^\circ$	M1 A1 f.t. A1 (3)
(e)	  $M(0), 10mg \times \frac{a}{4} = P \times 2a$ (OR: $4mg \times \frac{5a}{2} - 3mg \times \frac{5a}{2} = P \times 2a$ )  $P = \frac{5mg}{4}^*$ (exact)  $S = \frac{5mg}{4}; R = 10mg$  $F = \sqrt{S^2 + R^2} = \frac{5mg\sqrt{65}}{4}$ (10.1 mg)	M1 A1 A1   A1 (4)  B1; B1  M1 A1 (4)  <b>(16 marks)</b>