

2000

1. (b) A car, starting from rest and travelling from p to q on a straight level road, where $|pq| = 10\,000$ m, reaches its maximum speed 25 m/s by constant acceleration in the first 500 m and continues at this maximum speed for the rest of the journey.

A second car, starting from rest and travelling from q to p , reaches the same maximum speed by constant acceleration in the first 250 m and continues at this maximum speed for the rest of the journey.

- (i) If the two cars start at the same time, after how many seconds do the two cars meet? Find, also, the distance travelled by each car in that time.
- (ii) If the start of one car is delayed so that they meet each other exactly halfway between p and q , find which car is delayed and by how many seconds.

$$\frac{1}{2}t_p(25) = 500 \Rightarrow t_p = 40 \text{ and}$$

$$\frac{1}{2}t_q(25) = 250 \Rightarrow t_q = 20$$

Time to reach maximum speed: 40 s for p and 20 s for q

$$s_p = 500 + 25(t - 40) \text{ and } s_q = 250 + 25(t - 20)$$

$$s_p + s_q = 10000 \Rightarrow t = 215$$

$$s_p = 500 + 25(215 - 40) = 4875 \text{ and}$$

$$s_q = 250 + 25(215 - 20) = 5125$$

$$s_q > s_p \Rightarrow q \text{ is delayed by } t_1 \text{ seconds}$$

$$s_p = s_q \Rightarrow 500 + 25(t - 40) = 250 + 25(t - t_1 - 20)$$

$$\Rightarrow t_1 = 10 \text{ seconds}$$

5

5

5

5

5

5

30