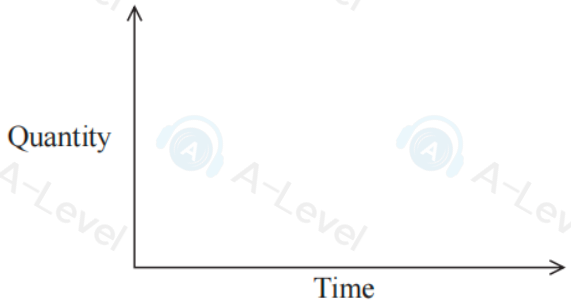
1 Graphs can be used to represent the motion of an object.



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 = 1 mark)

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10 A lift moves upwards from rest with an acceleration a. A student of mass 70 kg standing in the lift exerts a force of 800 N on the floor of the lift.

Which of the following expressions could be used to determine a?

☒ **A** $70g = 70a$

☒ **B** $800 = 70a$

☒ **C** $800 - 70g = 70a$

☒ **D** $70g - 800 = 70a$

(Total for Question 10 = 1 mark)

TOTAL FOR SECTION A = 10 MARKS

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8 A crane lifts a container of weight 4.0×10^5 N through a height of 25 m.

Which of the following gives the gravitational potential energy gained by the container in joules?

- ☒ **A** $4.0 \times 10^5 \times 9.81 \times 25$
- ☒ **B** $4.0 \times 10^5 \times 25$
- ☒ **C** $4.0 \times 10^5 \times 25 \div 9.81$
- ☒ **D** $4.0 \times 10^5 \div 9.81$

(Total for Question 8 = 1 mark)

9 The stiffness constant and the Young modulus are terms used in physics.

Which row of the table shows the correct application of these terms?

	Stiffness constant applies to	Young modulus applies to
☒ **A**	materials	materials
☒ **B**	objects	objects
☒ **C**	materials	objects
☒ **D**	objects	materials

(Total for Question 9 = 1 mark)

1 Which of the following units is equivalent to the watt?

- ☒ **A** Nm
- ☒ **B** Nm^{-1}
- ☒ **C** Js
- ☒ **D** Js^{-1}

(Total for Question 1 = 1 mark)

10 On a guitar two strings are tightened to the same tension. The diameter of one string is double the diameter of the other.

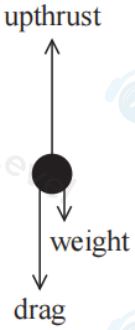
The stress in the thicker string is σ.

What is the stress in the thinner string?

- ☒ **A** 4σ
- ☒ **B** 2σ
- ☒ **C** $\frac{\sigma}{2}$
- ☒ **D** $\frac{\sigma}{4}$

(Total for Question 10 = 1 mark)

2 A bubble moves upwards through a fluid at a steady speed. The forces acting on the bubble are as shown.



Which equation correctly describes the forces acting on the bubble?

- ☒ **A** drag + upthrust = weight
- ☒ **B** weight + upthrust = drag
- ☒ **C** drag + weight – upthrust = 0
- ☒ **D** weight – drag + upthrust = 0

(Total for Question 2 = 1 mark)

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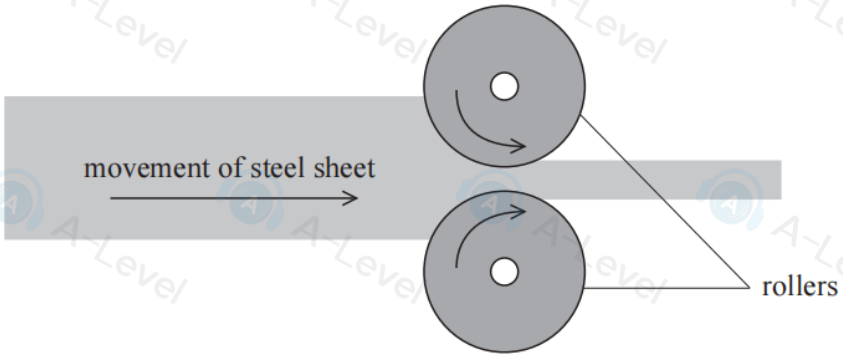
2 The thickness of a steel sheet is reduced by passing it between two rollers.



The thickness reduces because steel is

- ☒ **A** ductile.
- ☒ **B** hard.
- ☒ **C** malleable.
- ☒ **D** stiff.

(Total for Question 2 = 1 mark)

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14 Two rocks in outer space are moving at different speeds along the same path.

(a) State the principle of conservation of momentum.

(2)

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(b) Rock A has a mass of 43 kg and a velocity of $7.8\,m\,s^{-1}$.

Rock B has a mass of 56 kg and moves in the same direction as rock A. The kinetic energy of rock B is 4.1×10^3 J.

Rock B collides with rock A. After the collision, rock B continues to move in the same direction with a momentum of $530\,kg\,m\,s^{-1}$.

Calculate the new velocity of rock A.

(4)

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New velocity of rock A = ...

(Total for Question 14 = 6 marks)

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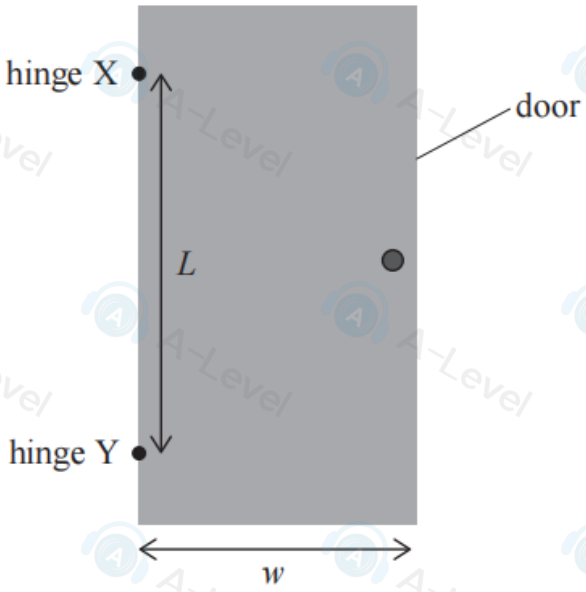
18 A uniform door of width w is supported by two hinges, X and Y.
X and Y are a vertical distance L apart as shown.



(a) State the conditions needed for the door to be in equilibrium.

(2)

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(b) Give the meaning of the term centre of gravity.

(1)

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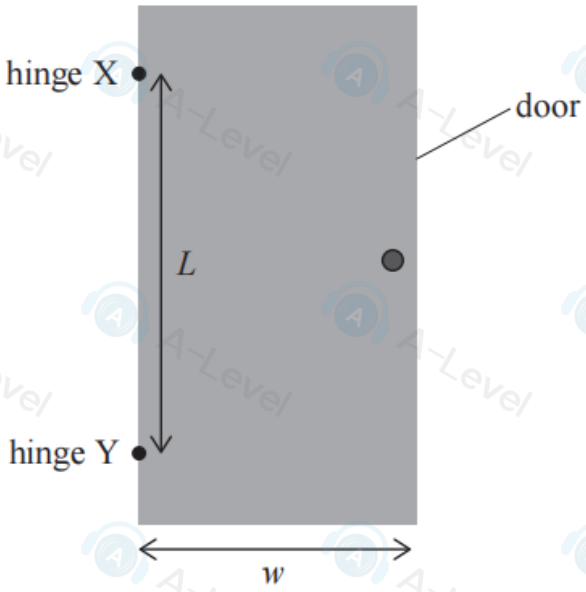
18 A uniform door of width w is supported by two hinges, X and Y.
X and Y are a vertical distance L apart as shown.



(a) State the conditions needed for the door to be in equilibrium.

(2)

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(b) Give the meaning of the term centre of gravity.

(1)

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(iii) An identical door is supported by hinges that are much closer together.

Explain how a smaller value of L affects F and θ.

You should consider moments about point X.

(4)

(Total for Question 18 = 16 marks)