A man walks on a straight road from his home to a market $2.5\ \mathrm{km}$ away with a speed of $5\ \mathrm{km\ h^{-1}}$. Finding the market closed, he instantly turns and walks back home with a speed of $7.5\ \mathrm{km\ h^{-1}}$. What is the

(a) magnitude of average velocity, and

(b) average speed of the man over the interval of time

(i) 0 to $30\ \mathrm{min}$,

(ii) 0 to $50\ \mathrm{min}$

(iii) 0 to $40\ \mathrm{min}$?

ANSWER

Distance to market $s = 2.5\text{km} = 2.5 \times 10^3 = 2500\text{m}$

Speed with which he goes to market $= 5\text{km/h} = 5\frac{10^3}{3600} = \frac{25}{18}\text{m/s}$

Speed with which he comes back $= 7.5\text{km/h} = 7.5 \times \frac{10^3}{3600} = \frac{75}{36}\text{m/s}$

(a)Average velocity is zero since his displacement is zero.

(b)

(i)Since the initial speed is 5km/s and the market is 2.5 km away,time taken to reach market:$\frac{2.5}{5} = 1/2\text{h} = 30$ minutes.

Average speed over this interval $= 5\text{km/h}$

(ii)After 30 minutes,the man is travelling wuth 7.5 km/h speed for 50-30=20 minutes.The distance he covers in 20 minutes :$7.5 \times \frac{1}{3} = 2.5\text{km}$

His average speed in 0 to 50 minutes:

$$\text{V}_{\text{avg}} = \frac{\text{distance traveled}}{\text{time}}$$

$$= \frac{2.5 + 2.5}{(50/60)} = 6\text{km/h}$$

(iii)In 40-30=10 minutes he travels a distance of :$7.5 \times \frac{1}{6} = 1.25\text{km}$

$$\text{V}_{\text{avg}} = \frac{2.5 + 1.25}{(40/60)} = 5.625\text{km/h}$$