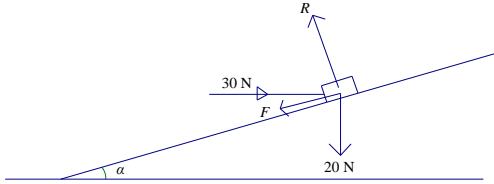| Question	Scheme	Marks	AOs
4 (a)			
	Resolve perpendicular to the plane: $R = 20\cos\alpha + 30\sin\alpha$	M1	3.4
	$R = 20 \times \dfrac{12}{13} + 30 \times \dfrac{5}{13} = 30$ (N)	A1	1.1b
		(2)	
(b)	Forces parallel to the plane:	M1	3.1b
	$30\cos\alpha \geqslant F_{max} + 20\sin\alpha$	A1ft	1.1b
	Use of $F_{max} = \mu R$	M1	1.2
	$30\mu \leqslant 30 \times \dfrac{12}{13} - 20 \times \dfrac{5}{13}, \qquad \mu \leqslant \dfrac{2}{3}$	A1	2.2a
		(4)	
(c)	Resolve perpendicular to the plane and use $F_{max} = \mu R$	M1	3.1b
	$F_{max} = \dfrac{1}{3} \times 20\cos\alpha \quad \left(= \dfrac{80}{13} \right)$	A1	1.1b
	Equation of motion:	M1	3.3
	$20\sin\alpha - F_{max} = \dfrac{20}{g}a \quad \left(\dfrac{100}{13} - \dfrac{80}{13} = \dfrac{20}{g}a \right)$	A1ft	1.1b
	$a = \dfrac{g}{13}, \ 0.75$ or $0.754 \, (\mathrm{m\,s}^{-2})$	A1	2.2a
		(5)	
		(11 marks)	

Notes:

(a)	
M1	All terms required. Condone sign errors and sin/cos confusion
A1	Correct answer only
(b)	
M1	All terms required. Condone sign errors and sin/cos confusion. Condone equality
A1ft	Correct unsimplified inequality follow their *R*

M1	Use $F_{\max} = \mu R$ to find the range of values for μ
A1	$\mu \leqslant 0.67$ or better
(c)	
M1	Resolve perpendicular to the plane and use $F = \dfrac{1}{3} R$. No additional terms in resolution. Condone sin/cos confusion.
A1	Correct unsimplified equation for $F_{\max}$
M1	Equation of motion down the slope. Condone missing g
A1ft	Correct unsimplified equation. Follow their $F_{\max}$
A1	Exact or 0.75 or 0.754