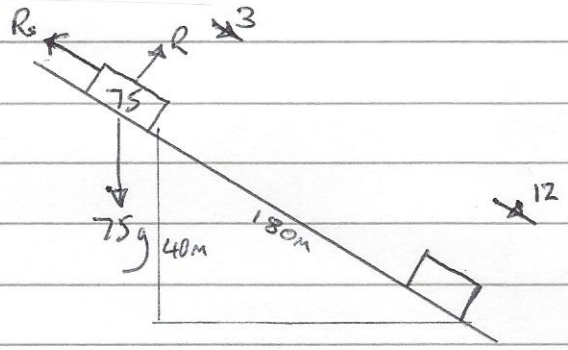
M2 Revision Work, Energy, Power.

1) Watts
2) Joules
3) Joules
4) $P=TV$ (or $P=FV$) where T or F are driving force.
5) Power = Rate of doing work

   Power = 80000/5 = 16000 Watts

6)



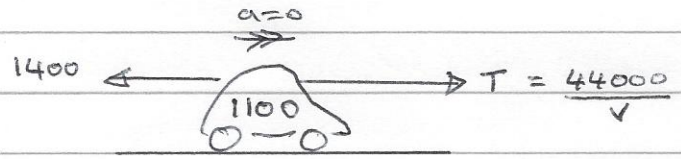
Work done by Resistance = Change in energy

Change in energy $= \frac{1}{2}\times 75\times 3^2 + 75g\times 40 - \frac{1}{2}\times 75\times 12^2 = 24337.5\text{ J}$

Work done = Force × distance

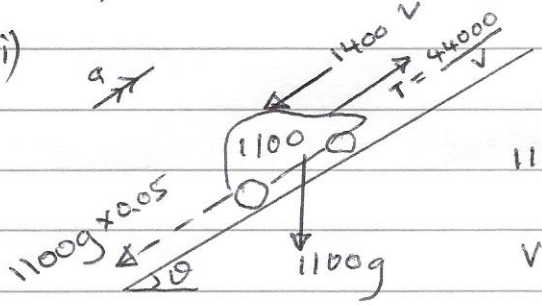
$24337.5 = R_s \times 180 \quad \therefore R_s = \frac{24337.5}{180} = 135\text{ N}$ (3 s.f.)

7) i)



$R(\leftrightarrow)\quad 1400 = \frac{44000}{V} \quad \therefore V = \frac{44000}{1400} = 31.4\text{ ms}^{-1}$

ii)

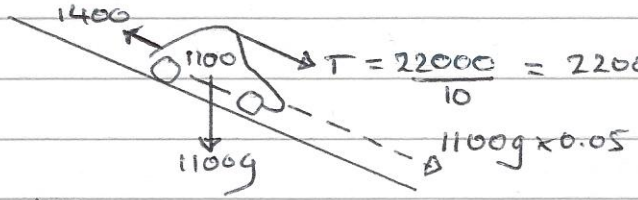


$R(\nearrow)$

$1100g\times 0.05 + 1400 = \frac{44000}{V}$

$V = \frac{44000}{1100g\times 0.05 + 1400} = 22.7\text{ ms}^{-1}$

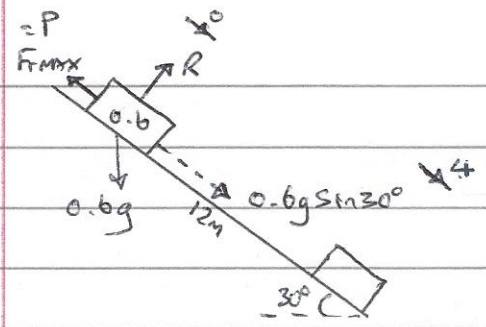
iii)

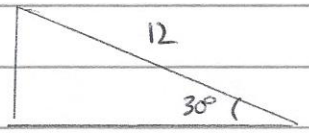


$F=ma$ (+ve →) $\quad 1100g\times 0.05 + 2200 - 1400 = 1100\times a$

$a = 1.22\text{ ms}^{-2}$ (3 s.f.)

8)





$\frac{h}{12} = \sin 30°$

$h = 12 \sin 30°$

$h = 6$

$\therefore$ loss of P.E. $= 0.6g \times 6 = 3.6g$

Work done by P = change in energy

$= 3.6g - \frac{1}{2} \times 0.6 \times 4^2 = 38.1$ J

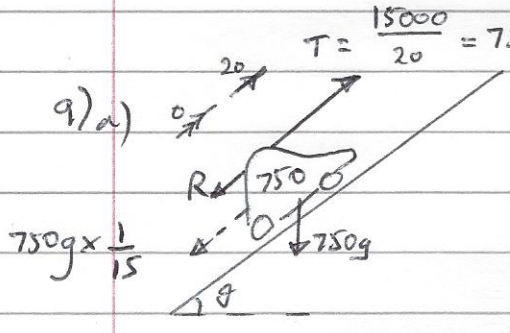
Work done (by P) = Force × dist

$38.1 = P \times 12 \quad \therefore P = 3.18$ N

$R(\nwarrow) \quad R = 0.6g \cos 30° \qquad P = F_{max} = \mu R$

$\therefore \mu = \frac{P}{R} = \frac{3.18}{0.6g \cos 30°} = 0.625$

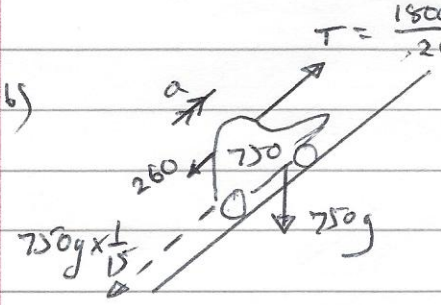
9) a)



$R(\nwarrow) \quad R + 750g \times \frac{1}{15} = 750$

$R = 750 - 750 \times g \times \frac{1}{15} = 260$ N as required.

b)



F = ma

+ve ↗

$900 - 260 - 750g \times \frac{1}{15} = 750a$

$a = \frac{900 - 260 - 750g \times \frac{1}{15}}{750}$

$a = 0.2$ ms^{-2}