

Exercise - Motion

Q1) diameter = 200 m

take time = 4 s.

total time = 2 min 20 s \Rightarrow 140 s.

distance covered in 4 s = $2\pi r$

$$4s = 2\pi \times 100 \times \frac{22}{7}$$

$$4s = \frac{4400}{7}$$

$$s = \frac{1100}{7}$$

distance in 140 s $\Rightarrow \frac{1100}{7} \times \frac{140}{1}$
 $\times 22000 \text{ m}$

Q2) distance from A to B = 300 m

distance from A to C = 400 m.

time to travel A to B = 2 min 30 s
 $= 150 \text{ s}.$

" " " A to C = 210 s.

displacement from A to B = 300 m

" " " A to C = 200 m

Avg speed = $\frac{\text{total distance}}{\text{total time}}$

$$= \frac{300}{150} \text{ m/s} = 2 \text{ m/s}$$

- Avg speed from A to C = $\frac{1200}{150} \text{ m/s} = 8 \text{ m/s}$
- Avg velocity from A to B = $\frac{210}{105} = 2 \text{ m/s}$
- Avg velocity from A to C = $\frac{200}{210} \text{ m/s} = 0.95 \text{ m/s}$

Q3) Distance travelled to reach school = t_1
 " " " " home = t_2

Time to reach school = t_1
 " " " home = t_2

avg speed to school = $d/t_1 = 20 \text{ km/h}$
 " " " home = $d/t_2 = 30 \text{ km/h}$

so $t_1 = d/20$ $t_2 = d/30$

avg speed = $\frac{d+d}{t_1+t_2} = \frac{120}{5} = 24 \text{ km/h}$

Q4) $u = 0 \text{ m/s}$, $a = 3 \text{ m/s}^2$, $t = 8 \text{ s}$

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

so total distance travelled =

$0 + \frac{1}{2}(3)(8)^2 = 96 \text{ m}$

Q7) $u = 0$

distance (s) = 20

$A = 10 \text{ m/s}^2$

3rd eqn of motion =

$$v^2 - u^2 = 2as$$
$$v^2 - 0 = 2 \times (10 \text{ m/s}^2) \times 20 \text{ m} \neq 0$$
$$v^2 = 400 \text{ m}^2/\text{s}^2$$
$$v = 20 \text{ m/s}$$

so final v is 20 m/s

$$v = u + at$$

$$\Rightarrow 20 = 0 + 10t$$

$$\Rightarrow t = 2 \text{ s}$$

Q9) a) It is possible, as an object thrown up has a constant acceleration due to gravity. However when it reaches its maximum height its velocity becomes 0.

b) It is impossible, acceleration implies an increase or decrease in speed. and uniform speed implies speed can't change over time.

(c) It is possible, for an object accelerating in a circular trajectory, the acceleration is perpendicular to the direction followed by the object -

(a) radius = $(r) = 42250 \text{ km}$,

circumference = $2 \times \pi \times r = 265571.42 \text{ km}$

time = 24 hrs,

speed = $\frac{265571.42}{24} \Rightarrow 1025.4 \text{ km/h}$