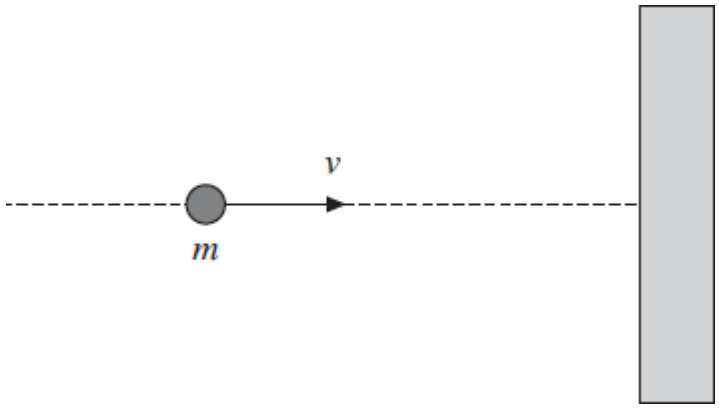
Bulk Properties of Solids

TOPIC QUESTIONS

Level	AS Level
Subject	Physics
Exam Board	AQA
Paper Type	Multiple Choice

Time Allowed : 30min

1. A ball of mass m travelling at velocity v collides normally with a smooth wall, as shown in thediagram, and rebounds elastically.



Which line, **A** to **D**, in the table, gives the correct expressions for the magnitude of the change ofmomentum, and the change of kinetic energy, of the ball?

	magnitude of change ofmomentum	change of kinetic energy
A	$2mv$	0
B	$2mv$	mv^2
C	0	0
D	0	mv^2

2. A cricket ball of mass 0.16 kg travelling at a speed of 35 ms^{-1} is hit by a bat and, as a result of the impact, leaves the bat in the opposite direction at 30 ms^{-1}. If the duration of the impact is 52 ms,what is the magnitude of the average force on the ball?

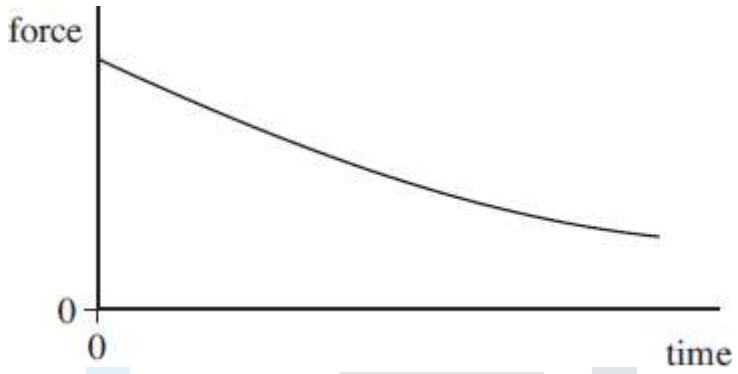
A 0.015 N

B 0.20 N

C 15 N

D 200 N

3. A ball is released so that it falls vertically. The graph shows how the resultant force acting on theball changes with time.



Which one of the following is represented by the area under the graph?

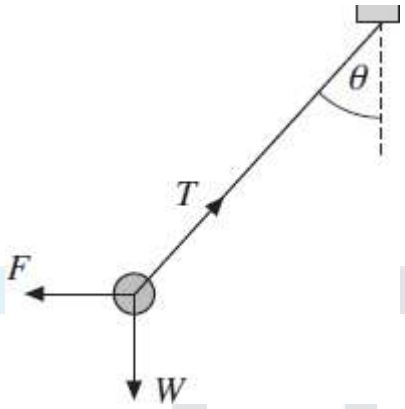
A distance travelled

B gain in kinetic energy

C acceleration

D impulse

4. A small sphere, of mass m and carrying a charge Q, is suspended from a thread and placed in a uniform horizontal electric field of strength E. When the sphere comes to rest the thread makes an angle θ with the vertical and the tension in it is T, as shown in the diagram. W is the weight ofthe sphere and F is the electric force acting on it.



Under these conditions, which one of the following equations is

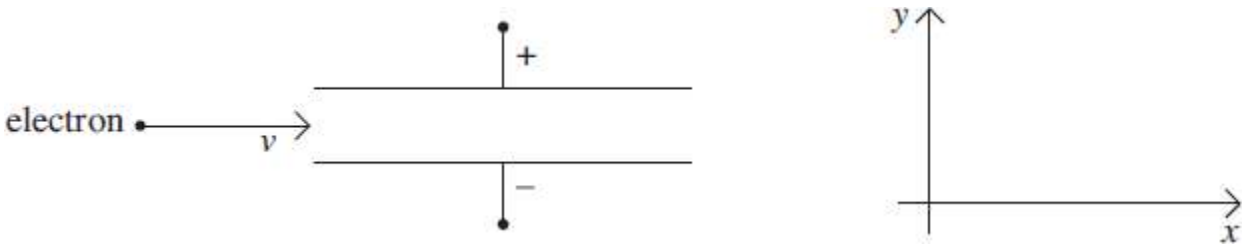
incorrect?A $T \sin\theta = EQ$

B $T = mg\cos\theta + EQ\sin\theta$

C $T^2 = (EQ)^2 + (mg)^2$

D $mg = EQ$
$\tan\theta$

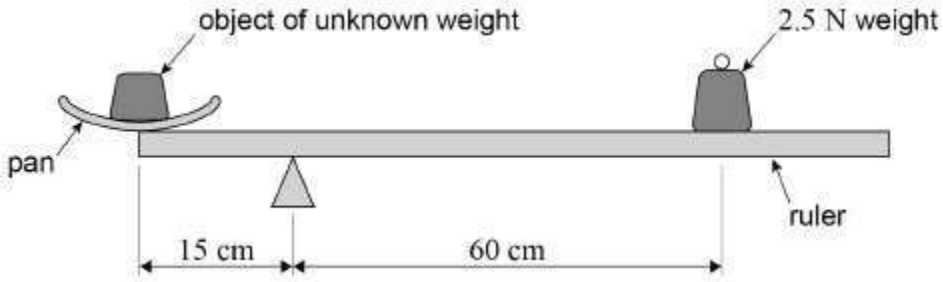
5. A beam of electrons, moving with a constant velocity v in a vacuum, enters a uniform electric field between two metal plates.



Which line, **A** to **D**, in the table describes the components of the acceleration of the electrons in the x and y directions as they move through the field?

	acceleration in x direction	acceleration in y direction
A	zero	zero
B	zero	constant
C	constant	zero
D	constant	constant

6. The diagram shows a uniform metre ruler of weight 1.5 N pivoted 15 cm from one end for use asa simple balance.



A scale pan of weight 0.5N is placed at the end of the ruler and an object of unknown weight is placed in the pan. The ruler moves to a steady horizontal position when a weight of 2.5N is added at a distance of 60cm from the pivot as shown.

What is the weight of the object?

A 9.5 N

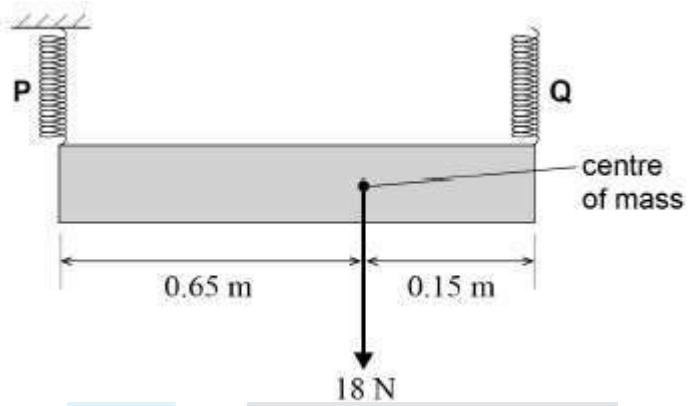
B 10.0 N

C 13.0 N

D 13.5 N

7. A non-uniform sign is 0.80 m long and has a weight of 18 N

It is suspended from two vertical springs **P** and **Q**. The springs obey Hooke's law and the spring constant of each spring is 240 N m^{-1}



The top end of spring **P** is fixed and the top end of spring **Q** is adjusted until the sign is horizontal and in equilibrium.

What is the extension of spring **Q**?

A 0.014 m

B 0.038 m

C 0.049 m

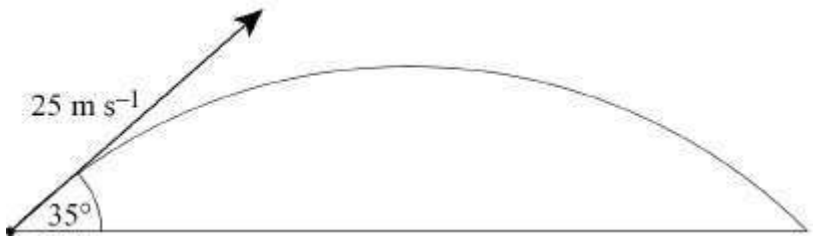
D 0.061 m

8. Three coplanar forces F_1, F_2 and F_3 act on a point object.

Which combination of forces can never produce a resultant force of zero?

	F_1 / N	F_2 / N	F_3 / N
A	3	4	5
B	8	8	8
C	2	10	10
D	3	6	10

9. A projectile is launched with a speed of 25 m s^{-1} at an angle of 35° to the horizontal, as shown inthe diagram.



Air resistance is negligible.

What is the time taken for the projectile to return to the ground?

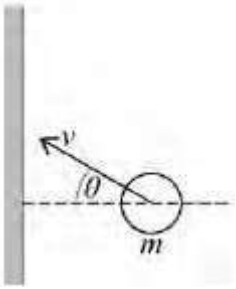
A 1.5 s

B 2.1 s

C 2.9 s

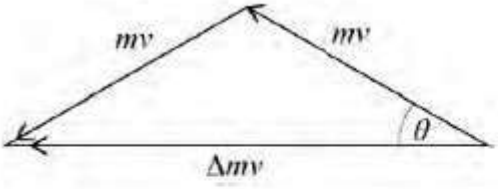
D 4.2 s

10. The diagram shows a gas particle about to collide elastically with a wall.

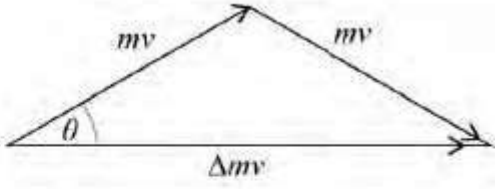


Which diagram shows the correct change in momentum Δmv that occurs during the collision?

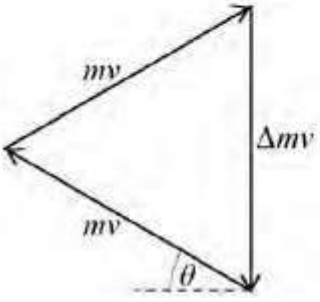
A



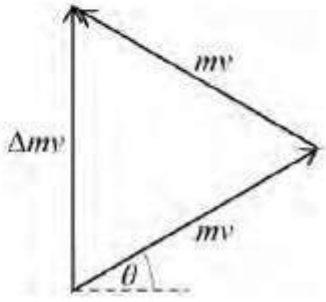
B



C



D



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

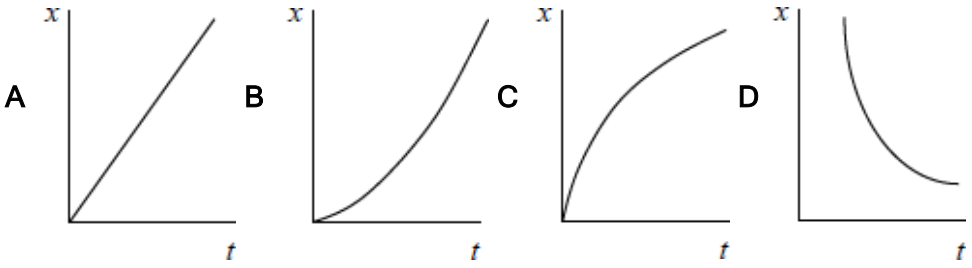
A N m s^{-1}

B $\text{kg m}^2\text{ s}^{-3}$

C J s^{-1}

D $\text{kg m}^{-1}\text{ s}^{-1}$

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



13. 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.

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

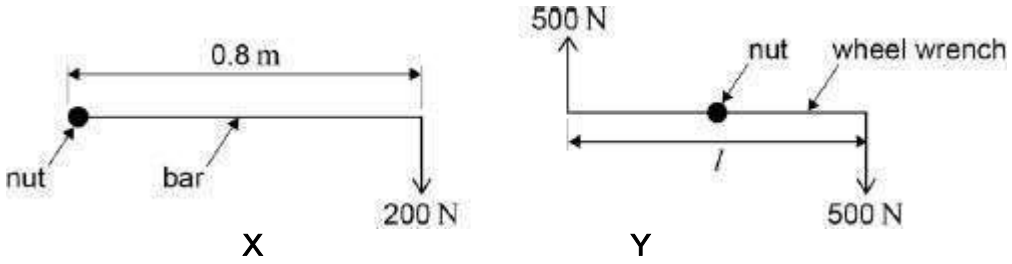
A 16 N

B 8 N

C 5 N

D 3 N

15. 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**.



X **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

16. 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*

17. 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

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

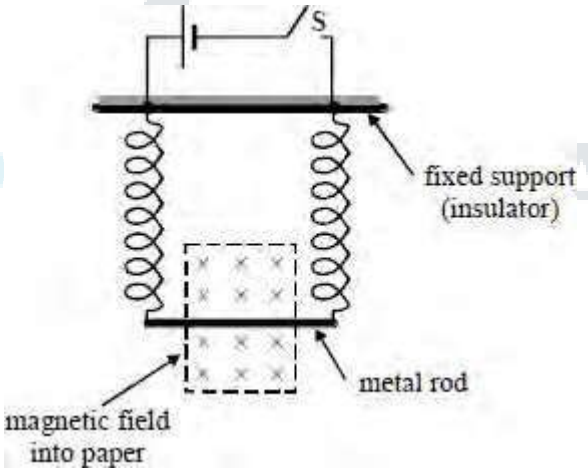
C

$\frac{mg}{4c}$

D

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

18. 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 magneticfield is to displace the rod vertically a distance *y*.



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

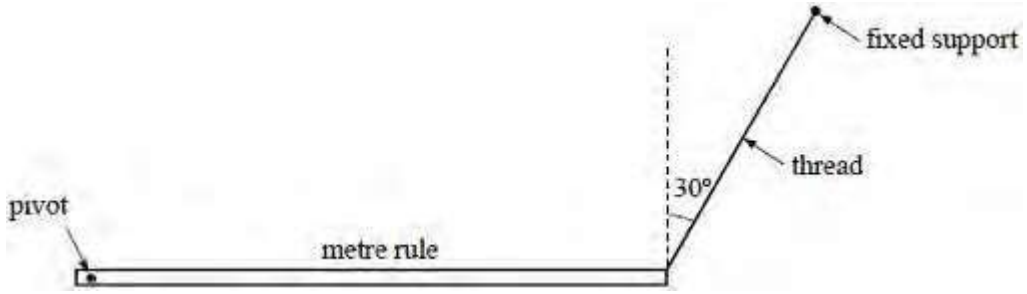
A $\frac{y}{2}$

B $\frac{y}{4}$

C y

D $4y$

19. A pivoted metre rule is supported in equilibrium horizontally by a thread inclined at 30° to the vertical.

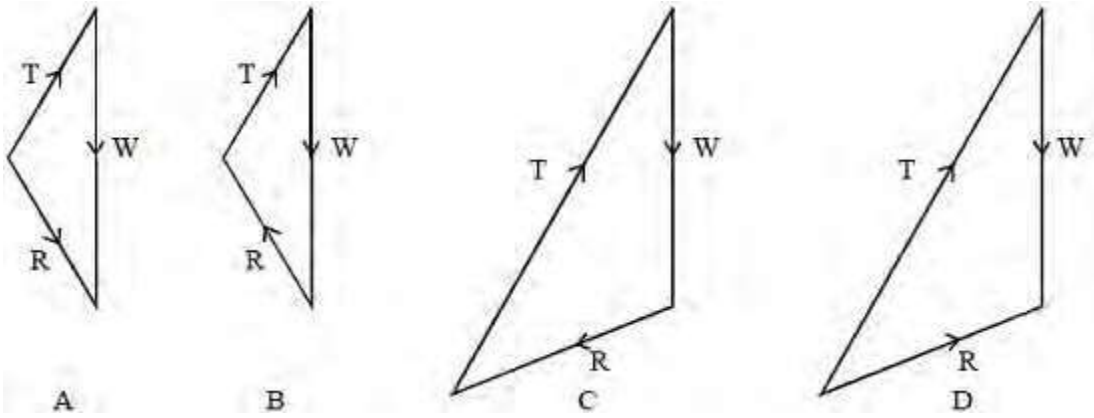


The three forces

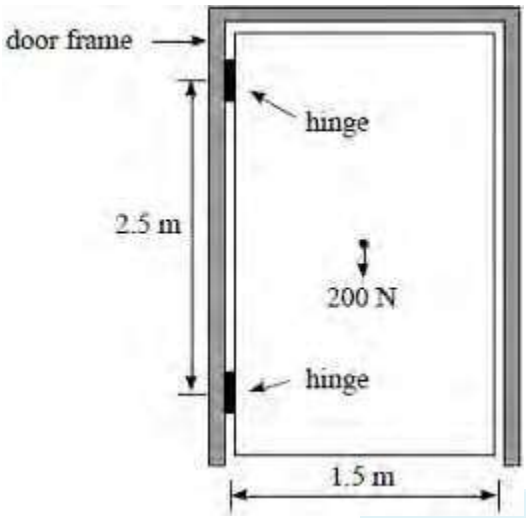
acting on the rule are:

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 thesethree forces?



20. 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