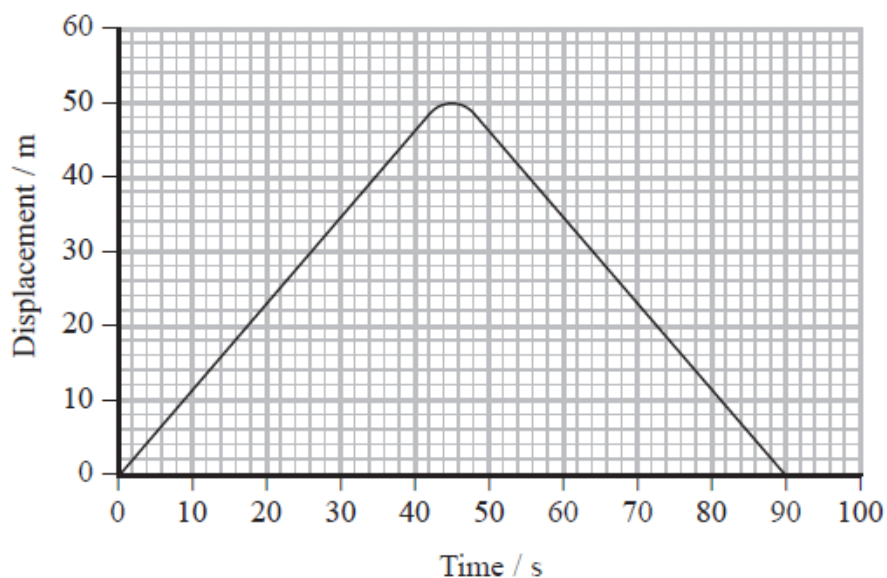


Questions

Q1.

A swimmer swims a 100 m race. A simplified displacement-time graph for the swimmer is shown.



(a) Draw a corresponding velocity-time graph for the motion of the swimmer on the axes below.

Show all working in the space below.

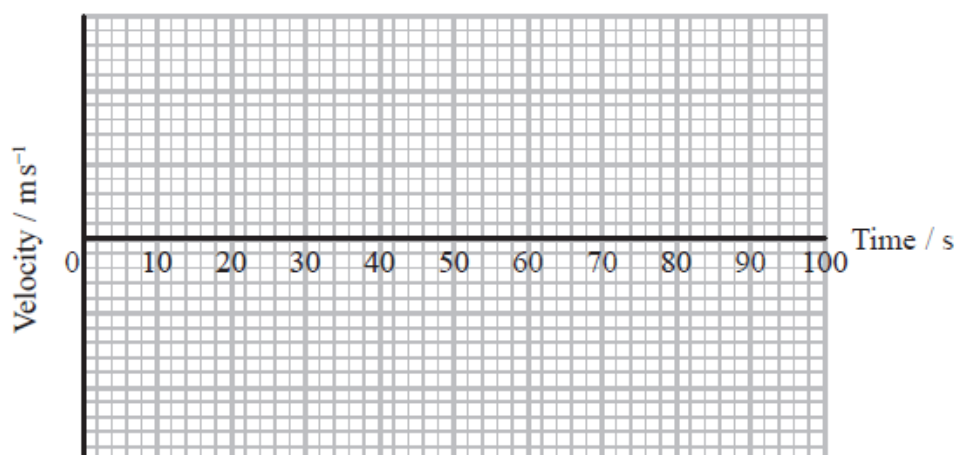
(4)

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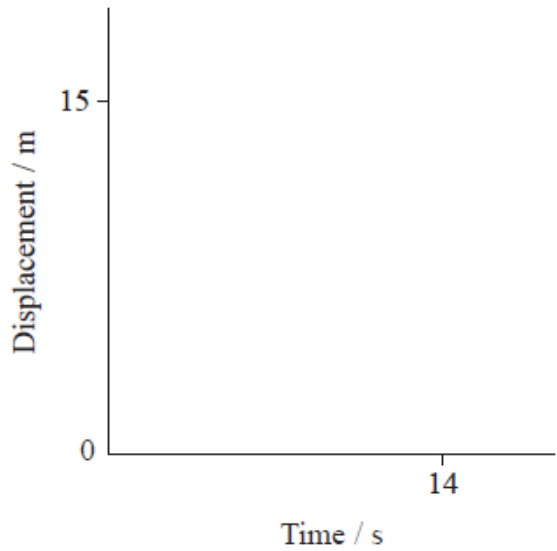


(b) To increase her initial speed, the swimmer began the race by gliding underwater

for 15 m and then began to use her arms and legs. This was not represented on the simplified displacement-time graph.

(i) Sketch onto the axes below to show the actual variation of displacement with time for the first 15 m of the race.

(2)



(ii) Explain one other way in which the motion of the swimmer has been simplified when drawing the displacement-time graph.

(2)

.....

.....

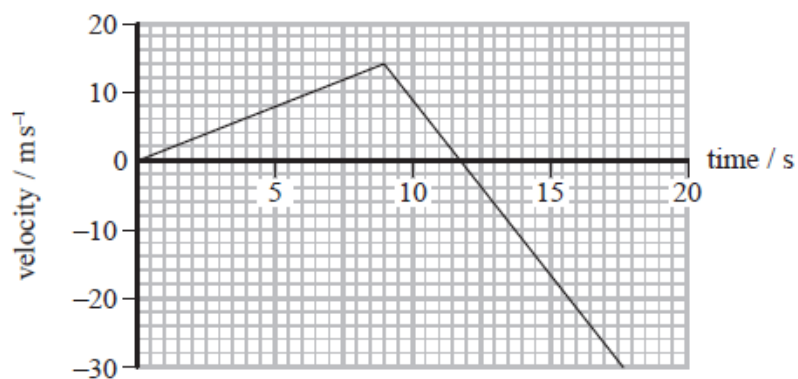
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(Total for question = 8 marks)

Q2.

The graph shows how the velocity of an object varies with time.



Describe how the acceleration of the object varies with time.
Your answer should include calculations.

(3)

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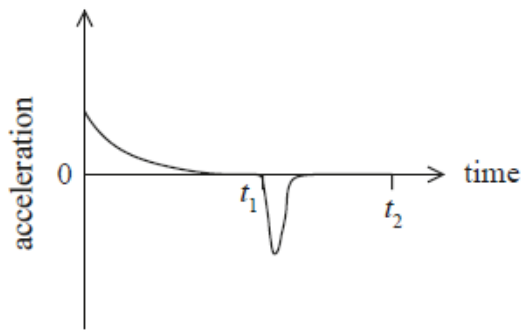
.....

(Total for question = 3 marks)

Q3.

* A skydiver jumps from an aeroplane and accelerates until she reaches terminal velocity. At a time t_1 , she opens a parachute and a second, lower terminal velocity is reached before landing safely at time t_2 .

The acceleration-time graph for the motion of the skydiver is shown.



Explain the shape of the graph. You should refer to the forces acting on the skydiver.

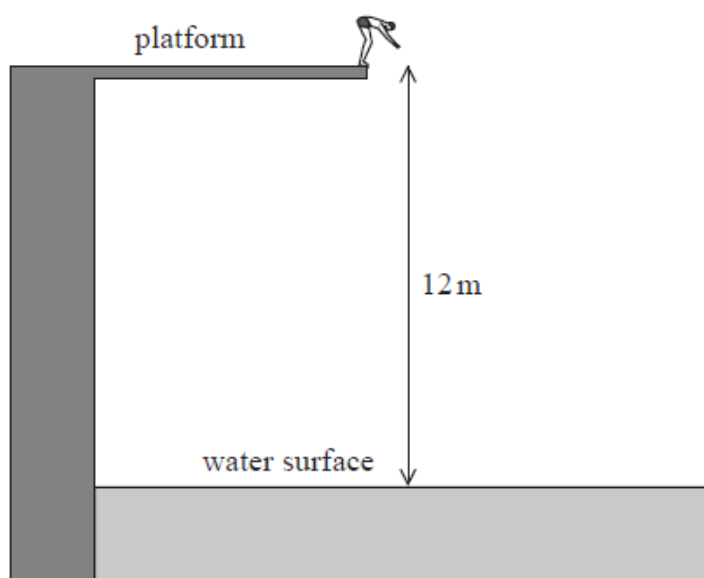
(6)

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

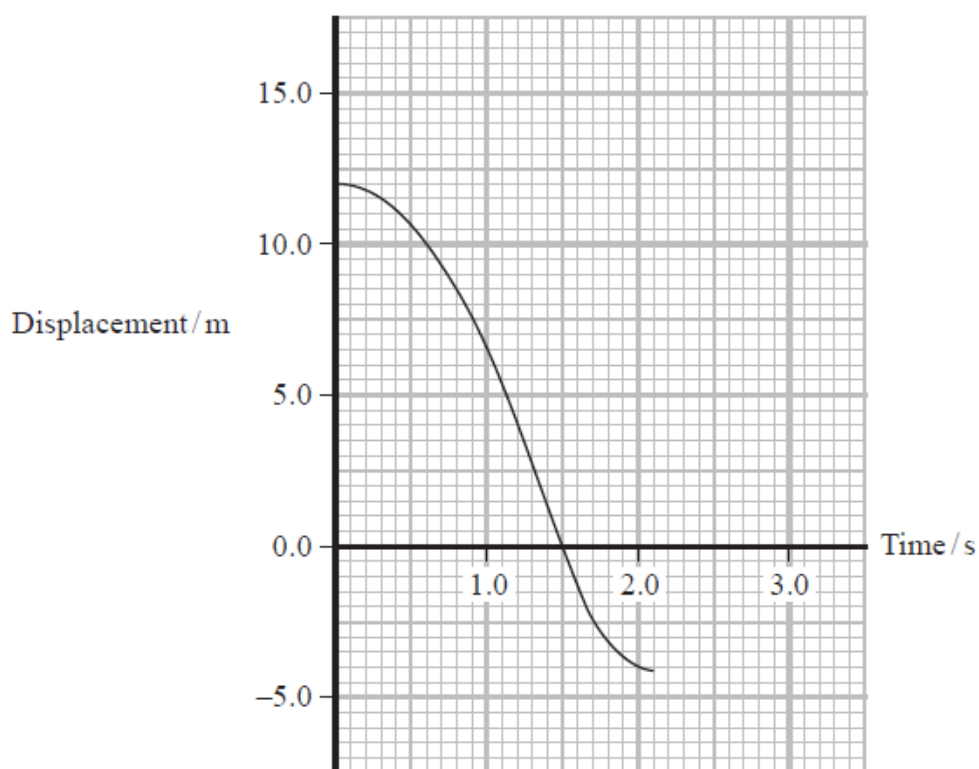
(Total for question = 6 marks)

Q4.

A man dives from a platform into a swimming pool. The platform is 12 m above the water surface as shown.



The graph shows the vertical displacement of the man from the water surface, after leaving the platform.



(a) (i) State how the graph shows that the man's initial vertical velocity is zero.

(1)

.....

.....

(ii) Determine the vertical velocity of the man as he enters the water.

(2)

.....

.....

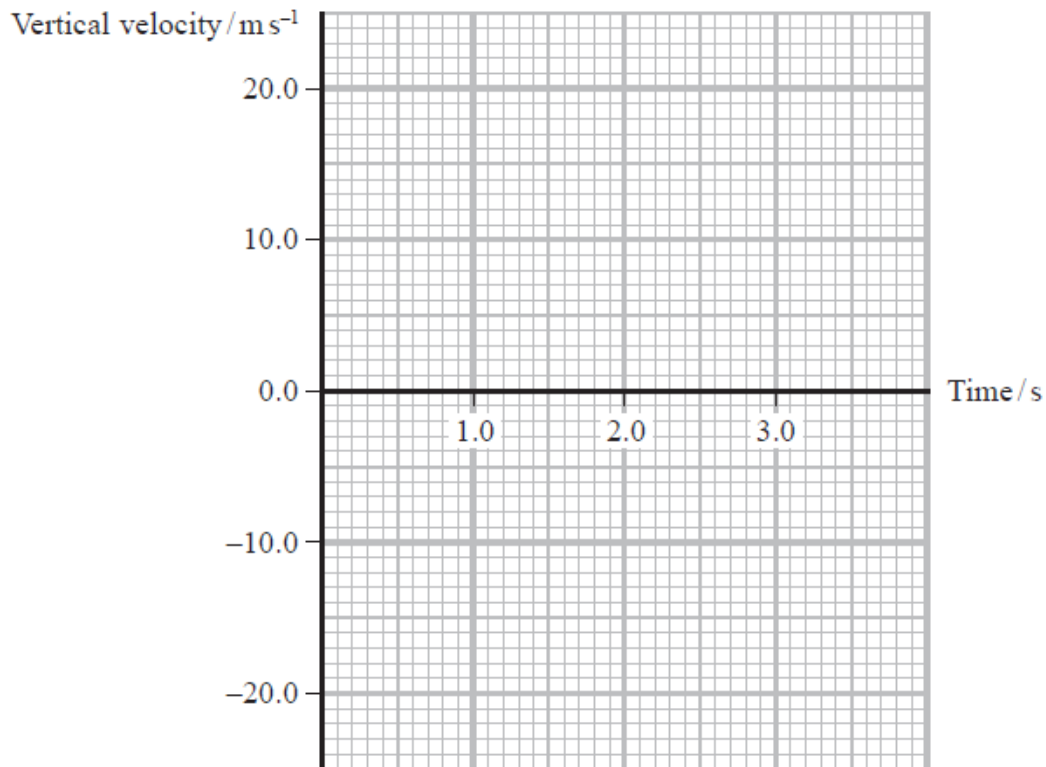
Vertical velocity =

(b) Before entering the water, the man has a constant vertical acceleration.

After entering the water, the man has a constant vertical deceleration.

Draw the velocity-time graph for the man on the axes below.

(2)



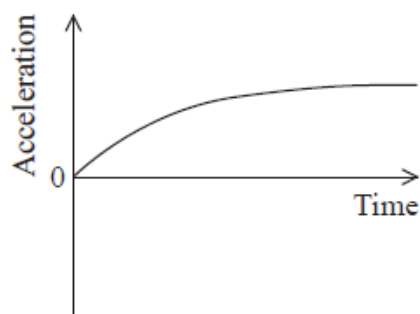
(Total for question = 5 marks)

Q5.

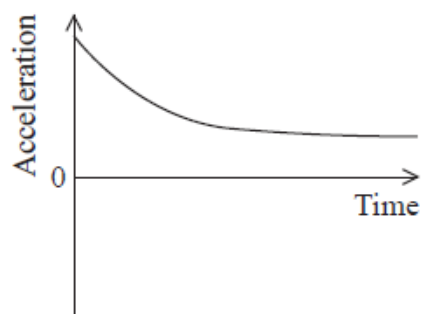
Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

A constant forward force acts on a car. The car accelerates along a straight road. After a while, the speed of the car reaches a constant value.

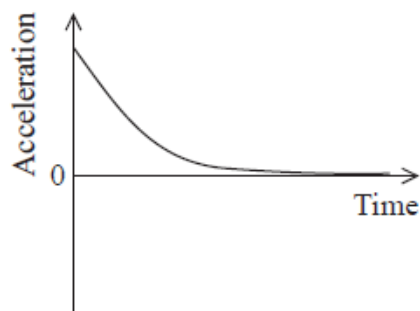
Which graph shows the variation of acceleration with time for the car?



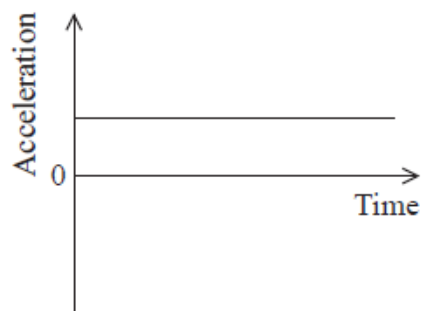
A



B



C



D

☐ A

☐ B

☐ C

☐ D

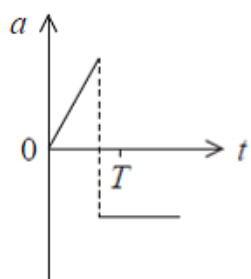
(Total for question = 1 mark)

Q6.

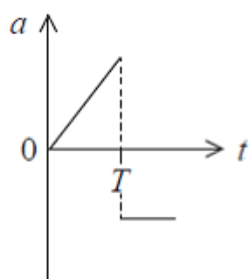
Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

A model rocket is launched and moves vertically upwards while still burning fuel to give a constant upwards thrust. The fuel runs out, and the rocket reaches the maximum height at time T before falling back to the ground.

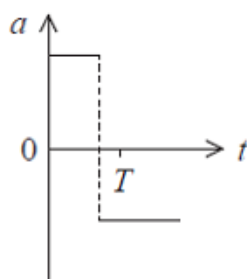
Which of the following graphs could show how the acceleration α of the rocket varies with time t , if the decrease in mass as the fuel burns is neglected?



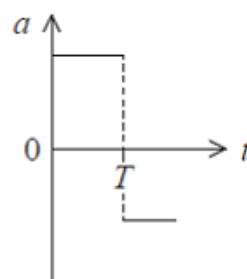
☐ A



☐ B



☐ C



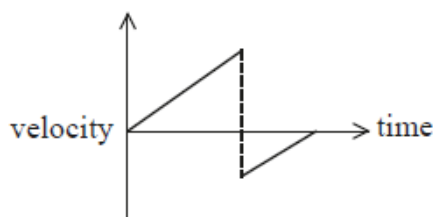
☐ D

(Total for question = 1 mark)

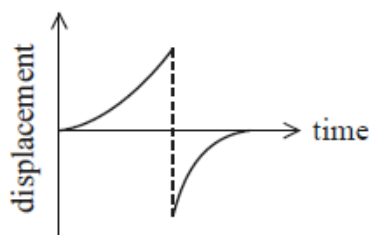
Q7.

Answer the question with a cross in the box you think is correct ☐ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐ .

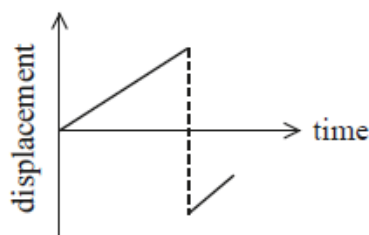
The velocity-time graph for the motion of a ball is shown.



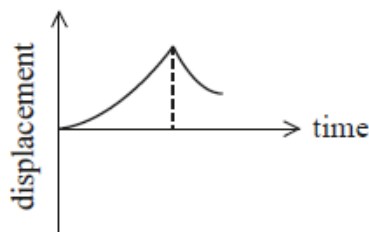
Which of the following graphs of displacement against time could represent the motion of the ball?



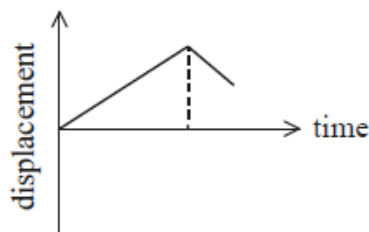
A



B



C



D

☒ A

☐ B

☐ C

☐ D

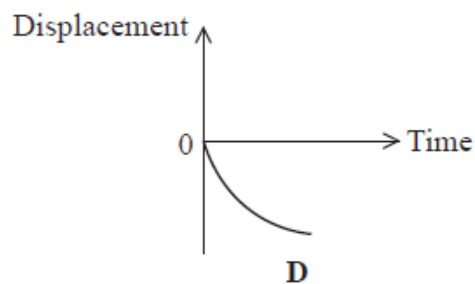
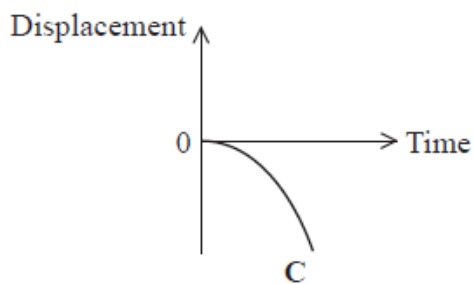
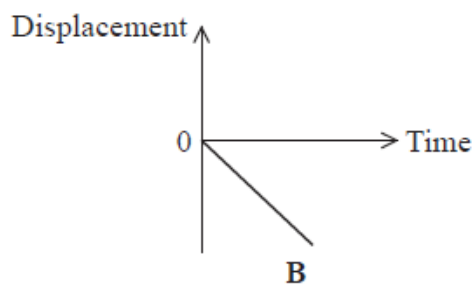
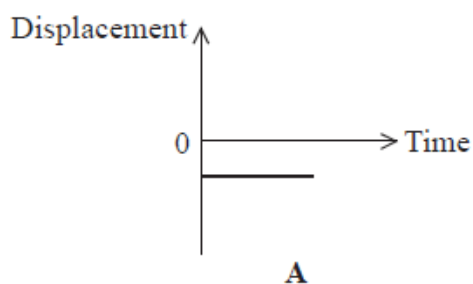
(Total for question = 1 mark)

Q8.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☐ and then mark your new answer with a cross ☐.

A ball falls through air from rest.

Which of the following shows the graph of displacement against time for the ball?



☐ A

☐ B

☐ C

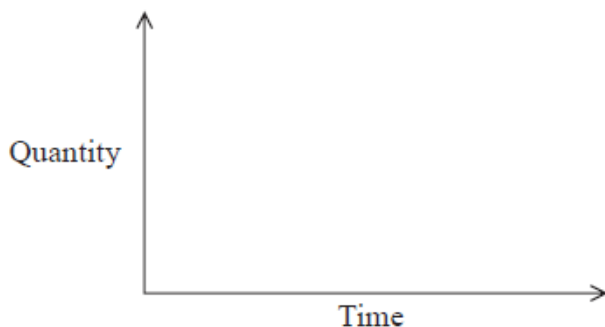
☐ D

(Total for question = 1 mark)

Q9.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

Graphs can be used to represent the motion of an object.



Which row in the table gives a quantity plotted on the y-axis and the corresponding quantity represented by the gradient of the graph?

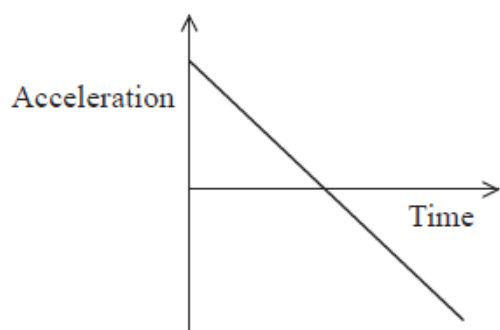
	Quantity plotted on y-axis	Gradient of graph
☐ A	displacement	acceleration
☐ B	velocity	acceleration
☐ C	acceleration	velocity
☐ D	acceleration	displacement

(Total for question = 1 mark)

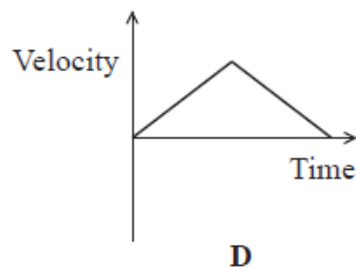
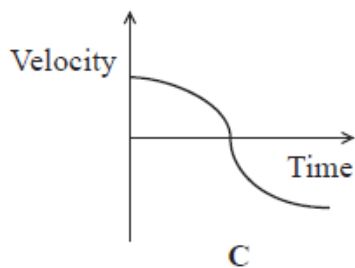
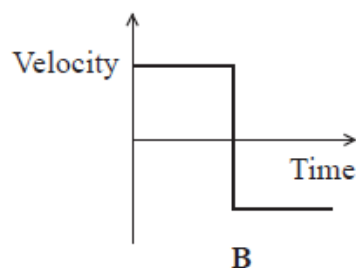
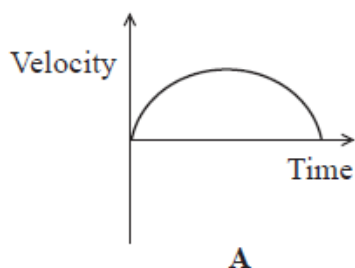
Q10.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

A car accelerated along a straight road. The graph shows how the acceleration of the car varied with time.



Which of the following graphs shows how the velocity of the car varied with time over the same time interval?



☐ A

☐ B

☐ C

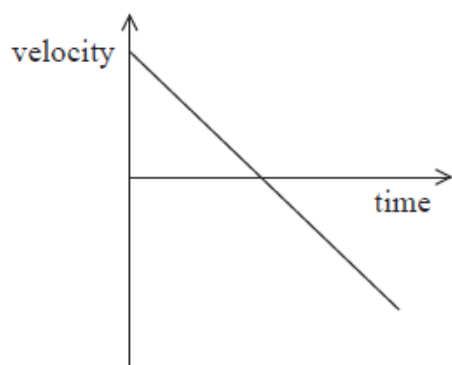
☐ D

(Total for question = 1 mark)

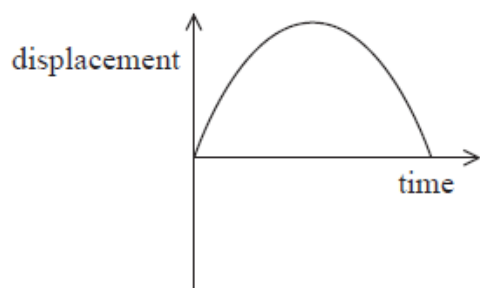
Q11.

Select one answer from A to D and put a cross in the box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

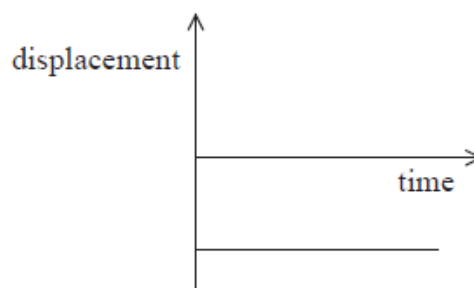
The velocity-time graph for a particle is shown.



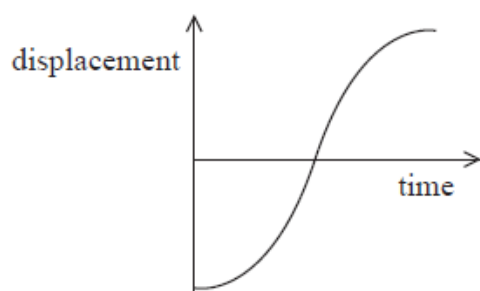
Which of the following is the displacement-time graph for this particle?



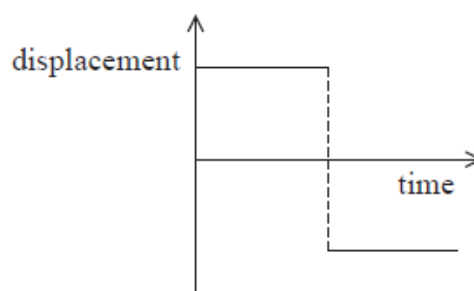
A



B



C



D

☐ A

☐ B

☐ C

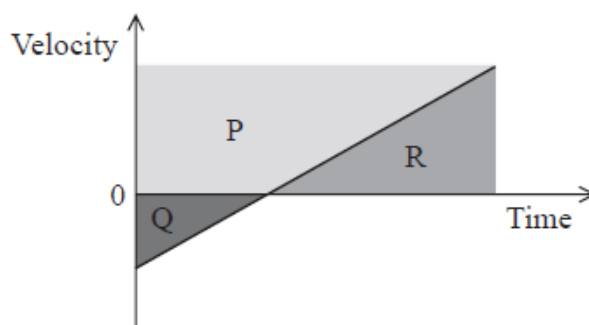
☐ D

(Total for question = 1 mark)

Q12.

Answer the question with a cross in the box you think is correct (☒). If you change your mind, put a line through the box (☒) and then mark your new answer with a cross (☒).

The velocity-time graph shows the motion of a particle with a constant acceleration. P, Q and R represent the magnitudes of each area shown.



Which of the following expressions gives the total displacement of the particle?

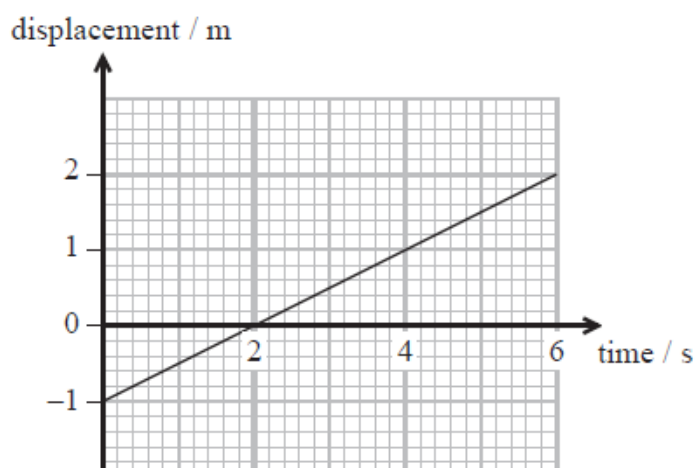
- ☐ **A** $P + Q$
- ☐ **B** $P + Q - R$
- ☐ **C** $R + Q$
- ☐ **D** $R - Q$

(Total for question = 1 mark)

Q13.

Select one answer from A to D and put a cross in the box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

A student walks for 6 seconds. The displacement-time graph for the student is shown.



Which row of the table shows the final displacement and velocity of the student?

	Displacement / m	Velocity / m s^{-1}
☐ A	2.0	0.5
☐ B	3.0	0.5
☐ C	5.0	2.0
☐ D	3.0	2.0

(Total for question = 1 mark)

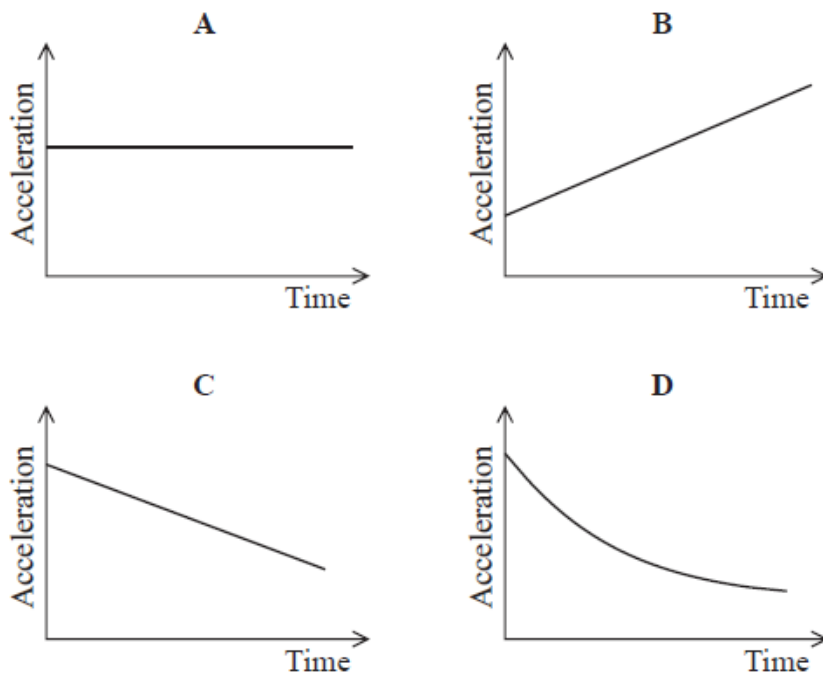
Q14.

Answer the question with a cross in the box you think is correct (☒). If you change your mind, put a line through the box (☒) and then mark your new answer with a cross (☒).

A rocket is accelerating horizontally due to a constant resultant force.

The mass of the rocket decreases steadily as it uses up its fuel.

Which graph shows how the acceleration of the rocket could change?



☐ A

☐ B

☐ C

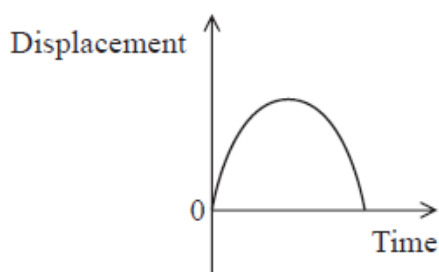
☒ **D**

(Total for question = 1 mark)

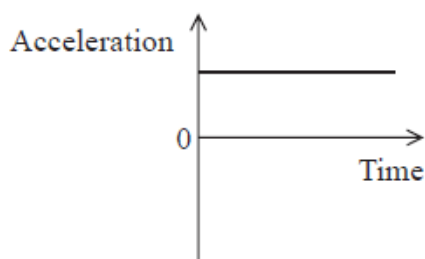
Q15.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

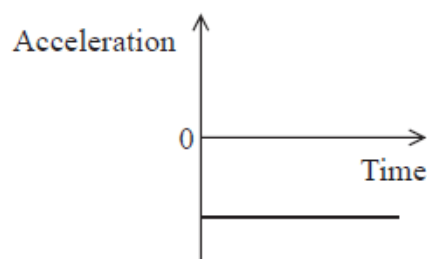
A person threw a ball vertically up in the air and caught the ball a few seconds later. The graph of vertical displacement against time for the ball is shown.



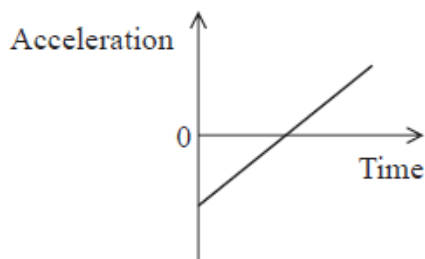
Which graph shows the acceleration of the ball against time?



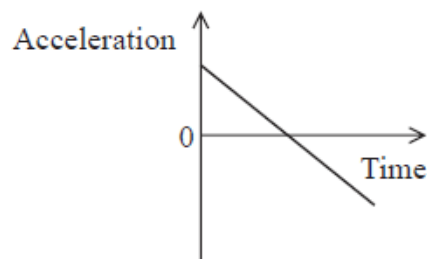
A



B



C



D

☒ **A**

☒ **B**

☒

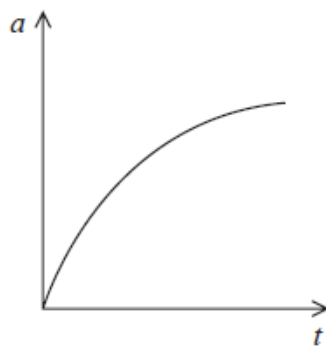
C

☐ D

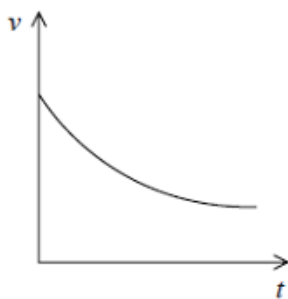
(Total for question = 1 mark)

Q16.

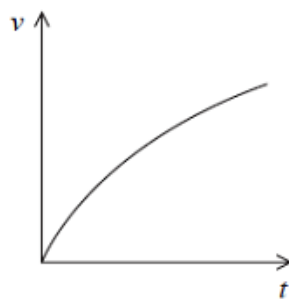
The graph shows how the acceleration a of an object varies with time t .



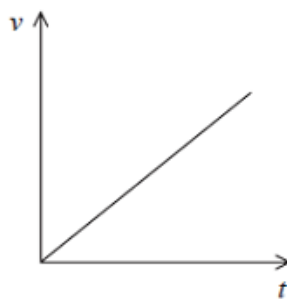
Which of the following graphs shows how the velocity v of the object varies with t ?



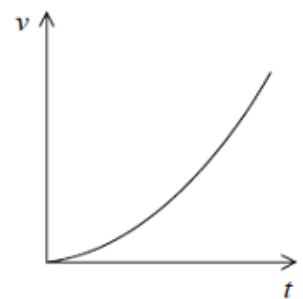
A



B



C



D

☐ A

☐ B

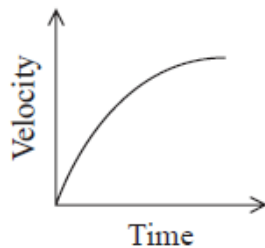
☐ C

☐ D

(Total for question = 1 mark)

Q17.

Some students were shown a velocity-time graph for the motion of an object falling through a liquid.



The students suggested possible explanations for the decrease in gradient of the graph.

Which explanation could be a reason for the gradient of the graph decreasing?

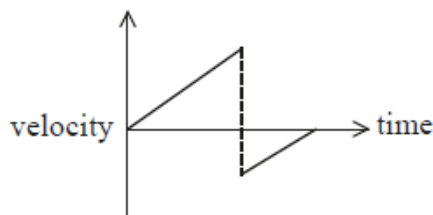
- ☐ **A** The drag force increases.
- ☐ **B** The gravitational force increases.
- ☐ **C** The temperature of the liquid increases.
- ☐ **D** The upthrust on the object decreases.

(Total for question = 1 mark)

Q18.

Answer the question with a cross in the box you think is correct ☐ . If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐ .

The velocity-time graph for the motion of a ball is shown.



Which of the following correctly describes the motion of the ball?

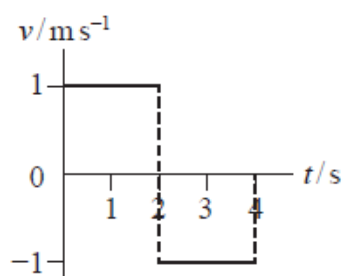
- ☐ **A** The ball is dropped and rebounds to its original position.
- ☐ **B** The ball is dropped and rebounds to a lower position.

- ☐ **C** The ball is thrown upwards and is caught at its original position.
- ☐ **D** The ball is thrown upwards and is caught at a higher position.

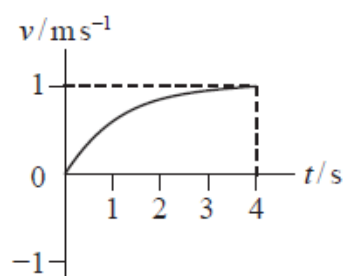
(Total for question = 1 mark)

Q19.

Two objects P and Q are at the same position at time $t = 0$ s. The graphs show how the velocity v varies with time t for each object.



object P



object Q

Which of the following statements describes the positions of P and Q at $t = 4$ s?

- ☐ **A** P and Q are both at the initial position.
- ☐ **B** P and Q are the same distance from the initial position.
- ☐ **C** P is further from the initial position than Q.
- ☐ **D** Q is further from the initial position than P.

(Total for question = 1 mark)

Q20.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☐ and then mark your new answer with a cross ☐.

Which of the following quantities is given by the area under a velocity-time graph?

- ☐ **A** acceleration
- ☐ **B** displacement
- ☐ **C** speed
- ☐ **D** time taken

(Total for question = 1 mark)