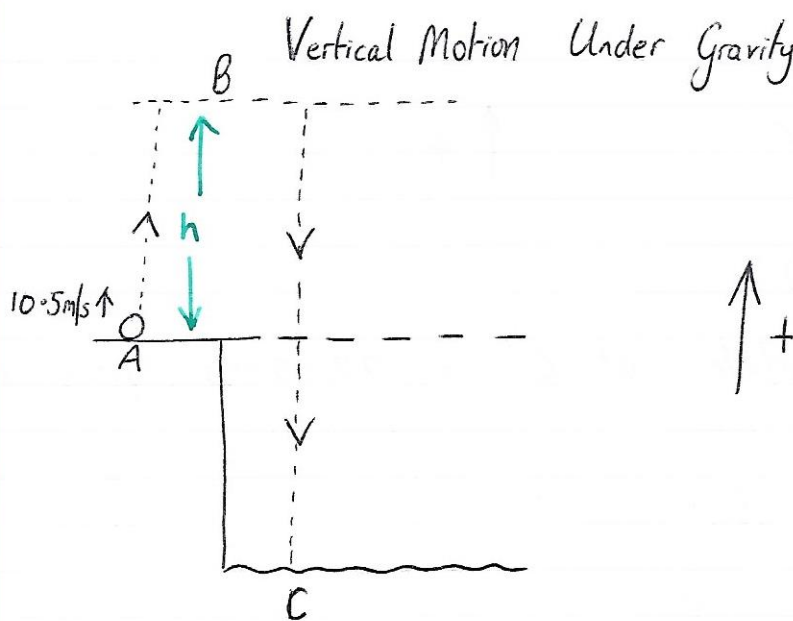


MI Jan
2007
1)

Vertical Motion Under Gravity 1 : Answers



a) AB

$$u = +10.5$$

$$v = 0$$

$$a = -9.8$$

$$s = s$$

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

$$0 = 10.5^2 + 2(-9.8)h$$

$$19.6h = 110.25$$

$$h = \frac{110.25}{19.6}$$

$$h = 5.625 \text{ m}$$

b) AC in one step

$$u = +10.5$$

$$a = -9.8$$

$$t = 5$$

$$s = s$$

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

$$s = 10.5(5) + \frac{1}{2}(-9.8)5^2$$

$$s = 52.5 - 122.5$$

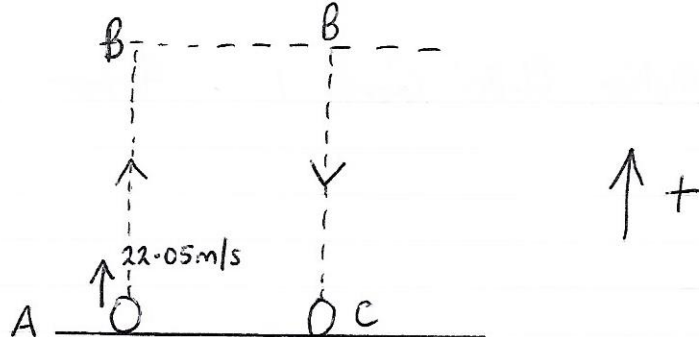
$$s = -70$$

← -ve indicates
70m down from A

∴ Height of

Cliff = 70m.

5)



- a) Speed of particle at C = 22.05 m/s from symmetry

AC in one step

$$u = +22.05$$

$$v = -22.05$$

$$a = -9.8$$

$$t = t$$

$$s = s$$

up
down

$$v = u + at$$

$$-22.05 = 22.05 - 9.8t$$

$$9.8t = 44.1$$

$$t = \frac{44.1}{9.8}$$

$$t = 4.5 \text{ secs}$$

b)

AB

$$u = +22.05$$

$$a = -9.8$$

$$v = 0$$

$$s = h$$

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

$$0^2 = 22.05^2 + 2(-9.8)h$$

$$19.6h = 22.05^2$$

$$h = \frac{22.05^2}{19.6}$$

$$h = 24.81 \text{ m is greatest height reached}$$

c)

When t=3

$$u = +22.05$$

$$a = -9.8$$

$$v = v$$

$$v = u + at$$

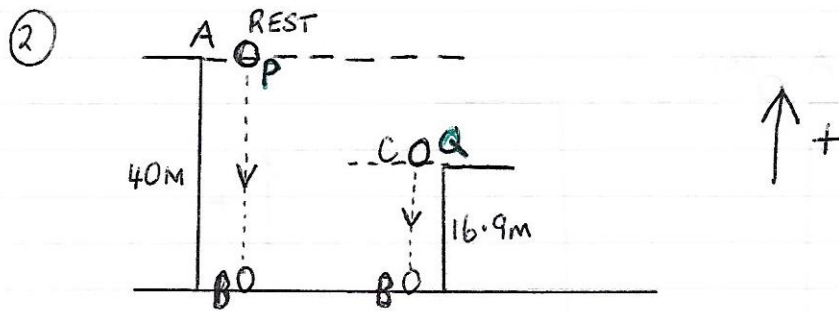
$$v = 22.05 - 9.8(3)$$

$$v = 22.05 - 29.4$$

$$v = -7.35 \text{ m/s}$$

i.e. After 3 secs particle is travelling at 7.35 m/s on the way DOWN.

MI JUNE 2001



a) AB

$$u = 0$$

$$s = -40$$

$$a = -9.8$$

$$v = v$$

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

$$v^2 = 0^2 + 2(-9.8)(-40)$$

$$v^2 = 784$$

$$v = \pm 28 \text{ m/s}$$

Travels down so - sign applicable.

$\therefore$ speed at floor = 28 m/s

b) AB

$$v = u + at$$

$$-28 = 0 - 9.8t$$

$$\frac{-28}{-9.8} = t$$

2.86 secs = t = time when P reaches the ground

c) Height of P above Q initially

$$= 40 - 16.9 = 23.1 \text{ m}$$

$\therefore$ Time for P to fall 23.1m = T

For P

$$u = 0$$

$$a = -9.8$$

$$s = -23.1$$

$$t = T$$

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

$$-23.1 = 0T - 4.9T^2$$

$$4.9T^2 = 23.1$$

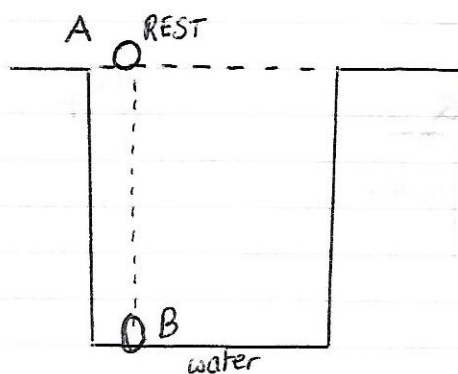
$$T^2 = \frac{23.1}{4.9}$$

$$T = 2.17 \text{ secs}$$

d) Air resistance has been ignored

MI JAN
2002

③



AB

$$u = 0$$

$$a = -9.8$$

$$s = s$$

$$t = 2.9$$

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

$$s = 0(2.9) + \frac{1}{2}(-9.8)(2.9)^2$$

$$s = -41.209 \text{ m} \quad \leftarrow - \text{ means } \underline{\text{down}} \quad 41.209 \text{ m}$$

ie Well is 41.209m deep

$$v = u + at$$

$$v = 0 - 9.8(2.9)$$

$$v = -28.42 \text{ m/s} \quad \leftarrow - \text{ means travelling down}$$

ie speed of pebble as it hits water = 28.42 m/s