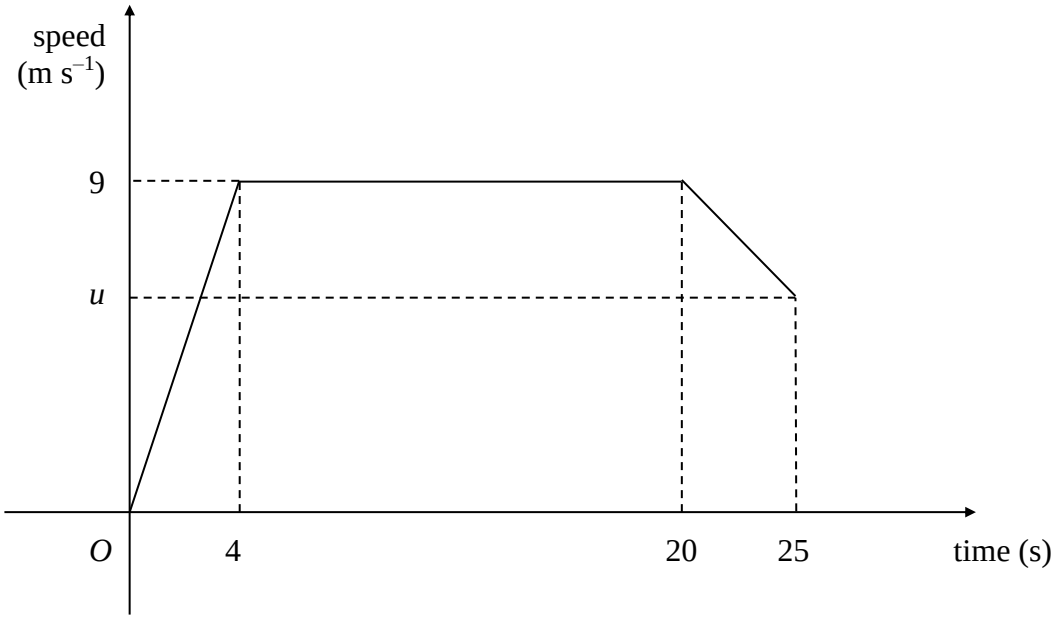
Constant Acceleration : Travel Graphs - Edexcel Past Exam Questions

1.



A sprinter runs a race of 200 m. Her total time for running the race is 25 s. Figure 2 is a sketch of the speed-time graph for the motion of the sprinter. She starts from rest and accelerates uniformly to a speed of 9 m s^{-1} in 4 s. The speed of 9 m s^{-1} is maintained for 16 s and she then decelerates uniformly to a speed of u m s^{-1} at the end of the race. Calculate

(a) the distance covered by the sprinter in the first 20 s of the race, **(2)**

(b) the value of u, **(4)**

(c) the deceleration of the sprinter in the last 5 s of the race. **(3)**

Jan 05 Q3

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2. A train is travelling at 10 m s^{-1} on a straight horizontal track. The driver sees a red signal 135 m ahead and immediately applies the brakes. The train immediately decelerates with constant deceleration for 12 s, reducing its speed to 3 m s^{-1}. The driver then releases the brakes and allows the train to travel at a constant speed of 3 m s^{-1} for a further 15 s. He then applies the brakes again and the train slows down with constant deceleration, coming to rest as it reaches the signal.

(a) Sketch a speed-time graph to show the motion of the train. **(3)**

(b) Find the distance travelled by the train from the moment when the brakes are first applied to the moment when its speed first reaches 3 m s^{-1}. **(2)**

(c) Find the total time from the moment when the brakes are first applied to the moment when the train comes to rest. **(5)**

June 05 Q5

3.

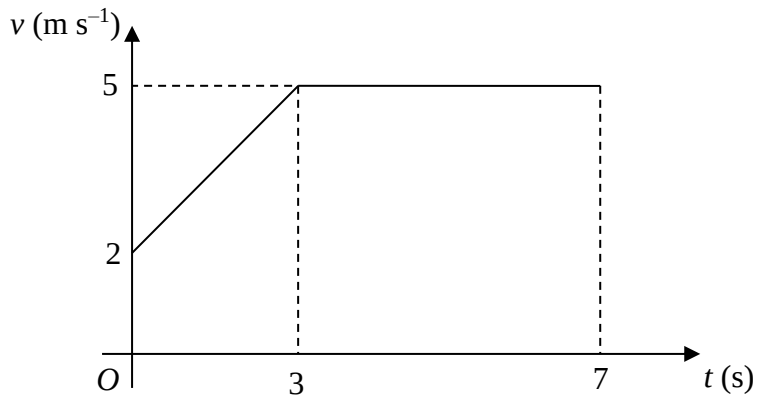

Figure 1 shows the speed-time graph of a cyclist moving on a straight road over a 7 s period. The sections of the graph from $t = 0$ to $t = 3$, and from $t = 3$ to $t = 7$, are straight lines. The section from $t = 3$ to $t = 7$ is parallel to the t-axis.

State what can be deduced about the motion of the cyclist from the fact that

(*a*) the graph from $t = 0$ to $t = 3$ is a straight line, **(1)**

(*b*) the graph from $t = 3$ to $t = 7$ is parallel to the t-axis. **(1)**

(*c*) Find the distance travelled by the cyclist during this 7 s period. **(4)**

June 06 Q1

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4. A car is moving along a straight horizontal road. At time $t = 0$, the car passes a point A with speed 25 m s^{-1}. The car moves with constant speed 25 m s^{-1} until $t = 10$ s. The car then decelerates uniformly for 8 s. At time $t = 18$ s, the speed of the car is V m s^{-1} and this speed is maintained until the car reaches the point B at time $t = 30$ s.

(*a*) Sketch a speed–time graph to show the motion of the car from A to B. **(3)**

Given that $AB = 526$ m, find

(*b*) the value of V, **(5)**

(*c*) the deceleration of the car between $t = 10$ s and $t = 18$ s. **(3)**

June 07 Q4

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5. A car moves along a horizontal straight road, passing two points A and B. At A the speed of the car is 15 m s^{-1}. When the driver passes A, he sees a warning sign W ahead of him, 120 m away. He immediately applies the brakes and the car decelerates with uniform deceleration, reaching W with speed 5 m s^{-1}. At W, the driver sees that the road is clear. He then immediately accelerates the car with uniform acceleration for 16 s to reach a speed of V m s^{-1} ($V > 15$). He then maintains the car at a constant speed of V m s^{-1}. Moving at this constant speed, the car passes B after a further 22 s.

(a) Sketch, in the space below, a speed-time graph to illustrate the motion of the car as it moves from A to B. **(3)**

(b) Find the time taken for the car to move from A to B. **(3)**

The distance from A to B is 1 km.

(c) Find the value of V. **(5)**

Jan 08 Q3

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6. A car is moving along a straight horizontal road. The speed of the car as it passes the point A is 25 m s^{-1} and the car maintains this speed for 30 s. The car then decelerates uniformly to a speed of 10 m s^{-1}. The speed of 10 m s^{-1} is then maintained until the car passes the point B. The time taken to travel from A to B is 90 s and AB = 1410 m.

(a) Sketch a speed-time graph to show the motion of the car from A to B. **(2)**

(b) Calculate the deceleration of the car as it decelerates from 25 m s^{-1} to 10 m s^{-1}. **(7)**

June 08 Q4

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7. A small ball is projected vertically upwards from ground level with speed u m s^{-1}. The ball takes 4 s to return to ground level.

(a) Draw, in the space below, a velocity-time graph to represent the motion of the ball during the first 4 s. **(2)**

(b) The maximum height of the ball above the ground during the first 4 s is 19.6 m. Find the value of u. **(3)**

Jan 09 Q2

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8. An athlete runs along a straight road. She starts from rest and moves with constant acceleration for 5 seconds, reaching a speed of 8 m s^{-1}. This speed is then maintained for T seconds. She then decelerates at a constant rate until she stops. She has run a total of 500 m in 75 s.

(a) Sketch a speed-time graph to illustrate the motion of the athlete. **(3)**

(b) Calculate the value of T. **(5)**

Jan 10 Q2

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9. Two cars P and Q are moving in the same direction along the same straight horizontal road. Car P is moving with constant speed 25 m s^{-1}. At time $t = 0$, P overtakes Q which is moving with constant speed 20 m s^{-1}. From $t = T$ seconds, P decelerates uniformly, coming to rest at a point X which is 800 m from the point where P overtook Q. From $t = 25$ s, Q decelerates uniformly, coming to rest at the same point X at the same instant as P.

(a) Sketch, on the same axes, the speed-time graphs of the two cars for the period from $t = 0$ to the time when they both come to rest at the point X. **(4)**

(b) Find the value of T. **(8)**

June 10 Q5

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10. A car accelerates uniformly from rest for 20 seconds. It moves at constant speed v m s^{-1} for the next 40 seconds and then decelerates uniformly for 10 seconds until it comes to rest.

(a) For the motion of the car, sketch

a speed-time graph, **(3)**

Given that the total distance moved by the car is 880 m,

(b) find the value of v. **(4)**

Jan 11 Q5
