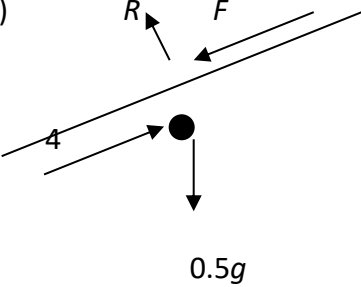
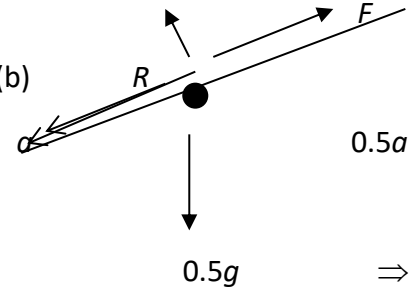
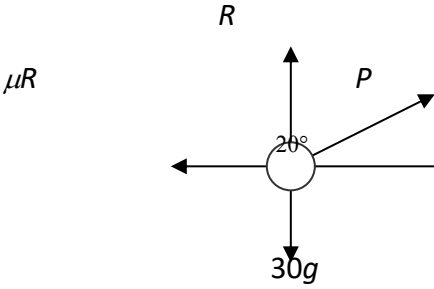


Forces & Friction - Edexcel Past Exam Questions **MARK SCHEME**

Question 1 June 06 Q4

1.	<p>(a) </p> $R = 0.5g \cos \alpha = 0.4g$ $4 = F + 0.5g \sin \alpha$ $F = \mu R \text{ used}$ $4 = 0.4g \cdot \mu + 0.3g$ $\Rightarrow \mu \approx \underline{0.27(0)}$ <p>(b) </p> $0.5a = 0.3g - 0.27 \times 0.4g$ $\Rightarrow a \approx (+) \underline{3.76 \text{ m s}^{-2}} \text{ (or 3.8)}$	<p>M1 A1 M1 A1 M1 M1 A1 (7)</p> <p>M1 A2,1,0√ A1 (4)</p>
<p>(a) 1st two M1's require correct number of the correct terms, with valid attempt to resolve the correct relevant term (valid 'resolve' = x sin/cos).</p> <p>4th M1 (dept) for forming equn in μ + numbers only</p> <p>(b) In first equn, allow their R or F in the equation for full marks.</p> <p>A marks: f.t. on their R, F etc. Deduct one A mark (up to 2) for each wrong term. (Note slight change from original scheme)</p>		

Question 2 Jan 07 Q6

Question Number	Scheme	Marks
2.	<p>(a)</p>  <p style="text-align: center;">Use of $F = \mu R$</p> <p style="text-align: center;">$\rightarrow P \cos 20^\circ = \mu R$</p> <p style="text-align: center;">$\uparrow R + P \sin 20^\circ = 30g$</p> <p style="text-align: center;">$P \cos 20^\circ = \mu(30g - P \sin 20^\circ)$</p> <p style="text-align: center;">$P = \frac{0.4 \times 30g}{\cos 20^\circ + 0.4 \sin 20^\circ}$</p> <p style="text-align: center;">$\approx 110 \text{ (N)}$ accept 109</p> <p>(b)</p> <p style="text-align: center;">$\uparrow R + 150 \sin 20^\circ = 30g$</p> <p style="text-align: center;">$(R \approx 242.7)$</p> <p>N2L $\rightarrow 150 \cos 20^\circ - \mu R = 30a$</p> <p style="text-align: center;">$a \approx \frac{150 \cos 20^\circ - 0.4 \times 242.7}{30}$</p> <p style="text-align: center;">$= 1.5 \text{ (ms}^{-2}\text{)}$ accept 1.46</p>	<p>B1</p> <p>M1 A1</p> <p>M1 A1</p> <p>M1</p> <p>M1</p> <p>A1 <u>8</u></p> <p>M1 A1</p> <p>M1 A1</p> <p>M1</p> <p>A1 <u>6</u> 14</p>

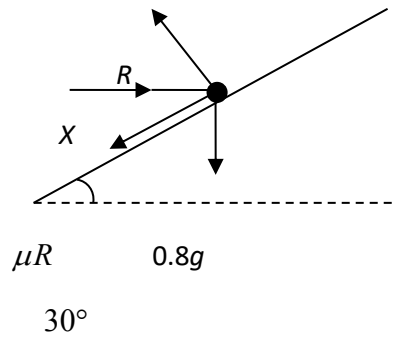
Question 3 Jan 08 Q4

4.(a)	R (// plane): $49 \cos \theta = 6g \sin 30$ $\Rightarrow \cos \theta = 3/5 *$	M1 A1 A1 (3)
(b)	R (perp to plane): $R = 6g \cos 30 + 49 \sin \theta$ $R \approx \underline{90.1 \text{ or } 90 \text{ N}}$	M1 A1 DM1 A1 (4)
(c)	R (// to plane): $49 \cos 30 - 6g \sin 30 = 6a$ $\Rightarrow a \approx \underline{2.17 \text{ or } 2.2 \text{ m s}^{-2}}$	M1 A2,1,0 A1 (4)
		11

Question 4 Jan 10 Q5

Question Number	Scheme	Marks
4.	(a) $s = ut + \frac{1}{2}at^2 \Rightarrow 2.7 = \frac{1}{2}a \times 9$ $a = 0.6 \text{ (m s}^{-2}\text{)}$	M1 A1 A1 (3)
	(b) <div style="display: flex; align-items: flex-start; margin-top: 10px;"> <div style="flex: 1;"> </div> <div style="flex: 2; margin-left: 20px;"> $R = 0.8g \cos 30^\circ (\approx 6.79)$ Use of $F = \mu R$ $0.8g \sin 30^\circ - \mu R = 0.8 \times a$ $(0.8g \sin 30^\circ - \mu 0.8g \cos 30^\circ = 0.8 \times 0.6)$ $\mu \approx 0.51 \quad \text{accept } 0.507$ </div> </div>	B1 B1 M1 A1 A1 (5)

(c)



$$\uparrow R \cos 30^\circ = \mu R \cos 60^\circ + 0.8g$$

$$(R \approx 12.8)$$

$$\rightarrow X = R \sin 30^\circ + \mu R \sin 60^\circ$$

Solving for X , $X \approx 12$ accept 12.0

M1 A2 (1,0)

M1 A1

DM1 A1 (7)

[15]

Alternative to (c)

$$\swarrow R = X \sin 30^\circ + 0.8 \times 9.8 \sin 60^\circ$$

$$\swarrow \mu R + 0.8g \cos 60^\circ = X \cos 30^\circ$$

$$X = \frac{\mu 0.8g \sin 60^\circ + 0.8g \cos 60^\circ}{\cos 30^\circ - \mu \sin 30^\circ}$$

Solving for X , $X \approx 12$ accept 12.0

M1 A2 (1,0)

M1 A1

DM1 A1 (7)