

Q1.

A

$$a = 1.96 \uparrow$$



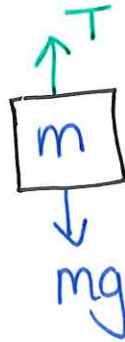
$$(a) \quad F = ma$$

$$T - 3g = 3a$$

$$T - 3g = 3(1.96)$$

$$T = \underline{\underline{35.28 \text{ N}}}$$

B



$$\Downarrow a = 1.96$$

$$F = ma$$

$$mg - T = ma$$

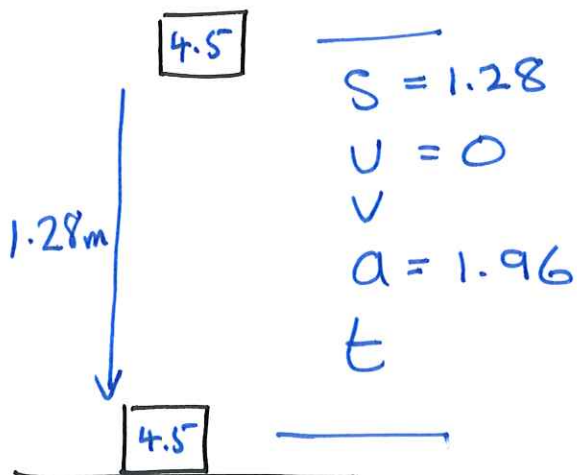
(b)

$$m(a.8) - 35.28 = m(1.96)$$

$$7.84m = 35.28$$

$$m = \underline{\underline{4.5 \text{ kg}}}$$

(c)



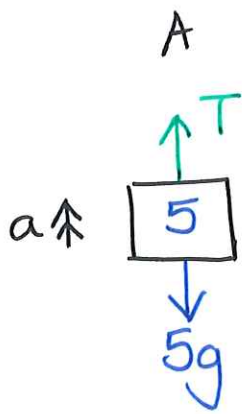
$$v^2 = u^2 + 2as$$

$$v^2 = (2)(1.96)(1.28)$$

$$v = \underline{\underline{2.24 \text{ ms}^{-1}}}$$

Q2.

a)

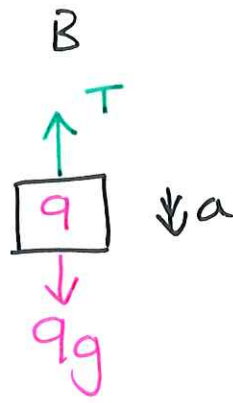


$$F = ma$$

$$T - 5g = 5a$$

$\times 9$

$$9T - 45g = 45a$$



$$F = ma$$

$$9g - T = 9a$$

$\times 5$

$$45g - 5T = 45a$$

$$9T - 45g = 45g - 5T$$

$$14T = 90g$$

$$T = \frac{90g}{14}$$

$$T = \underline{\underline{63N}}$$

b)

[9]

$$s = 1.75$$

$$u = 0$$

$$v =$$

$$a =$$

$$t =$$



$$9g - 63 = 9a$$

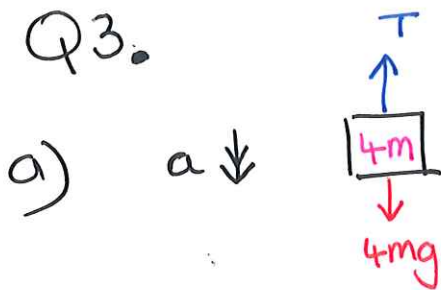
$$a = 2.8$$

$$v^2 = u^2 + 2as$$

$$v^2 = 0 + 2(2.8)(1.75)$$

$$v = \underline{\underline{3.13 \text{ (sf)}}}$$

Q3.

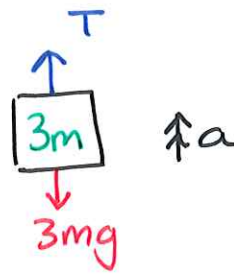


$$F = ma$$

$$4mg - T = 4ma$$

$\times 3$

$$12mg - 3T = 12ma$$



$$F = ma$$

$$T - 3mg = 3ma$$

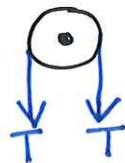
$\times 4$

$$4T - 12mg = 12ma$$

$$12mg - 3T = 4T - 12mg$$

$$24mg = 7T$$

$$T = \frac{24mg}{7}$$

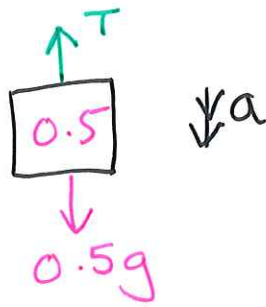


$$\text{Force on pulley} = 2T = \frac{48mg}{7}$$

- b) Pulley not smooth  
weight of rope  
extensibility of rope

Q4.

a)



$$s = +3.15$$

$$v = 0$$

$$v$$

$$a$$

$$t = 1.5$$

$$s = ut + \frac{1}{2}at^2$$

$$+3.15 = \frac{1}{2}a(1.5)^2$$

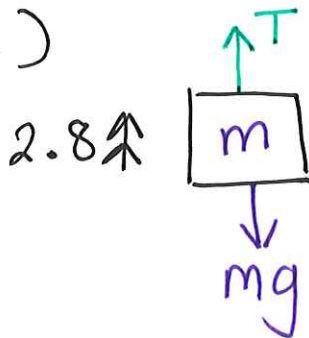
$$a = 2.8$$

b)  $F = ma$

$$0.5g - T = 0.5(2.8)$$

$$T = 3.5$$

(c)



$$F = ma$$

$$T - mg = m(2.8)$$

$$T = 2.8m + 9.8m$$

$$3.5 = 12.6m$$

$$m = \frac{5}{18}$$

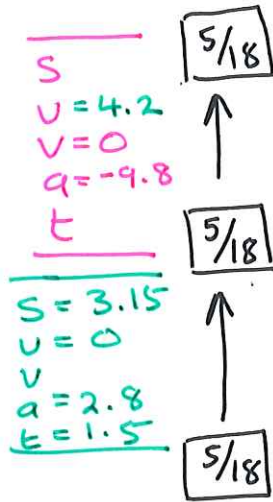
(d) Acceleration of P and Q are equal

Q4.

e)

$$v = u + at$$
$$0 = 4.2 - 9.8t$$
$$t = \frac{3}{7} \text{ up}$$

$$v = u + at$$
$$v = 0 + 2.8(1.5)$$
$$v = 4.2$$



$$t = \frac{3}{7} \text{ down}$$

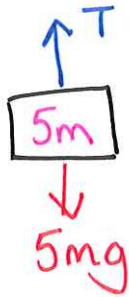
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$$\text{Total time} = 2 \times \frac{3}{7} = \underline{\underline{\frac{6}{7} \text{ sec}}}$$

Q5.

a)

$$\frac{1}{4}g = a \uparrow$$



$$F = ma$$

$$5mg - T = 5ma$$

$$5mg - T = 5m\left(\frac{1}{4}g\right)$$

$$20mg - 4T = 5mg$$

$$4T = 15mg$$

$$T = \frac{15mg}{4}$$

b)

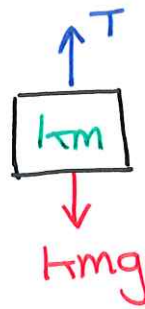
$$\frac{15mg}{4} - kmg = km\left(\frac{1}{4}g\right)$$

$\div m \times 4$

$$15g - 4kg = kg$$

$$15g = 5kg$$

$$k = 3$$



$$\Downarrow a = \frac{1}{4}g$$

$$F = ma$$

$$T - kmg = kma$$

Q5.

c) the tension in the two parts of the spring are the same.

d)

|    |                                                                               |
|----|-------------------------------------------------------------------------------|
| 3m | $\begin{aligned} S &= \\ u &= 2.94 \\ v &= 0 \\ a &= -g \\ t & \end{aligned}$ |
|----|-------------------------------------------------------------------------------|

$$v^2 = u^2 + 2as$$

$$0 = 2.94^2 + 2(-9.8)s$$

$$s = 0.441$$

|    |                                                                                          |
|----|------------------------------------------------------------------------------------------|
| 3m | $\begin{aligned} S &= 1.764 \\ u &= 0 \\ v &= \\ a &= \frac{1}{4}g \\ t & \end{aligned}$ |
|----|------------------------------------------------------------------------------------------|

$$v^2 = u^2 + 2as$$

$$v^2 = 2\left(\frac{1}{4}g\right)(1.764)$$

$$v = 2.94$$

|   |                                                                                         |
|---|-----------------------------------------------------------------------------------------|
| 3 | $\begin{aligned} S &= \\ u &= 0 \\ v &= \\ a &= \frac{1}{4}g \\ t &= 1.2 \end{aligned}$ |
|---|-----------------------------------------------------------------------------------------|

|    |                                                                                         |
|----|-----------------------------------------------------------------------------------------|
| 5m | $\begin{aligned} S &= \\ u &= 0 \\ v &= \\ a &= \frac{1}{4}g \\ t &= 1.2 \end{aligned}$ |
|----|-----------------------------------------------------------------------------------------|

|    |                                                                                         |
|----|-----------------------------------------------------------------------------------------|
| 5m | $\begin{aligned} S &= \\ u &= 0 \\ v &= \\ a &= \frac{1}{4}g \\ t &= 1.2 \end{aligned}$ |
|----|-----------------------------------------------------------------------------------------|

$$s = ut + \frac{1}{2}at^2$$

$$s = \frac{1}{2}\left(\frac{1}{4}g\right)(1.2)^2$$

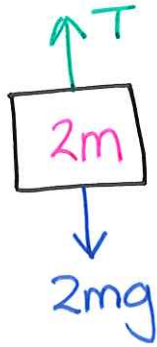
$$s = 1.764$$

$$\begin{aligned} \text{Total Distance} &= 1.764 + 1.764 + 0.441 \\ &= \underline{\underline{3.969\text{m}}} \end{aligned}$$

Q6.

a)

$P$   
 $a \downarrow$

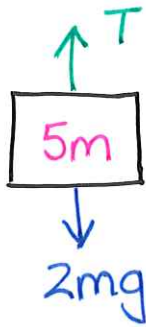


$$F = ma$$

$$2mg - T = 2ma$$

Q

$a \uparrow$



$$F = ma$$

$$T - 2mg = 5ma$$



Q6.

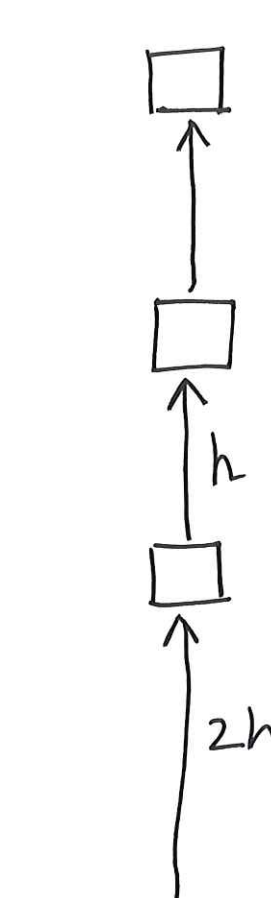
b)  $T = 2ma + 2mg$

sub

$$5mg - 2ma - 2mg = 5ma$$

$$3mg = 7ma$$

$$a = \frac{3g}{7}$$



$S =$   
 $u = \sqrt{\frac{6gh}{7}}$   
 $v = 0$   
 $a = -g$   
 $t =$

$S = h$   
 $u = 0$   
 $v$   
 $a = \frac{3g}{7}$   
 $t$

$v^2 = u^2 + 2as$   
 $0 = \frac{6gh}{7} + 2(-g)S$   
 $S = \frac{3h}{7}$

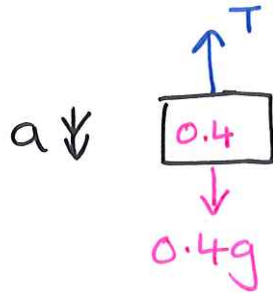
$v^2 = u^2 + 2as$   
 $v^2 = 2(\frac{3g}{7})h$   
 $v = \sqrt{\frac{6gh}{7}}$

Total height =  $2h + h + \frac{3h}{7} = \frac{24h}{7}$

(c) Distance that Q falls to the ground would not be exactly h

Q7.

a)



$$F = ma$$

$$0.4g - T = 0.4a$$

$\times 30$

$$12g - 30T = 12a$$

$\times 40$

$$40T - 12g = 12a$$

$$12g - 30T = 40T - 12g$$

$$24g = 70T$$

$$T = \underline{\underline{3.36 \text{ N}}}$$

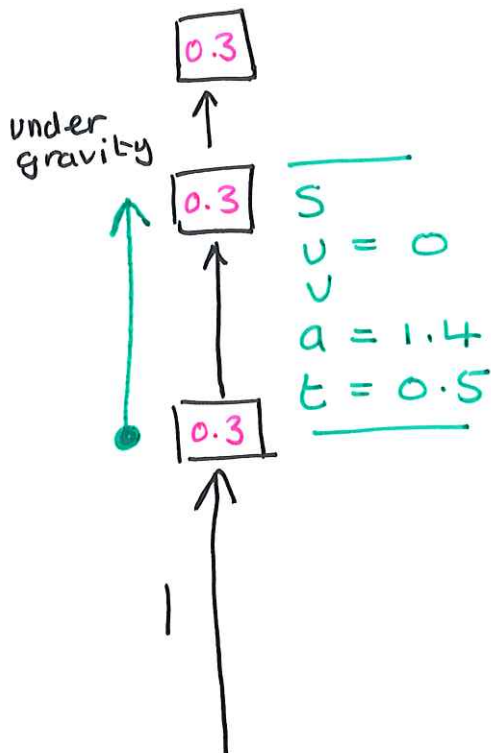
b)

$$3.36 - 0.3g = 0.3a$$

$$a = \frac{7}{5} = \underline{\underline{1.4 \text{ ms}^{-2}}}$$

Q7.

c)



$$\begin{aligned} S &= \\ u &= 0 \\ v &= \\ a &= 1.4 \\ t &= 0.5 \end{aligned}$$

$$v = u + at$$

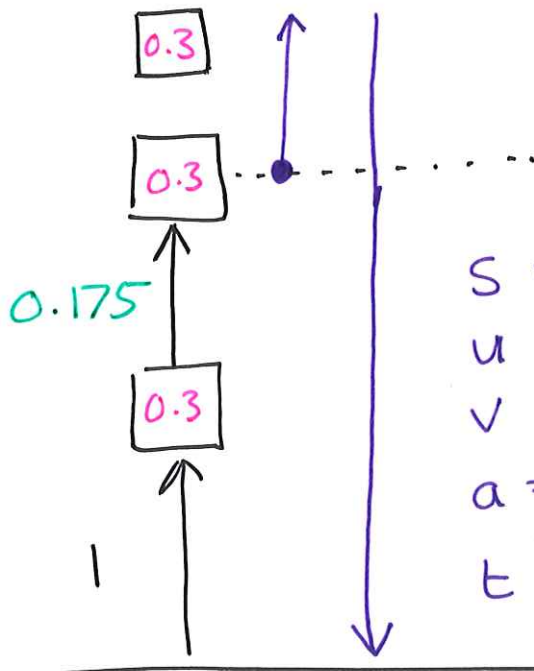
$$v = 0 + 1.4(0.5)$$

$$v = 0.7$$

$$v^2 = u^2 + 2as$$

$$0.7^2 = 0 + 2(1.4)s$$

$$s = 0.175$$



$$S = -1.175$$

$$u = 0.7$$

$$v =$$

$$a = -9.8$$

$$t =$$

$$S = ut + \frac{1}{2}at^2$$

$$-1.175 = 0.7t + \frac{1}{2}(-9.8)t^2$$

$$4.9t^2 - 0.7t - 1.175 = 0$$

$$t = \underline{\underline{0.5663}}$$