AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



EXAM QUESTION PACK

4.5.7 MOMENTUM (PACK 1)

SCORE	PERCENTAGE
/70	%

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Q1.

Figure 1 shows a man using a resistance band when exercising.

The resistance band behaves elastically.

Figure 1



(a) What happens to the store of elastic potential energy of the resistance band when the band is stretched?

_____

(1)

(b) Explain what happens to the resistance band as it is released.

_____

_____

_____

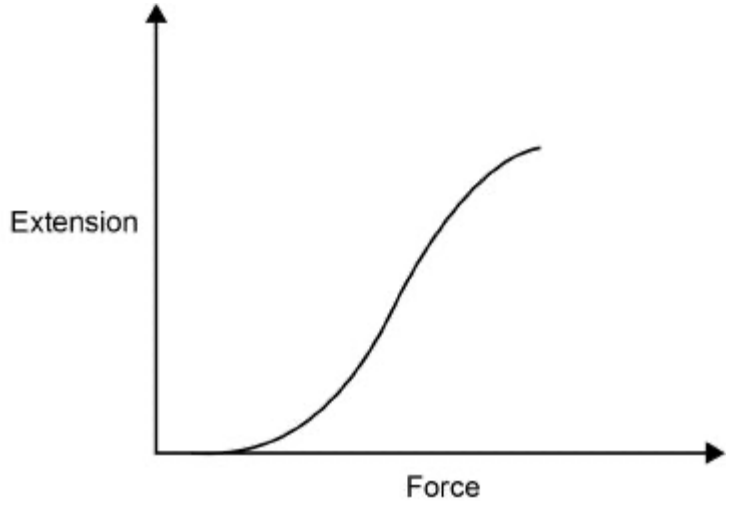
_____

(2)

(c) **Figure 2** shows how the extension of the resistance band changes as the force applied changes.

Figure 2

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Describe the trend shown in the graph.

_____

_____

_____

_____

(2)

Figure 3 shows a chest expander.

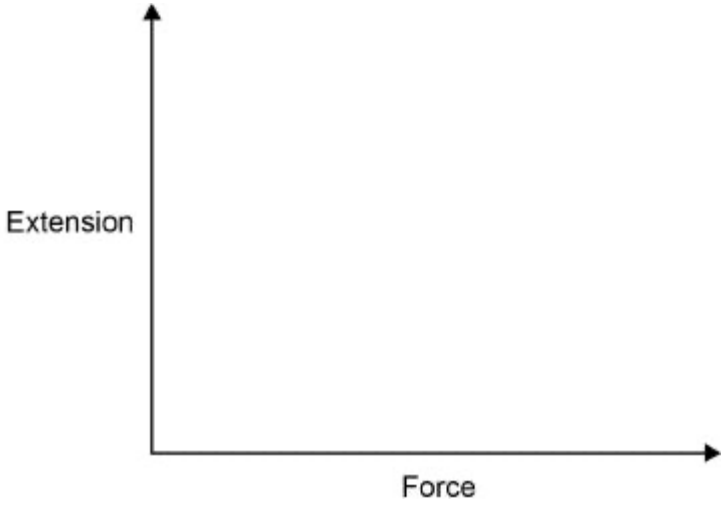
Figure 3



(d) Sketch a graph on **Figure 4** to show how the extension of a spring in the chest expander changes as the force applied changes.

Figure 4

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(2)

When a force is applied to a spring, the spring extends by 7.5 cm

(e) Write down the equation that links extension, force and spring constant.

_____

(1)

(f) Calculate the force applied to the spring.

The spring has a spring constant of 1 600 N/m

Use your equation from part **(e)**

_____

_____

_____

Force = _____ N

(3)

(Total 11 marks)

Q2.

The diagram below shows an ice skater, Skater A.



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(a) Write down the equation that links mass, momentum and velocity.

_____

(1)

(b) Skater **A** travels with a velocity of 3.2 m/s and has a momentum of 200 kg m/s

Calculate the mass of Skater **A**.

_____

_____

Mass = _____ kg

(3)

(c) Skater **A** bumps into another skater, Skater **B**. Skater **B** is stationary.

The skaters move off together in a straight line.

Explain what happens to the velocity of each of the skaters.

Use the idea of conservation of momentum.

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

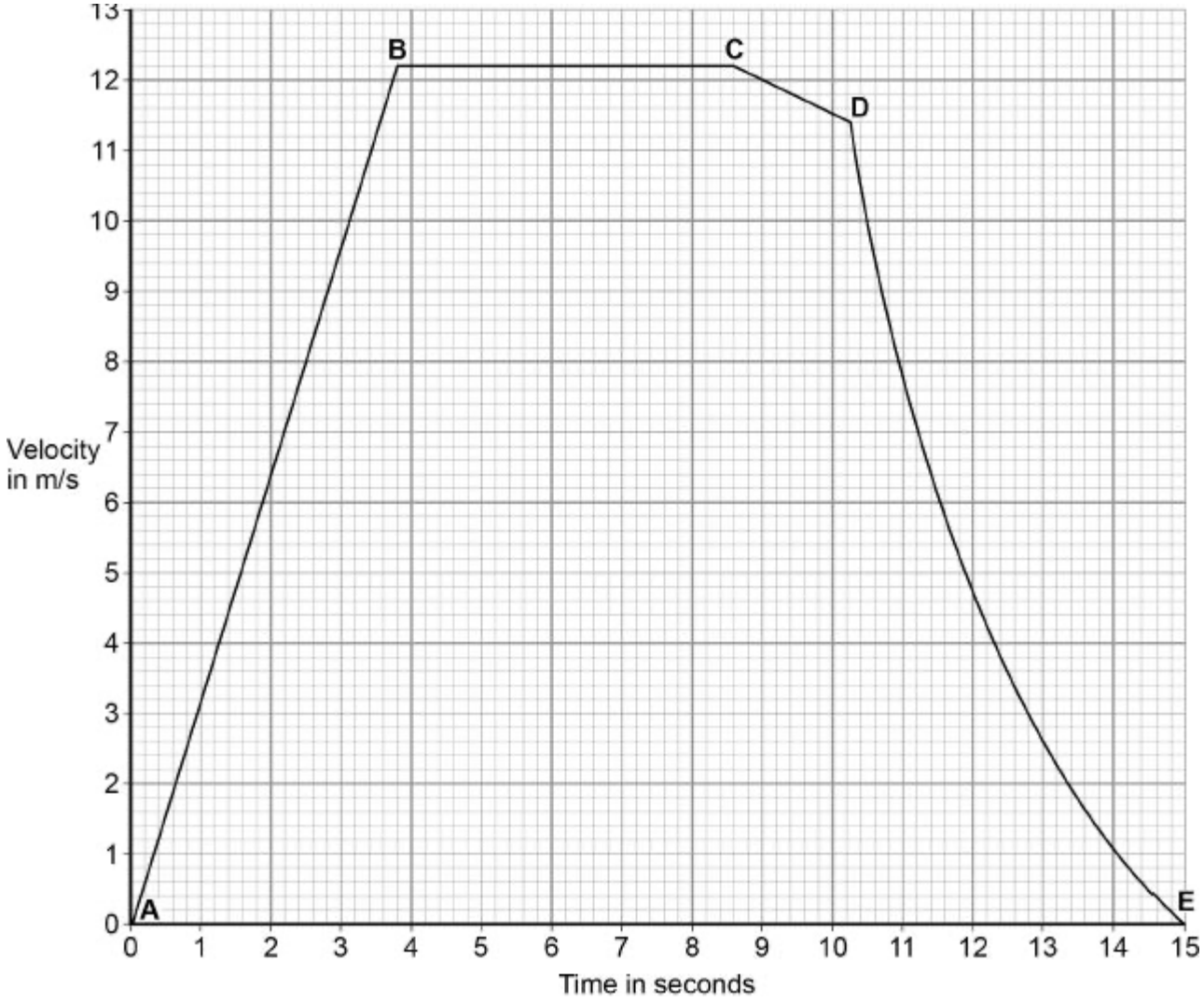
Q3.

An athlete takes part in a race on a straight, horizontal running track.

Figure 1 shows the velocity-time graph for the athlete during the race.

Figure 1

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(a) What is the main force that opposes the athlete's forward motion?

_____

_____

(1)

(b) Which section of the graph represents a part of the race where the resultant force on the athlete is zero?

Tick **one** box.

A–B	**B–C**	**C–D**	**D–E**
☐	☐	☐	☐

(1)

(c) The athlete has a mass of 94.8 kg

Calculate the momentum of the athlete at a time of 6.0 s

Use **Figure 1**.

_____

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Momentum = _____ kg m/s

(3)

(d) The acceleration is **not** constant from **D** to **E**.

Determine the acceleration at a time of 12.0 s

Use **Figure 1**.

Give the unit.

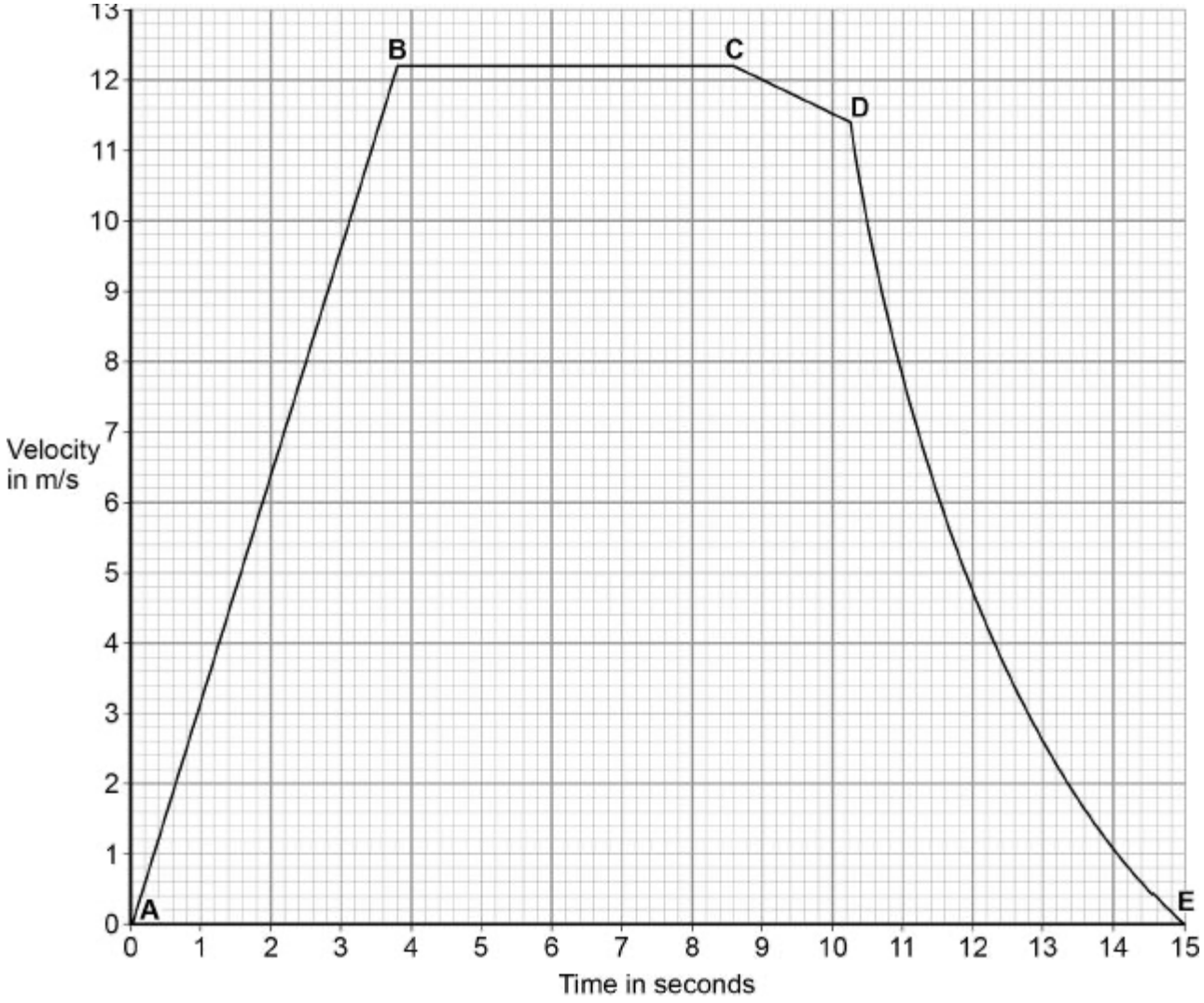
Acceleration = _____ Unit _____

(5)

Figure 2 is a copy of **Figure 1** to help you answer the following questions.

Figure 2

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A second athlete starts the race at the same time as the first athlete.

The second athlete moves with a constant acceleration of 1.6 m/s^2 for the first 6.0 seconds of the race.

The first athlete travels further than the second athlete during the first 6.0 seconds.

(e) Draw a line on **Figure 2** to represent the motion of the second athlete for the first 6.0 seconds of the race.

(2)

(f) Determine the extra distance travelled by the first athlete over the first 6.0 seconds of the race.

Use **Figure 2**.

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Extra distance travelled by first athlete = _____ m

(4)

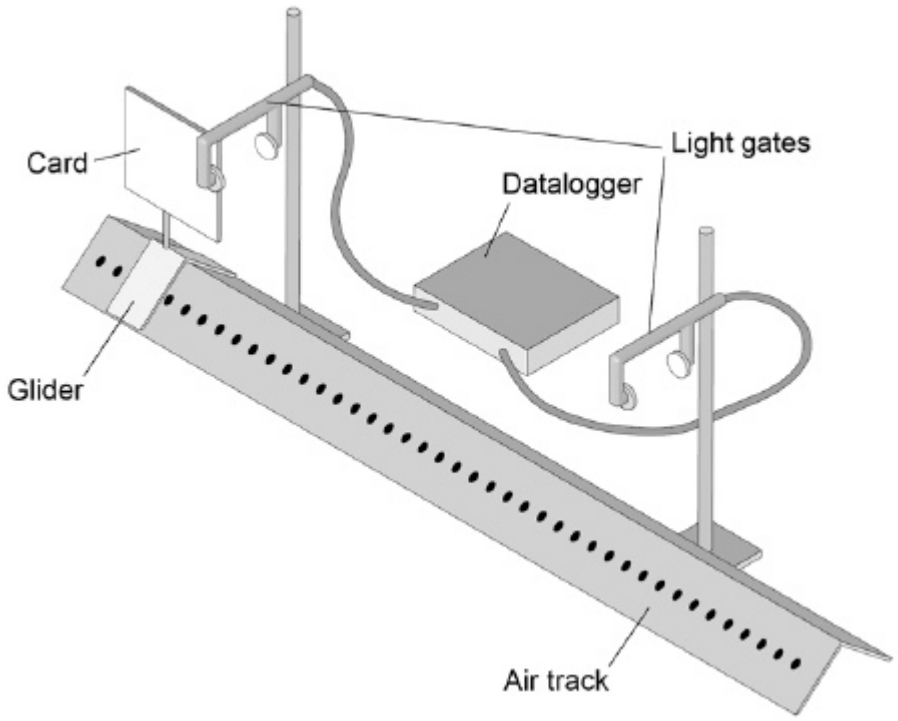
(Total 16 marks)

Q4.

A student investigated the motion of a glider on an air track.

Figure 1 shows the apparatus.

Figure 1



(a) The speed of the glider is the same at both ends of the air track.

What is the tendency for objects to continue at the same speed in the same direction called?

_____

(1)

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(b) The glider has a mass of 0.14 kg and a velocity of 17 cm/s

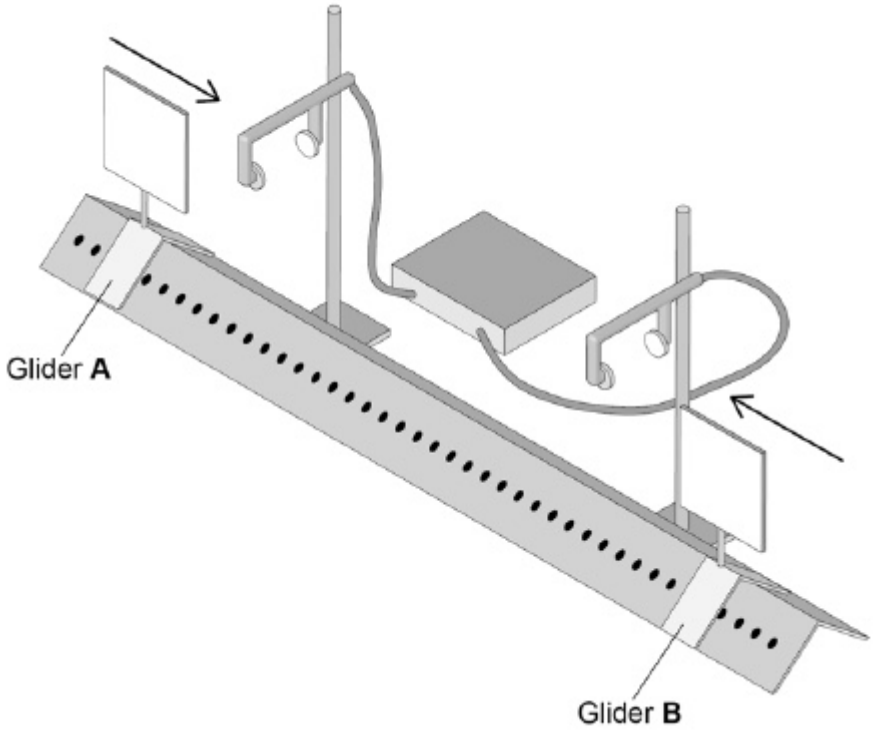
Calculate the momentum of the glider.

Momentum = _____ kg m/s

(3)

(c) **Figure 2** shows two identical gliders travelling at the same speed in opposite directions.

Figure 2



The gliders collide and stick together.

Explain what happens to the momentum and speed of the gliders.

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(4)

(d) The light gate on the air track shown in **Figure 3** aims a beam of light at a sensor.

A datalogger calculates the speed of the glider.

The datalogger divides the length of card by the time for which the card breaks the beam of light.

Figure 3

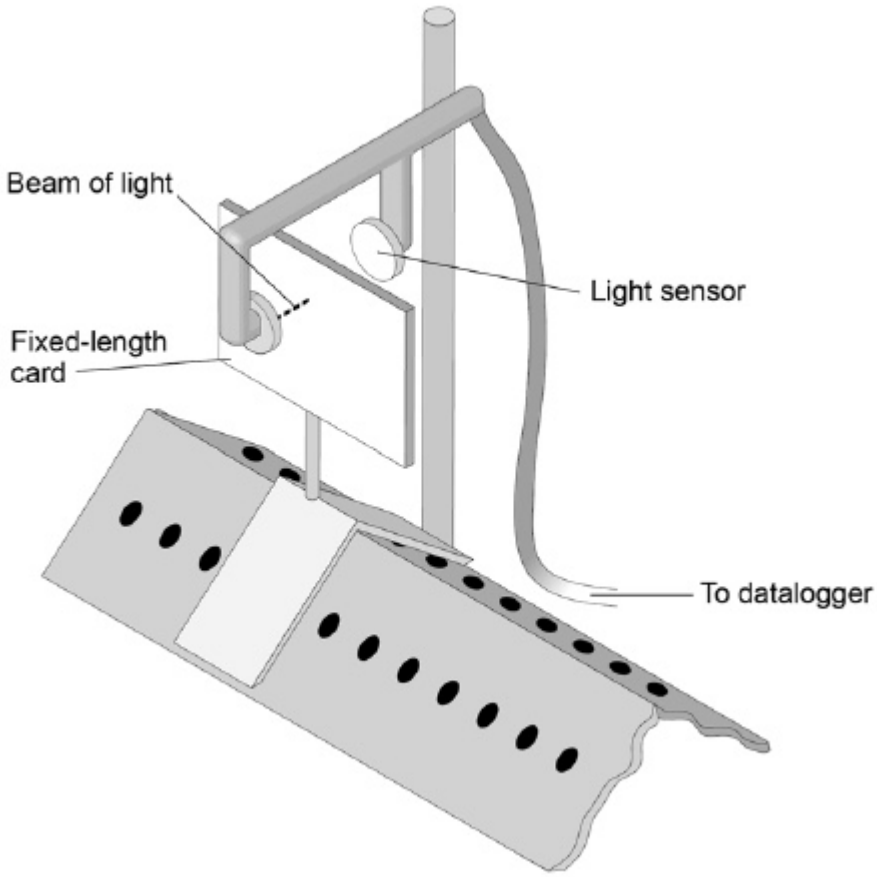
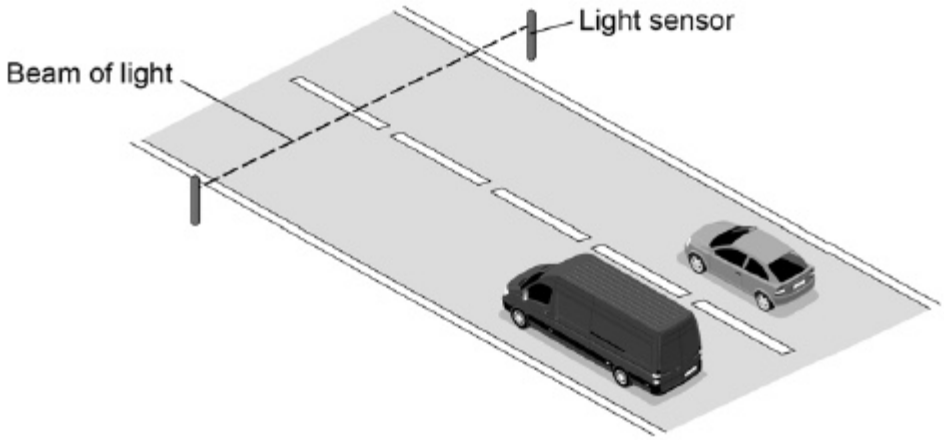


Figure 4 shows two vehicles on a road.

Figure 4

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The beam of light and light sensor shown in **Figure 4** are not suitable for determining the speed of vehicles on the road.

Give **two** reasons why they are **not** suitable.

Give an explanation for each reason.

Reason 1 _____

_____

Explanation _____

_____

Reason 2 _____

_____

Explanation _____

_____

(4)

(Total 12 marks)

Q5.

A swimmer dives off a boat.

Look at **Figure 1**.

Figure 1



(a) What **two** factors determine the momentum of the swimmer?

1. _____

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2. _____

(2)

(b) What is the unit of momentum?

Tick **one** box.

J / s ☐

kg m / s ☐

N m ☐

m / s^2 ☐

(1)

(c) The boat was stationary.

As the swimmer dives forwards, the boat moves backwards.

Use the idea of conservation of momentum to explain why the boat moves backwards.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(d) Explain what would happen to the motion of the boat if there were more people on the boat when the swimmer dived off.

_____

_____

_____

_____

(2)

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(e)



The swimmer's speed increases as she swims away from the boat.

The swimmer has a top speed.

Explain why.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(Total 14 marks)

Q6.

The figure below shows an ice skater standing on the ice.



Mass
70 kg

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(a) Write down the equation that links acceleration, change in velocity and time.

_____

(1)

(b) As the skater pushes away across the ice there is a small frictional force.

After pushing, the skater starts to move with a velocity of 5 m / s.

He slows to 3 m / s in 6 seconds.

Calculate the acceleration of the skater.

_____

_____

_____

Acceleration = _____ m / s^2

(2)

(c) Write down the equation that links acceleration, force and mass.

_____

(1)

(d) Friction reduces the speed of the skater.

Calculate the frictional force acting on the skater to slow him down.

_____

_____

_____

Frictional force = _____ N

(2)

(e) The skater stands still on the ice.

He throws his bag to a friend.

As he throws his bag forwards, the skater moves backwards across the ice.

Use the idea of conservation of momentum to explain why he moves backwards.

_____

_____

_____

_____

_____

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_____

_____

_____

(4)

(Total 10 marks)

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