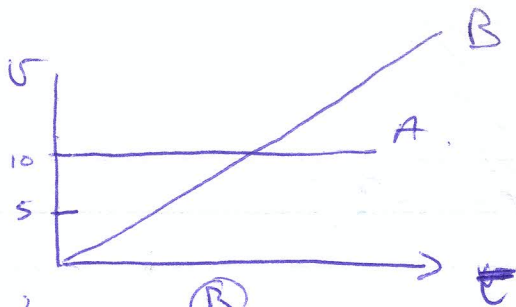


1982 Kinematics :



(A)
 $u = 10 \text{ ms}^{-1}$
 $s = |pr|$
 $a = 0$

(B)
 $u = 0$
 $a = 2.5 \text{ ms}^{-1}$

To find time to reach r from p, r being the point of overtaking

$$u_{AB} = 10 \text{ ms}^{-1}$$

$s_{AB} = 0$ when overtake.

$$a_{AB} = -2.5 \text{ ms}^{-1}$$

Find t for overtaking $s = ut + \frac{1}{2}at^2$

$$0 = 10t + \frac{1}{2}(-2.5)t^2$$

$$\Rightarrow 0 = 10t - 1.25t^2$$

$$\Rightarrow t = 0 \text{ OR } t = \frac{10}{1.25} = 8 \text{ secs}$$

How far from is (pr)

Also gone

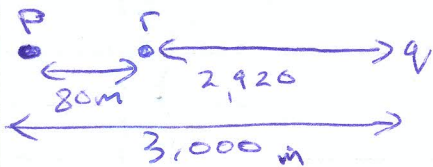
$$s = ut$$

$$s = 10(8)$$

$$s = 80 \text{ m}$$

Overtaking occurs after 8 secs, 80 m from p.

(ii)



Time elapses after two cars passing point q 3 km from p.

After r :

(A)

$$u = 10 \text{ ms}^{-1}$$

$$a = 0$$

(B)

$$u = 0 + 2.5(8)$$

$$\Rightarrow u = 20 \text{ ms}^{-1}$$

and $a = 0$ * (because toward accel)

N.B. distance to q from r = $3000 - 80 = 2,920 \text{ m}$

Time for A to get to q from r = $\frac{2920}{10} = 292 \text{ secs}$

Time for B to get to q from r = $\frac{2920}{20} = 146 \text{ secs}$

Gap between at q = $292 - 146 = 146 \text{ secs}$

(b)

$\uparrow \downarrow$

Region ①:

Forces $\downarrow F, \text{ gravity}$

$$u = 0 \quad v = ? \quad s = 4 \quad a = 9.8 \text{ ms}^{-1}$$

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

$$\Rightarrow v^2 = 0 + 2(9.8)(4) = 78.4$$

Region ②

$\uparrow R, \text{ Resistance}$

$\downarrow F, \text{ gravity}$

Find a :

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

$$0^2 = (7.84)^2 + 2a(0.0245)$$

$$\Rightarrow a = -160 \text{ ms}^{-2}$$

\therefore Newton $\Rightarrow \Sigma F = ma$

$$\Rightarrow W - R = 0.03(60)$$

$$\Rightarrow 0.03(7.8) - R = 0.03(160)$$

$$\Rightarrow R =$$

with 5 m from p
 for this