

# Moments

## TOPIC QUESTIONS

<b>Level</b>	<b>AS Level</b>
<b>Subject</b>	<b>Physics</b>
<b>Exam Board</b>	<b>AQA</b>
<b>Paper Type</b>	<b>Multiple Choice</b>

Time Allowed : 30min



EXAM PAPERS PRACTICE

1. A ballbearing **X** of mass  $2m$  is projected vertically upwards with speed  $u$ . A ballbearing **Y** of mass  $m$  is projected at  $30^\circ$  to the horizontal with speed  $2u$  at the same time. Air resistance is negligible. Which of the following statements is correct?
- A The horizontal component of **Y**'s velocity is  $u$ .
  - B The maximum height reached by **Y** is half that reached by **X**
  - C **X** and **Y** reach the ground at the same time.
  - D **X** reaches the ground first.



2. What is the relationship between the distance  $y$  travelled by an object falling freely from rest and the time  $x$  the object has been falling?

A  $y$  is proportional to  $x^2$

B  $y$  is proportional to  $\sqrt{x}$

C  $y$  is proportional to  $\frac{1}{x}$

D  $y$  is proportional to  $\frac{1}{x^2}$

3. A car exerts a driving force of 500 N when travelling at a constant speed of  $72 \text{ km h}^{-1}$  on a level track. What is the work done in 5 minutes?

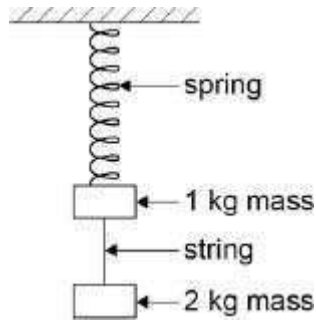
A  $3.0 \times 10^6 \text{ J}$

B  $2.0 \times 10^6 \text{ J}$

C  $2.0 \times 10^5 \text{ J}$

D  $1.1 \times 10^5 \text{ J}$

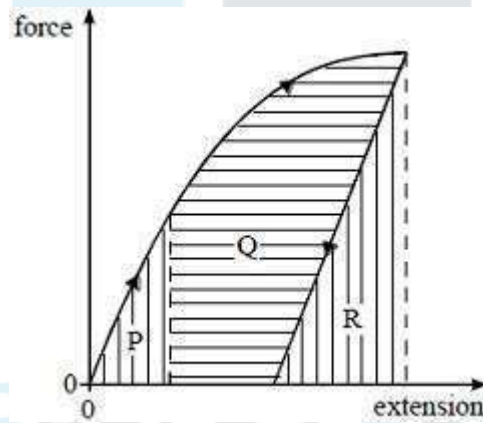
4. Two masses hang at rest from a spring, as shown in the diagram. The string separating the masses is burned through.



Which of the following gives the accelerations of the two masses as the string breaks? acceleration of free fall =  $g$

	acceleration of 1 kg mass upwards in $\text{m s}^{-2}$	acceleration of 2 kg mass downwards in $\text{m s}^{-2}$	
A	$3g$	$1g$	<input type="checkbox"/>
B	$2g$	$2g$	<input type="checkbox"/>
C	$2g$	$1g$	<input type="checkbox"/>
D	$1g$	$1g$	<input type="checkbox"/>

5. An object falls freely from rest. After falling a distance  $d$  its velocity is  $v$ . What is its velocity after it has fallen a distance  $2d$ ?
- A  $2v$
- B  $4v$
- C  $2v^2$
- D  $\sqrt{2}v$
6. The force on a sample of a material is gradually increased and then decreased. The graph of force against extension is shown in the diagram.



The increase in thermal energy in the sample is represented by area

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

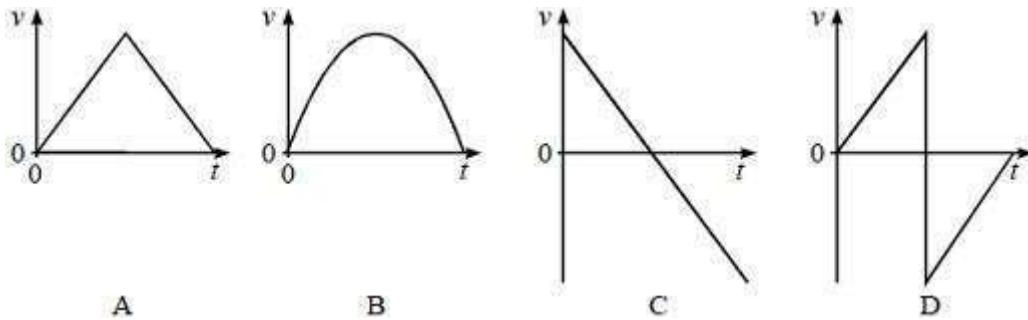
7. The diagram shows a strobe photograph of a mark on a trolley X, moving from right to left, in collision with another trolley Y which had no mark on it.

After the collision both trolleys are in motion together.

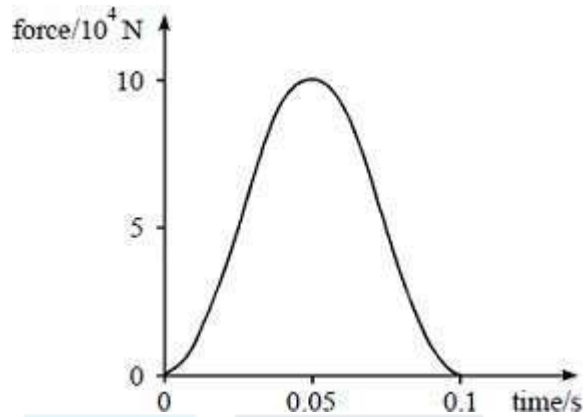


Which **one** of the following is consistent with the photograph?

- A Trolley Y has the same mass as trolley X and was initially stationary
  - B Trolley Y had a smaller mass than X and was moving from right to left
  - C Trolley Y had the same mass and was initially moving left to right at the same speed as trolley X
  - D Trolley Y had the same mass and was initially moving left to right at a higher speed than trolley X
8. A perfectly elastic rubber ball falls vertically from rest and rebounds from the floor. Which one of the following velocity-time,  $v-t$ , graphs best represents the motion from the moment of release to the top of the first rebound?



9. The diagram shows the graph of force on a car against time when the car of mass 500 kg crashes into a wall without rebounding.



Which one of the following statements is correct?

- A The area under the graph is equal to the initial momentum of the car
  - B Momentum is not conserved in the collision
  - C Kinetic energy is conserved in the collision
  - D The average force exerted on the car is  $10 \times 10^4$  N
10. A stone is projected horizontally by a catapult consisting of two rubber cords. The cords, which obey Hooke's law, are stretched and released. When each cord is extended by  $x$ , the stone is projected with a speed  $v$ . Assuming that all the strain energy in the rubber is transferred to the stone, what is the speed of the stone when each cord is extended by  $2x$ ?

- A  $v$
- B  $\sqrt{2}v$
- C  $2v$

**D** 4v

11. A suitcase weighing 200 N is placed on a weighing scale in a lift. The scale reads 180 N when the lift is moving.

The lift is

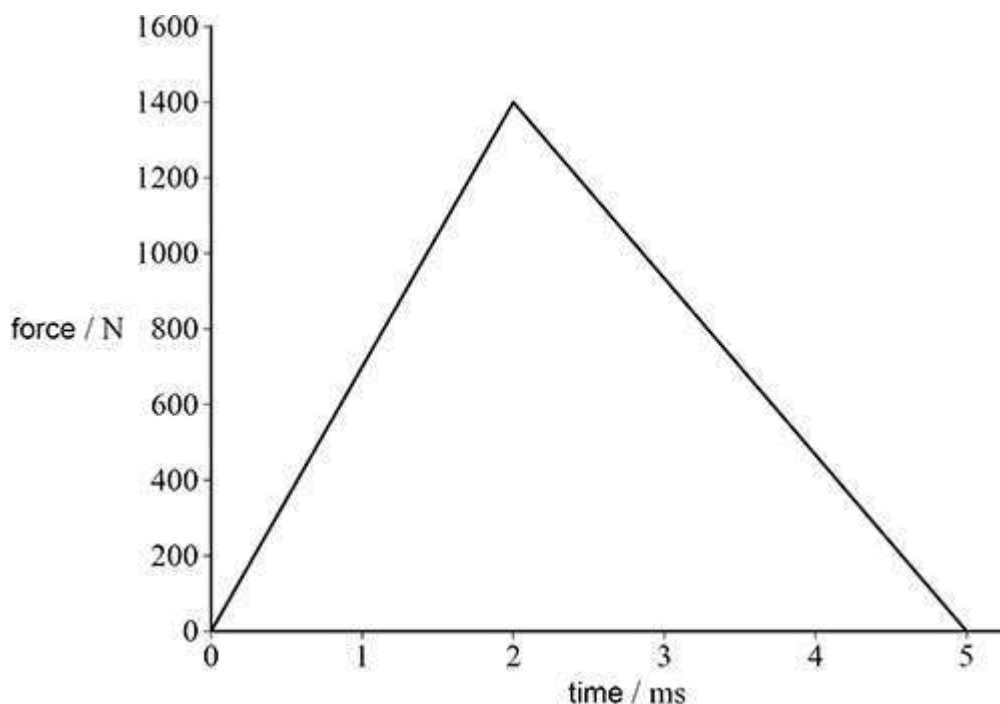
- A** moving down at a constant velocity.
- B** moving down with a decreasing velocity.
- C** moving up at a constant velocity.
- D** moving up with a decreasing velocity.





12. A stationary ball is free to move. The ball is hit with a bat.

The graph shows how the force of the bat on the ball changes with time.



The ball has a mass of 0.044 kg.

What is the speed of the ball immediately after being hit?

**A**  $13 \text{ m s}^{-1}$

**B**  $60 \text{ m s}^{-1}$

**C**  $80 \text{ m s}^{-1}$

**D**  $160 \text{ m s}^{-1}$

13. The question below is about three spheres **X**, **Y** and **Z**.

The relative mass and relative diameter of each sphere are given in the table.

	<b>X</b>	<b>Y</b>	<b>Z</b>
relative mass	1	5	1
relative diameter	1	1	5

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Each sphere is dropped from rest and accelerates to its terminal speed.

What is true about the accelerations of the spheres at the instant they are released?

- A The acceleration of **X** is less than that of **Y**.
- B The acceleration of **X** is greater than that of **Z**.
- C The acceleration of **X** is the same as that of **Y**.
- D The acceleration of **Y** is less than that of **Z**.

14. The question below is about three spheres **X**, **Y** and **Z**.

The relative mass and relative diameter of each sphere are given in the table.

	<b>X</b>	<b>Y</b>	<b>Z</b>
relative mass	1	5	1
relative diameter	1	1	5

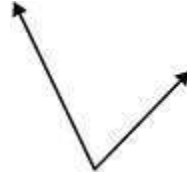
Each sphere is dropped from rest and accelerates to its terminal speed.

What is true about the terminal speeds?

- A The terminal speed of **X** is greater than that of **Y**.
- B The terminal speed of **X** is the same as that of **Y**.
- C The terminal speed of **Y** is greater than that of **Z**.
- D The terminal speed of **X** is less than that of **Z**.

15. The diagram shows a vector diagram of two forces acting on an object. The diagram is drawn to scale.

The magnitude of the smaller force is 5.0 N.



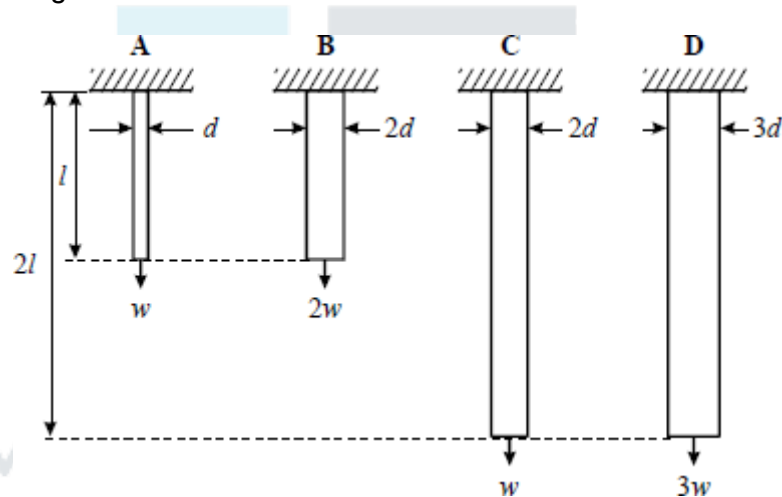
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What is the magnitude of the resultant force on the object?

- A 3.2 N
- B 7.5 N
- C 8.6 N
- D 9.6 N

16. The four bars A, B, C and D have diameters, lengths and loads as shown. They are all made of the same material.

Which bar has the greatest extension?



(Total 1 mark)

17. For which of the following relationships is the quantity  $y$  related to the quantity  $x$  by the

relationship  $x \propto \frac{1}{y}$ ?

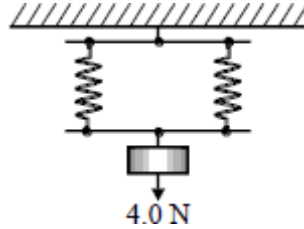
	$x$	$y$
A	energy stored in a spring	extension of the spring
B	gravitational field strength	distance from a point mass
C	de Broglie wavelength of an electron	momentum of the electron
D	period of a mass-spring system	spring constant (stiffness) of the

		spring
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18. A load of 4.0 N is suspended from a parallel two-spring system as shown in the diagram.

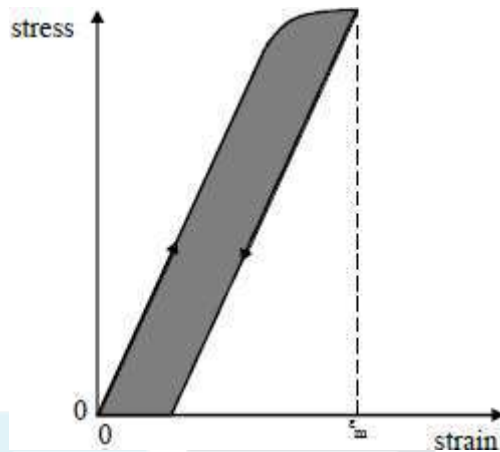


The spring constant of each spring is  $20 \text{ N m}^{-1}$ . The elastic energy, in J, stored in the system is

- A 0.1
- B 0.2
- C 0.4
- D 0.8



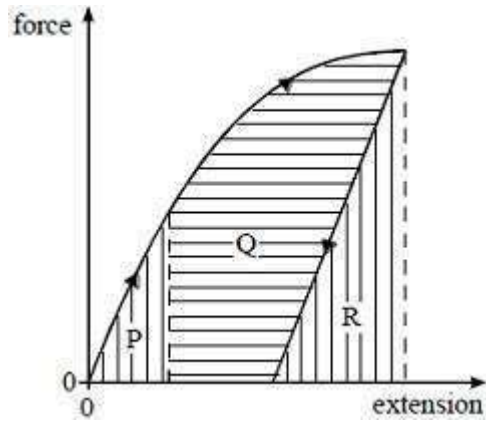
19. The graph shows the variation of stress with strain for a ductile alloy when a specimen is slowly stretched to a maximum strain of  $\epsilon_m$  and the stress is then slowly reduced to zero.



The shaded area

- A represents the work done per unit volume when stretching the specimen
- B represents the energy per unit volume recovered when the stress is removed
- C represents the energy per unit volume which cannot be recovered
- D has units of  $\text{J m}^{-1}$

20. The force on a sample of a material is gradually increased and then decreased. The graph of force against extension is shown in the diagram.



The increase in thermal energy in the sample is represented by area

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