1   Which quantity is measured in newton seconds (N s)?

   A   impulse

   B   moment

   C   power

   D   work done

2   Which measurement can be made using a micrometer screw gauge?

   A   the air pressure of a tyre

   B   the diameter of a wire

   C   the turning effect of a spanner

   D   the wavelength of microwaves

3   A parachutist is falling at terminal velocity, without her parachute open.

   She now opens her parachute.

   What is the direction of her motion, and what is the direction of her acceleration, immediately after she opens her parachute?

	direction of motion of the parachutist	direction of acceleration of the parachutist
A	downwards	downwards
B	downwards	upwards
C	upwards	downwards
D	upwards	upwards

4   An astronaut in an orbiting spacecraft experiences a force due to gravity. This force is less than when she is on the Earth's surface.

   Compared with being on the Earth's surface, how do her mass and her weight change when she goes into orbit?

	mass in orbit	weight in orbit
A	decreases	decreases
B	decreases	unchanged
C	unchanged	decreases
D	unchanged	unchanged

5 The diagram shows an experiment to find the density of a liquid.
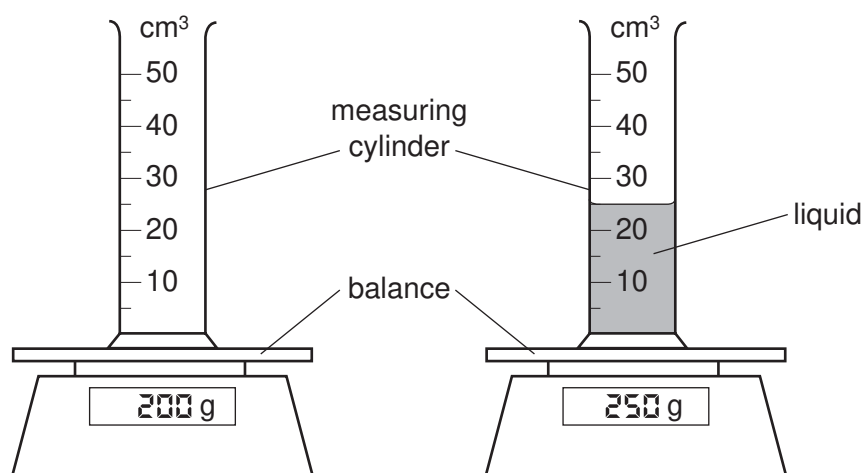
What is the density of the liquid?

A $0.5\,\text{g}/\text{cm}^3$ **B** $2.0\,\text{g}/\text{cm}^3$ **C** $8.0\,\text{g}/\text{cm}^3$ **D** $10.0\,\text{g}/\text{cm}^3$

6 An experiment is carried out to measure the extension of a rubber band for different loads.

The results are shown below.

load/N	0	1.0	2.0	3.0
length/cm	15.2	16.2		18.6
extension/cm	0	1.0	2.1	3.4

Which figure is missing from the table?

**A**   17.2   **B**   17.3   **C**   17.4   **D**   17.6

7 The diagram shows a satellite that is moving at a uniform rate in a circular orbit around the Earth.
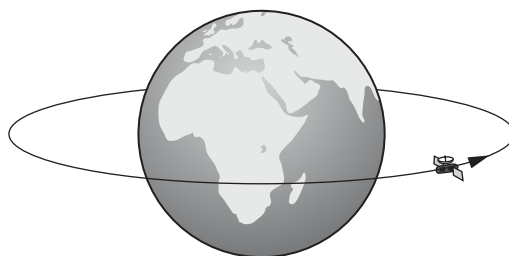
Which statement describes the motion of this satellite?

A   It is accelerating because its speed is changing.

B   It is accelerating because its velocity is changing.

C   It is not accelerating but its speed is changing.

**D**   It is not accelerating but its velocity is changing.

8 Which statement about an object moving in a straight line through air is correct?

A When it accelerates, the resultant force acting on it is zero.

B When it moves at a steady speed, the air resistance acting on it is zero.

C When it moves at a steady speed, the resultant force acting on it is zero.

D When it moves, there is a resultant force acting on it.

9 A beam pivoted at one end has a force of 5.0N acting vertically upwards on it as shown. The beam is in equilibrium.
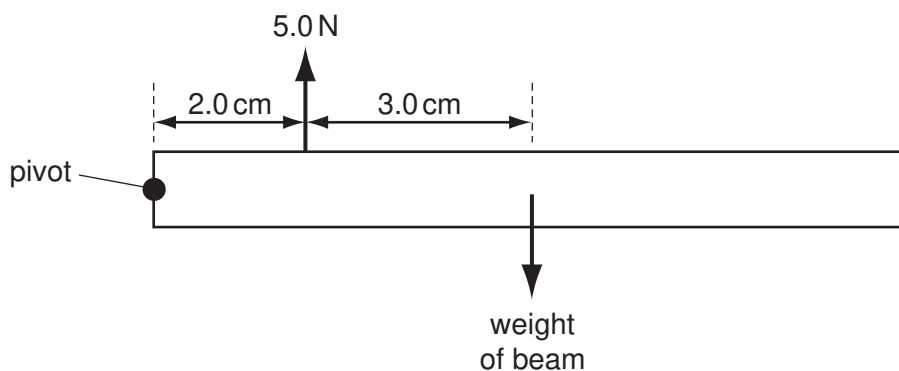

What is the weight of the beam?

A 2.0N **B** 3.0N **C** 3.3N **D** 5.0N

10 A car has a mass of 1000 kg and a momentum of 12000 kg m/s.

What is its kinetic energy?

A 6 kJ

B 12 kJ

C 72 kJ

D 144 kJ

11 Which diagram shows two forces X and Y with their resultant force?

A

B

C

D
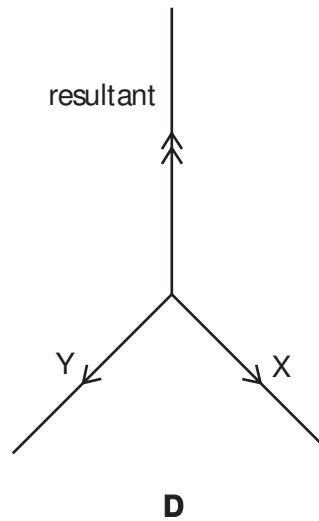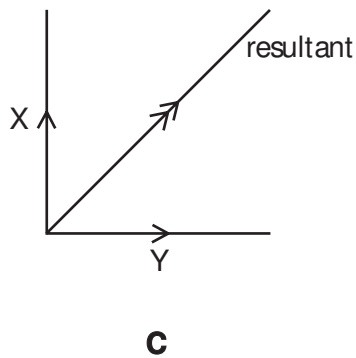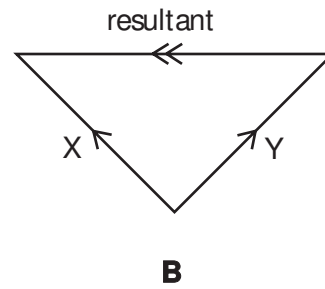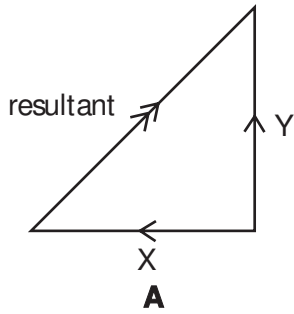
12 A ball is dropped on to a hard surface and bounces. It does not bounce all the way back to where it started, and so has not regained all of its original gravitational potential energy.

ball dropped from here

ball bounces to here

hard surface
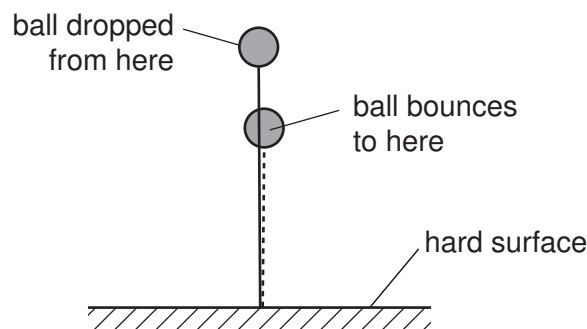
Which statement accounts for the loss of gravitational potential energy?

A Energy was destroyed as the ball hit the ground.

B Energy was destroyed as the ball travelled through the air.

C The chemical energy and elastic energy of the ball have increased.

D The internal (heat) energy of the ball and its surroundings has increased.

13 The Sun is the original source of energy for many of our energy resources.

Which energy resource **does not** originate from the Sun?

   A   geothermal

   B   hydroelectric

   C   waves

   D   wind

14 A dam across a lake is divided into two sections by a rock. Section X is longer than section Y but the two sections are otherwise identical. The water in the lake by the dam is the same depth everywhere. The diagram shows a view from above of the lake and the dam.
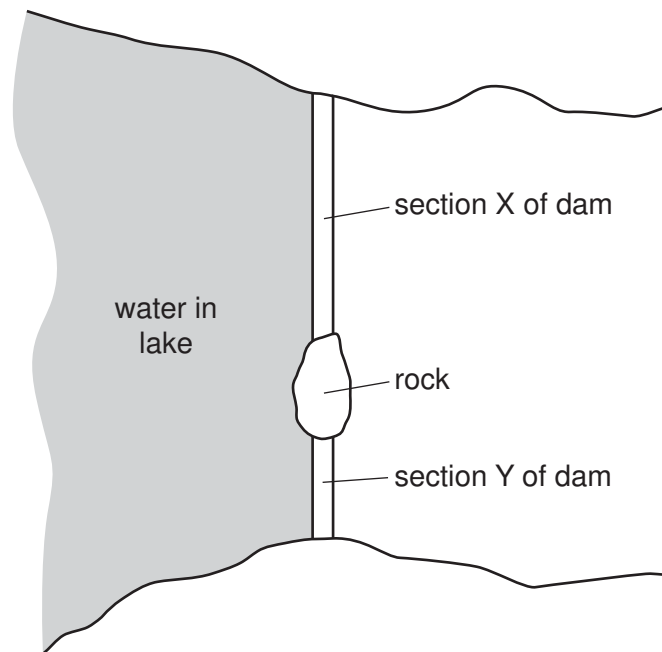

The water creates a total force on each section of the dam and an average pressure on each section of the dam.

Which statement is correct?

   A   The average pressure on X equals the average pressure on Y.

   B   The average pressure on X is less than the average pressure on Y.

   C   The total force on X equals the total force on Y.

   D   The total force on X is less than the total force on Y.
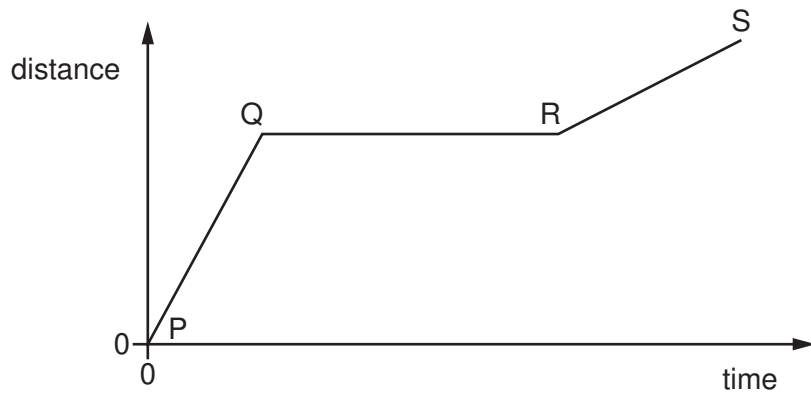
15 The diagram shows a simple mercury barometer alongside a mercury manometer. The manometer contains some trapped gas.
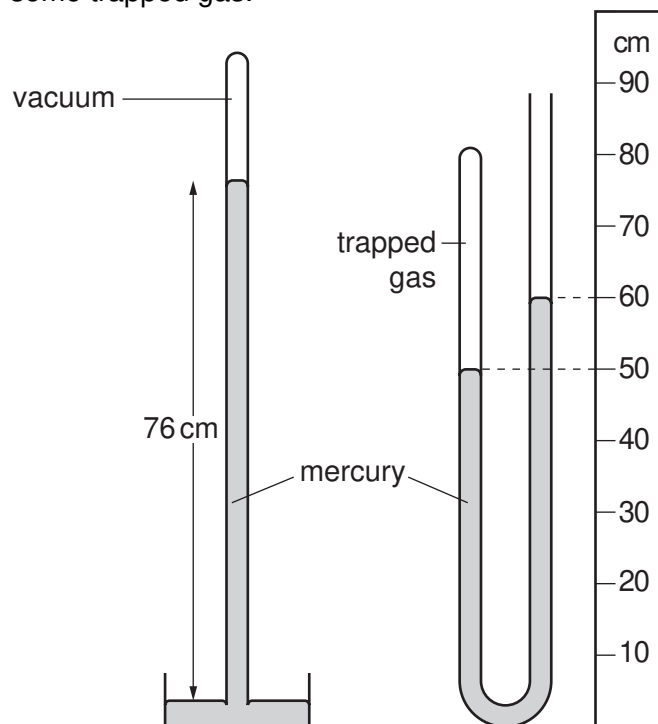
What is the pressure of the trapped gas?

A   10 cm of mercury

B   50 cm of mercury

C   66 cm of mercury

D   86 cm of mercury

**1** The graph shows how the distance travelled by a vehicle changes with time.

Which row describes the speed of the vehicle in each section of the graph?

|	P to Q	Q to R	R to S
A	constant	zero	constant
B	constant	zero	decreasing
C	increasing	constant	decreasing
D	increasing	zero	constant

2 A stone falls freely from the top of a cliff. Air resistance may be ignored.

Which graph shows how the acceleration of the stone varies with time as it falls?
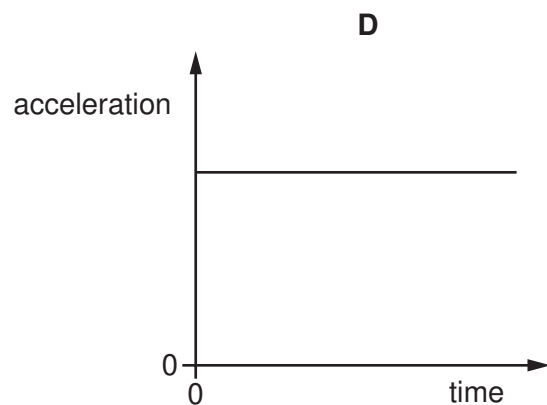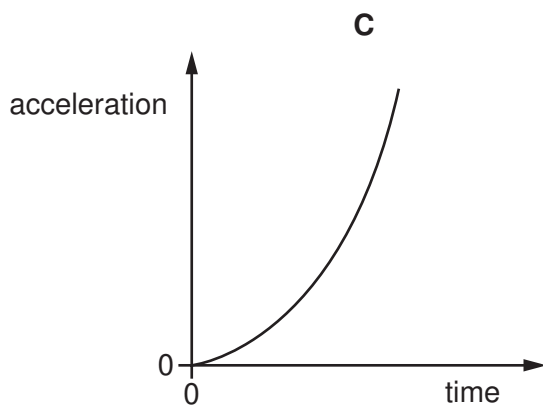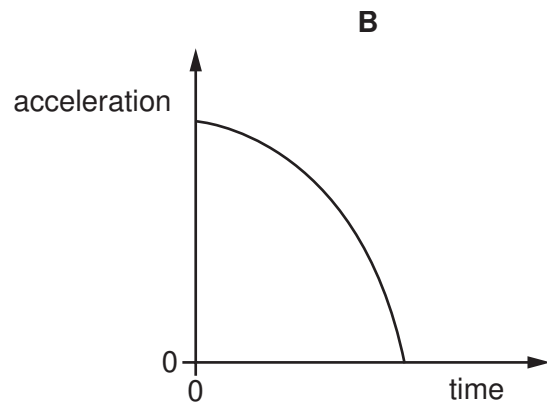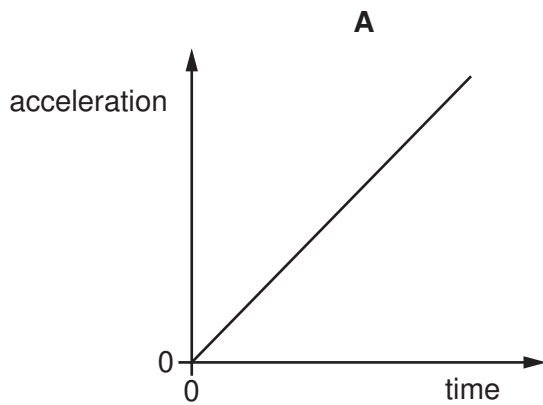
3 A car travels along a horizontal road in a straight line. The driver presses the accelerator to increase the speed of the car.

The speed-time graph for the car is shown.
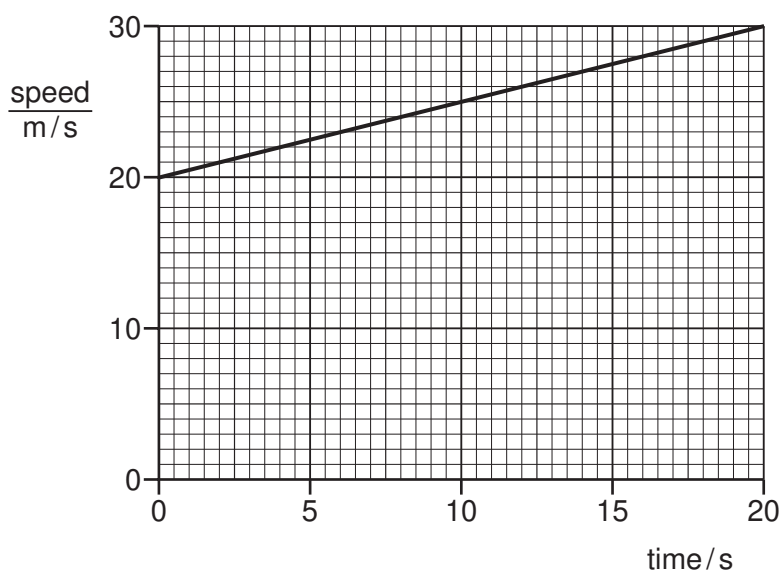

What is the acceleration of the car?

A 0.50 m/s² **B** 1.00 m/s² **C** 1.50 m/s² **D** 2.00 m/s²

4 A spaceship approaches the Earth from deep space. Near the Earth, a force on the spaceship causes it to have weight. This causes it to change its speed and direction.

Which type of force causes the spaceship's weight, and which property of the spaceship resists its change in speed and direction?
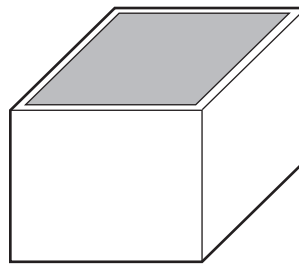
	force that causes weight	property that resists change in speed and direction
A	gravitational	mass
B	gravitational	volume
C	magnetic	mass
D	magnetic	volume

5 The diagrams show an empty rectangular box, and the same box filled with liquid.

The box has a mass of 60 g when empty. When filled with liquid, the total mass of the box and the liquid is 300 g.
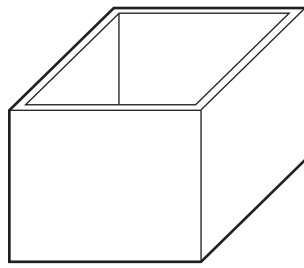
empty box
60 g

box filled with liquid
300 g

The density of the liquid is $1.2 \, \text{g}/\text{cm}^3$.

What is the volume of the liquid in the box?

A $50 \, \text{cm}^3$ **B** $200 \, \text{cm}^3$ **C** $250 \, \text{cm}^3$ **D** $300 \, \text{cm}^3$

6 An object travels in a circular path at constant speed.

Which statement about the object is correct?

A It has changing kinetic energy.

B It has changing momentum.

C It has constant velocity.

D It is not accelerating.

7 Which diagram shows the magnitude and direction of the resultant R of the two forces F_1 and F_2?
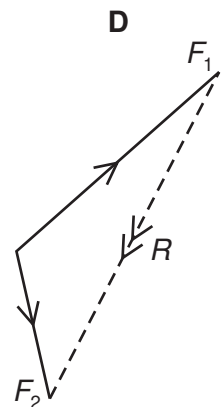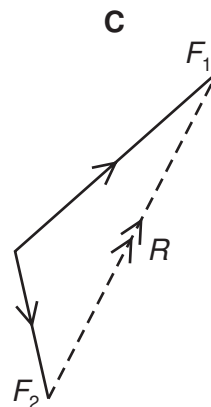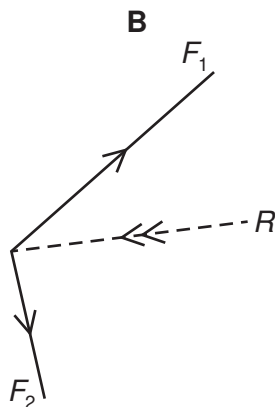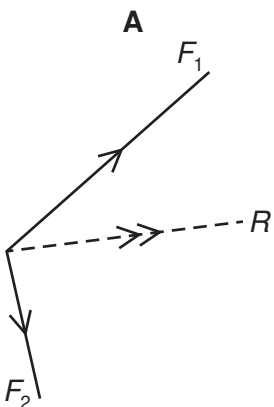
8 Two cars, P and Q, have different masses and different speeds as shown.

mass
1000 kg

speed
10 m/s

car P

mass
500 kg

speed
20 m/s

car Q

Which row correctly compares the momentum and the kinetic energy of P with the momentum and the kinetic energy of Q?

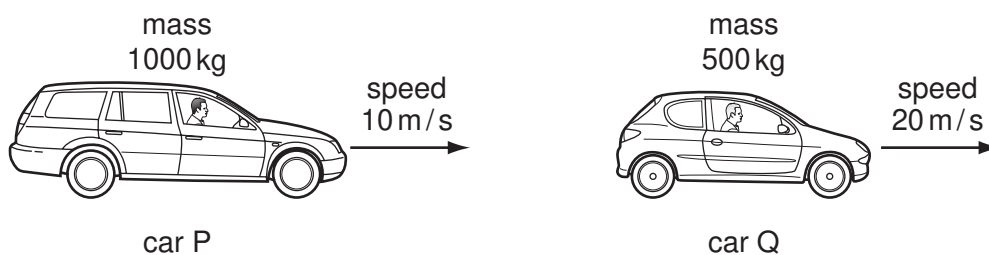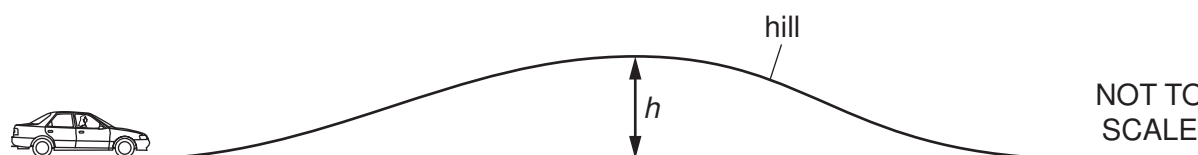|	momentum	kinetic energy
A	P greater than Q	P equal to Q
B	P equal to Q	P equal to Q
C	P equal to Q	P less than Q
D	P less than Q	P greater than Q

9 A car of mass 800 kg travels over a hill of height h.

hill

h

NOT TO
SCALE

By travelling to the top of the hill, the car gains 40 000 J of gravitational potential energy.

The gravitational field strength g is 10 N/kg.

What is the height h of the hill?

A 5.0 m **B** 20 m **C** 50 m **D** 500 m

10 A lamp has a power input of 5.0 W. It wastes 1.0 W of power heating the surroundings.

What is the efficiency of the lamp?

A 20% **B** 50% **C** 80% **D** 120%

11 The box contains the names of eight different energy resources.

natural gas	geothermal	solar	waves
hydroelectric	oil	wind	coal

How many of these energy resources are renewable?

A 3 **B** 4 **C** 5 **D** 6

12 The diagram shows a dam holding back water.
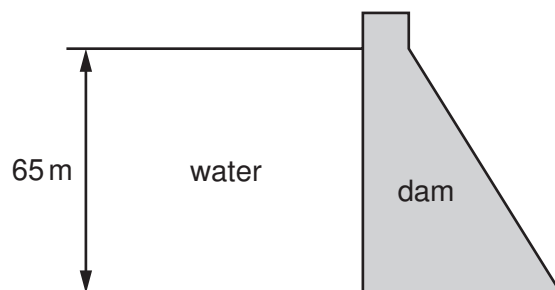
The depth of the water is 65 m.

The density of the water is $1000 \, \text{kg}/\text{m}^3$. The gravitational field strength g is $10 \, \text{N}/\text{kg}$.

What is the pressure exerted at the base of the dam due to the water?

A   15.4 Pa   **B**   154 Pa   **C**   65 000 Pa   **D**   650 000 Pa

1 A student measures the volume of a cork.

He puts some water into a measuring cylinder and then one glass ball. He puts the cork and then a second, identical glass ball into the water as shown.
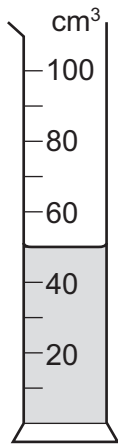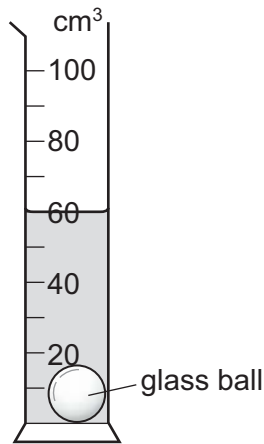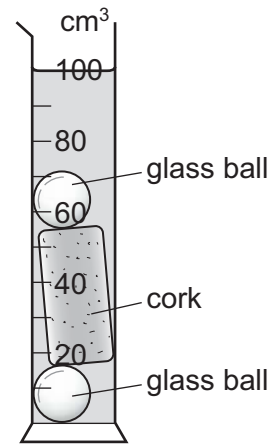
| diagram 1 | diagram 2 | diagram 3 |

Diagram 1 shows the first water level.

Diagram 2 shows the water level after one glass ball is added.

Diagram 3 shows the water level after the cork and the second glass ball are added.

What is the volume of the cork?

A $30\,cm^3$ **B** $40\,cm^3$ **C** $50\,cm^3$ **D** $100\,cm^3$

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

Air resistance may be ignored.

Which ball has the smallest average speed?

3 An ice crystal falls vertically from a cloud.

What happens to the acceleration of the ice crystal as it falls?

A It decreases because of air resistance.

B It decreases because of gravity.

C It increases because of air resistance.

D It increases because of gravity.

4 A spring is stretched by hanging a piece of metal from it.

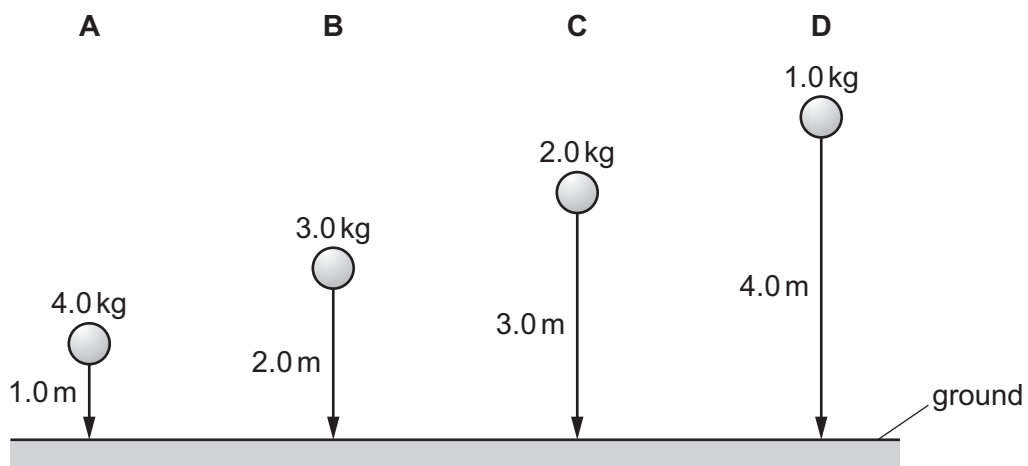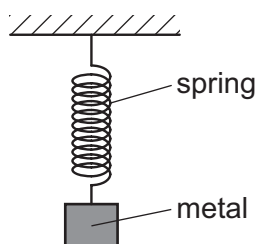Which name is given to the force that stretches the spring?

A friction

B mass

C pressure

D weight

5 Which object has the greatest weight?

A an object of mass 10 kg in a 15 N/kg gravitational field

B an object of mass 15 kg in a 13 N/kg gravitational field

C an object of mass 20 kg in a 9.0 N/kg gravitational field

D an object of mass 50 kg in a 3.0 N/kg gravitational field

6 A uniform beam XY is 100 cm long and weighs 4.0 N.
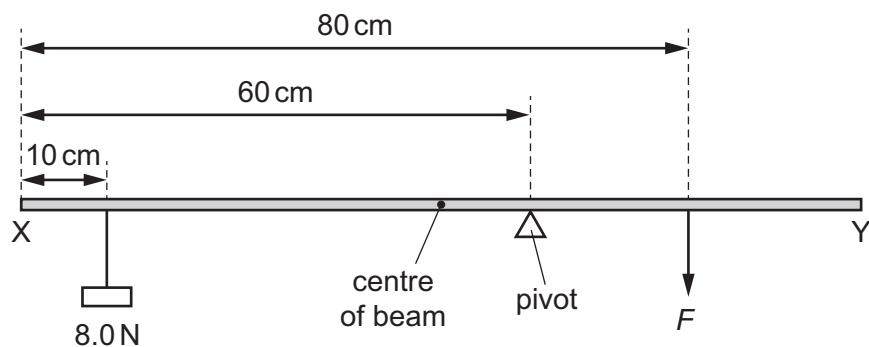
The beam rests on a pivot 60 cm from end X.

A load of 8.0 N hangs from the beam 10 cm from end X.

The beam is kept balanced by a force *F* acting on the beam 80 cm from end X.

What is the magnitude of force *F*?

A 8.0 N   **B** 18 N   **C** 22 N   **D** 44 N

7 The diagrams show four table lamps resting on a table. The position of the centre of mass of each lamp is labelled X.

Which lamp is the most stable?
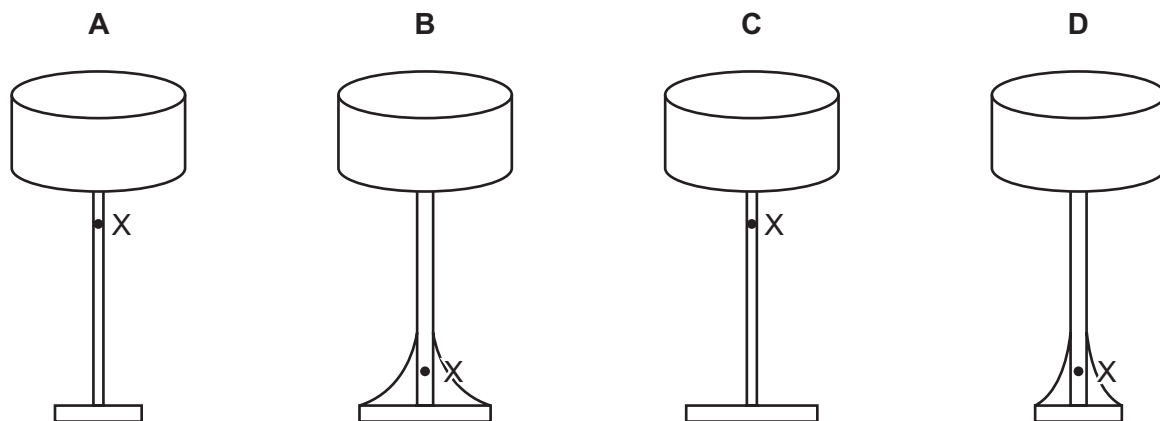
8   The diagram shows an incomplete scale drawing to find the resultant of two 10 N forces acting at a point in the directions shown.
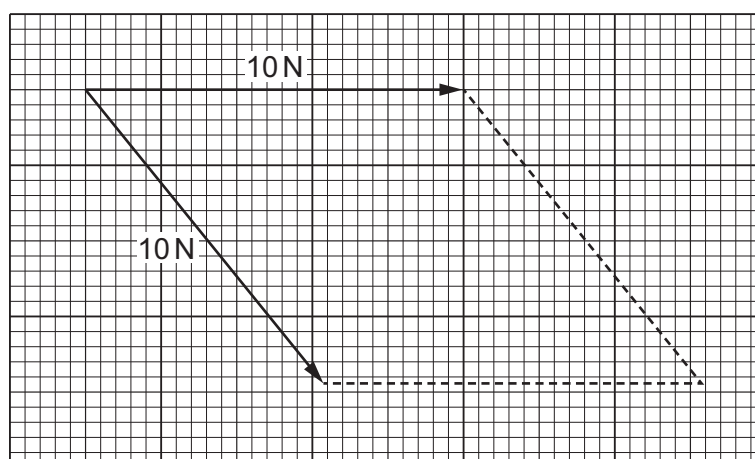
What is the magnitude of the resultant force?

A 7.5 N   **B** 8.6 N   **C** 18 N   **D** 20 N

9   A tennis ball of mass 0.060 kg travels horizontally at a speed of 25 m/s. The ball hits a tennis racket and rebounds horizontally at a speed of 40 m/s.
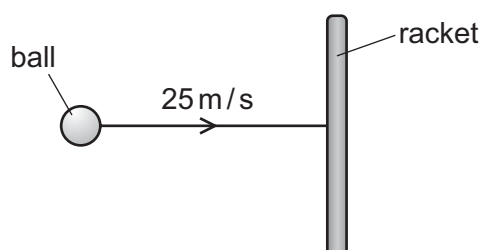
before hitting racket   after hitting racket
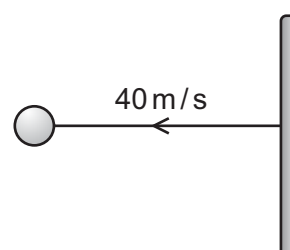
The ball is in contact with the racket for 50 ms.

What force does the racket exert on the ball?

A 0.018 N   **B** 0.078 N   **C** 18 N   **D** 78 N

10 The diagram shows the path of a stone that is thrown from X and reaches its maximum height at Y.
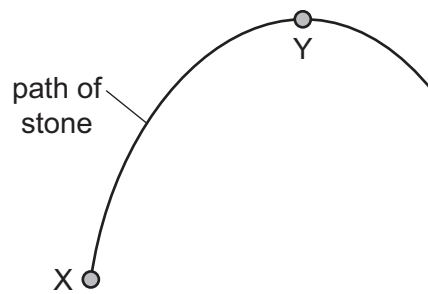
The stone gains 10 J of gravitational potential energy as it moves from X to Y.

The stone has 2.0 J of kinetic energy at Y.

Air resistance can be ignored.

How much kinetic energy did the stone have immediately after it was thrown at X?

A   2.0 J   **B**   8.0 J   **C**   10 J   **D**   12 J

11 A motor is used to lift a load of 40 N.
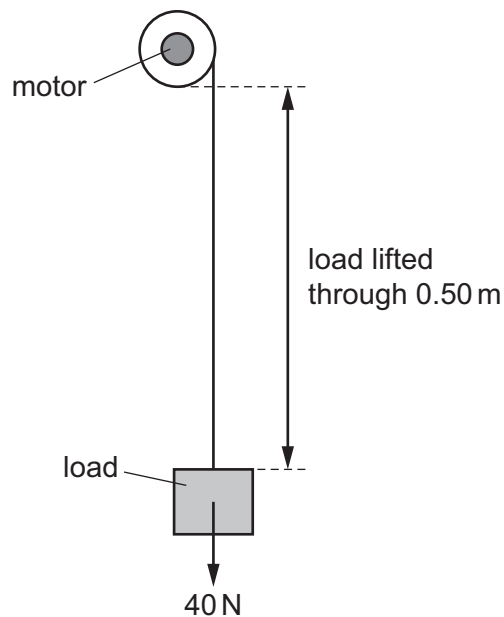
The power of the motor is 40 W and the system is 20% efficient.

How long does it take the motor to lift the load through 0.50 m?

A   0.50 s   **B**   2.5 s   **C**   5.0 s   **D**   25 s

12 A student runs up a flight of stairs.
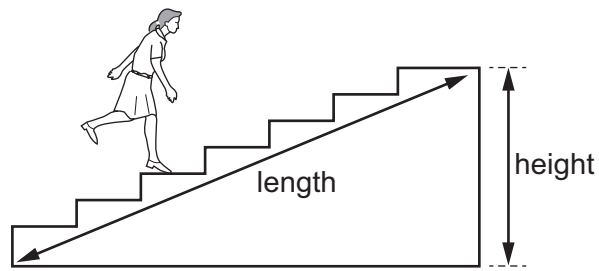
Which information is **not** needed to calculate the rate at which the student is doing work against gravity?

    A   the height of the flight of stairs

    B   the length of the flight of stairs

    C   the time taken to run up the stairs

    D   the weight of the student

13 The diagram shows a simple mercury barometer.
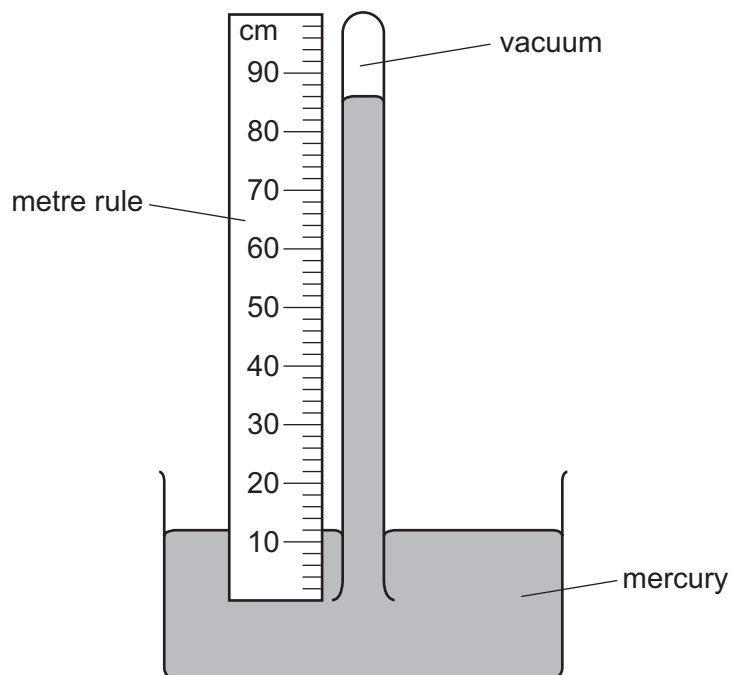
Which length is used to find the value of atmospheric pressure?

    A   12 cm   **B**   74 cm   **C**   86 cm   **D**   100 cm

1 The diagram shows part of a micrometer screw gauge.
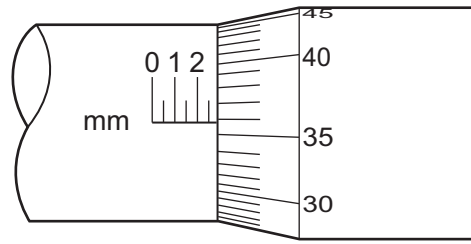
What is the smallest reading that can be achieved using this micrometer screw gauge?

A 0.0001 mm **B** 0.01 mm **C** 0.1 mm **D** 1 mm

2 A small, light ball is dropped from the top of a tall building.

Which graph shows how the speed of the ball changes with time?
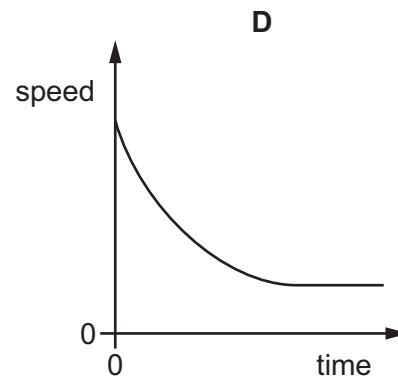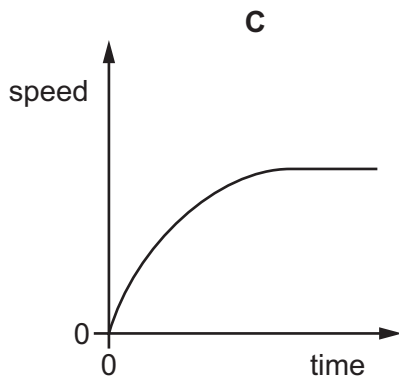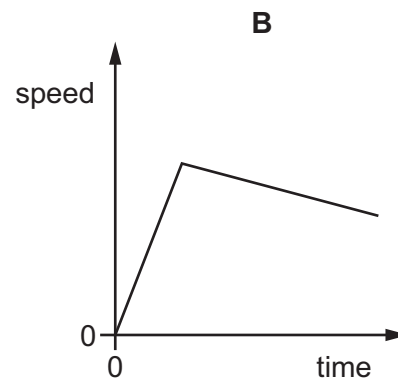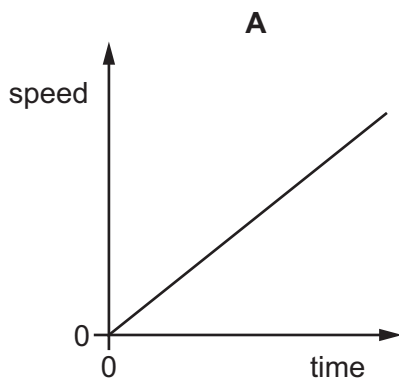
3 A runner runs 300 m at an average speed of 3.0 m/s. She then runs another 300 m at an average speed of 6.0 m/s.

What is her average speed for the total distance of 600 m?

A 2.0 m/s **B** 4.0 m/s **C** 4.5 m/s **D** 8.0 m/s

4 A helium balloon is tied to a top-pan balance. A metal block of mass 100 g is placed on the balance. The reading on the balance is 91 g.
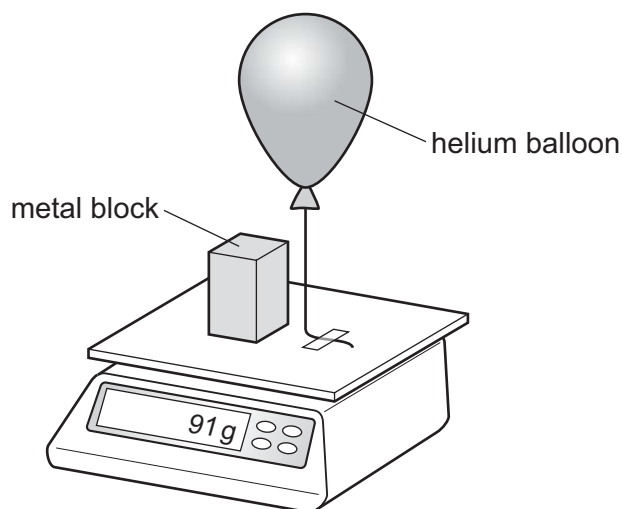
Which statement can be deduced from this experiment?

A The balloon exerts a downward force of 0.09 N on the top-pan balance.

B The helium has a mass of –9 g.

C The helium has a mass of +9 g.

D The resultant downward force on the top-pan balance is 0.91 N.

5 A liquid has a volume of 0.040 m³ and a mass of 30 000 g.

What is the density of the liquid?

A 0.075 kg / m³ **B** 7.5 kg / m³ **C** 750 kg / m³ **D** 7500 kg / m³

6 A resultant force of 4.0 N acts on an object of mass 0.50 kg for 3.0 seconds.

What is the change in velocity caused by this force?

A 4.0 m/s **B** 6.0 m/s **C** 12 m/s **D** 24 m/s

7 Which quantities are both vectors?

A acceleration and force

B acceleration and pressure

C density and force

D density and pressure

8 A moving ball with a momentum of 25 kg m / s collides head-on with a wall.
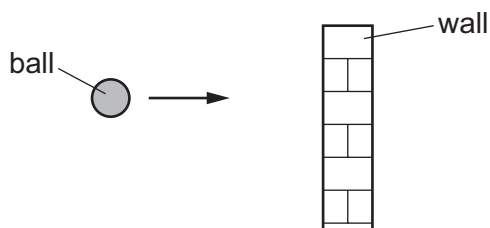
It rebounds from the wall with the same speed but in the opposite direction. The time of collision is 50 ms.

What is the average force exerted on the wall by the ball during the collision?

A   0.50 N   **B**   1.00 N   **C**   500 N   **D**   1000 N

9 Which device is designed to convert chemical energy into kinetic energy?

A   an a.c. generator

B   a battery-powered torch

C   a car engine

D   a wind-up mechanical clock

10 An object, initially at rest, is dropped from a height of 12.0 m. The change in gravitational potential energy when it falls to the ground is 565 J.

The frictional forces are negligible.

What is its speed when it hits the ground?

A   4.71 m / s   **B**   15.5 m / s   **C**   47.1 m / s   **D**   240 m / s

11 A man climbs a ladder.

Which two quantities can be used to calculate the useful power of the man?

A   the weight of the man and the time taken only

B   the weight of the man and the vertical distance moved only

C   the work done by the man and the time taken only

D   the work done by the man and the vertical distance moved only

12 A manometer is used to measure the pressure of a gas supply.

manometer

connection
to gas supply

h
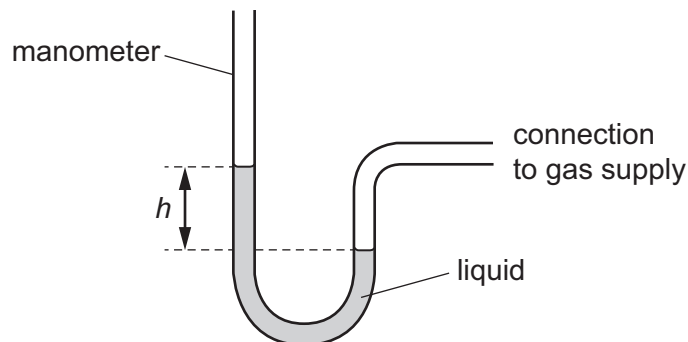
liquid

Which change gives a greater value of height h?

A using a less dense liquid

B using a more dense liquid

C using a narrower tube

D using a wider tube

13 A washbasin has an exit pipe covered with a plug of area $12\,cm^2$. A chain is attached to the centre of the plug to assist in pulling the plug away from the exit hole. The washbasin contains water to a depth of $0.080\,m$.

The density of the water is $1000\,kg/m^3$.

chain
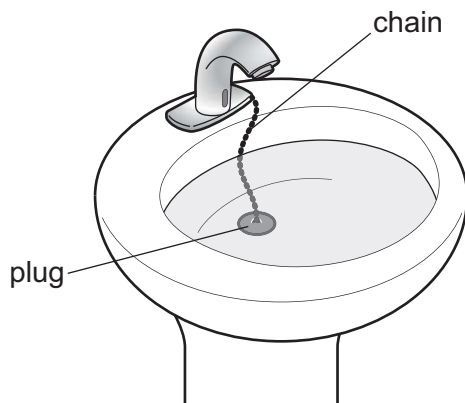
plug

What is the force acting on the plug due to the water?

A $0.96\,N$ **B** $800\,N$ **C** $9600\,N$ **D** $80\,000\,N$

1 A student measures the diameter of a pencil.

Which measuring instrument will give the most precise reading?

A a measuring tape

B a metre rule

C a micrometer screw gauge

D a ruler

2 A light object is dropped from rest. It falls a large distance vertically through air.

How can the motion of the object be described?

A constant acceleration

B increasing acceleration

C decreasing acceleration and then moving at terminal velocity

D increasing acceleration and then moving at terminal velocity

3 A car travels at an average speed of 60 km/h for 15 minutes.

How far does the car travel in 15 minutes?

A 4.0 km   **B** 15 km   **C** 240 km   **D** 900 km

4 Which quantity is a force due to a gravitational field?

A density

B mass

C weight

D volume

5 The density of air is $1.2 \, \text{kg/m}^3$.

A room has dimensions $5.0 \, \text{m} \times 4.0 \, \text{m} \times 3.0 \, \text{m}$.

What is the mass of the air in the room?

A 0.02 kg   **B** 0.10 kg   **C** 50 kg   **D** 72 kg

6 A car is travelling around a circular track at a constant speed, as shown.

In which direction is the resultant force on the car?
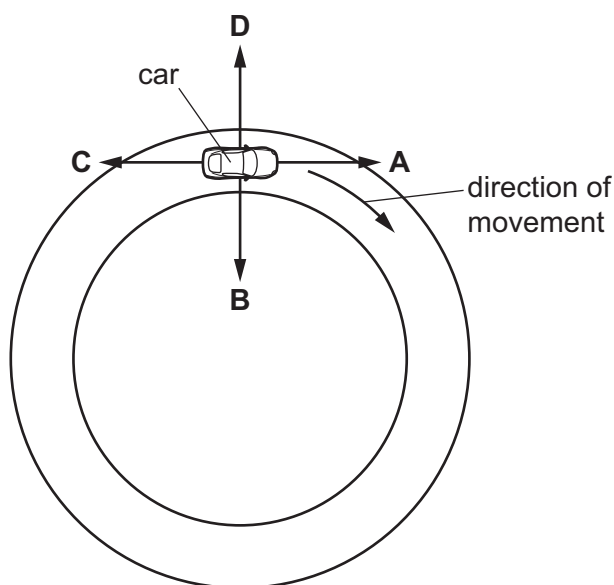
7 Two forces *P* and *Q* act on a metre rule as shown. The metre rule is pivoted at one end. The rule starts to rotate in a clockwise direction.
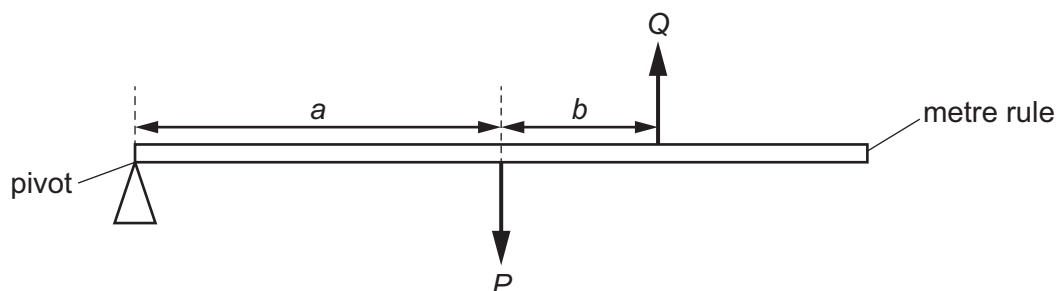
Which statement is correct?

A *P* equals *Q*

B *P* is less than *Q*

C $(P \times a)$ is equal to $(Q \times b)$

D $(P \times a)$ is greater than $(Q \times (a + b))$

8 Which statement gives a complete description of any object that is in equilibrium?

A There are no forces acting.

B There is no resultant force.

C There is no resultant force and no resultant turning effect.

D There is no resultant turning effect.

9 Two objects X and Y move directly towards each other. The objects have the same mass.

Object X has a velocity of 5.0 m/s to the right. Object Y has a velocity of 3.0 m/s to the left.

Object X and object Y collide and stick together.

What is their velocity after colliding?

A 1.0 m/s to the left

B 1.0 m/s to the right

C 4.0 m/s to the left

D 4.0 m/s to the right

10 Brakes are used to slow down a moving car.

Into which form of energy is most of the kinetic energy converted as the car slows down?

A chemical

B elastic

C thermal

D sound

11 A man carries 20 tiles from the ground to the roof of a house. Each tile has a mass of 1.2 kg. The roof of the house is 15 m above the ground.

How much work does the man do against gravity on the tiles in carrying them to the roof?

A 36 J **B** 180 J **C** 360 J **D** 3600 J

12 A car is moving along a straight horizontal road. The car has 1.6 MJ of kinetic energy. The car accelerates for 20 s until the kinetic energy of the car increases to 2.5 MJ.

What is the minimum average power developed by the car engine for this acceleration?

A 45 W **B** 205 W **C** 45 kW **D** 205 kW

13 A drawing pin (thumb tack) has a sharp point at one end and a flat surface at the other end.

sharp point   flat surface
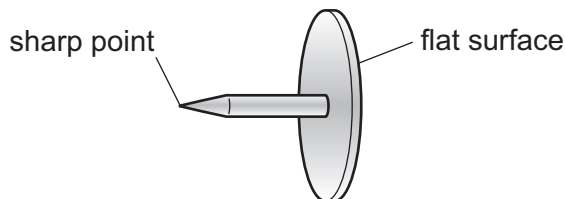
The pin is pushed into a wooden board.

How do the pressure and the force at the sharp point compare with the pressure and the force on the flat surface?

	force at the sharp point	pressure at the sharp point
A	greater than on the flat surface	greater than on the flat surface
B	greater than on the flat surface	less than on the flat surface
C	the same as on the flat surface	greater than on the flat surface
D	the same as on the flat surface	less than on the flat surface

14 An object is 20 cm below the surface of a liquid. The density of the liquid is 1200 kg/m^3.

What is the pressure on the object due to the liquid?

A   600 Pa   **B**   2400 Pa   **C**   60 000 Pa   **D**   240 000 Pa

15 A bubble of gas is formed deep under water. The bubble has a volume of 40 cm^3 and the pressure inside the bubble is *P.*

The bubble rises up through the water. The volume of the bubble increases to 56 cm^3 and the pressure becomes 100 kPa. The temperature of the gas does not change.

What is the initial pressure *P*?

A   71 Pa   **B**   71 kPa   **C**   140 Pa   **D**   140 kPa