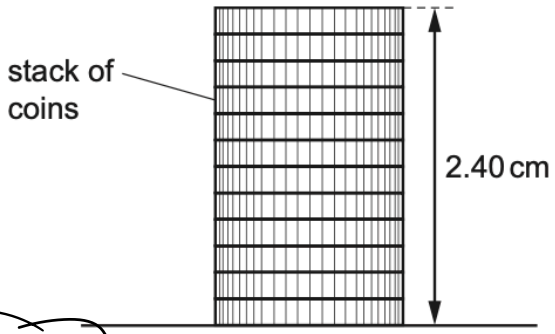
1 The diagram shows the height of a stack of identical coins.



What is the thickness of one coin?

A 0.20 mm **B** 2.0 mm **C** 0.24 cm **D** 2.0 cm

1 What is the most accurate and precise method to measure the thickness of a coin?

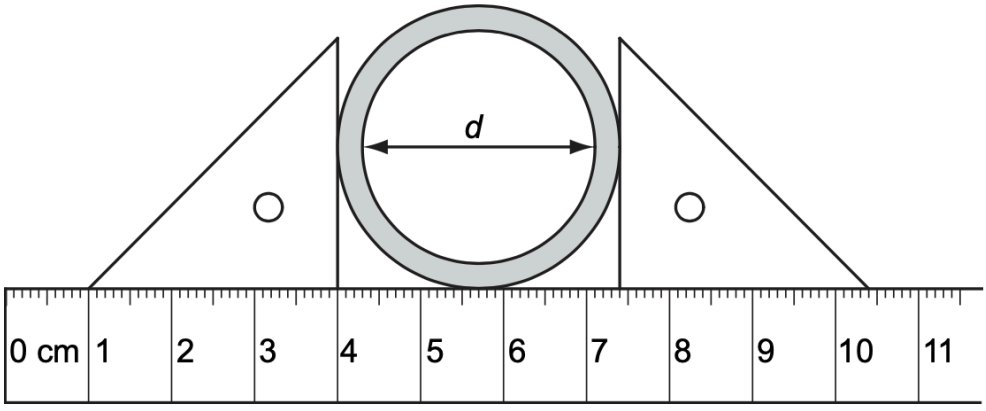
A Use a micrometer screw gauge.

B Use a ruler and look at the scale perpendicularly.

C Use a top pan balance.

D Use the displacement method with water in a measuring cylinder.

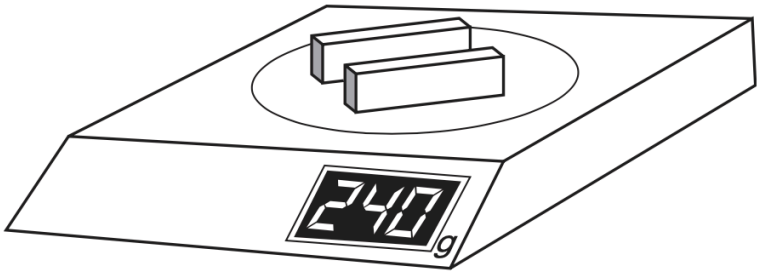
The diagram shows a thick-walled tube. The thickness of the wall is 3 mm.



What is the internal diameter *d* of the tube?

A 2.8 cm **B** 3.1 cm **C** 3.4 cm **D** 7.4 cm

A shop-keeper places two identical blocks of cheese on a set of scales and notices that their combined mass is 240 g. Each block measures 2.0 cm x 5.0 cm x 10.0 cm.



What is the density of the cheese?

A 0.42 g / cm^3 **B** 0.83 g / cm^3 **C** 1.2 g / cm^3 **D** 2.4 g / cm^3

What apparatus is needed to determine the density of a regularly-shaped block?

A a balance and a ruler

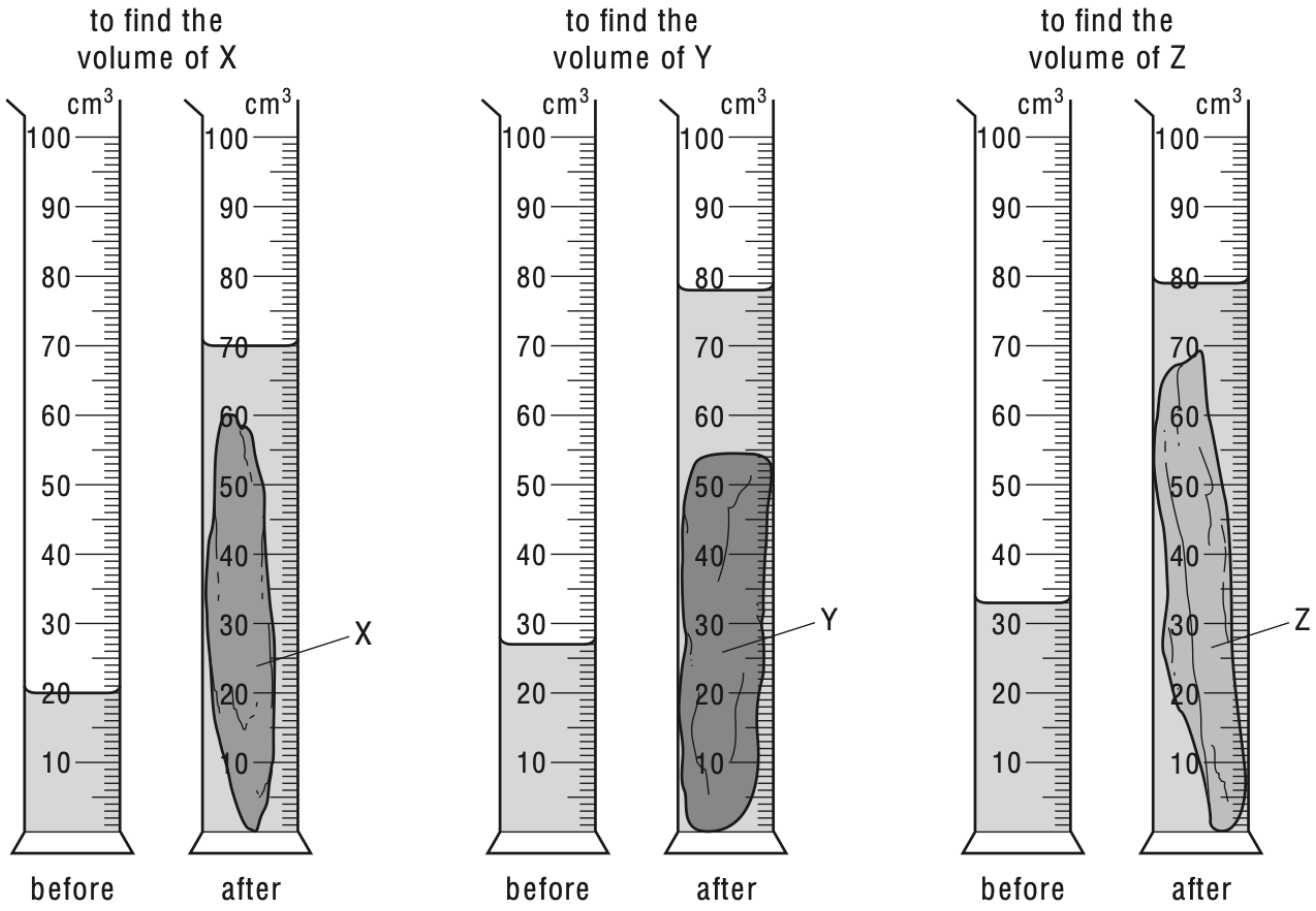
B a balance and a forcemeter (spring balance)

C a measuring cylinder and a ruler

D a measuring cylinder and a beaker

A geologist compares the volumes of three rocks, X, Y and Z. Three measuring cylinders contain different volumes of water. He places each rock into one of the measuring cylinders.

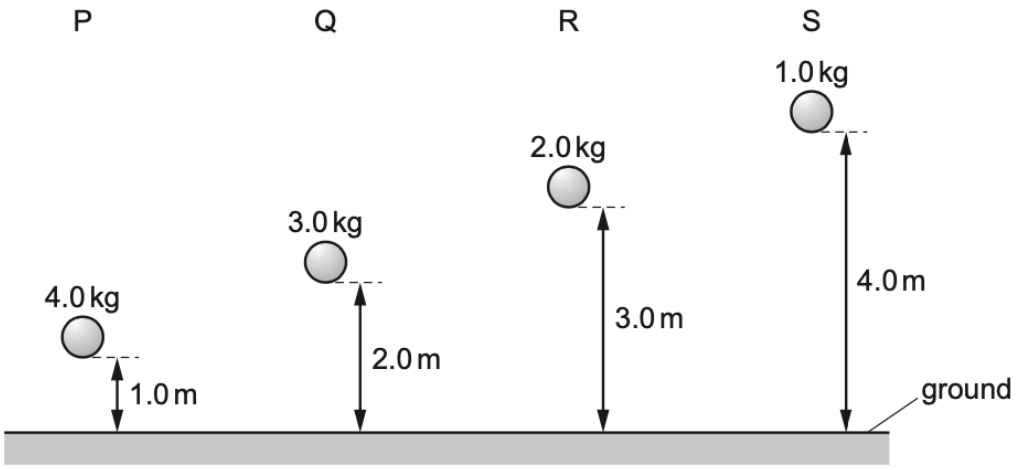
The diagrams show the measuring cylinders before and after the rocks are put in.



Which row shows the volumes of X, Y and Z in order, from largest to smallest?

	largest volume → smallest volume		
A	X	Z	Y
B	Y	X	Z
C	Y	Z	X
D	Z	Y	X

2 Four balls with different masses are dropped from the heights shown.



Air resistance may be ignored.

Which statement about the balls is correct?

A Ball P has the greatest acceleration.

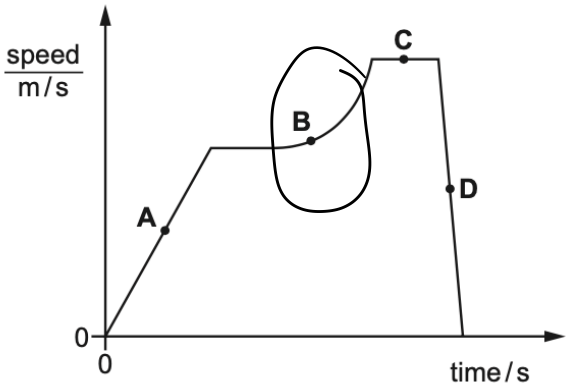
B Balls Q and R take the same time to fall to the ground.

C The acceleration of ball R is half the acceleration of ball P.

D Ball S has the greatest average speed.

3 An object is travelling in a straight line. The diagram is the speed-time graph for the object.

At which labelled point is the object accelerating at a changing rate?



4 Which statement about the masses and weights of objects on the Earth is correct?

A A balance can only be used to compare weights, not masses.

B Heavy objects always have more mass than light ones.

C Large objects always have more mass than small ones.

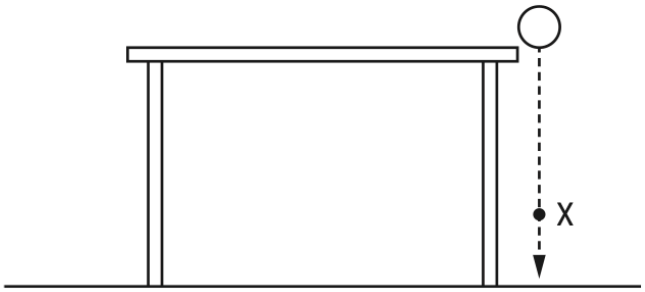
D Mass is a force but weight is not.

In a race, a car travels 60 times around a 3.6 km track. This takes 2.4 hours.

What is the average speed of the car?

A 1.5 km / h **B** 90 km / h **C** 144 km / h **D** 216 km / h

A ball is dropped from a table-top. Air resistance may be ignored.

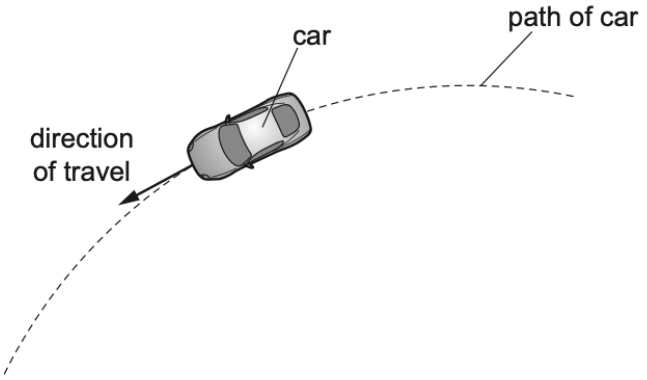


Which row describes the velocity and the acceleration of the ball at point X?

	acceleration	velocity
A	constant	constant
B	constant	increasing
C	increasing	constant
D	increasing	increasing

7 A car moves in a circular path as it turns a corner on a horizontal road.

The car moves at constant speed.



Which description of the forces acting on the car is correct?

A All the forces are balanced as the car is moving at constant speed.

B The forces are unbalanced and the resultant force acts away from the centre of the circle.

C The forces are unbalanced and the resultant force acts towards the centre of the circle.

D The forces are unbalanced and the resultant force is in the direction of travel of the car.

3 Four objects are moving in a straight line.

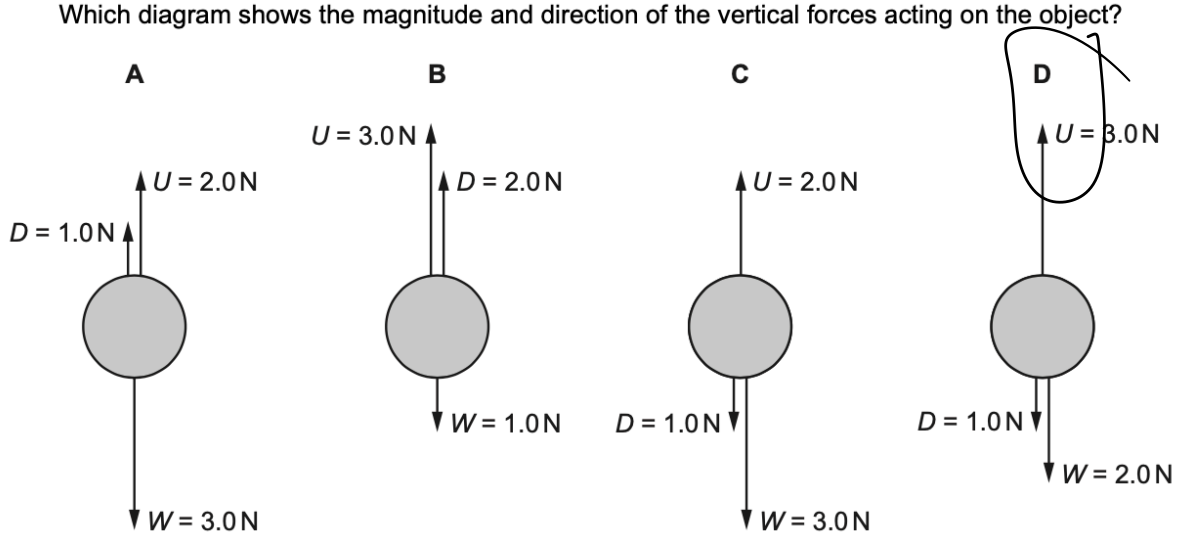
The table shows the distances moved by each object in each second of its motion.

Which object is moving with constant non-zero acceleration?

	distance moved in 1st second / m	distance moved in 2nd second / m	distance moved in 3rd second / m	distance moved in 4th second / m
A	5	5	5	5
B	5	6	7	8
C	5	7	10	14
D	5	8	14	26

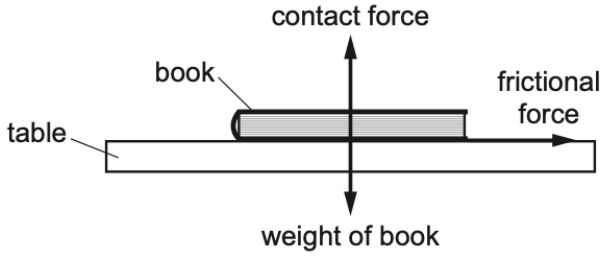
6 An object is rising vertically at constant speed through water. There are three vertical forces acting on it: the weight *W*, the drag force *D*, and the upward force *U*.

Which diagram shows the magnitude and direction of the vertical forces acting on the object?



7 A train is travelling horizontally in a straight line. A book is on a table in the train.

The diagram shows all the forces acting on the book.



How is the train moving?

A accelerating to the left of the diagram

B accelerating to the right of the diagram

C moving at uniform speed to the left of the diagram

D moving at uniform speed to the right of the diagram

5 Which moving object has a resultant force acting on it?

A a diver rising vertically through water at constant speed

B an aircraft circling an airport at constant speed

C a train going up a straight incline at constant speed

D a parachutist descending vertically at terminal velocity

8 A moving body undergoes a change of momentum.

What is a unit for change of momentum?

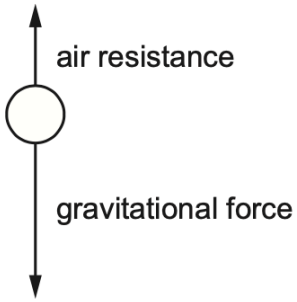
A Nm **B** N/m **C** Ns **D** N/s

An object of mass 1.2 kg is moving with a velocity of 2.0 m/s when it is acted on by a force of 4.0 N. The velocity of the object increases to 5.0 m/s in the same direction.

For which period of time does the force act on the object?

A 0.90 s **B** 1.1 s **C** 1.5 s **D** 3.6 s

A ball falls from rest through the air towards the ground. The diagram shows two forces acting on the ball.



As the ball falls, the air resistance increases.

Which statement is correct?

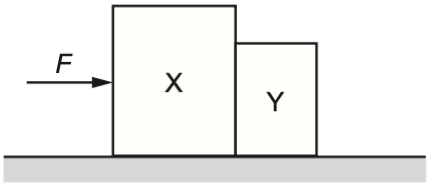
A The acceleration of the ball decreases.

B The acceleration of the ball increases.

C The speed of the ball decreases.

D The gravitational force on the ball decreases.

A single horizontal force *F* is applied to a block X which is in contact with a separate block Y, as shown.



The blocks remain in contact as they accelerate along a horizontal frictionless surface. Air resistance is negligible. X has a greater mass than Y.

Which statement is correct?

A The acceleration of X is equal to force *F* divided by the mass of X.

B The force that X exerts on Y is equal to *F*.

C The force that X exerts on Y is less than *F*.

D The force that X exerts on Y is less than the force that Y exerts on X.

9 A ball of mass 0.25 kg hits a wall at a speed of 16 m/s. It then rebounds back along its original path at a speed of 12 m/s.

What is the impulse experienced by the ball during its impact with the wall?

A 1.0 Ns **B** 3.0 Ns **C** 4.0 Ns **D** 7.0 Ns

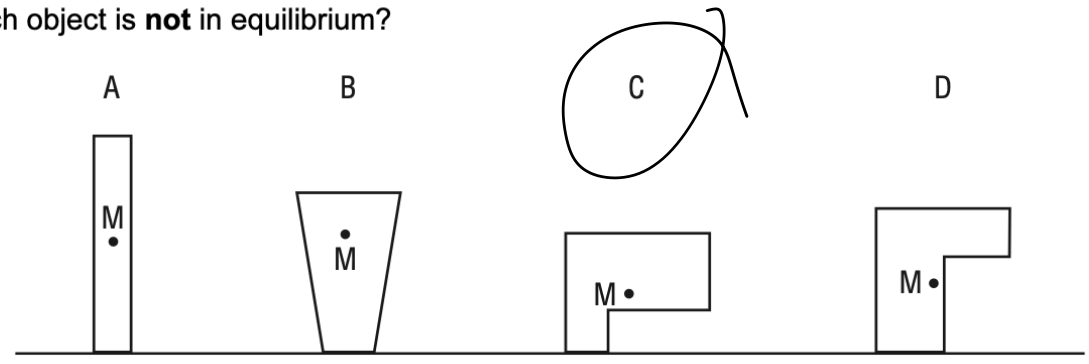
9 A resultant force of 2.0 N acts on an object of mass 3.0 kg for 6.0 s.

What is the change in velocity of the object?

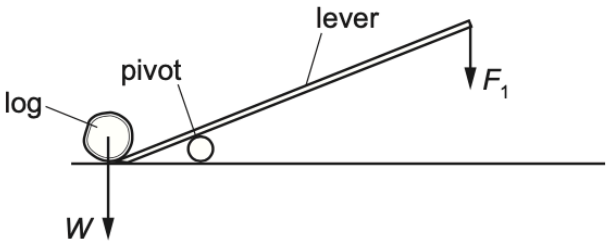
A 0.25 m/s **B** 1.0 m/s **C** 4.0 m/s **D** 36 m/s

The diagrams show four objects **A**, **B**, **C** and **D**. The centre of mass M of each object is marked on the diagrams.

Which object is **not** in equilibrium?

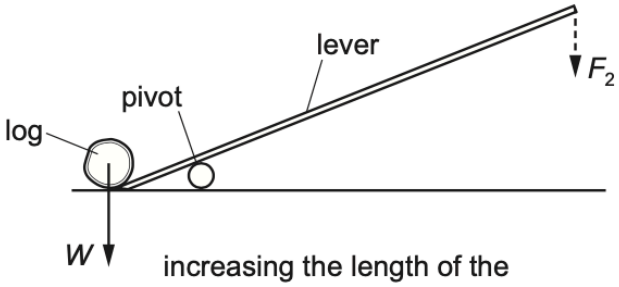


8 The diagram shows the minimum force F_1 acting vertically on a lever required to lift a heavy log of weight W.



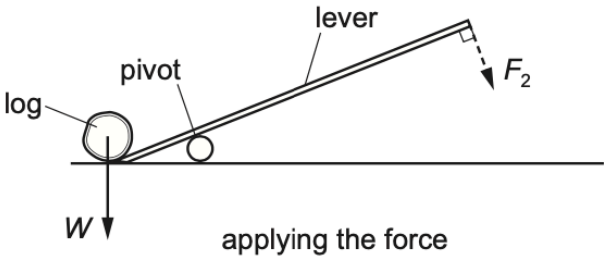
The log needs to be lifted by a smaller force than F_1. The diagrams show the changes tried. Each diagram has only **one** change from the original diagram. In each case, F_2 is the minimum force required to lift the log.

P



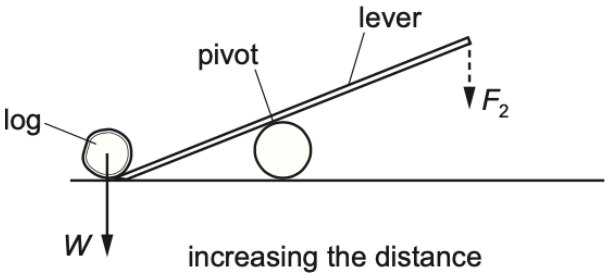
increasing the length of the lever to the right of the pivot

Q



applying the force perpendicular to the lever

R



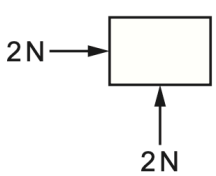
increasing the distance from the log to the pivot

In which situations will F_2 be smaller than F_1?

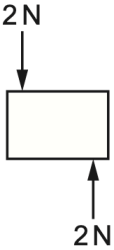
A P, Q and R **B** P and Q only **C** P only **D** Q and R only

Which object is in equilibrium?

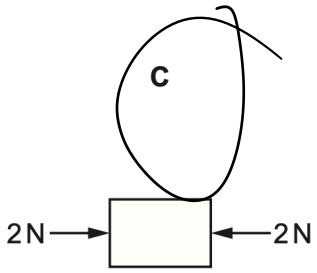
A



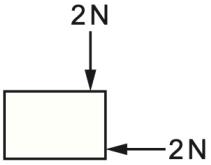
B



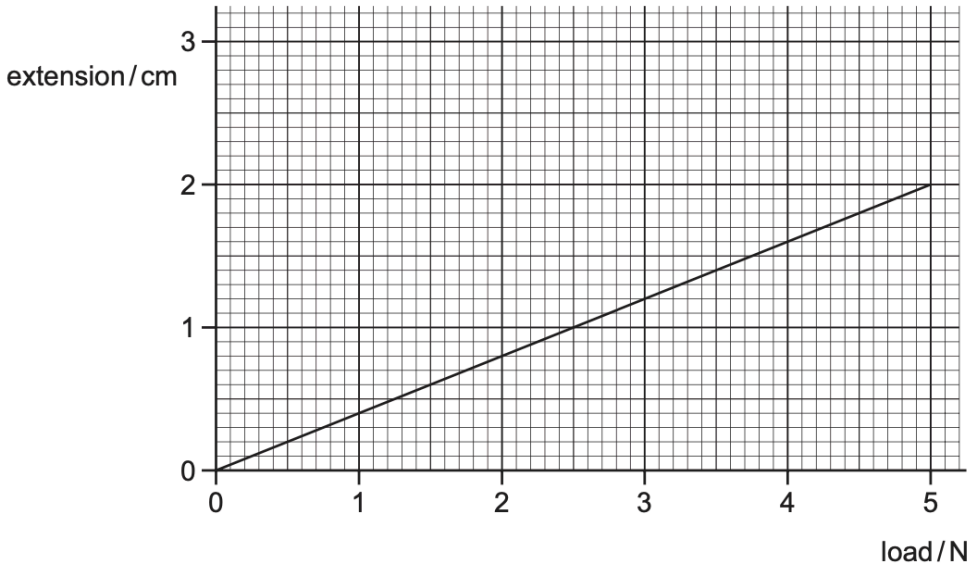
C



D



The extension / load graph for a spring is shown. The unloaded length of the spring is 15.0 cm.

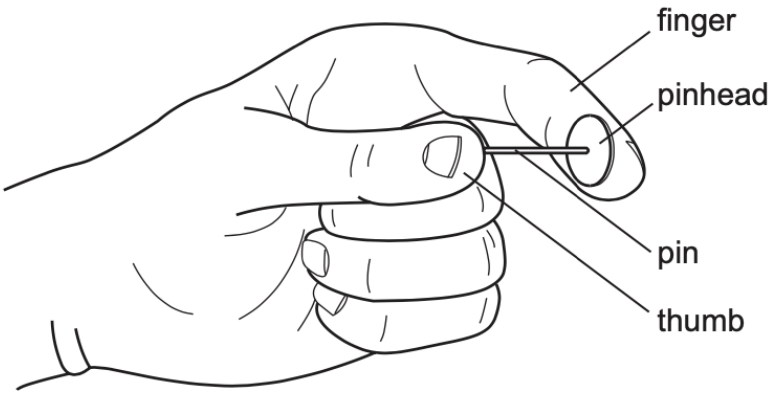


When an object of unknown weight is hung on the spring, the length of the spring is 16.4 cm.

What is the weight of the object?

A 0.55 N **B** 0.67 N **C** 3.5 N **D** 4.1 N

A pin is squeezed between finger and thumb.



Which statement is correct?

A The force of the pin is larger on the finger than on the thumb.

B The force of the pin is larger on the thumb than on the finger.

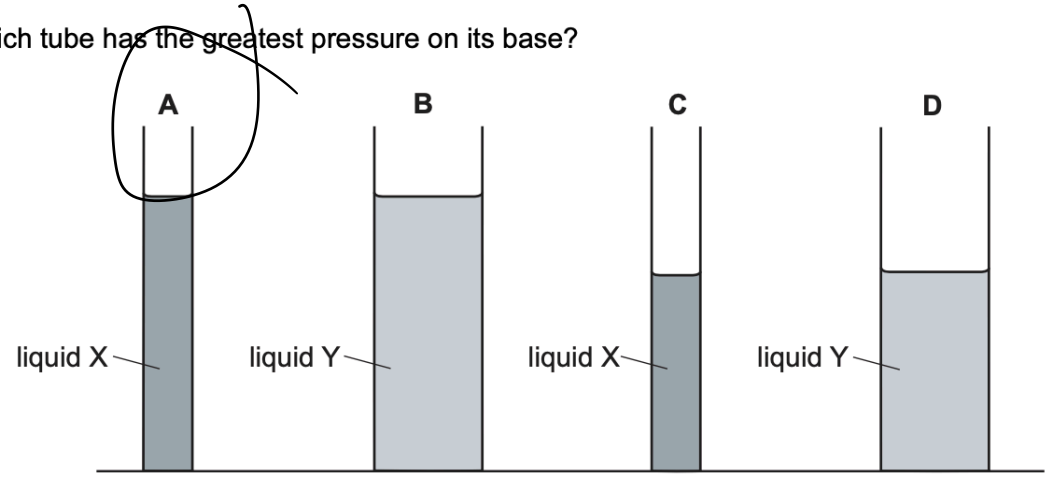
C The pressure of the pin is larger on the finger than on the thumb.

D The pressure of the pin is larger on the thumb than on the finger.

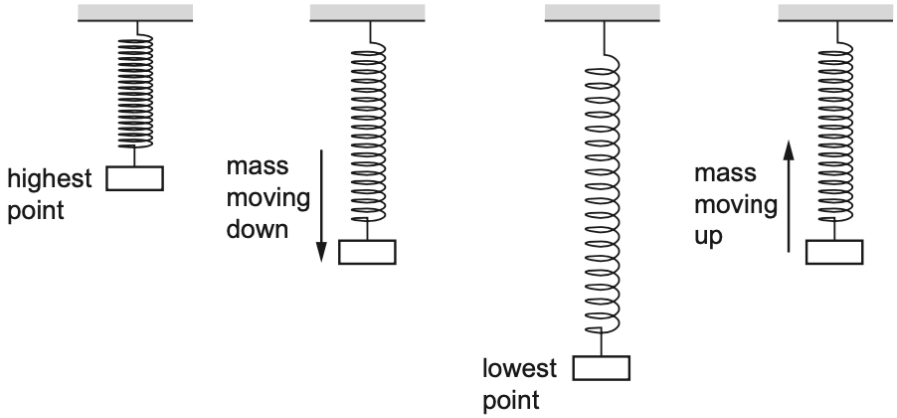
Liquid X has a density of 1010 kg / m^3. Liquid Y has a density of 950 kg / m^3.

The liquids are poured into tubes as shown.

Which tube has the greatest pressure on its base?



8 A mass bounces up and down on a steel spring. The diagram shows the mass and the spring at different points during the motion.



At which point is the least energy in the gravitational potential store of the mass and at which point is the most energy in the elastic store of the spring?

	least energy in gravitational potential store of the mass	most energy in the elastic store of the spring
A	mass moving down	mass moving up
B	mass moving down	lowest point
C	lowest point	mass moving up
D	lowest point	lowest point

A rock of mass $2m$, travelling in deep space at velocity v, explodes into two parts of equal mass, one of which is then stationary.

What is the kinetic energy of the moving part after the explosion?

A $\frac{1}{2}mv^2$ **B** mv^2 **C** $\frac{3}{2}mv^2$ **D** $2mv^2$

10 A bicycle braking system transfers energy from a kinetic energy store to an internal energy store.

A motor converts energy from a chemical energy store (battery) to a kinetic energy store.

What enables these energy transfers?

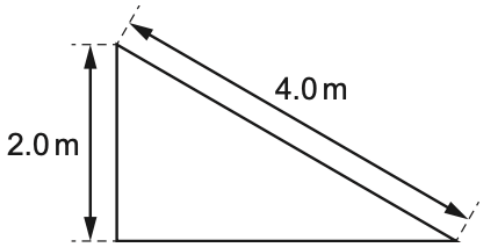
	braking system	motor
A	electrical work	mechanical work
B	electrical work	electrical work
C	mechanical work	mechanical work
D	mechanical work	electrical work

A box is initially at rest at the top of a rough slope.

The box slides down the slope.

The weight of the box is 20 N.

The slope is 4.0 m long and 2.0 m high.



The box does 10 J of work against friction as it slides down the slope.

What is the speed of the box as it reaches the bottom of the slope?

A 5.4 m/s **B** 6.3 m/s **C** 7.1 m/s **D** 9.5 m/s

9 A boy uses a rope to pull an object of mass m up a slope.

The rope is parallel to the slope.

The tension in the rope is constant and of value F.

The object moves a distance d along the slope and rises through a height h.

How much work is done by the boy?

A $F \times d$

B $F \times h$

C $m \times g \times h \times d$

D $m \times g \times h^2$

10 An electric car is charged overnight. In 8.0 hours, 180 MJ of energy is transferred.

What is the power of the charger?

A 6.3 kW **B** 380 kW **C** 23 MW **D** 1400 MW