Impulse Questions

Q1.

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 is fitted with an airbag which will inflate if the car stops very suddenly.

(Source: © KAIROS, LATIN STOCK/SCIENCE PHOTO LIBRARY)

Which of the following is increased if the airbag inflates because the car suddenly stops?

☐ **A** change in momentum of the driver

☐ **B** change in velocity of the driver

☐ **C** force on the driver

☐ **D** time that the driver takes to stop

(Total for question = 1 mark)

Q2.

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 are the base units for impulse?

☐ **A** kg m s^{-1}

☐ **B** kg m s^{-2}

☐ **C** N m

☐ **D** N s

(Total for question = 1 mark)

Q3.

A footballer kicks a football from the penalty spot. A graph of force on the ball against time is drawn.

The area under the force-time graph represents

☐ **A** acceleration

☐ **B** change in kinetic energy

☐ **C** change in momentum

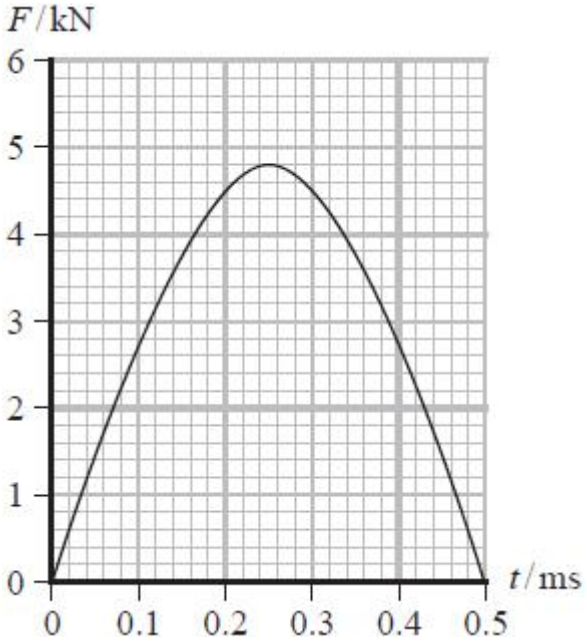
☐ **D** displacement

(Total for question = 1 mark)

Q4.

In the game of golf a stationary ball is hit by a club. One of the aims of the game is to land the ball on a patch of ground called the green.

The graph shows how the force *F* exerted by the club on the ball varies with time *t* as the ball is hit.



State why the area under the graph represents impulse.

(1)

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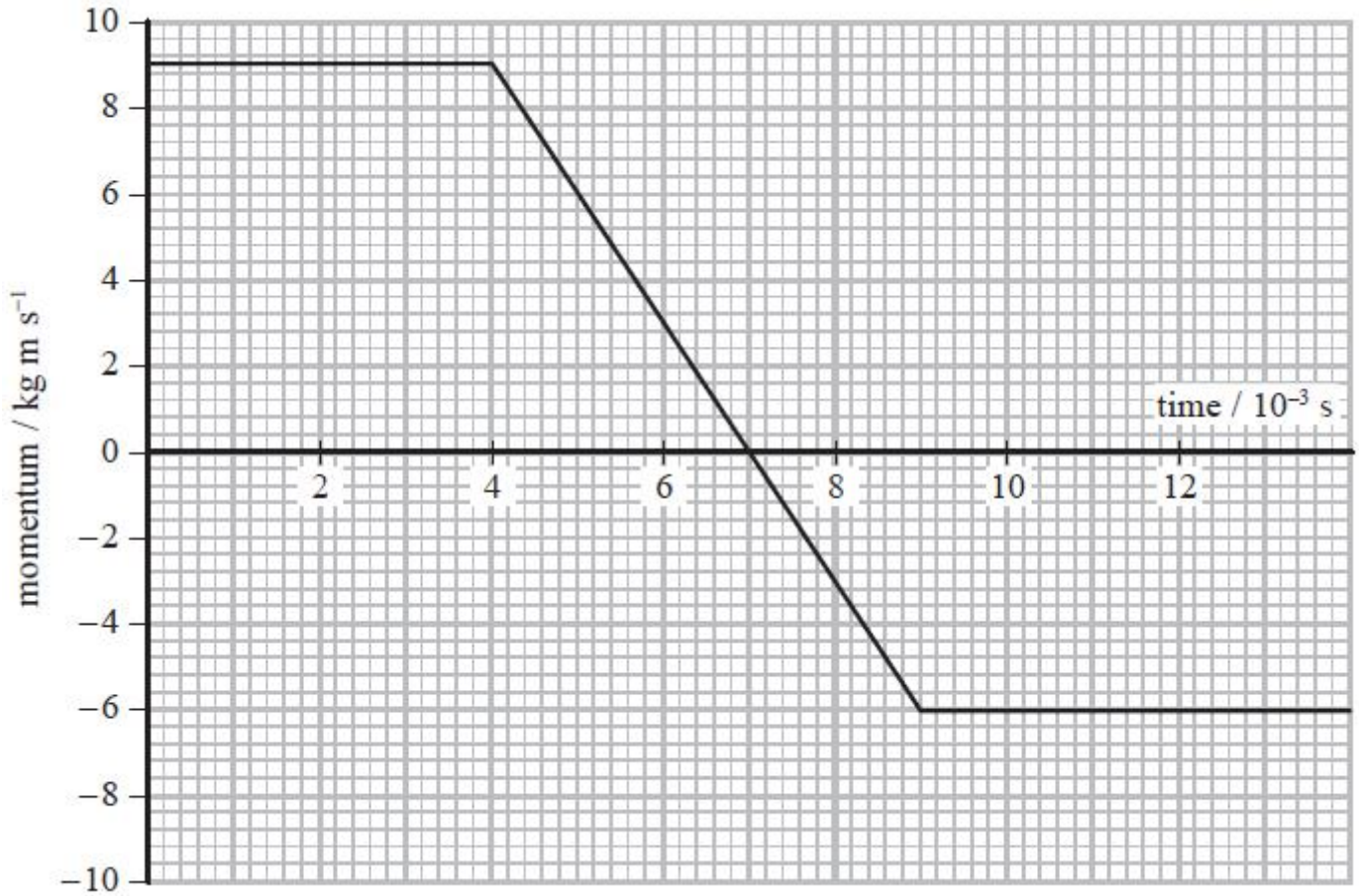
(Total for question = 1 mark)

Q5.

A football is kicked horizontally to hit a wall. Its momentum just before it hits the wall is 9.0 kg m s^{-1}. It rebounds horizontally from the wall with a momentum of −6.0 kg m s^{-1}. The graph shows how the momentum of the football varies during the impact with the wall.



The force exerted by the wall on the football is

- ☒ **A** 3.0 N
- ☒ **B** 15 N
- ☒ **C** 600 N
- ☒ **D** 3000 N

(Total for question = 1 mark)

Q6.

Which of the following is a possible unit for rate of change of momentum?

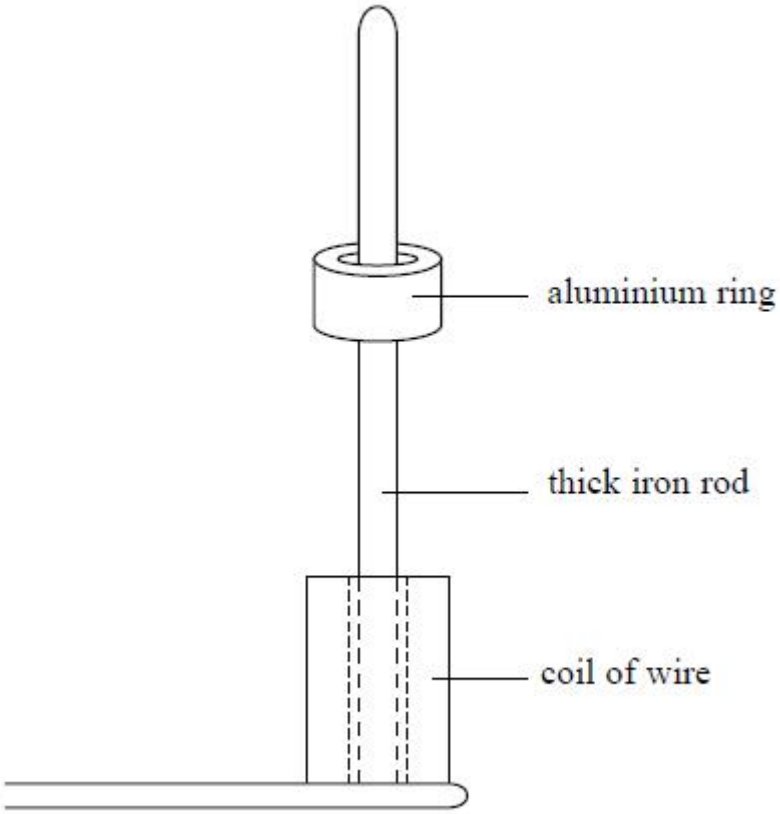
- ☒ **A** kg m s^{-1}
- ☒ **B** kg m s^{-2}
- ☒ **C** N s
- ☒ **D** N s^{-1}

(Total for question = 1 mark)

Q7.

A coil of wire is placed around the lower end of an iron rod. The coil is supplied with an alternating current.

A thick aluminium ring is placed around the iron rod above the coil. The coil remains in the position shown.



The current is switched off and the aluminium ring comes to rest on top of the coil.
The supply to the coil is changed and a direct current (dc) is switched on. An upwards force *F* acts on the ring for 0.05 s accelerating it to a final speed, *v*. The ring then moves freely through a height of 30 cm.

Mean diameter of ring = 4.8 cm
Mass of ring = 0.019 kg
Magnetic field strength = 0.032 T

(i) Use conservation of energy to calculate the speed *v* of the ring after 0.05 s.

(2)

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v = ...

(ii) Use the idea of impulse to calculate the magnitude of the mean force *F* acting on the ring and hence the mean current *I* in the ring.

(3)

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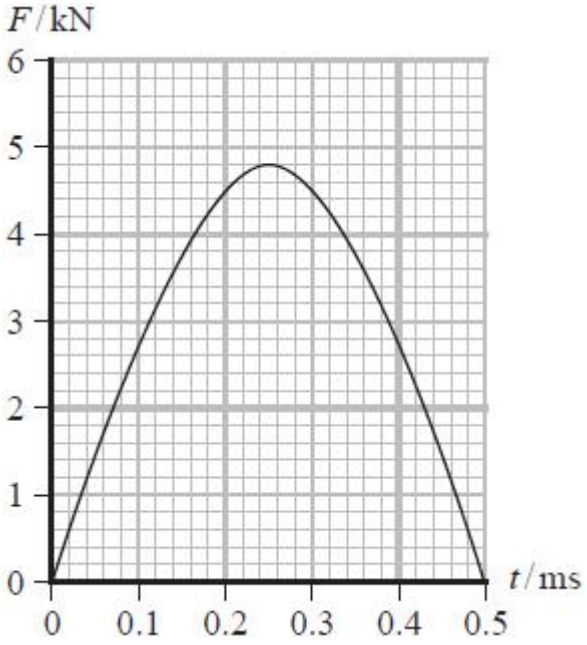
F = ...

(Total for question = 5 marks)

Q8.

In the game of golf a stationary ball is hit by a club. One of the aims of the game is to land the ball on a patch of ground called the green.

The graph shows how the force *F* exerted by the club on the ball varies with time *t* as the ball is hit.



(i) Show that the velocity of the ball is about 30 m s^{-1} immediately after it is hit by the club.

mass of ball = 0.046 kg

(3)

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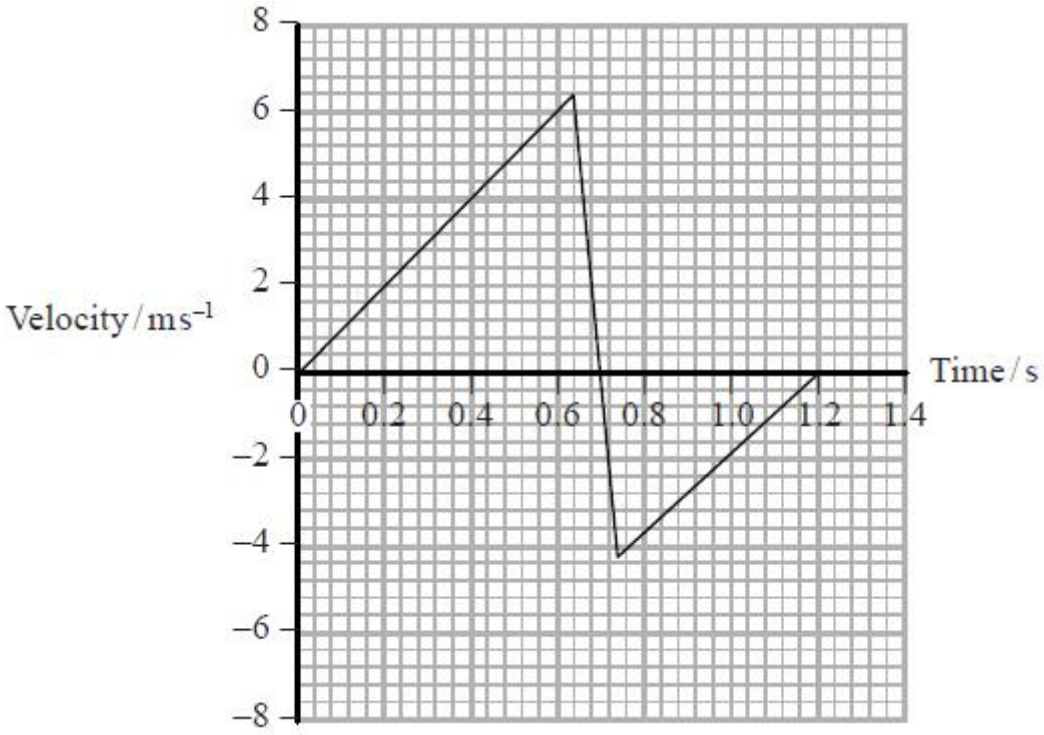
(Total for question = 3 marks)

Q9.

A stationary ball is released from a height of 2.0 m onto a hard surface.

The simplified velocity-time graph shows the motion of the ball as it falls and bounces back to its maximum height.



(c) Calculate the resultant force on the ball when it is in contact with the ground.

(3)

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Resultant force = ...

(Total for question = 3 marks)