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

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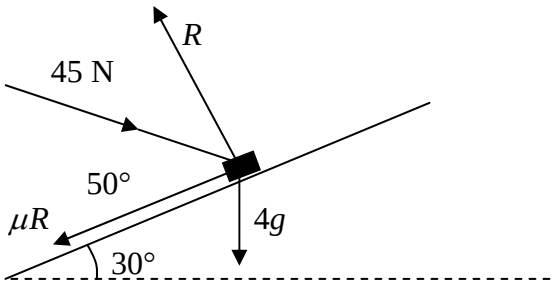
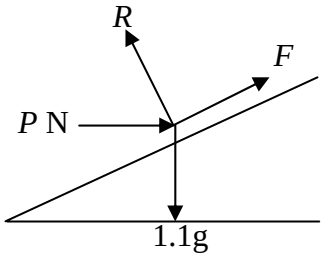
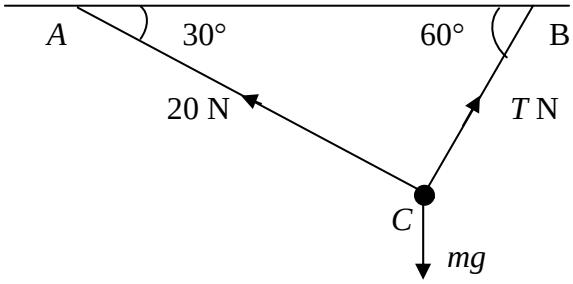
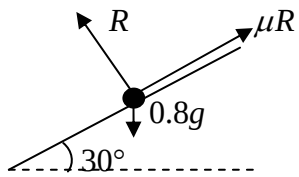
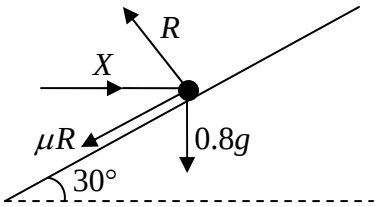
Question Number	Scheme	Marks
7.	(a) 	
	$R = 45\cos 40° + 4g\cos 30°$	M1 A2 (1, 0)
	$R \approx 68$ accept 68.4	DM1 A1 (5)
	(b) Use of $F = \mu R$	M1
	$F + 4g\sin 30 = 45\cos 50°$	M1 A2 (1, 0)
	Leading to $\mu \approx 0.14$ accept 0.136	DM1 A1 (6) **[11]**

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

Question Number	Scheme	Marks
Q5	$F = P\cos 50^o$	M1 A1
	$F = 0.2R$ seen or implied.	B1
	$P\sin 50^o + R = 15g$	M1 A1 A1
	Eliminating R; Solving for P ; $P =$ 37 (2 SF)	DM1;D M1; A1 **[9]**

Question Number	Scheme	Marks
Q3.		
	(a) R($\rightarrow$) $20\cos 30° = T\cos 60°$	M1 A2 (1,0)
	$T = 20\sqrt{3}$, 34.6, 34.64,…	A1 (4)
	(b) R($\uparrow$) $mg = 20\sin 30° + T\sin 60°$	M1 A2 (1,0)
	$m = \frac{40}{g}(\approx 4.1)$,4.08	A1 (4)
		[8]

Question Number	Scheme	Marks
Q5.	(a) $s = ut + \frac{1}{2}at^2 \quad \Rightarrow \quad 2.7 = \frac{1}{2}a \times 9$	M1 A1
	$a = 0.6\left(\text{m s}^{-2}\right)$	A1 (3)
	(b)	
	 $\nwarrow \quad R = 0.8g\cos 30° \left(\approx 6.79\right)$	B1
	Use of $F = \mu R$	B1
	$\swarrow \quad 0.8g\sin 30° - \mu R = 0.8 \times a$	M1 A1
	$\left(0.8g\sin 30° - \mu 0.8g\cos 30° = 0.8 \times 0.6\right)$	
	$\mu \approx 0.51$ accept 0.507	A1 (5)
	(c) 	
	$\uparrow \quad R\cos 30° = \mu R\cos 60° + 0.8g$	M1 A2 (1,0)
	$\left(R \approx 12.8\right)$	
	$\rightarrow \quad X = R\sin 30° + \mu R\sin 60°$	M1 A1
	Solving for X, $X \approx 12$ accept 12.0	DM1 A1 (7)
		[15]
	Alternative to (c)	
	$\nwarrow \quad R = X\sin 30° + 0.8 \times 9.8\sin 60°$	M1 A2 (1,0)
	$\swarrow \quad \mu R + 0.8g\cos 60° = X\cos 30°$	M1 A1
	$X = \dfrac{\mu 0.8g\sin 60° + 0.8g\cos 60°}{\cos 30° - \mu\sin 30°}$	
	Solving for X, $X \approx 12$ accept 12.0	DM1 A1 (7)

Question Number	Scheme	Marks
Q7 (a)	$F = \frac{1}{3}R$	B1
	$(\uparrow)\ R\cos\alpha - F\sin\alpha = 0.4g$	M1 A1
	$R = \frac{2}{3}g = 6.53$ or 6.5	M1 A1 (5)
(b)	$(\rightarrow) P - F\cos\alpha - R\sin\alpha = 0$	M1 A2
	$P = \frac{26}{45}g = 5.66$ or 5.7	M1 A1 (5)
		[10]