4	In equilibrium, $\frac{5mge}{a}=5mg, \quad e=a$.
	Let x be the length of the string when speed of P is $\sqrt{\frac{7}{5}ag}$. Energy equation in subsequent motion: $\frac{5mga^2}{2a}-\frac{5mg(x-a)^2}{2a}=mg(e+a-x)+\frac{1}{2}m\left(\frac{7}{5}ag\right)$
	$25x^2-60ax+27a^2=0$
	$x=\frac{9}{5}a$ only.
	Alternative method for question 4
	In equilibrium, $\frac{5mge}{a}=5mg, \quad e=a$.
	Let x be the extension when P is released. Energy equation in subsequent motion: $\frac{5mga^2}{2a}-\frac{5mgx^2}{2a}=mg(e-x)+\frac{1}{2}m\left(\frac{7}{5}ag\right)$
	$25x^2-10ax-8a^2=0$
	$(5x+2a)(5x-4a)=0, \quad x=\frac{4}{5}a$ only. Required length of string = $\frac{9}{5}a$.

2(a)	$$\text{EPE} = \frac{2mg}{2a}\left(\tfrac{1}{3}a\right)^2$$ Work done by friction $= \mu mg\left(\tfrac{1}{3}a\right)$
	$\frac{2mg}{2a}\left(\tfrac{1}{3}a\right)^2 = \mu mg\left(\tfrac{1}{3}a\right)$
	$\mu = \tfrac{1}{3}$
2(b)	Let x be the extension in the string when P comes to rest. $\frac{2mg}{2a}\left(\tfrac{1}{3}a\right)^2 = \frac{2mg}{2a}x^2 + \tfrac{1}{2}mg\left(\tfrac{1}{3}a - x\right)$
	$\left[18x^2 - 9ax + a^2 = 0,\ \ (6x-a)(3x-a) = 0\right]$ $\quad x = \tfrac{1}{6}a$ only.
	Alternative method for question 2(b)
	Let x be the distance moved by P before coming to rest. $\frac{2mg}{2a}\left(\tfrac{1}{3}a\right)^2 = \frac{2mg}{2a}\left(\tfrac{1}{3}a - x\right)^2 + \tfrac{1}{2}mgx$
	$6x^2 - ax = 0,\ \ x = \tfrac{1}{6}a$ Extension $= \tfrac{1}{3}a - x = \tfrac{1}{6}a$

6(a)	N2L: $T_1 = T_2 + kmg$
	$T_1 = \dfrac{5mg\left(22a - BP - 4a\right)}{4a}$
	$T_2 = \dfrac{6mg\left(BP - 8a\right)}{8a}$
	$\dfrac{5mg\left(22a - BP - 4a\right)}{4a} = \dfrac{6mg\left(BP - 8a\right)}{8a} + kmg$ $8BP = 114a - 4ak$ $BP = \dfrac{57a - 2ak}{4}$
	Alternative method for question 6(a)
	N2L: $T_1 = T_2 + kmg$
	$T_1 = \dfrac{5mgx}{4a}$
	$T_2 = \dfrac{6mg\left(18a - x - 8a\right)}{8a}\left[= \dfrac{6mg\left(10a - x\right)}{8a}\right]$
	$\dfrac{5mgx}{4a} = \dfrac{6mg\left(10a - x\right)}{8a} + kmg$ $x = \dfrac{15a + 2ak}{4}$ $BP = 18a - x = 18a - \dfrac{15a + 2ak}{4} = \dfrac{57a - 2ak}{4}$

6(a)	**Alternative method for question 6(a)**
	N2L: $T_1 = T_2 + kmg$
	$T_1 = \dfrac{5mg(x-4a)}{4a}$
	$T_2 = \dfrac{6mg(22a-x-8a)}{8a}\left[= \dfrac{6mg(14a-x)}{8a}\right]$
	$\dfrac{5mg(x-4a)}{4a} = \dfrac{6mg(14a-x)}{8a} + kmg$ $x = \dfrac{31a+2ak}{4}, \quad BP = 22a - x = 22a - \dfrac{31a+2ak}{4} = \dfrac{57a-2ak}{4}$
	Alternative method for question 6(a)
	N2L: $T_1 = T_2 + kmg$
	$T_1 = \dfrac{5mg(10a-x)}{4a}$
	$T_2 = \dfrac{6mgx}{8a}$
	$\dfrac{5mg(10a-x)}{4a} = \dfrac{6mgx}{8a} + kmg$ $x = \dfrac{25a-2ak}{4}, \quad BP = 8a + x = 8a + \dfrac{25a-2ak}{4} = \dfrac{57a-2ak}{4}$

6(a)	**Alternative method for question 6(a)**
	N2L: $T_1 = T_2 + kmg$
	$T_1 = \dfrac{5mgx_A}{4a}$ or $T_2 = \dfrac{6mgx_B}{8a}$
	$T_1 = \dfrac{5mgx_A}{4a}$, $T_2 = \dfrac{6mgx_B}{8a}$, $x_A + x_B = 10a$
	$\dfrac{5mgx_A}{4a} = \dfrac{6mgx_B}{8a} + kmg,\quad 5x_A - 3x_B = 4k$ $x_A = \dfrac{15a+2ak}{4}$ OR $x_B = \dfrac{25a-2ak}{4}$ Either $BP = 18a - x_A = 18a - \dfrac{15a+2ak}{4} = \dfrac{57a-2ak}{4}$ OR $BP = 8a + x_A = 8a + \dfrac{25a-2ak}{4} = \dfrac{57a-2ak}{4}$
6(b)	$\dfrac{6mg(18a-8a)^2}{2\times 8a} + 18kmga = \dfrac{5mg(14a-4a)^2}{2\times 4a} + 8kmga$
	$k = \frac{5}{2}$

5	At v_{max}, $T = 2g\sin\alpha$ $\left[= \frac{14}{25}g\right]$
	$\frac{14x}{0.5} = \frac{14g}{25}$ leading to $x = \frac{1}{5}$.
	EPE at top: $\frac{14\times0.3^2}{2\times0.5}$ $[=1.26]$ EPE at bottom: $\frac{14\times(\text{"their}\,x\text{"})^2}{2\times0.5}$ $[=0.56]$
	$2g\sin\alpha(0.8+0.5+\text{"their}\,x\text{"}) + \frac{14\times0.3^2}{2\times0.5} = \frac{14\times(\text{"their}\,x\text{"})^2}{2\times0.5} + \frac{1}{2}\times2\times v^2$
	$v^2 = 0.91g = 9.1$ leading to $v = 3.02\,\text{m}\,\text{s}^{-1}$.

2(a)	$\frac{mg}{2a}(x-a)^2 = mgx\sin 30 - \frac{11}{30}mgx$
	$15x^2 - 34ax + 15a^2 = 0$ $(3x-5a)(5x-3a) = 0$
	$x = \frac{5}{3}a$
2(b)	$T = \frac{2}{3}mg$
	$F = T - mg\sin 30 \quad \left[= \frac{2}{3}mg - \frac{1}{2}mg\right]$
	$\frac{1}{6}mg$