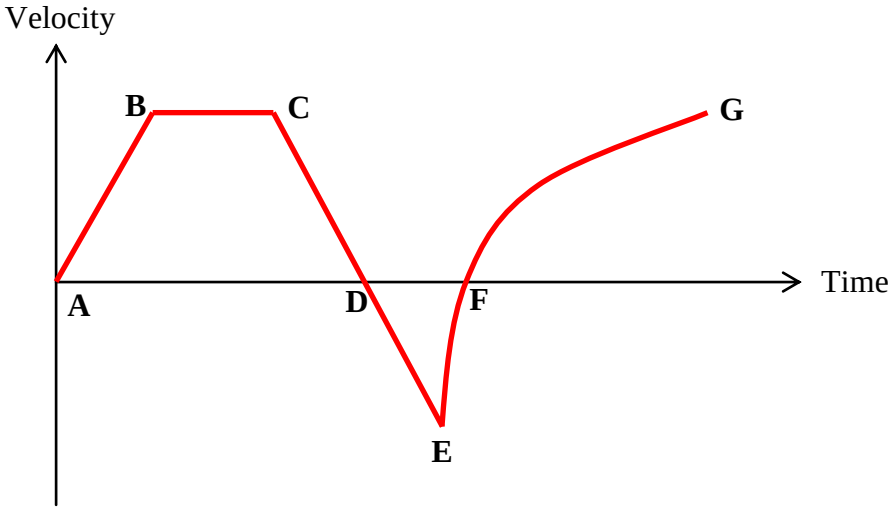
Section 2: Velocity and acceleration

Section test

1. A car is moving at 10 ms^{-1} at an instant when it starts to accelerate at 2 ms^{-2}. How long will it take to reach a speed of 18 ms^{-1}?

2. The diagram below shows the velocity–time graph for a particle.

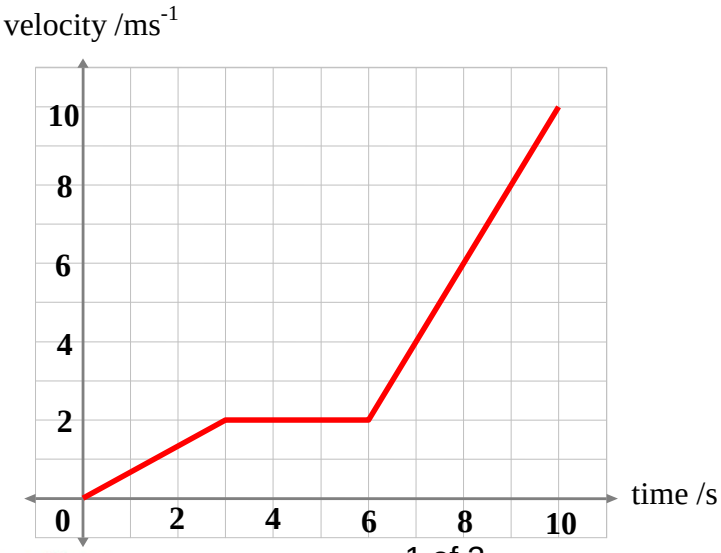


(i) How many times is the velocity of the particle zero during the period shown on the graph?

(ii) The part of the graph which shows an acceleration of zero is
(a) A to B (b) B to C
(c) C to E (d) E to G

(iii)The part of the graph which shows a variable acceleration is
(a) A to B (b) B to C
(c) C to E (d) E to G

3. The velocity-time graph for a particle is shown below.

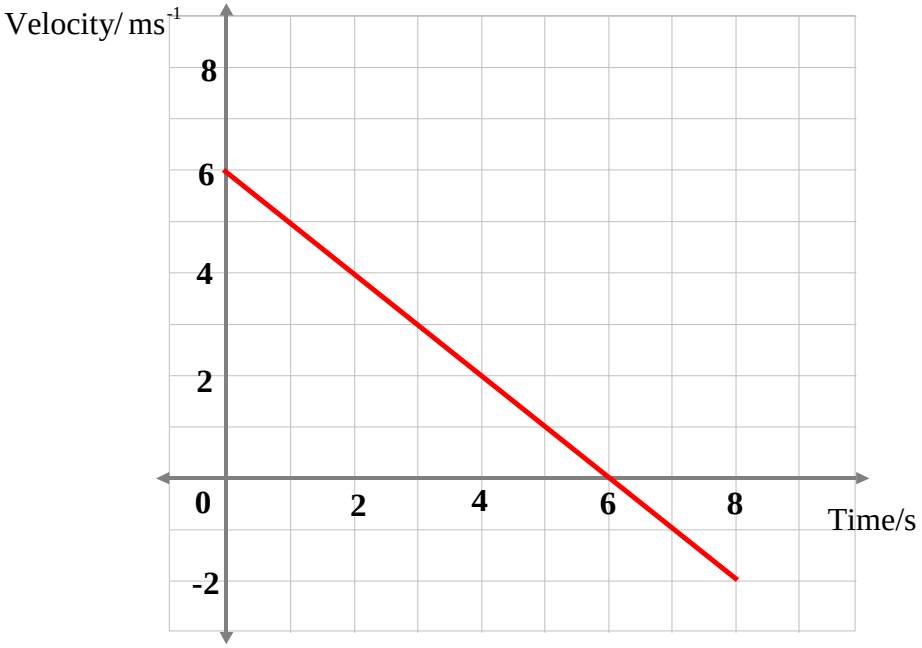


(i) What is the greatest acceleration of the particle?

(ii) What is the total distance travelled by the particle?

(iii)What is the average speed of the particle?

4. The velocity-time graph for a particle is shown below.



(i) What is the acceleration of the particle?

(ii) What is the total distance travelled by the particle?

(iii)The particle started at the origin. What is its displacement after 8 seconds?

Edexcel AS Maths Kinematics 2 Section test solutions

Solutions to section test

1. $\text{Accerelation} = \dfrac{\text{increase in speed}}{\text{time}}$

$2 = \dfrac{18-10}{t}$

$2 = \dfrac{8}{t} \quad \Rightarrow t = 4$

After 4 seconds.

2. (i) The velocity is zero at points A, D and F, so the velocity is zero three times.

(ii) The acceleration is zero when the velocity is constant, i.e. the graph is horizontal. This is between B and C.

(iii) The acceleration is shown by the gradient of the graph. The part of the graph where the gradient is not constant (i.e. not a straight line) is from E to G.

3. The acceleration is greatest where the graph is steepest, which is the last part of the graph.

$\text{Acceleration} = \dfrac{\text{increase in velocity}}{\text{time}} = \dfrac{10-2}{4} = 2 \text{ ms}^{-1}.$

Distance travelled = area under graph

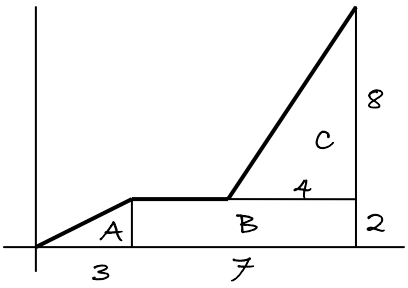
Area A $= \frac{1}{2} \times 3 \times 2 = 3$

Area B $= 7 \times 2 = 14$

Area C $= \frac{1}{2} \times 4 \times 8 = 16$

Total distance travelled $= 3 + 14 + 16$

$= 33$ m



$\text{Average speed} = \dfrac{\text{total distance}}{\text{time}} = \dfrac{33}{10} = 3.3 \text{ ms}^{-1}.$

4. (i) $\text{Acceleration} = \dfrac{\text{change in velocity}}{\text{time}} = \dfrac{-2-6}{8} = -1 \text{ ms}^{-1}.$

(ii) Distance travelled in positive direction $= \frac{1}{2} \times 6 \times 6 = 18$

Distance travelled in negative direction $= \frac{1}{2} \times 2 \times 2 = 2$

Total distance travelled $= 18 + 2 = 20$ m.

(iii) Total displacement $= 18 - 2 = 16$ m