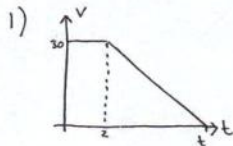


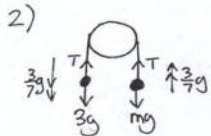
MI Nov 04

(1)



$$\text{Area} = \frac{(2+t) \times 30}{2} = 300$$

$$2+t = 20 \Rightarrow t = 18 \text{ sec}$$

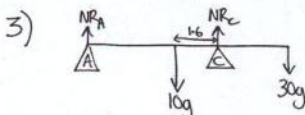


a) $3g - T = 3 \times \frac{3}{7}g \Rightarrow T = 3g - \frac{9}{7}g = \frac{12}{7}g$

b) $T - mg = m \times \frac{3}{7}g$

$$\frac{12}{7}g = \frac{3}{7}mg + mg \Rightarrow \frac{12}{7}g = \frac{10}{7}mg$$

$$m = 1.2 \text{ kg}$$

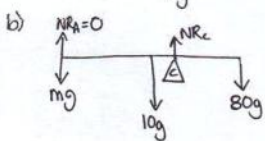


c) $30g \times 0.4 + NR_B \times 3.6 = 10g \times 1.6$

$$12g + 3.6NR_B = 16g$$

$$3.6NR_B = 4g$$

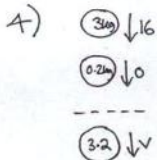
$$NR_B = 10.89 \text{ N}$$



c) $80g \times 0.4 = 10g \times 1.6 + mg \times 3.6$

$$32g = 16g + 3.6mg$$

$$16g = 3.6mg \Rightarrow m = \frac{16}{3.6} = 4.4$$



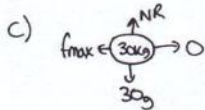
total momentum before = 48Ns

total momentum after = 3.2v Ns

$$48 = 3.2v \Rightarrow v = 15 \text{ m/s}$$

Mom before = 48Ns Mom after = 0Ns Impulse = 48

Impulse = $f \times t$ $48 = f \times 0.05 \Rightarrow f = 960 \text{ N}$



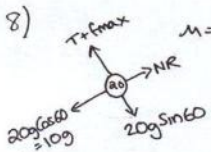
$NR = 30g \Rightarrow f_{max} = \mu NR$

$$f_{max} = 0.2 \times 30g = 6g$$

$$\vec{R} = ma \Rightarrow -6g = 30a \Rightarrow a = -1.96$$

$U = 12 \quad a = -1.96 \quad v = 0$

$$v^2 = U^2 + 2as \Rightarrow 0 = 144 - 3.92s \Rightarrow s = \frac{144}{3.92} = 36.7 \text{ m}$$

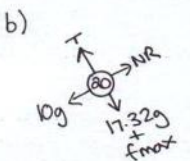


$m = 0.4 \quad R_{f \uparrow} = 0 \Rightarrow NR = 10g \text{ N}$

$$f_{max} = \mu NR = 0.4 \times 10g = 4g \text{ N}$$

$R_{f \uparrow} = 0 \quad T + 4g = 17.32g$

$$T = 13.32g = 130.5 \text{ N}$$



$NR = 10g \Rightarrow f_{max} = 4g \text{ N}$

$R_{f \uparrow} = 0$ (no acceleration)

$$T = 21.32g = 208.9 \text{ N}$$

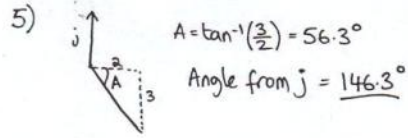
- c) i) f_{max} acts down the slope when the package moves up the slope
- ii) Constant speed \Rightarrow no acceleration $\rightarrow R_{f \uparrow} = 0$

* 4b) $R_{f \uparrow} = 960$

$Res - 3.2g = 960$

$$Res = 991 \text{ N}$$

(2)



b) $Vel = (2i - 3j) + t(-i + 2j) = (2-t)i + (-3+2t)j$

c) $t = 3 \Rightarrow Vel = -i + 3j \text{ m/s}^{-1}$ Speed = $\sqrt{1+3^2} = 3.16 \text{ m/s}$

d) parallel to i when j value is zero

$$(-3+2t) = 0 \Rightarrow 2t = 3 \Rightarrow t = 1.5 \text{ sec}$$

6) $U = 20 \quad a = 4 \quad S = 78$

$$v^2 = U^2 + 2as \Rightarrow v^2 = 400 + 624 \Rightarrow v = 32 \text{ m/s}$$

b) $v = u + at \Rightarrow 32 = 20 + 4t \Rightarrow 4t = 12 \Rightarrow t = 3 \text{ sec}$

In 3 sec A travels 90m

c) $S = ut + \frac{1}{2}at^2 \quad S = 20t + 2t^2 \quad S = 30t$

Overtakes when $S_B = S_A$

$$\Rightarrow 20t + 2t^2 = 30t \Rightarrow 2t^2 - 10t = 0$$

$$\Rightarrow 2t(t-5) = 0$$

$$t = 0 \quad t = 5$$

