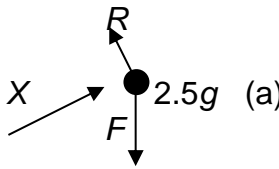
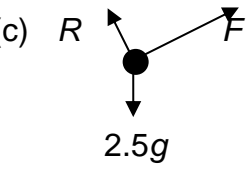


Friction and Static Particles - Edexcel Past Exam Questions **MARK SCHEME**

Question 1: Jan 05 Q4

Question Number	Marks	Scheme
	<p>(a) </p>	<p>$R = 2.5g \cos 20$ M1 $\approx \underline{23.0 \text{ or } 23 \text{ N}}$ A1 (2)</p> <p>(b) $X = 0.4 \times 23.0 + 2.5g \sin 20$ M1 A2,1,0√ $\approx \underline{17.6 \text{ or } 18 \text{ N}}$ A1 (4)</p> <p>(c) </p> <p>In equil. $F = 2.5g \sin 20 \approx 8.38 \text{ or } 8.4 \text{ N}$ B1 $\mu R = 0.4 \times 2.5g \cos 20 \approx 9.21 \text{ or } 9.2 \text{ N}$ B1 $8.4 < 9.2$ (using '$F < \mu R$' not $F = \mu R$) M1 Since $F < \mu R$ remains in equilibrium (cso) A1 (4)</p>

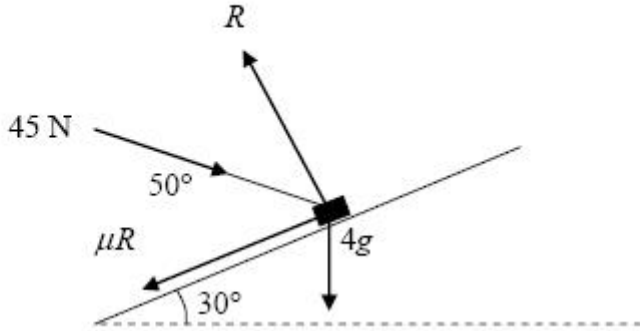
Question 2: Jan 06 Q5

Question Number	Scheme	Marks
	<p>(a) R(perp to plane): $P \sin 30 + 10 \cos 30 = 18$ Solve: $P \approx \underline{18.7 \text{ N}}$</p> <p>(b) R(// plane): $P \cos 30 = 10 \sin 30 + F$ $F = 18\mu$ used Sub and solve: $\mu = \underline{0.621 \text{ or } 0.62}$</p> <p>(c) Normal reaction now = $10 \cos 30$ Component of weight down plane = $10 \sin 30 (= 5 \text{ N})$ (seen) $F_{\max} = \mu R_{\text{new}} \approx 5.37 \text{ N}$ (AWRT 5.4) $5.37 > 5 \Rightarrow$ does not slide</p>	M1 A1 ↓ M1 A1 (4) M1 A1 M1 ↓↓ M1 A1 (5) M1 A1 B1 ↓ M1 A1 cso (5) 14

Question 3: June 07 Q5

Question Number	Scheme	Marks
(a)	<p>↑ $\pm R + 1.2 \sin 40^\circ = 0.25g$ Solving to $R = 1.7 \text{ (N)}$ accept 1.68</p>	M1 A1 DM1 A1 (4)
(b)	<p>→ $F = 1.2 \cos 40^\circ (\approx 0.919)$ Use of $F = \mu R$ $1.2 \cos 40^\circ = \mu R$ ft their R $\mu \approx 0.55$ accept 0.548</p>	M1 A1 B1 DM1 A1ft A1 cao (6) [10]

Question 4: June 08 Q7

Question Number	Scheme	Marks
(a)	 <p> $R = 45 \cos 40^\circ + 4g \cos 30^\circ$ $R \approx 68$ </p>	<p>M1 A2, 1, 0</p> <p>accept 68.4 M1 A1 (5)</p>
(b)	<p>Use of $F = \mu R$</p> <p>$F + 4g \sin 30 = 45 \cos 50^\circ$</p> <p>Leading to $\mu \approx 0.14$</p>	<p>M1</p> <p>M1 A2, 1, 0</p> <p>accept 0.136 M1 A1(6)</p> <p>(11 marks)</p>

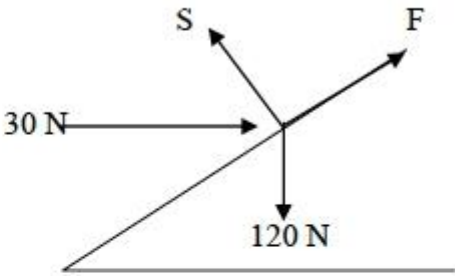
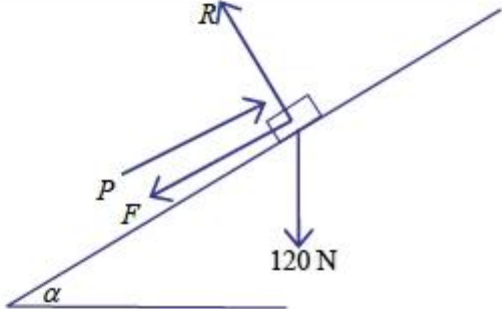
Question 5: Jan 09 Q5

Question Number	Scheme	Marks
(a)		B2 -1 e.e.o.o. (labels not needed) (2)
(b)	$F = \frac{1}{2}R$ $(\uparrow), R \cos \alpha + F \sin \alpha = mg$ $R = \frac{1.1g}{(\cos \alpha + \frac{1}{2} \sin \alpha)} = 9.8 \text{ N}$ $(\rightarrow), P + \frac{1}{2}R \cos \alpha = R \sin \alpha$ $P = R(\sin \alpha - \frac{1}{2} \cos \alpha)$ $= 1.96$	B1 M1 A2 M1 A1 (6) M1 A2 M1 A1 (5) [13]

Question 6: June 10 Q7

Question Number	Scheme	Marks
(a)	$F = \frac{1}{3}R$ $(\uparrow) R \cos \alpha - F \sin \alpha = 0.4g$ $R = \frac{2}{3}g = 6.53 \text{ or } 6.5$	B1 M1 A1 M1 A1 (5)
(b)	$(\rightarrow) P - F \cos \alpha - R \sin \alpha = 0$ $P = \frac{26}{45}g = 5.66 \text{ or } 5.7$	M1 A2 M1 A1 (5) [10]

Question 7: Jan 11 Q6

Question Number	Scheme	Marks
(a)	 <p>Resolving perpendicular to the plane: $S = 120 \cos \alpha + 30 \sin \alpha$ $= 114 *$</p>	<p>M1 A1 A1 A1 (4)</p>
(b)	 <p>Resolving perpendicular to the plane: $R = 120 \cos \alpha$ $= 96$ $F_{\max} = \frac{1}{2} R$</p> <p>Resolving parallel to the plane: In equilibrium: $P_{\max} = F_{\max} + 120 \sin \alpha$ $= 48 + 72 = 120$</p>	<p>M1 A1 A1 M1 M1 A(2,1,0) A1 (8)</p>
(c)	<p>$30 + F = 120 \sin \alpha$ OR $30 - F = 120 \sin \alpha$</p> <p>So $F = 42\text{N}$ acting up the plane.</p>	<p>M1 A1 A1 (3) [15]</p>

Question 8: June 11 Q3

Question Number	Scheme	Marks
<u>OR</u>	$\begin{aligned} & \nearrow 4 \cos \alpha + F = W \sin \alpha \\ & \nwarrow R = 4 \sin \alpha + W \cos \alpha \\ & F = 0.5R \\ & \cos \alpha = 0.8 \text{ or } \sin \alpha = 0.6 \\ & R = 20\text{N} \text{ ** GIVEN ANSWER} \\ & W = 22\text{N} \end{aligned}$	M1 A1 M1 A1 B1 B1 M1 A1 A1
	$\begin{aligned} & \rightarrow R \sin \alpha = 4 + F \cos \alpha \\ & \uparrow R \cos \alpha + F \sin \alpha = W \\ & F = 0.5R \\ & \cos \alpha = 0.8 \text{ or } \sin \alpha = 0.6 \\ & R = 20\text{N} \text{ ** GIVEN ANSWER} \\ & W = 22\text{N} \end{aligned}$	(9) M1 A1 M1 A1 B1 B1 M1 A1 A1 (9) 9