

# Scalars and Vectors

## TOPIC QUESTIONS

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

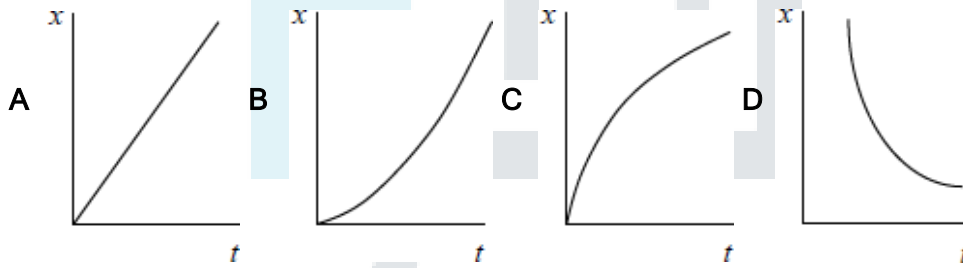
Time Allowed : 30min

EXAM PAPERS PRACTICE

1. Which of the following is **not** a unit of power?

- A  $\text{N m s}^{-1}$
- B  $\text{kg m}^2 \text{s}^{-3}$
- C  $\text{J s}^{-1}$
- D  $\text{kg m}^{-1} \text{s}^{-1}$

2. A car accelerates uniformly from rest along a straight road. Which graph shows the variation of displacement  $x$  of the car with time  $t$ ?



EXAM PAPERS PRACTICE

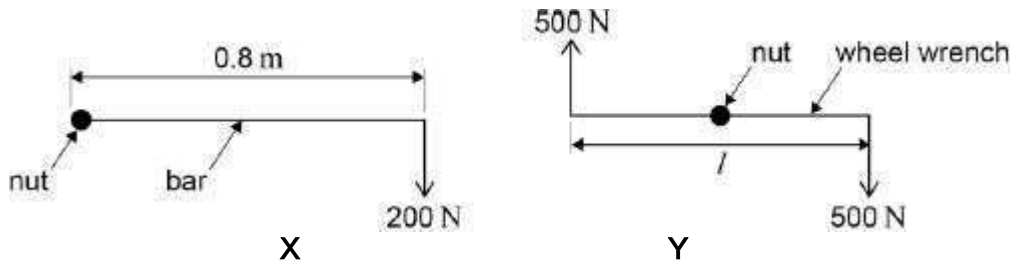
3. Which of the following statements is correct? The force acting on an object is equivalent to

- A its change of momentum.
- B the impulse it receives per second.
- C the energy it gains per second.
- D its acceleration per metre.

4. Two forces of 6 N and 10 N act at a point. Which of the following could **not** be the magnitude of the result?

- A 16 N
- B 8 N
- C 5 N
- D 3 N

5. A car wheel nut can be loosened by applying a force of 200 N on the end of a bar of length 0.8 m as in **X**. A car mechanic is capable of applying forces of 500 N simultaneously in opposite directions on the ends of a wheel wrench as in **Y**.



What is the minimum length  $l$  of the wrench which would be needed for him to loosen the nut?

- A 0.16 m
  - B 0.32 m
  - C 0.48 m
  - D 0.64 m
6. A steel ball of weight  $W$  falls through oil. At a time **before** the ball reaches terminal velocity, the magnitude of the viscous resistance force on the ball is
- A zero
  - B between zero and  $W$
  - C equal to  $W$
  - D greater than  $W$

7. A raindrop of mass  $m$  falls to the ground at its terminal speed  $v$ . The specific heat capacity of water is  $c$  and the acceleration of free fall is  $g$ . Given that 25% of the energy is retained in the raindrop when it strikes the ground, what is the rise in temperature of the raindrop?

A

$$\frac{mv^2}{8c}$$

B  $\frac{v^2}{4mc}$

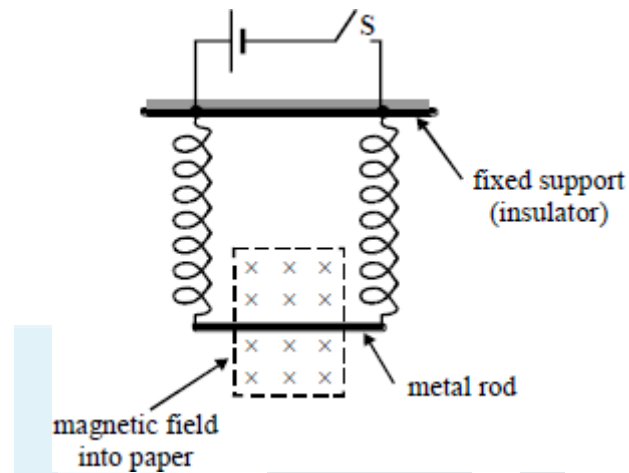
C  $\frac{mg}{4c}$

D  $\frac{v^2}{8c}$



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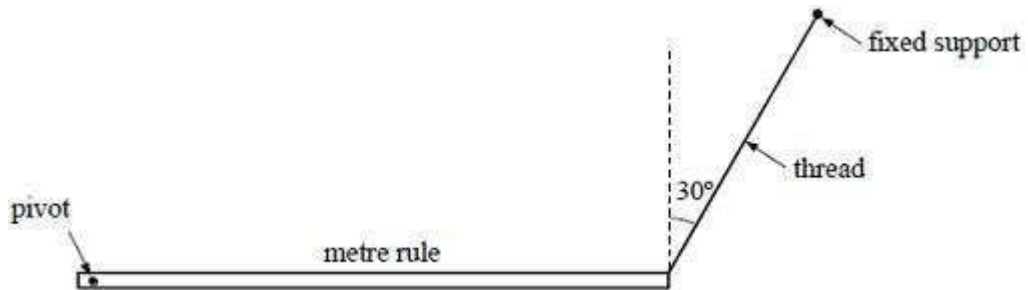
8. The diagram shows a metal rod suspended in a magnetic field by two vertical conducting springs. The cell and rod have negligible resistance. When the switch **S** is closed the effect of the magnetic field is to displace the rod vertically a distance  $y$ .



When both the spring constant and electrical resistance of **each** spring is doubled, closing the switch would now cause the rod to be displaced a distance

- A  $\frac{y}{2}$   
B  $\frac{y}{4}$   
C  $y$   
D  $4y$

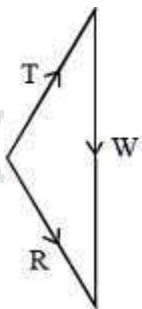
9. A pivoted metre rule is supported in equilibrium horizontally by a thread inclined at  $30^\circ$  to the vertical.



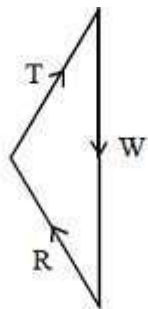
The three forces acting on the rule

are: its weight  $W$ ,  
 the tension  $T$  in the thread;  
 the reaction force  $R$  at the pivot.

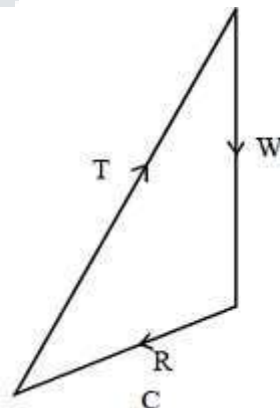
Which one of these diagrams, drawn to scale, represents the magnitudes and directions of these three forces?



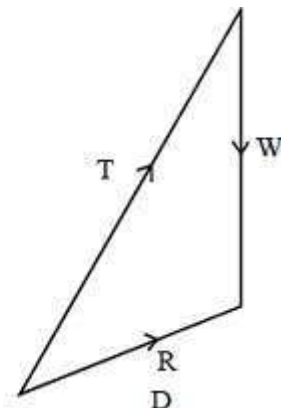
A



B

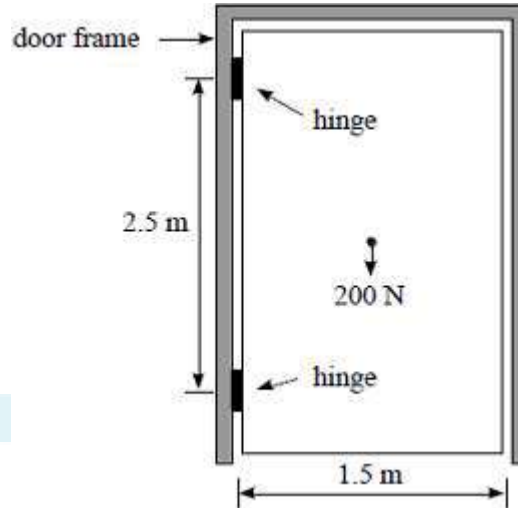


C



D

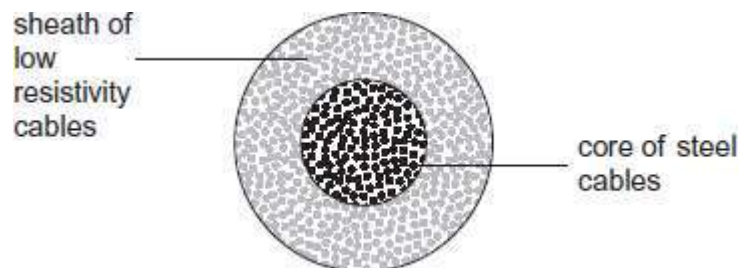
10. The diagram shows a uniform door hanging from two hinges 2.5 m apart.



The moment of the couple that the hinges exert on the door is

- A 150 N m
- B 200 N m
- C 250 N m
- D 500 N m

11. The overhead cables used to transmit electrical power by the National Grid usually consist of a central core of steel cables surrounded by a sheath of cables of low resistivity material, such as aluminium.

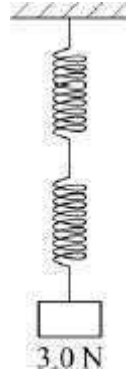


What is the main purpose of the steel core?

- A To force more current into the outer sheath.
- B To provide additional current paths through the cables.
- C To reduce the power lost from the cables.
- D To increase the mechanical strength of the cables.



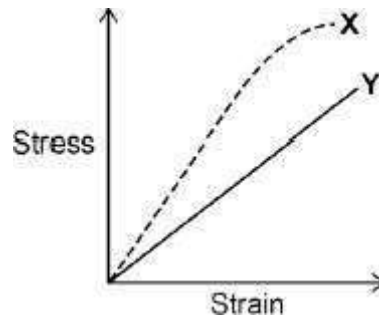
12. A load of 3.0 N is attached to a spring of negligible mass and spring constant  $15 \text{ N m}^{-1}$ .



What is the energy stored in the spring?

- A 0.3 J
- B 0.6 J
- C 0.9 J
- D 1.2 J

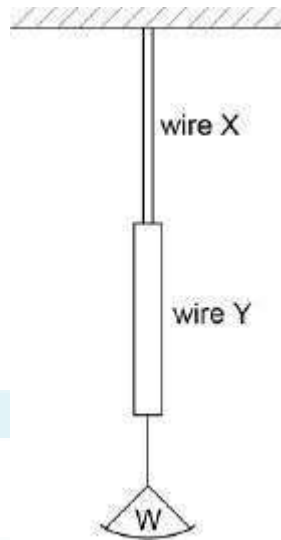
13. The diagram shows how the stress varies with strain for metal specimens X and Y which are different. Both specimens were stretched until they broke.



Which of the following is incorrect?

- A X is stiffer than Y
- B X has a higher value of the Young modulus
- C X is more brittle than Y
- D Y has a lower maximum tensile stress than X

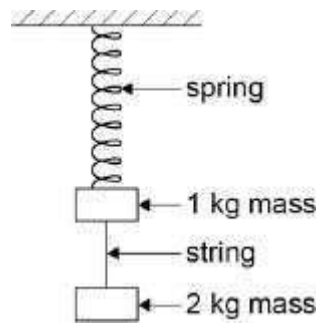
14. Two vertical copper wires X and Y of equal length are joined as shown. Y has a greater diameter than X. A weight  $W$  is hung from the lower end of Y.



Which of the following is correct?

- A** The strain in X is the same as that in Y.
- B** The stress in Y is greater than that in X.
- C** The tension in Y is the same as that in X.
- D** The elastic energy stored in X is less than that stored in Y.

15. 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	$3g$	$1g$
B	$2g$	$2g$
C	$2g$	$1g$
D	$1g$	$1g$

16. An electron has speed  $v$ . The electron's kinetic energy is doubled.

What is the new speed of the electron?

- A  $\frac{v}{\sqrt{2}}$
- B  $\sqrt{2}v$
- C  $2v$
- D  $4v$

17. An object of mass  $m$  is accelerated from rest to a velocity  $v$  by a constant resultant force

$F$ . What is the work done on the object during this acceleration?

A  $\frac{Fv}{2}$

B  $Fv$

C  $mv^2$

D  $\frac{mv^2}{2}$

18. What is true for an inelastic collision between two isolated objects?

A Both total momentum and total kinetic energy are conserved.

B Neither total momentum nor total kinetic energy is conserved.

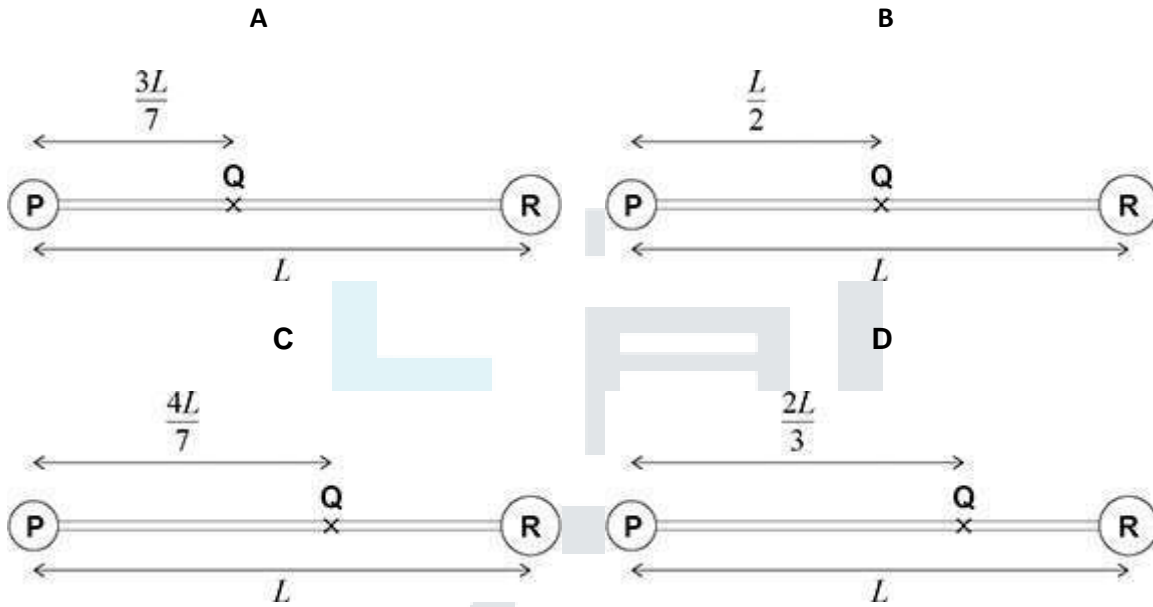
C Only total kinetic energy is conserved.

D Only total momentum is conserved.

EXAM PAPERS PRACTICE

**19.** **P** and **R** are uniform spheres of mass 3 kg and 4 kg respectively.  
**P** and **R** are joined by a rod of negligible mass.  
 The distance between their centres is  $L$ .  
 The centre of mass of this system is at **Q**.

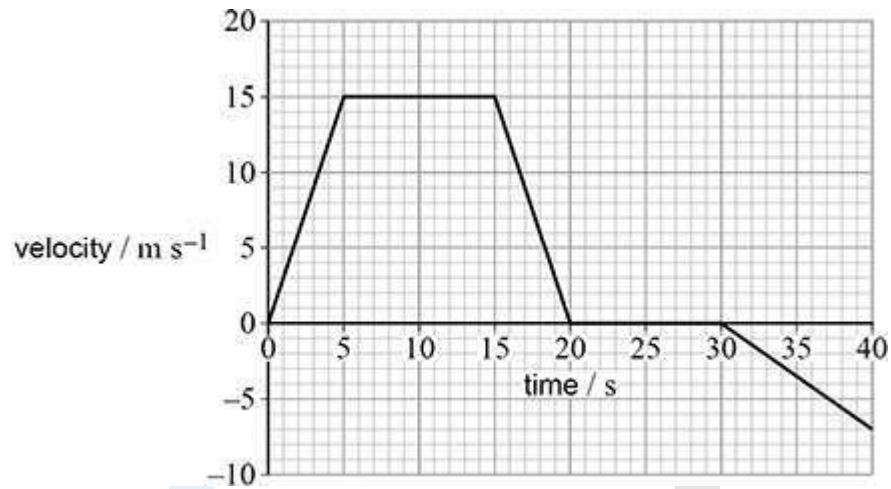
Which diagram shows the position of the centre of mass?



- A
- B
- C
- D

EXAM PAPERS PRACTICE

20. A vehicle travels on a straight road, starting at time  $t = 0$ . The graph shows how its velocity varies with time.



What is the distance of the vehicle from its start position when  $t = 40$  s?

- A 115 m
- B 190 m
- C 260 m
- D 370 m