

Name of the Student: \_\_\_\_\_

Max. Marks : 20 Marks

Time : 20 Minutes

**Q1.**

**P** and **Q** represent displacements.



What is the resultant displacement when **P** and **Q** are added?

**A**  ☐

**B**  ☐

**C**  ☐

**D**  ☐

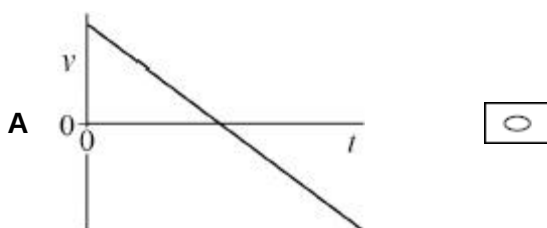
(Total 1 mark)

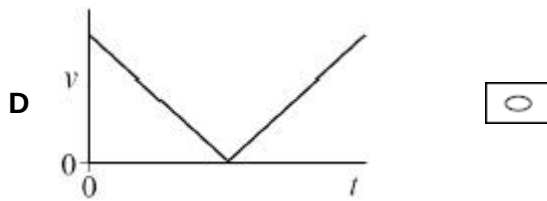
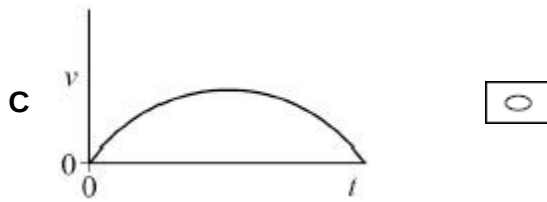
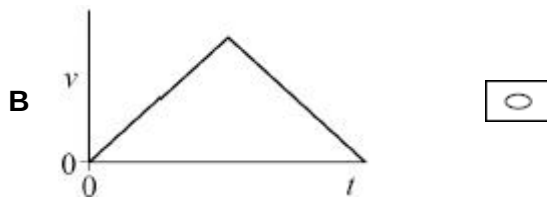
**Q2.**

A girl kicks a football vertically upwards at time  $t = 0$

Air resistance is negligible.

What is the variation of the vertical component of velocity  $v$  of the football with  $t$  until it reaches the ground?





(Total 1 mark)

### Q3.

A ball is dropped from a height  $h$ . The ball hits the ground with a velocity  $v$ .

The ball is now dropped from a height of  $2h$ .  
Air resistance is negligible.

What is the velocity at which the ball hits the ground?

**A**  $v$

☐

**B**  $\sqrt{2}v$

☐

**C**  $v\sqrt{2}$

☐

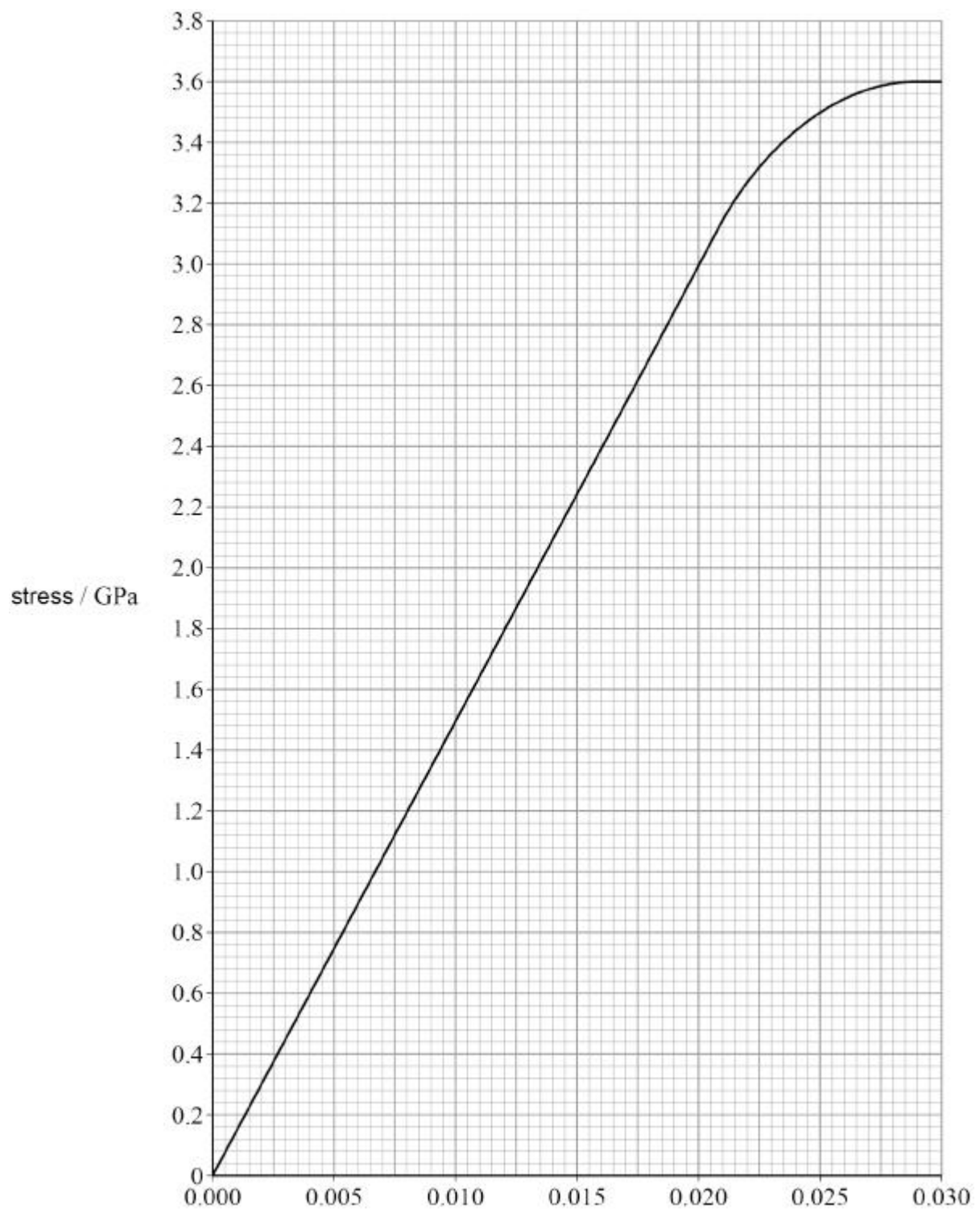
**D**  $2v$

☐

(Total 1 mark)

### Q4.

The graph shows the variation of stress with strain for a material.



What is the Young modulus of the material?

- A  $1.2 \times 10^5 \text{ Pa}$  ☐
- B  $1.5 \times 10^5 \text{ Pa}$  ☐
- C  $1.2 \times 10^{11} \text{ Pa}$  ☐
- D  $1.5 \times 10^{11} \text{ Pa}$  ☐

(Total 1 mark)

**Q5.**

A pellet of mass 25 g travelling horizontally at  $40 \text{ m s}^{-1}$  enters a fixed wooden block. The pellet stops after travelling a horizontal distance of 2.5 cm in the block.

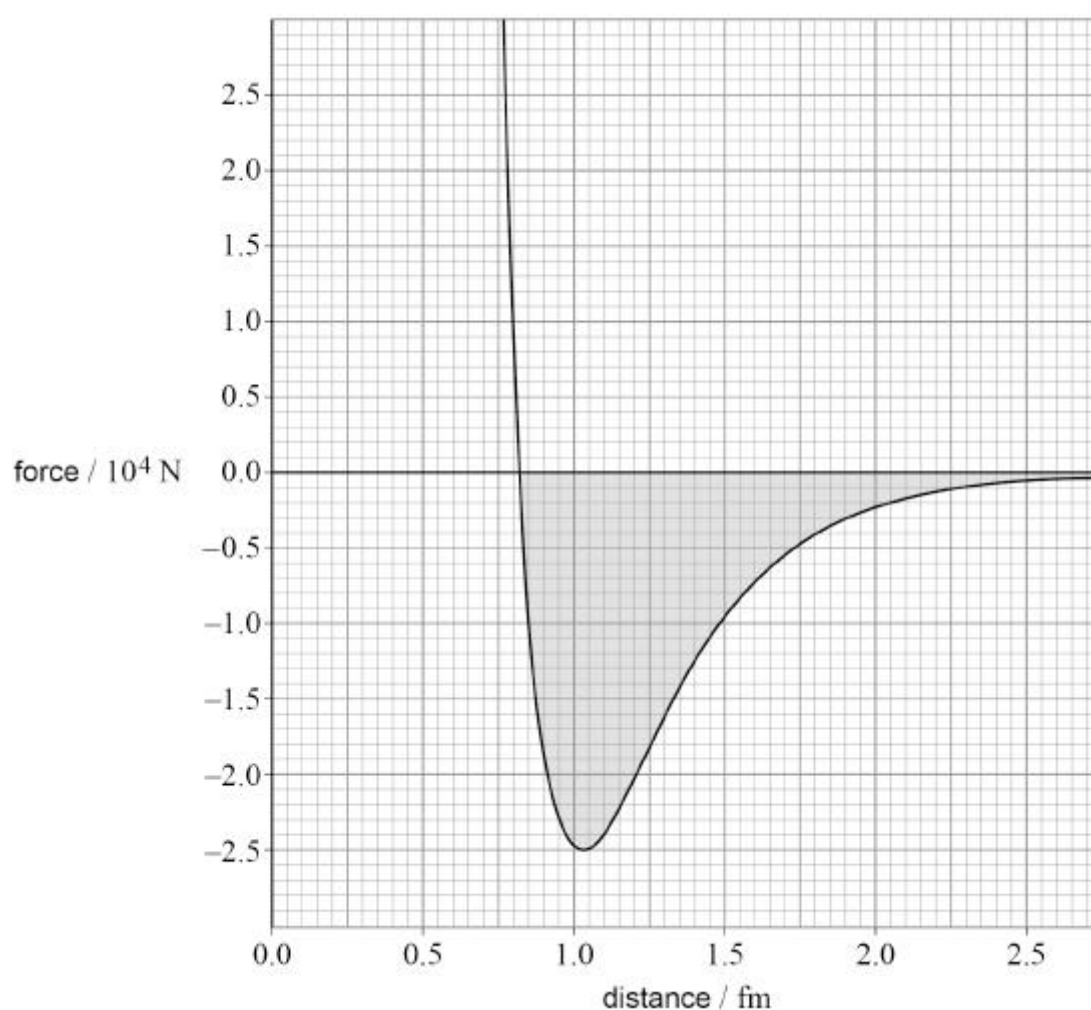
What is the average resistive force acting on the pellet?

- A 20 N ☐
- B 800 N ☐
- C 1600 N ☐
- D 8000 N ☐

(Total 1 mark)

**Q6.**

The graph shows the variation of force with distance between a proton and a neutron.



The shaded area represents

- A acceleration. ☐
- B impulse. ☐
- C rate of change of kinetic energy. ☐

D work done.

☐

(Total 1 mark)

Q7.

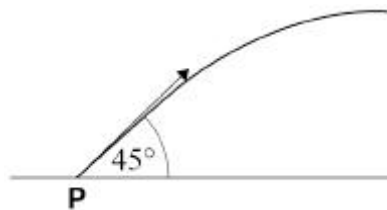
Which combination of an object's speed and journey time gives a distance travelled of 1 mm?

|   | Speed                   | Journey time       |                       |
|---|-------------------------|--------------------|-----------------------|
| A | $10 \mu\text{m s}^{-1}$ | 100 s              | <input type="radio"/> |
| B | $10 \text{ km s}^{-1}$  | $0.01 \mu\text{s}$ | <input type="radio"/> |
| C | $1 \text{ nm s}^{-1}$   | 1 Gs               | <input type="radio"/> |
| D | $0.1 \text{ Mm s}^{-1}$ | 100 ns             | <input type="radio"/> |

(Total 1 mark)

Q8.

A ball is kicked from point **P** on level ground. The ball initially travels at  $45^\circ$  to the horizontal. The ball reaches its maximum height after a time of 2.0 s. Air resistance can be ignored.



What is the displacement of the ball from **P** when at its maximum height?

- A 20 m ☐
- B 40 m ☐
- C 45 m ☐
- D 60 m ☐

(Total 1 mark)

Q9.

An object is moving in a straight line. A graph is plotted to show the variation of the momentum of the object with time.

Which quantities can be calculated from the gradient of the graph and the area under the graph?

|   | Gradient of graph | Area under graph           |                       |
|---|-------------------|----------------------------|-----------------------|
| A | power             | mass $\times$ displacement | <input type="radio"/> |
| B | force             | work done $\times$ time    | <input type="radio"/> |

|   |       |                            |                       |
|---|-------|----------------------------|-----------------------|
| C | power | work done $\times$ time    | <input type="radio"/> |
| D | force | mass $\times$ displacement | <input type="radio"/> |

(Total 1 mark)

### Q10.

Which is a pair of vectors?

- A weight and work ☐
- B force and energy ☐
- C displacement and momentum ☐
- D acceleration and power ☐

(Total 1 mark)

### Q11.

A sphere of mass  $m$  falls with speed  $v$ .

The resistive force on the sphere is  $kv$ , where  $k$  is a constant.

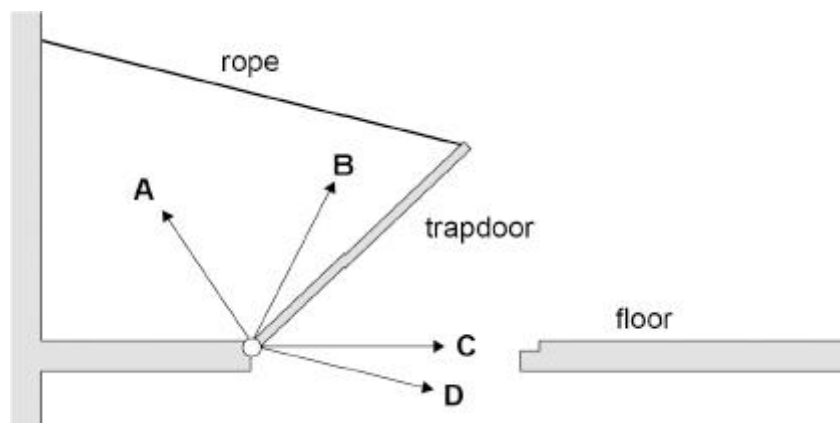
What is the terminal speed of the sphere?

- A  $\frac{mg}{k}$  ☐
- B  $\frac{km}{g}$  ☐
- C  $kmg$  ☐
- D  $\frac{k}{mg}$  ☐

(Total 1 mark)

### Q12.

A heavy uniform trapdoor is hinged to the floor. It is held open by a rope as shown.



Which arrow shows the direction of the reaction force of the hinge on the trapdoor?

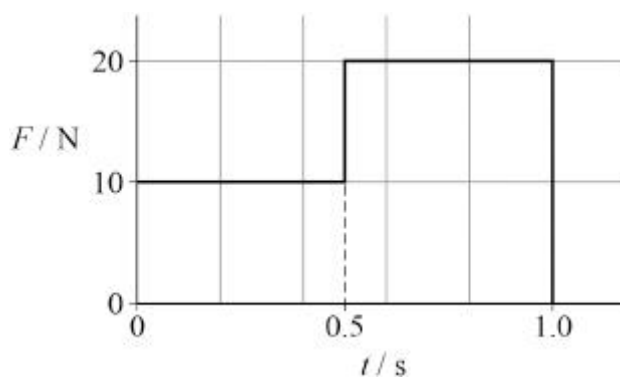
- A ☐
- B ☐
- C ☐
- D ☐

(Total 1 mark)

**Q13.**

A variable force  $F$  acts on an object of mass  $2.0 \text{ kg}$ . The object is at rest at time  $t = 0$

The graph shows the variation of  $F$  with  $t$ .



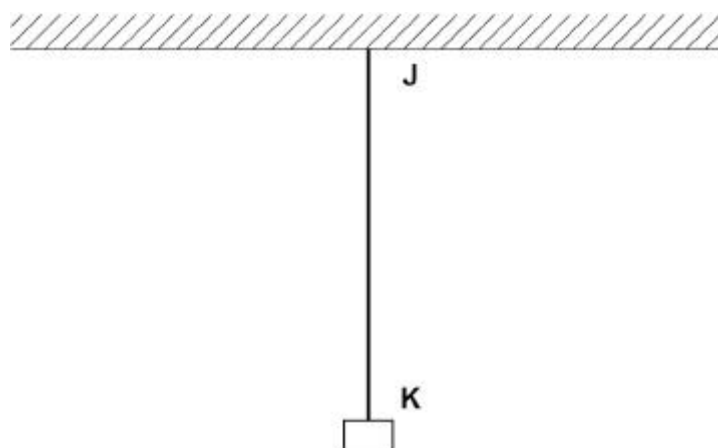
What is the speed of the object when  $t = 1.0 \text{ s}$ ?

- A  $3.75 \text{ m s}^{-1}$  ☐
- B  $5.00 \text{ m s}^{-1}$  ☐
- C  $7.50 \text{ m s}^{-1}$  ☐
- D  $15.0 \text{ m s}^{-1}$  ☐

(Total 1 mark)

**Q14.**

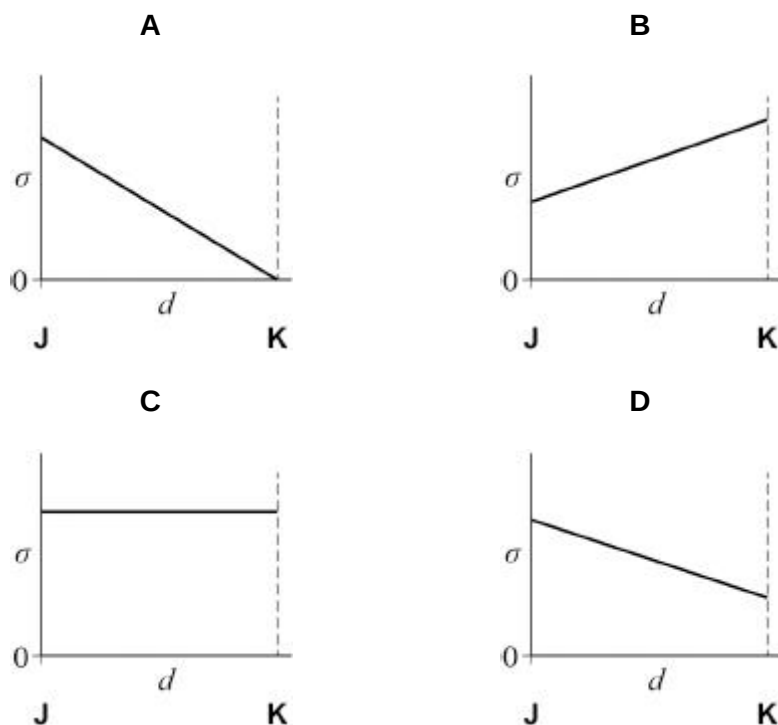
A heavy cable is attached to a fixed support and carries a load at its lower end.



The weight of the cable is **not** negligible.

The cable has constant cross-sectional area and density.

Which graph shows the variation of tensile stress  $\sigma$  in the cable with distance  $d$  from J to K?

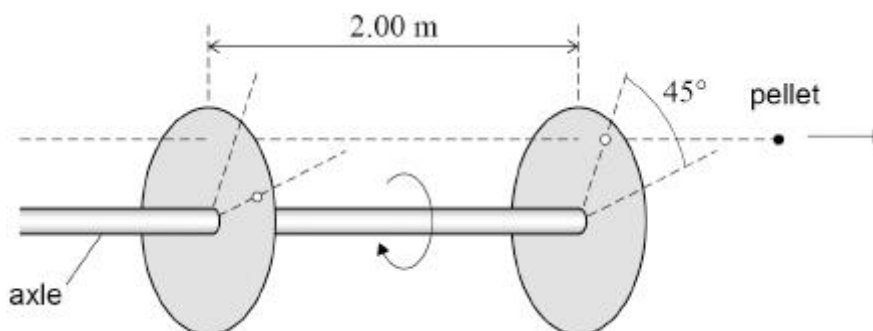


- A ☐
- B ☐
- C ☐
- D ☐

(Total 1 mark)

### Q15.

Two circular discs made of card rotate at constant speed on a common axle.



The discs are 2.00 m apart.

An air-gun pellet is fired parallel to the axle. The pellet makes holes in the discs.

The holes are separated by an angle of 45°.

The speed of the pellet between the discs is 300 m s<sup>-1</sup>.

How many revolutions does each disc complete in one second?

A 19

☐

B 118

☐

C 740

☐

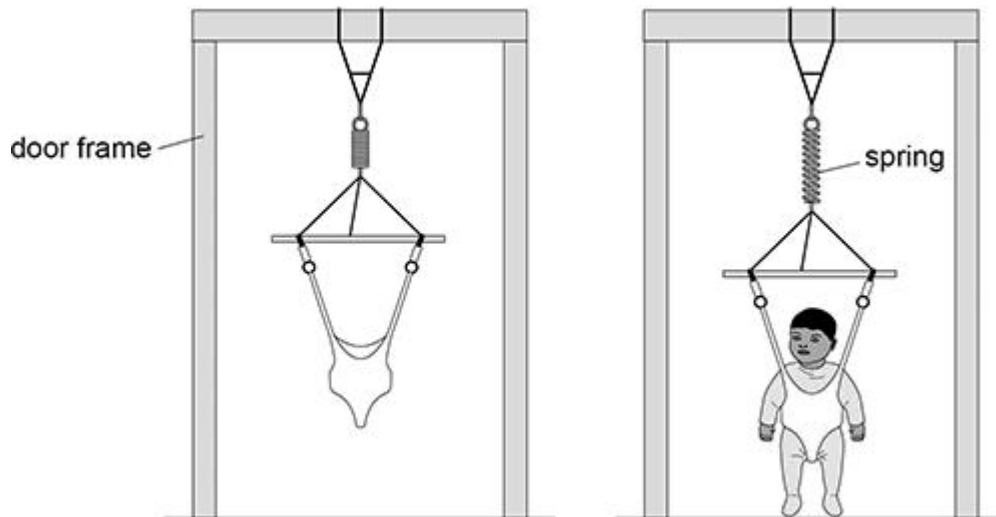
D 1074

☐

(Total 1 mark)

### Q16.

A baby bouncer consists of an inextensible harness attached to a spring.



The stiffness of the spring is in the range:

A 1–10 N m<sup>-1</sup>

☐

B 10–100 N m<sup>-1</sup>

☐

C 100–1000 N m<sup>-1</sup>

☐

D 1000–10 000 N m<sup>-1</sup>

☐

(Total 1 mark)

### Q17.

A mass **M** hangs in equilibrium from a vertical spring that obeys Hooke's law.

**M** is pulled down by 10 cm and then released to oscillate about the equilibrium position.

**M** returns to the equilibrium position for the first time 0.50 s after release.

Which row gives the amplitude and the period of the oscillations?

|   | Amplitude / cm | Period / s |                       |
|---|----------------|------------|-----------------------|
| A | 10             | 1.0        | <input type="radio"/> |
| B | 10             | 2.0        | <input type="radio"/> |

|          |    |     |                       |
|----------|----|-----|-----------------------|
| <b>C</b> | 20 | 2.0 | <input type="radio"/> |
| <b>D</b> | 20 | 1.0 | <input type="radio"/> |

(Total 1 mark)

### Q18.

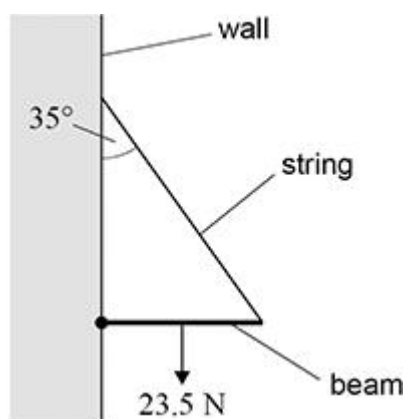
Which is a scalar quantity?

- A** force ☐
- B** kinetic energy ☐
- C** momentum ☐
- D** velocity ☐

(Total 1 mark)

### Q19.

A uniform beam of weight 23.5 N is attached by a hinge to a vertical wall and supported by a string. The string makes an angle of  $35^\circ$  to the wall.



What is the tension in the string?

- A** 14 N ☐
- B** 21 N ☐
- C** 29 N ☐
- D** 41 N ☐

(Total 1 mark)

### Q20.

Which description of a couple and its unit is correct?

|          | Description                           | Unit              |                       |
|----------|---------------------------------------|-------------------|-----------------------|
| <b>A</b> | consists of two equal parallel forces | $\text{N m}^{-1}$ | <input type="radio"/> |

|          |                                           |                   |                       |
|----------|-------------------------------------------|-------------------|-----------------------|
| <b>B</b> | produces translational motion             | N m               | <input type="radio"/> |
| <b>C</b> | consists of two equal and opposite forces | N m               | <input type="radio"/> |
| <b>D</b> | produces rotational motion                | N m <sup>-1</sup> | <input type="radio"/> |

**(Total 1 mark)**