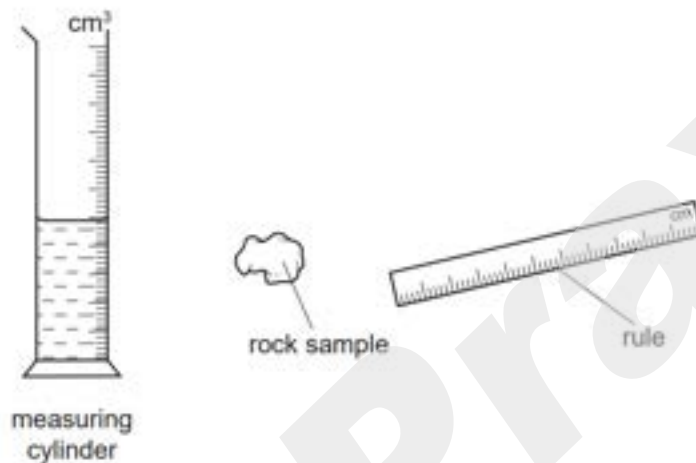


Motion, Forces and Energy*(Past Year Topical Questions 2010-2015)*May/June 2010 (11)

- 1 A scientist needs to determine the volume of a small, irregularly shaped rock sample. Only a rule and a measuring cylinder, partially filled with water, are available.



To determine the volume, which apparatus should the scientist use?

- A both the measuring cylinder and the rule
- B neither the measuring cylinder nor the rule
- C the measuring cylinder only
- D the rule only

- 2 A student uses a stopwatch to time a runner running around a circular track. The runner runs two laps (twice around the track). The diagrams show the reading on the stopwatch when the runner starts running, at the end of the first lap, and at the end of the second lap.



reading when runner starts



reading at end of first lap

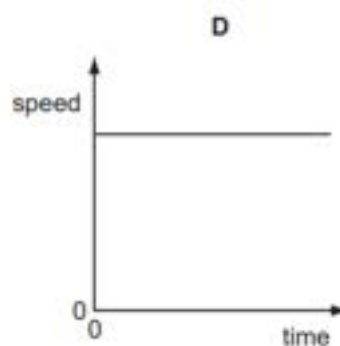
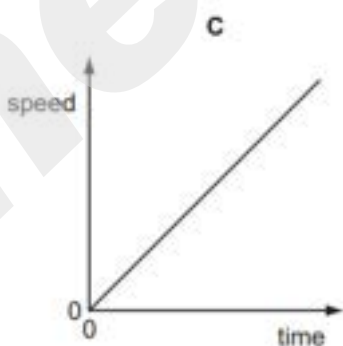
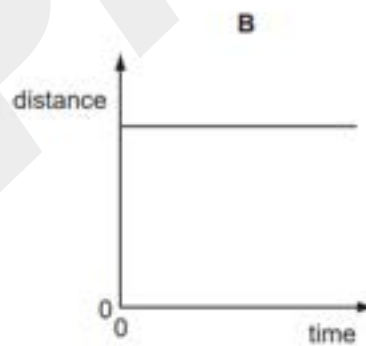


reading at end of second lap

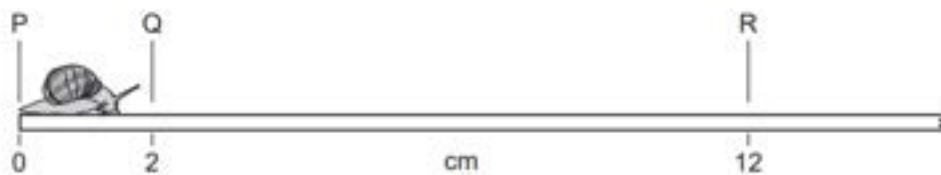
What is the time taken for the runner to run the second lap?

- A 0 min 50s B 1 min 10s C 1 min 13s D 2 min 03s
- 3 Two distance/time graphs and two speed/time graphs are shown.

Which graph represents an object that is at rest?

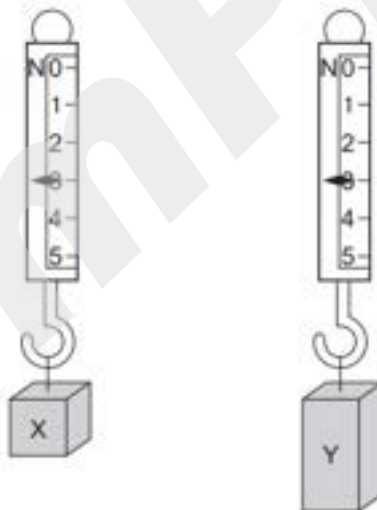


- 4 A snail moves along a ruler. It takes 20s to move from Q to R.



What is its average speed from Q to R?

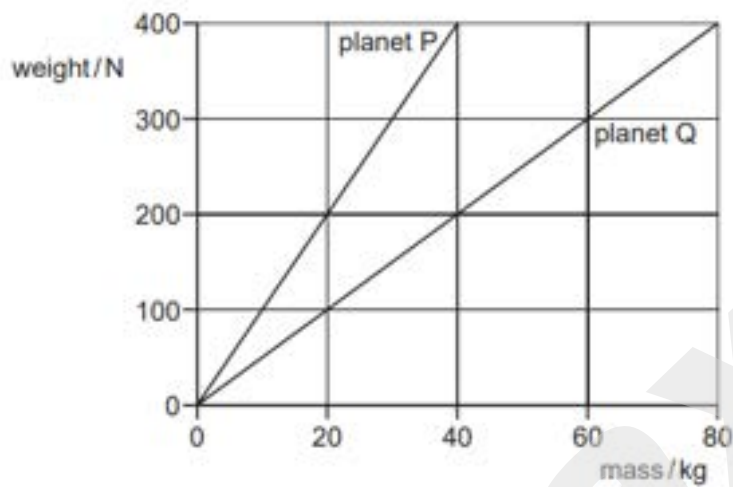
- A $\frac{12}{20}$ cm/s
- B $\frac{12-2}{20}$ cm/s
- C $\frac{20}{12}$ cm/s
- D $\frac{20}{12-2}$ cm/s
- 5 Two blocks of metal X and Y hang from spring balances as shown in the diagram.



What does the diagram show about X and Y?

- A They have the same mass and the same volume but different weights.
- B They have the same mass and the same weight but different volumes.
- C They have the same mass, the same volume and the same weight.
- D They have the same weight and the same volume but different masses.

- 6 The graph shows how weight varies with mass on planet P and on planet Q.

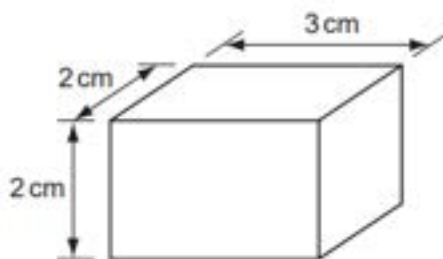


An object weighs 400 N on planet P. The object is taken to planet Q.

Which row is correct?

	mass of object on planet Q/kg	weight of object on planet Q/N
A	40	200
B	40	400
C	80	200
D	80	400

- 7 The diagram shows a rectangular block of density 2 g/cm^3 .



What is the mass of the block?

- A** 2g **B** 6g **C** 14g **D** 24g

8 Which statement about a moving object is correct?

- A When an object is accelerating, the resultant force acting on it must equal zero.
- B When an object is moving at a steady speed, the air resistance acting on it must equal zero.
- C When an object is moving at a steady speed, the resultant force acting on it must equal zero.
- D When an object is moving, there must be a resultant force acting on it.

9 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	2	3
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

10 Energy is stored in a battery and in a box of matches.

Which type of energy is stored in each of them?

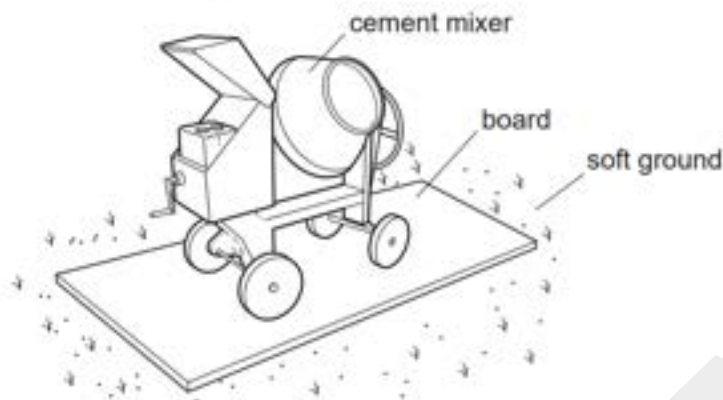
	a battery	a box of matches
A	chemical	chemical
B	chemical	internal (thermal)
C	electrical	chemical
D	electrical	internal (thermal)

11 A man lifts 20 bricks, each of weight 6 N.

What other information is needed to calculate the useful work done in lifting the bricks?

- A the distance he lifts the bricks
- B the mass of the bricks
- C the time taken to lift the bricks
- D the volume of the bricks

12 To prevent a cement mixer sinking into soft ground, the mixer is placed on a large flat board.



Why does this prevent the mixer sinking?

- A The large area decreases the pressure on the ground.
- B The large area increases the pressure on the ground.
- C The large area decreases the weight on the ground.
- D The large area increases the weight on the ground.

May/June 2010 (12)

1 A student uses a stopwatch to time a runner running around a circular track. The runner runs two laps (twice around the track). The diagrams show the reading on the stopwatch when the runner starts running, at the end of the first lap, and at the end of the second lap.



reading when
runner starts



reading at end
of first lap

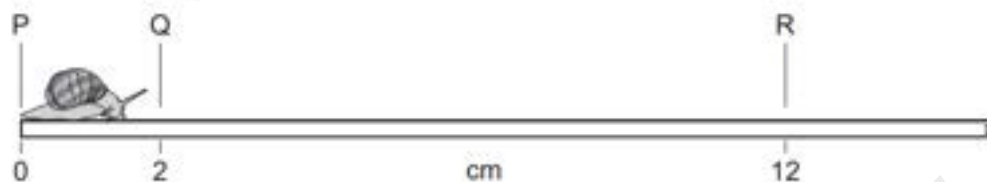


reading at end
of second lap

What is the time taken for the runner to run the second lap?

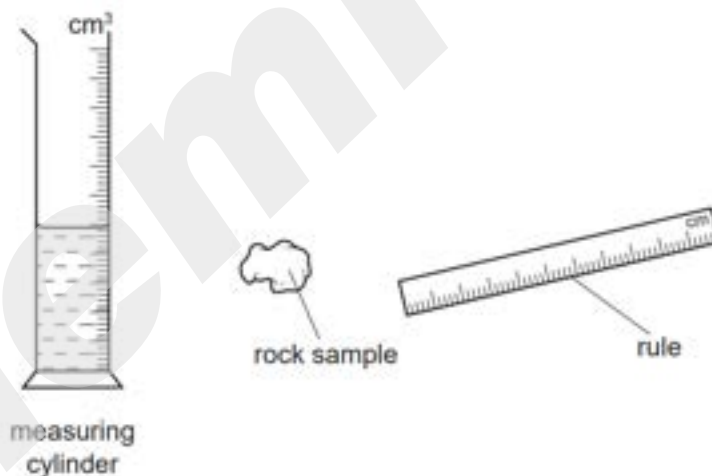
- A 0 min 50 s
- B 1 min 10 s
- C 1 min 13 s
- D 2 min 03 s

- 2 A snail moves along a ruler. It takes 20 s to move from Q to R.



What is its average speed from Q to R?

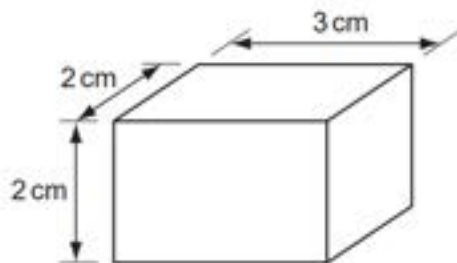
- A $\frac{12}{20}$ cm/s
- B $\frac{12-2}{20}$ cm/s
- C $\frac{20}{12}$ cm/s
- D $\frac{20}{12-2}$ cm/s
- 3 A scientist needs to determine the volume of a small, irregularly shaped rock sample. Only a rule and a measuring cylinder, partially filled with water, are available.



To determine the volume, which apparatus should the scientist use?

- A both the measuring cylinder and the rule
- B neither the measuring cylinder nor the rule
- C the measuring cylinder only
- D the rule only

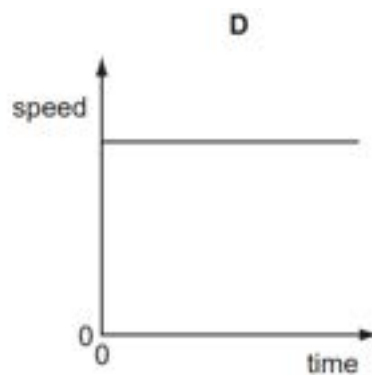
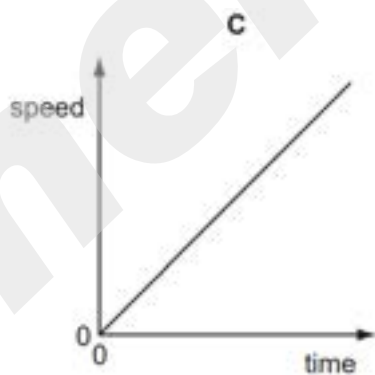
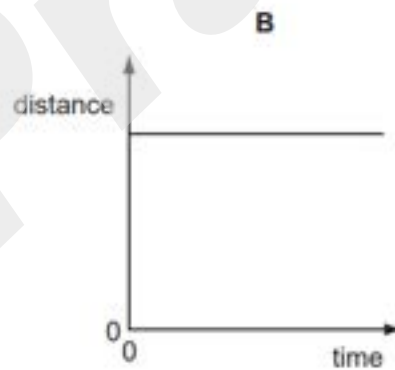
- 4 The diagram shows a rectangular block of density 2 g/cm^3 .



What is the mass of the block?

- A 2g B 6g C 14g D 24g
- 5 Two distance/time graphs and two speed/time graphs are shown.

Which graph represents an object that is at rest?



- 6 Which statement about a moving object is correct?
- A When an object is accelerating, the resultant force acting on it must equal zero.
 - B When an object is moving at a steady speed, the air resistance acting on it must equal zero.
 - C When an object is moving at a steady speed, the resultant force acting on it must equal zero.
 - D When an object is moving, there must be a resultant force acting on it.

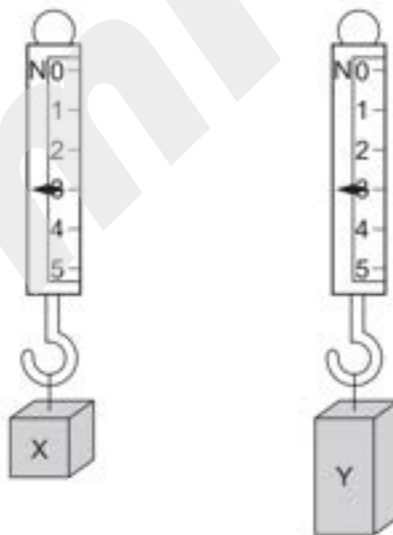
- 7 An experiment is carried out to measure the extension of a rubber band for different loads.

The results are shown below.

load / N	0	1	2	3
length / cm	15.2	16.2		18.6
extension / cm	0	1.0	2.1	3.4

Which figure is missing from the table?

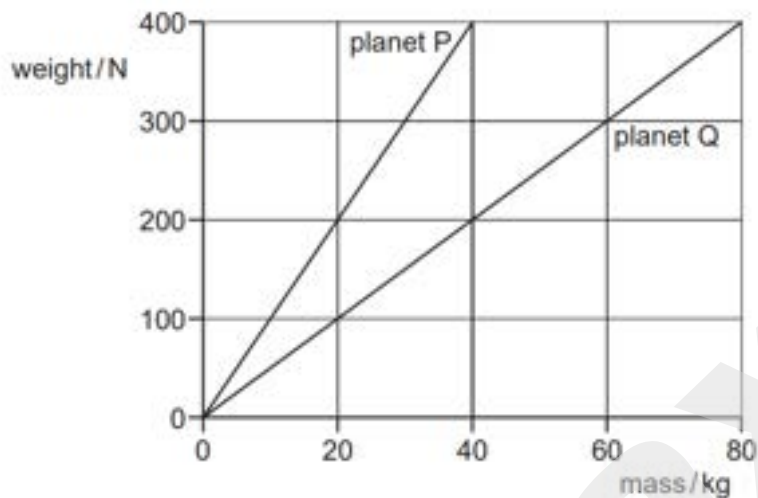
- A 17.2
 - B 17.3
 - C 17.4
 - D 17.6
- 8 Two blocks of metal X and Y hang from spring balances as shown in the diagram.



What does the diagram show about X and Y?

- A They have the same mass and the same volume but different weights.
- B They have the same mass and the same weight but different volumes.
- C They have the same mass, the same volume and the same weight.
- D They have the same weight and the same volume but different masses.

9 The graph shows how weight varies with mass on planet P and on planet Q.



An object weighs 400N on planet P. The object is taken to planet Q.

Which row is correct?

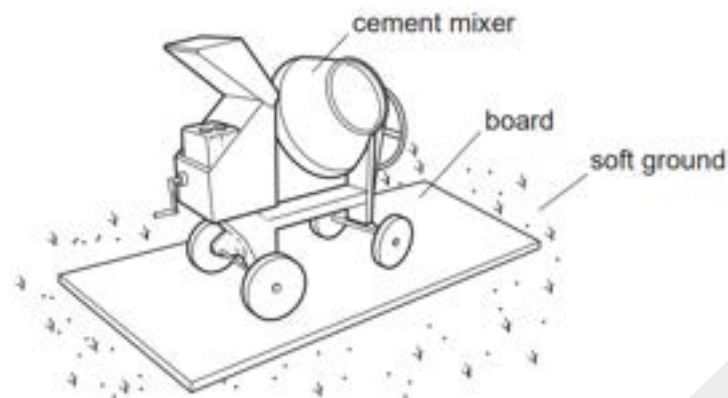
	mass of object on planet Q/kg	weight of object on planet Q/N
A	40	200
B	40	400
C	80	200
D	80	400

10 A man lifts 20 bricks, each of weight 6 N.

What other information is needed to calculate the useful work done in lifting the bricks?

- A** the distance he lifts the bricks
- B** the mass of the bricks
- C** the time taken to lift the bricks
- D** the volume of the bricks

11 To prevent a cement mixer sinking into soft ground, the mixer is placed on a large flat board.



Why does this prevent the mixer sinking?

- A The large area decreases the pressure on the ground.
- B The large area increases the pressure on the ground.
- C The large area decreases the weight on the ground.
- D The large area increases the weight on the ground.

14 Energy is stored in a battery and in a box of matches.

Which type of energy is stored in each of them?

	a battery	a box of matches
A	chemical	chemical
B	chemical	internal (thermal)
C	electrical	chemical
D	electrical	internal (thermal)

May/June 2010 (13)

- 1 A student uses a stopwatch to time a runner running around a circular track. The runner runs two laps (twice around the track). The diagrams show the reading on the stopwatch when the runner starts running, at the end of the first lap, and at the end of the second lap.


 reading when
runner starts

 reading at end
of first lap

 reading at end
of second lap

What is the time taken for the runner to run the second lap?

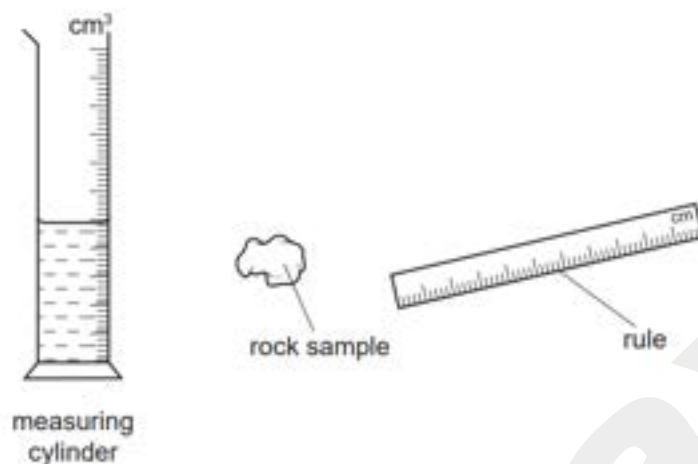
- A 0 min 50 s B 1 min 10 s C 1 min 13 s D 2 min 03 s
- 2 A snail moves along a ruler. It takes 20 s to move from Q to R.



What is its average speed from Q to R?

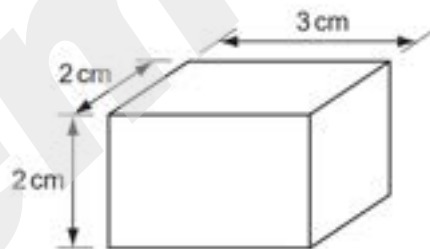
- A $\frac{12}{20}$ cm/s
- B $\frac{12-2}{20}$ cm/s
- C $\frac{20}{12}$ cm/s
- D $\frac{20}{12-2}$ cm/s

- 3 A scientist needs to determine the volume of a small, irregularly shaped rock sample. Only a rule and a measuring cylinder, partially filled with water, are available.



To determine the volume, which apparatus should the scientist use?

- A both the measuring cylinder and the rule
 - B neither the measuring cylinder nor the rule
 - C the measuring cylinder only
 - D the rule only
- 4 The diagram shows a rectangular block of density 2 g/cm^3 .

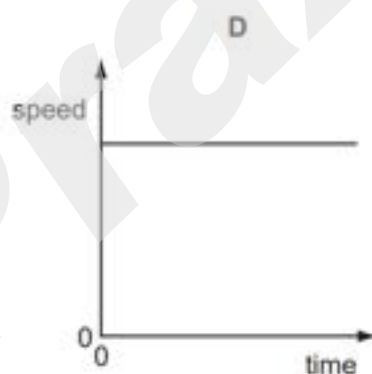
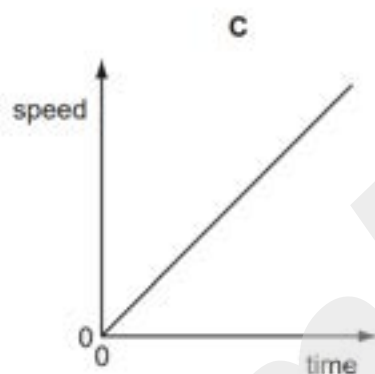
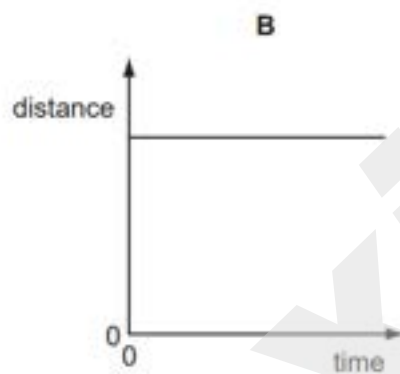
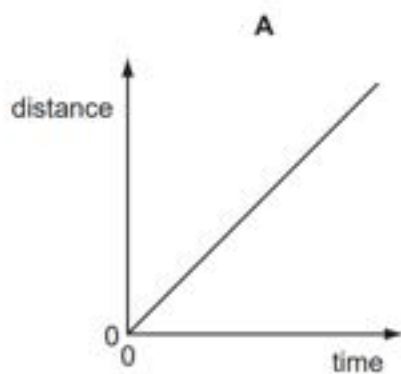


What is the mass of the block?

- A 2g
- B 6g
- C 14g
- D 24g

5 Two distance/time graphs and two speed/time graphs are shown.

Which graph represents an object that is at rest?



6 Which statement about a moving object is correct?

- A** When an object is accelerating, the resultant force acting on it must equal zero.
- B** When an object is moving at a steady speed, the air resistance acting on it must equal zero.
- C** When an object is moving at a steady speed, the resultant force acting on it must equal zero.
- D** When an object is moving, there must be a resultant force acting on it.

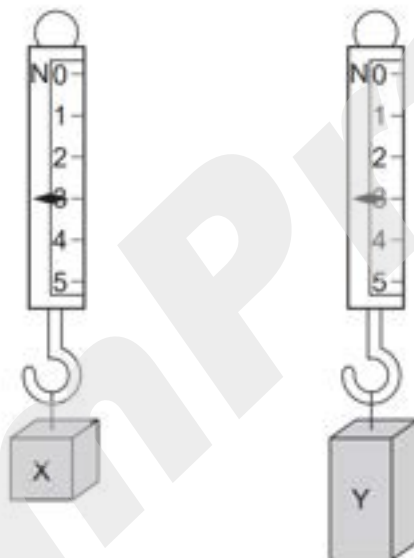
- 7 An experiment is carried out to measure the extension of a rubber band for different loads.

The results are shown below.

load / N	0	1	2	3
length / cm	15.2	16.2		18.6
extension / cm	0	1.0	2.1	3.4

Which figure is missing from the table?

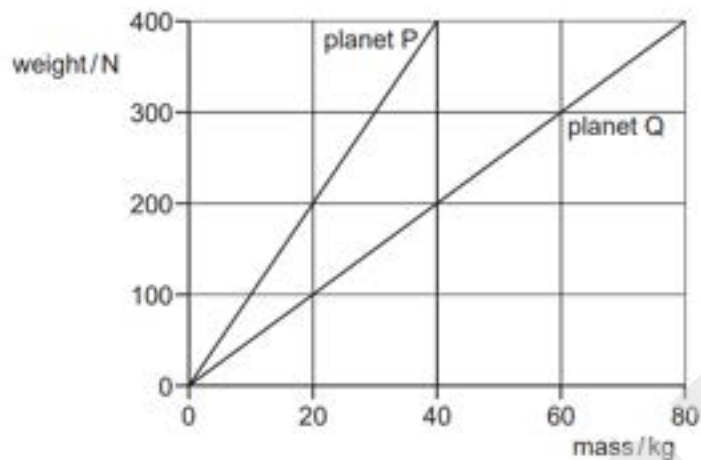
- A 17.2 B 17.3 C 17.4 D 17.6
- 8 Two blocks of metal X and Y hang from spring balances as shown in the diagram.



What does the diagram show about X and Y?

- A They have the same mass and the same volume but different weights.
 B They have the same mass and the same weight but different volumes.
 C They have the same mass, the same volume and the same weight.
 D They have the same weight and the same volume but different masses.

9 The graph shows how weight varies with mass on planet P and on planet Q.



An object weighs 400N on planet P. The object is taken to planet Q.

Which row is correct?

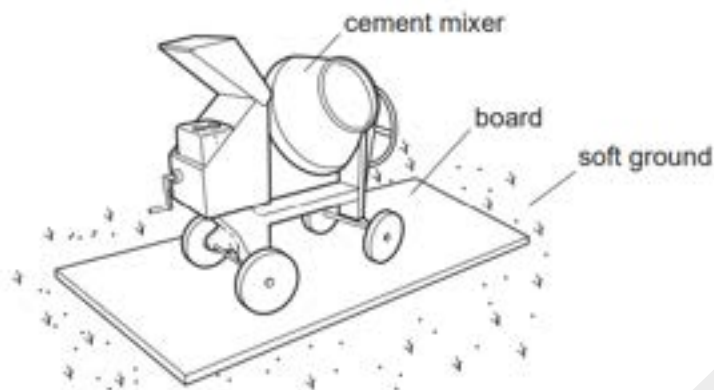
	mass of object on planet Q/kg	weight of object on planet Q/N
A	40	200
B	40	400
C	80	200
D	80	400

10 A man lifts 20 bricks, each of weight 6 N.

What other information is needed to calculate the useful work done in lifting the bricks?

- A** the distance he lifts the bricks
- B** the mass of the bricks
- C** the time taken to lift the bricks
- D** the volume of the bricks

11 To prevent a cement mixer sinking into soft ground, the mixer is placed on a large flat board.



Why does this prevent the mixer sinking?

- A** The large area decreases the pressure on the ground.
- B** The large area increases the pressure on the ground.
- C** The large area decreases the weight on the ground.
- D** The large area increases the weight on the ground.

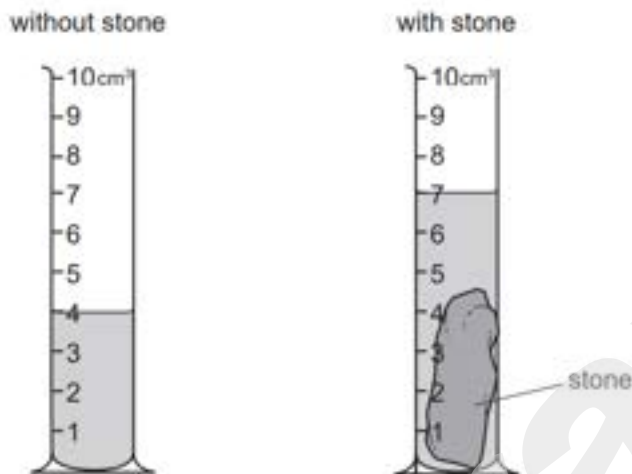
14 Energy is stored in a battery and in a box of matches.

Which type of energy is stored in each of them?

	a battery	a box of matches
A	chemical	chemical
B	chemical	internal (thermal)
C	electrical	chemical
D	electrical	internal (thermal)

October/November 2010 (11)

- 1 The diagrams show an experiment to determine the volume of a stone.



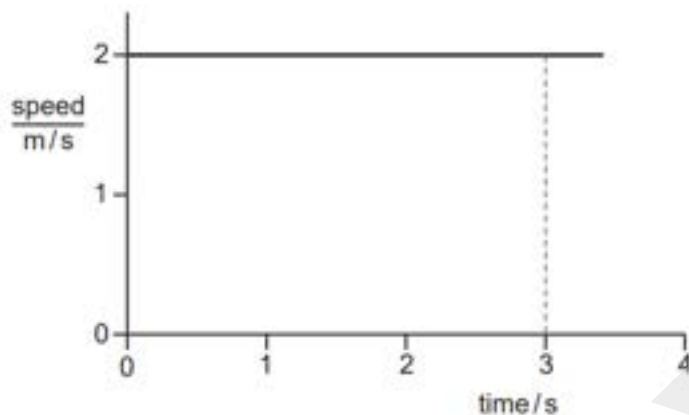
What is the volume of the stone?

- A 3 cm^3 B 4 cm^3 C 7 cm^3 D 11 cm^3
- 2 Four athletes run twice around a track. The table shows their times at the end of each lap.

Which athlete runs the second lap the fastest?

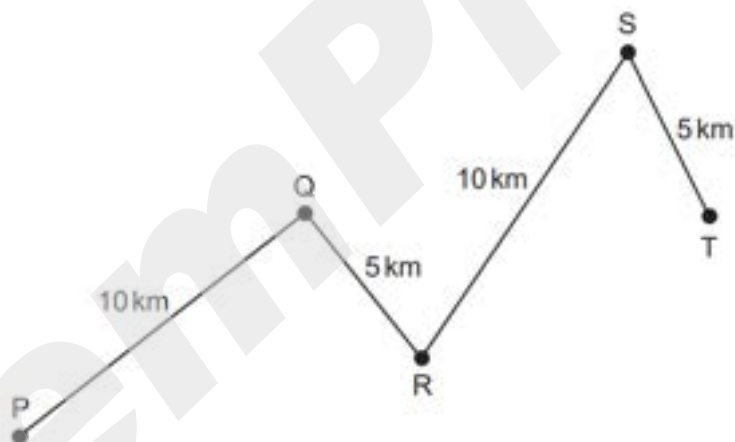
athlete	time at end of first lap/s	time at end of second lap/s
A	22.99	47.04
B	23.04	47.00
C	23.16	47.18
D	23.39	47.24

- 3 The diagram shows the speed/time graph for an object moving at constant speed.



What is the distance travelled by the object in the first 3 s?

- A** 1.5m **B** 2.0m **C** 3.0m **D** 6.0m
- 4 A car travels along the route PQRST in 30 minutes.

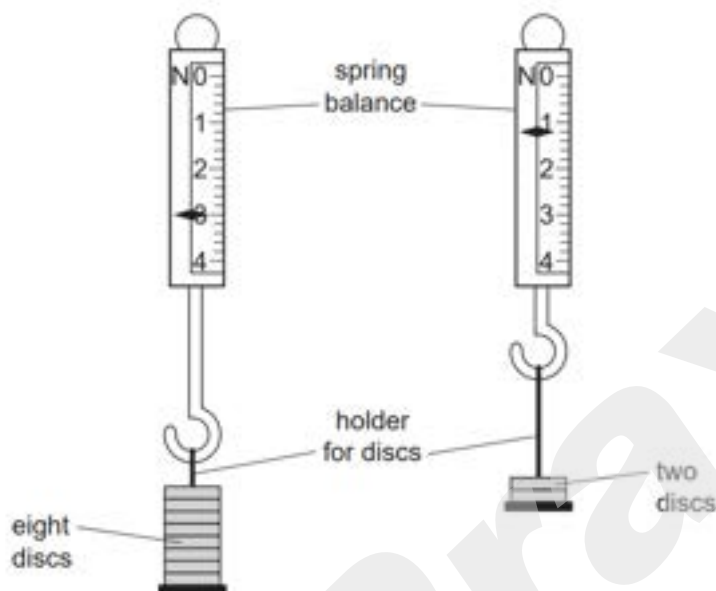


What is the average speed of the car?

- A** 10 km/hour **B** 20 km/hour **C** 30 km/hour **D** 60 km/hour
- 5 Which list contains the name of a force?
- A** acceleration, charge, temperature
- B** density, resistance, speed
- C** distance, frequency, mass
- D** energy, power, weight

- 6 The reading on a spring balance with a holder and eight identical discs is 3.0N.

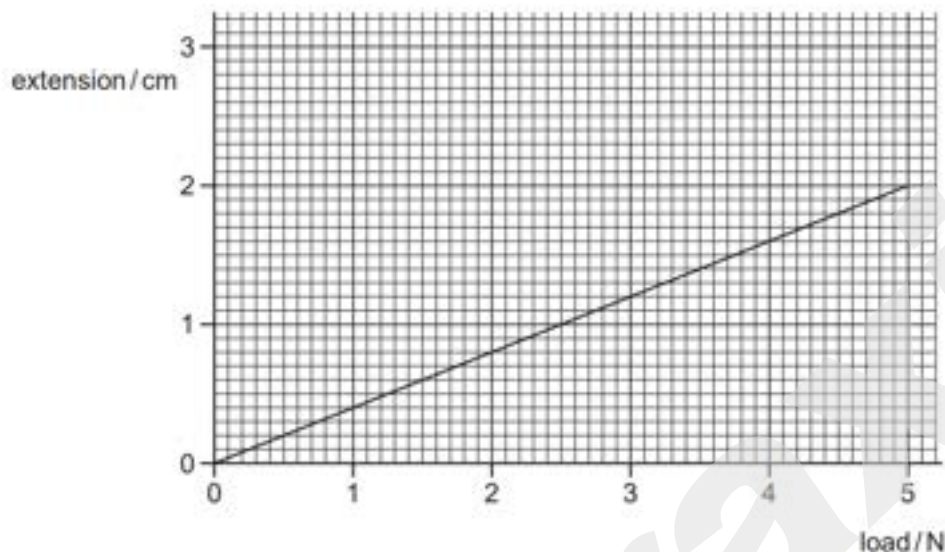
Six discs are removed and the reading becomes 1.2N.



What is the weight of one disc?

- A 0.2N B 0.3N C 0.5N D 0.6N
- 7 A student is trying to find the density of water and of a large, regularly shaped concrete block. Which apparatus is needed to find the density of **both** the water and the concrete block?
- A balance, clock, measuring cylinder
 B balance, clock, ruler
 C balance, measuring cylinder, ruler
 D clock, measuring cylinder, ruler
- 8 A force acts on a moving rubber ball. Which of these changes could **not** happen to the ball because of the force?
- A a change in direction
 B a change in mass
 C a change in shape
 D a change in speed

- 9 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
- 10 Which of these is designed to change electrical energy into kinetic energy?
- A** a capacitor
B a generator
C a motor
D a transformer
- 11 A car is driven on a long journey along a flat, horizontal road. The car stops several times on the journey and its engine becomes hot.
- Which type of energy does **not** change during the journey?
- A** the chemical energy in the fuel tank
B the gravitational energy of the car
C the internal (thermal) energy of the engine
D the kinetic energy of the car

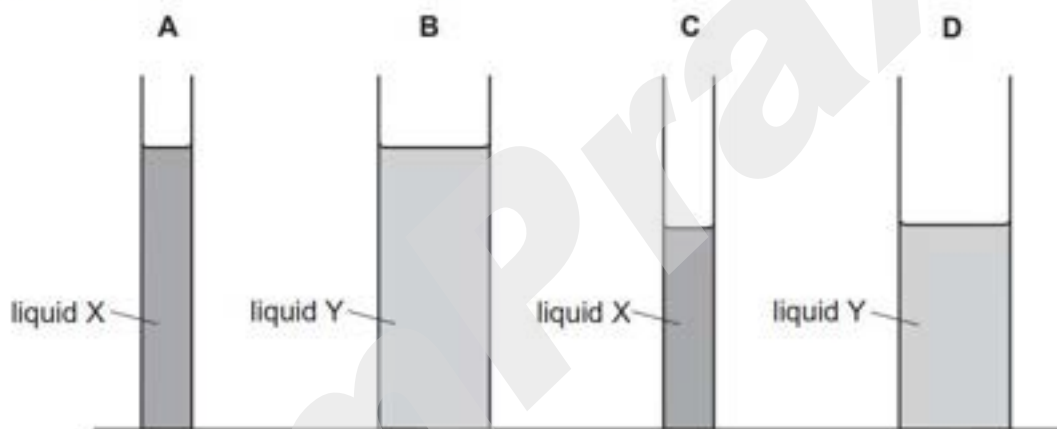
12 What is a simple mercury barometer designed to measure?

- A the pressure beneath a liquid
- B the pressure of a gas supply
- C the pressure of car tyres
- D the pressure of the atmosphere

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

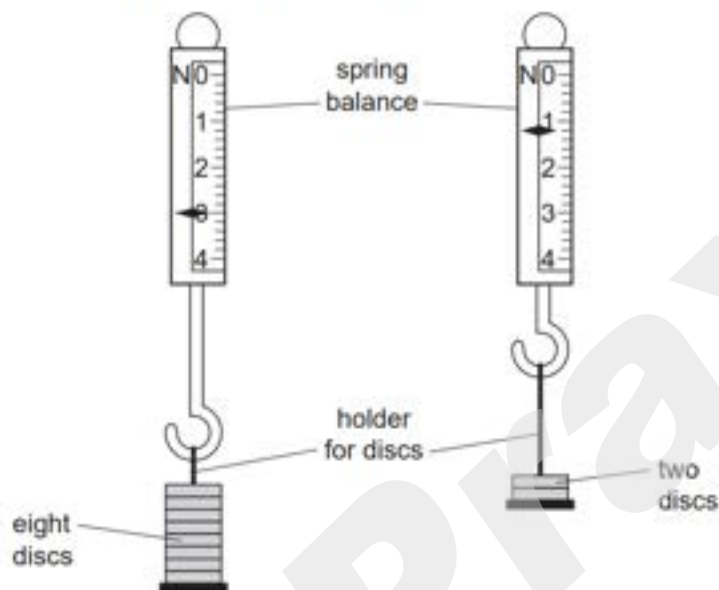
The liquids are poured into tubes as shown.

Which tube has the greatest pressure on its base?



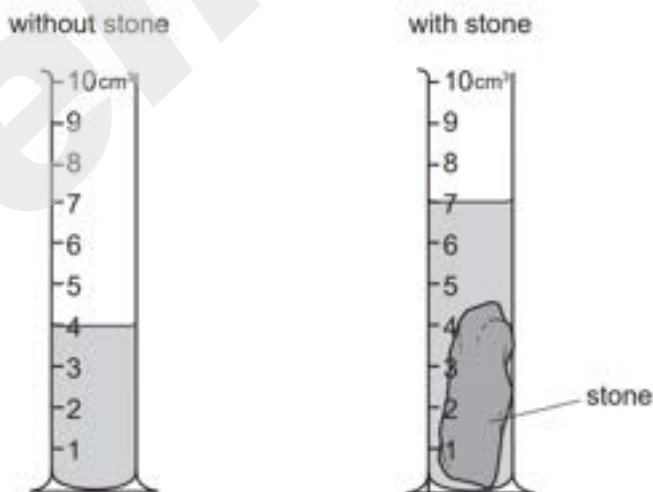
October/November 2010 (12)

- 1 The reading on a spring balance with a holder and eight identical discs is 3.0 N.
Six discs are removed and the reading becomes 1.2 N.



What is the weight of one disc?

- A 0.2 N B 0.3 N C 0.5 N D 0.6 N
- 2 The diagrams show an experiment to determine the volume of a stone.



What is the volume of the stone?

- A 3 cm³ B 4 cm³ C 7 cm³ D 11 cm³

- 3 A student is trying to find the density of water and of a large, regularly shaped concrete block.

Which apparatus is needed to find the density of **both** the water and the concrete block?

- A balance, clock, measuring cylinder
B balance, clock, ruler
C balance, measuring cylinder, ruler
D clock, measuring cylinder, ruler
- 4 What is a simple mercury barometer designed to measure?

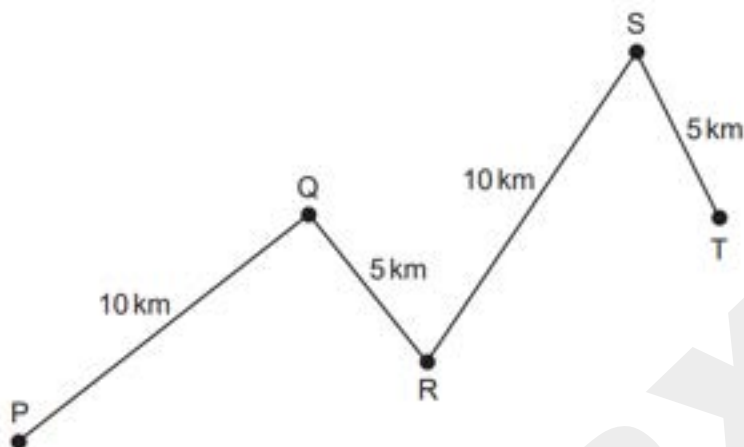
- A the pressure beneath a liquid
B the pressure of a gas supply
C the pressure of car tyres
D the pressure of the atmosphere

- 5 Four athletes run twice around a track. The table shows their times at the end of each lap.

Which athlete runs the second lap the fastest?

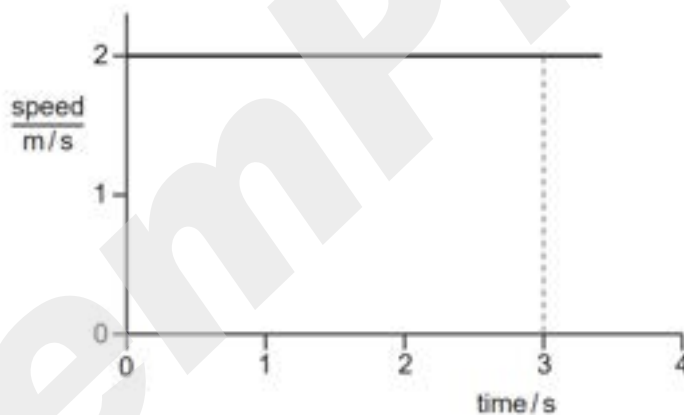
athlete	time at end of first lap /s	time at end of second lap /s
A	22.99	47.04
B	23.04	47.00
C	23.16	47.18
D	23.39	47.24

- 6 A car travels along the route PQRST in 30 minutes.



What is the average speed of the car?

- A** 10 km/hour **B** 20 km/hour **C** 30 km/hour **D** 60 km/hour
- 7 The diagram shows the speed/time graph for an object moving at constant speed.



What is the distance travelled by the object in the first 3 s?

- A** 1.5m **B** 2.0m **C** 3.0m **D** 6.0m

- 8 A car is driven on a long journey along a flat, horizontal road. The car stops several times on the journey and its engine becomes hot.

Which type of energy does **not** change during the journey?

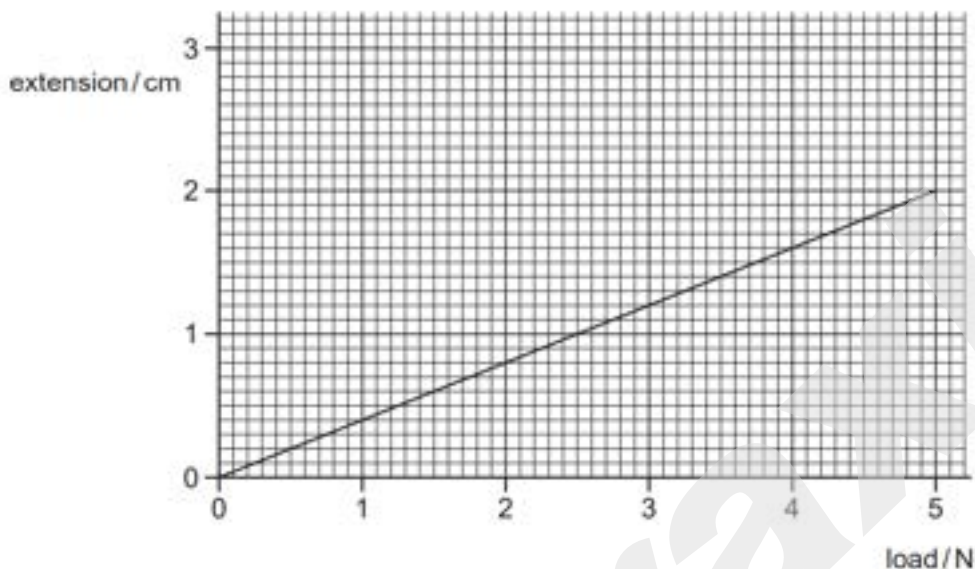
- A the chemical energy in the fuel tank
 - B the gravitational energy of the car
 - C the internal (thermal) energy of the engine
 - D the kinetic energy of the car
- 9 Which list contains the name of a force?
- A acceleration, charge, temperature
 - B density, resistance, speed
 - C distance, frequency, mass
 - D energy, power, weight

- 10 A force acts on a moving rubber ball.

Which of these changes could **not** happen to the ball because of the force?

- A a change in direction
- B a change in mass
- C a change in shape
- D a change in speed

11 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.

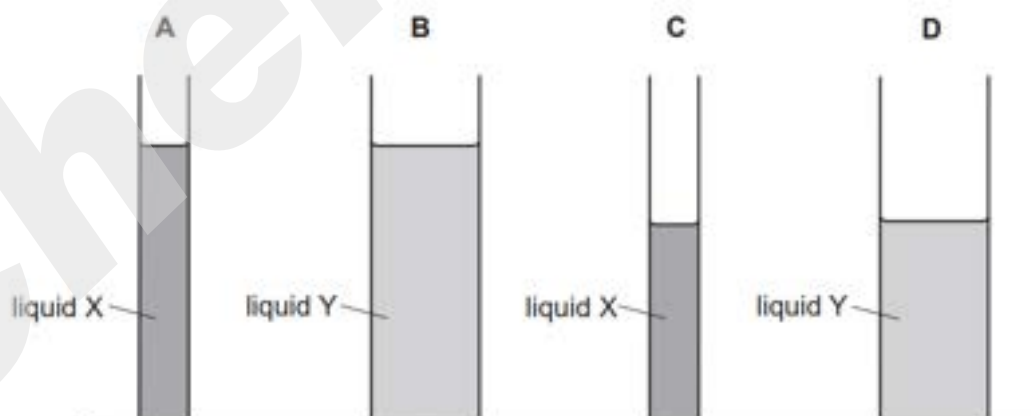
What is the weight of the object?

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

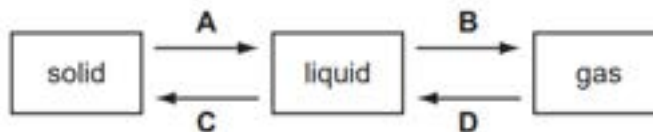
12 Liquid X has a density of 1010 kg/m^3 . Liquid Y has a density of 950 kg/m^3 .

The liquids are poured into tubes as shown.

Which tube has the greatest pressure on its base?



13 Which change is condensation?



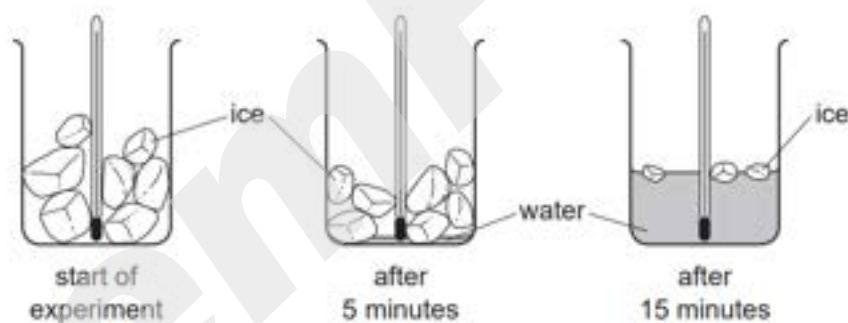
14 Some gas in a sealed plastic bag is cooled.

How do the gas molecules behave when this happens?

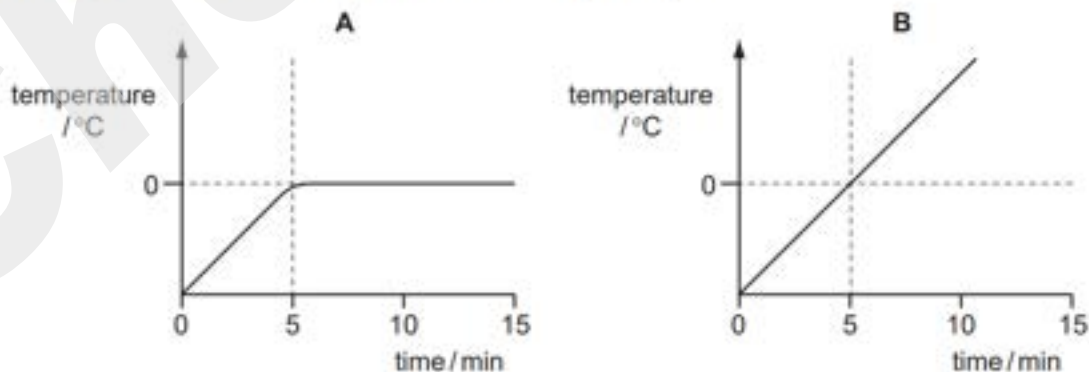
- A They move more quickly and become closer together.
- B They move more quickly and become further apart.
- C They move more slowly and become closer together.
- D They move more slowly and become further apart.

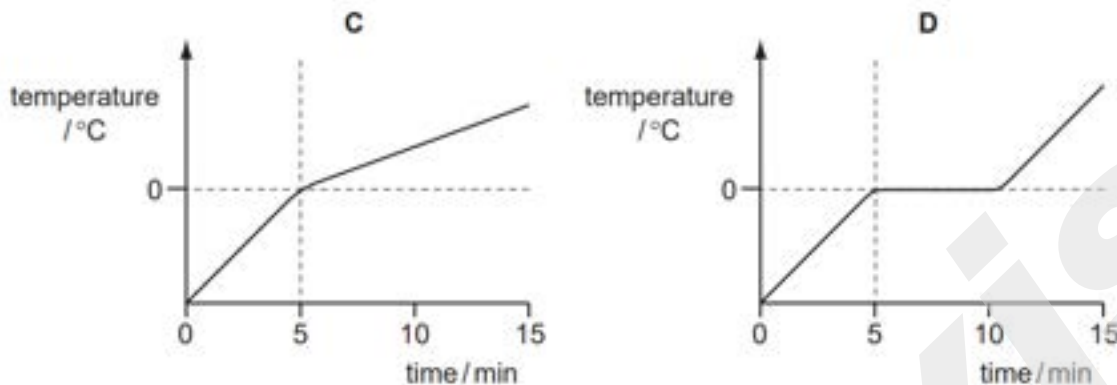
15 A beaker containing ice and a thermometer is left in a warm room for 15 minutes.

No water is visible in the beaker until 5 minutes has passed. After 15 minutes some ice is still visible.



Which graph shows how the thermometer reading changes?





October/November 2010 (13)

- 1 A student is trying to find the density of water and of a large, regularly shaped concrete block.

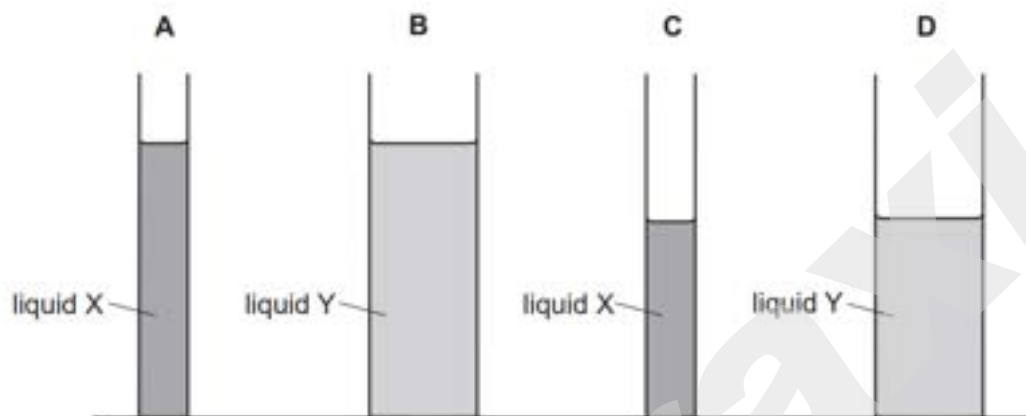
Which apparatus is needed to find the density of both the water and the concrete block?

- A balance, clock, measuring cylinder
- B balance, clock, ruler
- C balance, measuring cylinder, ruler
- D clock, measuring cylinder, ruler

- 2 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.

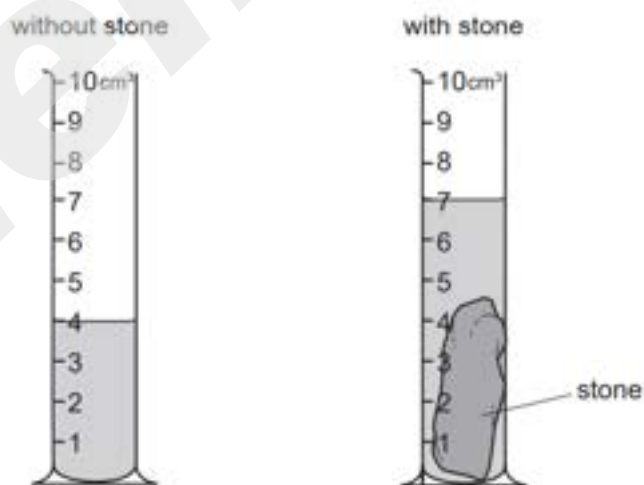
Which tube has the greatest pressure on its base?



- 3 What is a simple mercury barometer designed to measure?

- A the pressure beneath a liquid
- B the pressure of a gas supply
- C the pressure of car tyres
- D the pressure of the atmosphere

- 4 The diagrams show an experiment to determine the volume of a stone.

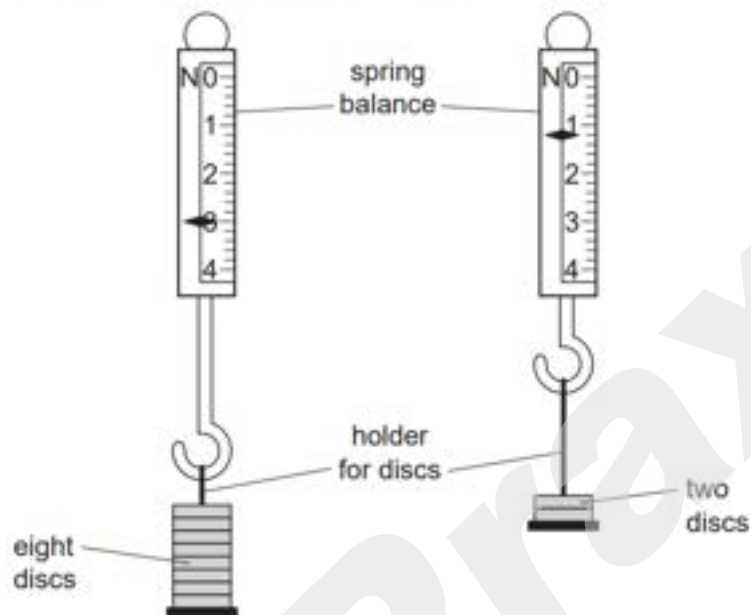


What is the volume of the stone?

- A 3 cm^3
- B 4 cm^3
- C 7 cm^3
- D 11 cm^3

- 5 The reading on a spring balance with a holder and eight identical discs is 3.0 N.

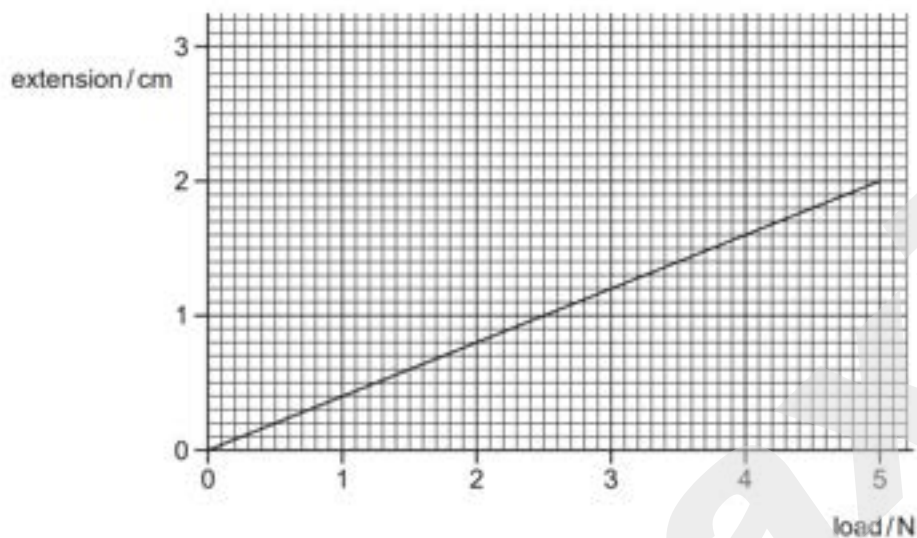
Six discs are removed and the reading becomes 1.2 N.



What is the weight of one disc?

- A 0.2 N B 0.3 N C 0.5 N D 0.6 N

- 6 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.

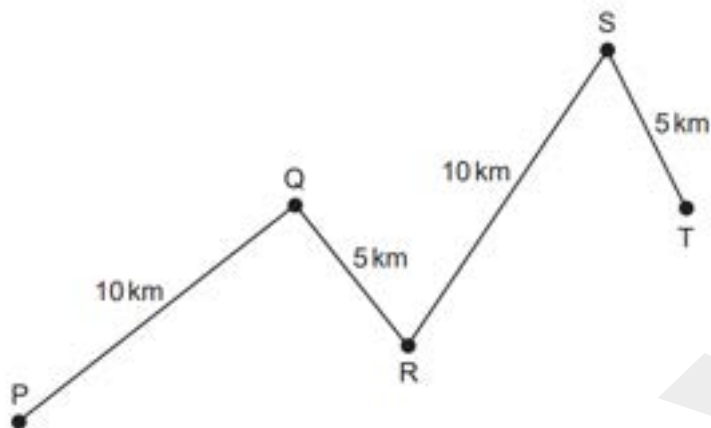
What is the weight of the object?

- A 0.55 N B 0.67 N C 3.5 N D 4.1 N
- 7 Four athletes run twice around a track. The table shows their times at the end of each lap.

Which athlete runs the second lap the fastest?

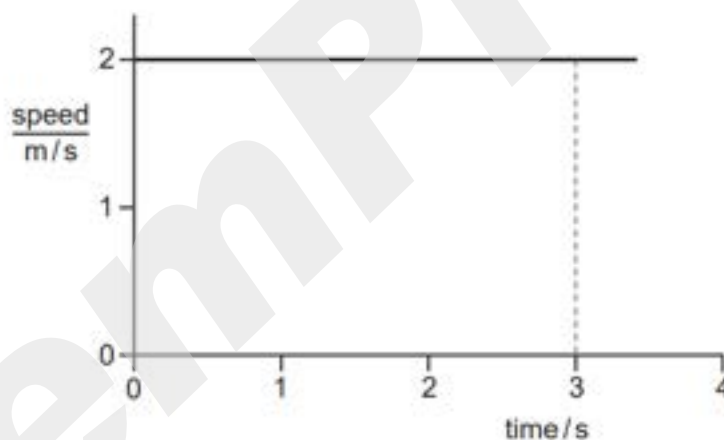
athlete	time at end of first lap/s	time at end of second lap/s
A	22.99	47.04
B	23.04	47.00
C	23.16	47.18
D	23.39	47.24

- 8 A car travels along the route PQRST in 30 minutes.



What is the average speed of the car?

- A 10 km/hour B 20 km/hour C 30 km/hour D 60 km/hour
- 9 The diagram shows the speed/time graph for an object moving at constant speed.



What is the distance travelled by the object in the first 3 s?

- A 1.5 m B 2.0 m C 3.0 m D 6.0 m
- 10 Which list contains the name of a force?
- A acceleration, charge, temperature
- B density, resistance, speed
- C distance, frequency, mass
- D energy, power, weight

11 A force acts on a moving rubber ball.

Which of these changes could **not** happen to the ball because of the force?

- A a change in direction
- B a change in mass
- C a change in shape
- D a change in speed

12 A car is driven on a long journey along a flat, horizontal road. The car stops several times on the journey and its engine becomes hot.

Which type of energy does **not** change during the journey?

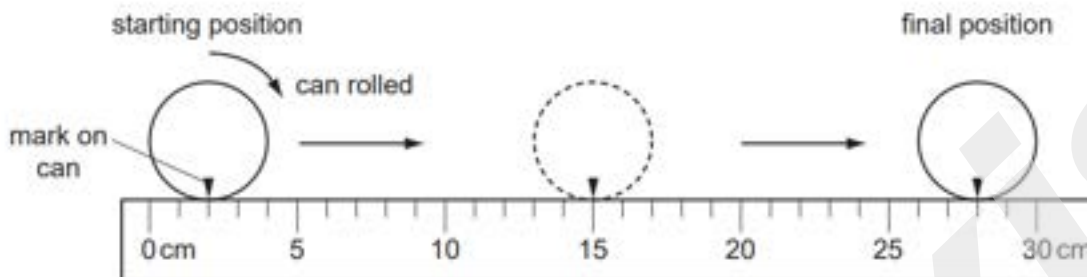
- A the chemical energy in the fuel tank
- B the gravitational energy of the car
- C the internal (thermal) energy of the engine
- D the kinetic energy of the car

13 Which of these is designed to change electrical energy into kinetic energy?

- A a capacitor
- B a generator
- C a motor
- D a transformer

May/June 2011 (11)

- 1 A cylindrical can is rolled along the ruler shown in the diagram.



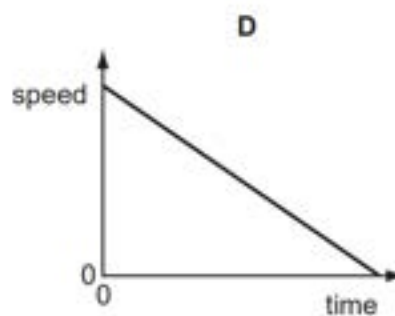
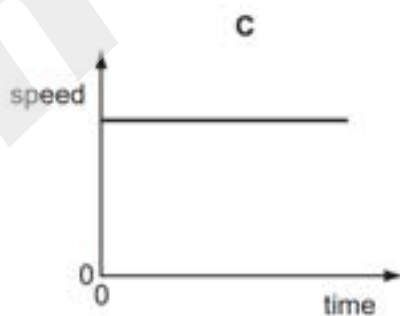
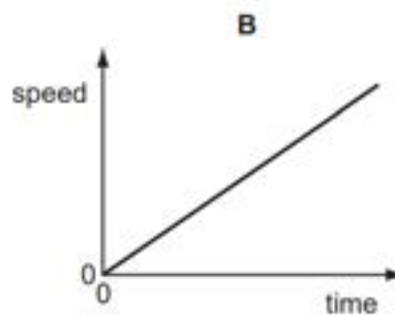
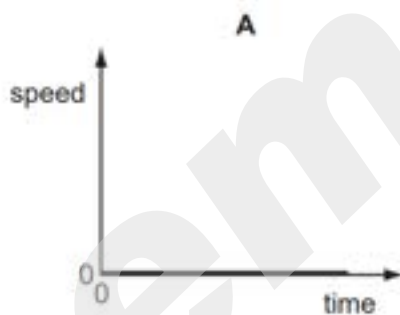
The can rolls over twice.

What is the circumference (distance all round) of the can?

- A 13 cm B 14 cm C 26 cm D 28 cm

- 2 A car is moving downhill along a road at a constant speed.

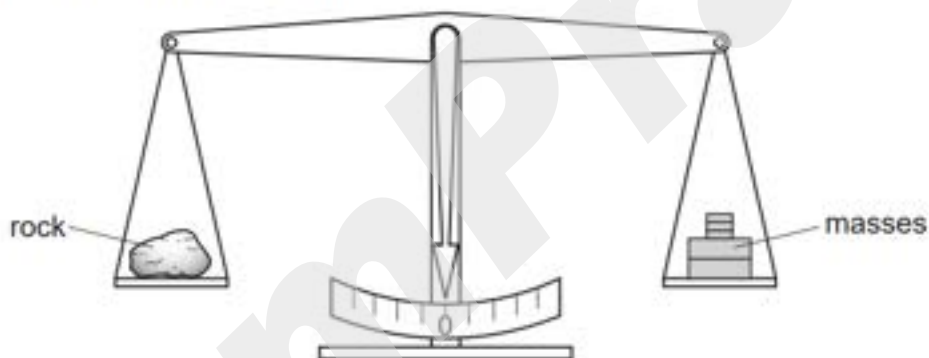
Which graph is the speed/time graph for the car?



- 3 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
- 4 Which quantity is measured in newtons?
- A density
B energy
C pressure
D weight
- 5 A geologist places a small rock on the left-hand pan of a balance. The two pans are level as shown when masses with a total weight of 23 N are placed on the right-hand pan. Take the weight of 1.0 kg to be 10 N.



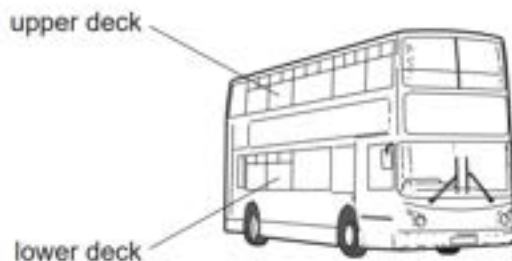
What is the mass of the small rock?

- A 0.023 kg B 2.3 kg C 23 kg D 230 kg
- 6 A stone has a volume of 0.50 cm^3 and a mass of 2.0 g.

What is the density of the stone?

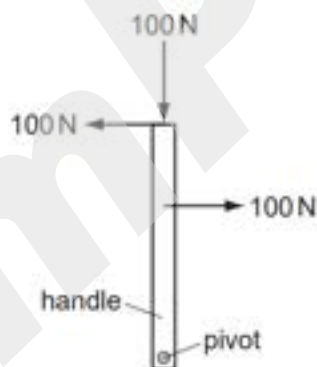
- A 0.25 g/cm^3
B 1.5 g/cm^3
C 2.5 g/cm^3
D 4.0 g/cm^3

- 7 Passengers are **not** allowed to stand on the upper deck of double-decker buses.



Why is this?

- A They would cause the bus to become less stable.
 - B They would cause the bus to slow down.
 - C They would increase the kinetic energy of the bus.
 - D They would lower the centre of mass of the bus.
- 8 The diagram shows a handle with three forces, each 100 N, applied to it. The handle is free to move.



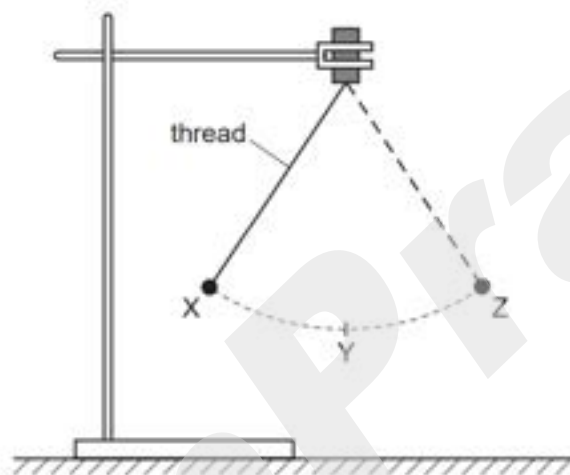
What is the effect of the forces on the handle?

- A The handle will move downwards.
- B The handle will not move.
- C The handle will turn anticlockwise (to the left).
- D The handle will turn clockwise (to the right).

9 In which pair of energy sources are both sources renewable?

- A oil and coal
- B oil and tidal
- C tidal and geothermal
- D tidal and nuclear fission

10 An object on a thread is swinging between X and Z, as shown in the diagram. It is momentarily at rest at X and at Z.



An incomplete word equation about the energy of the object is shown below.

$$\begin{array}{ccccccc} \text{gravitational potential energy} & = & \text{kinetic energy} & + & \text{..... energy} & + & \text{energy losses} \\ \text{at X} & & \text{at Y} & & \text{at Y} & & \end{array}$$

Which form of energy is needed to complete the word equation?

- A chemical
- B gravitational potential
- C internal
- D strain

11 Which statement is explained by reference to pressure?

- A Objects with greater mass have greater weight.
- B One kilogram of water occupies more volume than one kilogram of lead.
- C Spikes on running-shoes sink into the ground.
- D Water cooled to a low enough temperature turns to ice.

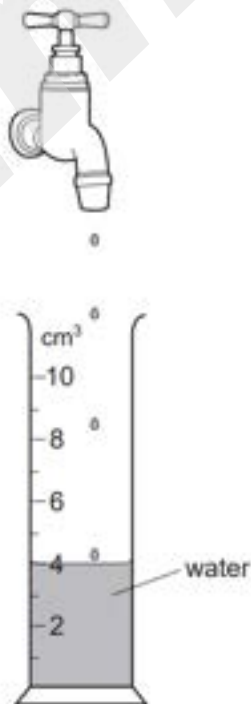
13 Brownian motion is observed when looking at smoke particles in air using a microscope.

What causes the smoke particles to move at random?

- A Smoke particles are hit by air molecules.
- B Smoke particles are moved by convection currents in the air.
- C Smoke particles have different weights and fall at different speeds.
- D Smoke particles hit the walls of the container.

May/June 2011 (12)

2 Drops of water are dripping steadily from a tap (faucet). The diagram shows a measuring cylinder which has collected 120 drops of water.



How many drops in total will have been collected when the measuring cylinder reads 10 cm^3 ?

- A 48 B 60 C 180 D 300

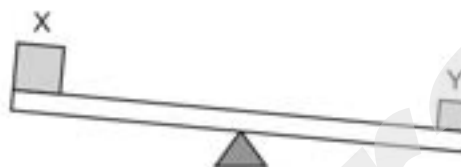
- 3 In a race, a car travels 60 times around a 3.6 km track. This takes 2.4 hours.

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

- 5 Two objects X and Y are placed on a balance.

The balance tilts as shown.



What does this show about the masses and weights of objects X and Y?

	masses	weights
A	X has less mass than Y	X has less weight than Y
B	X has less mass than Y	X has more weight than Y
C	X has the same mass as Y	X has less weight than Y
D	X has the same mass as Y	X has more weight than Y

- 6 A stone has a volume of 0.50 cm^3 and a mass of 2.0 g.

What is the density of the stone?

- A 0.25 g/cm^3
 B 1.5 g/cm^3
 C 2.5 g/cm^3
 D 4.0 g/cm^3

8 On which ball is a non-zero resultant force acting?

A

a ball moving at constant speed on a smooth surface



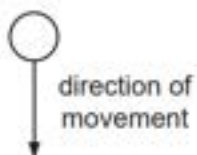
B

a ball at rest on a bench



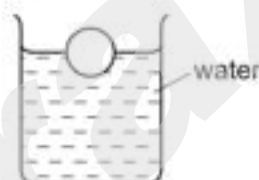
C

a free-falling ball which has just been released



D

a ball floating on water

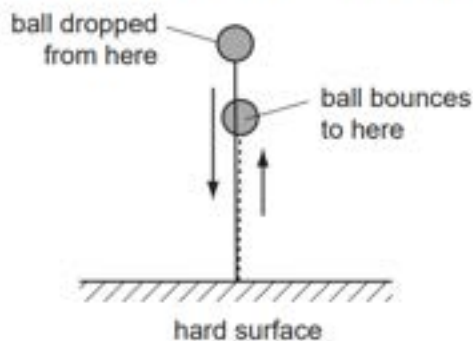


9 Electricity can be obtained from different energy resources.

Which energy resource is used to obtain electricity without producing heat to boil water?

- A coal
- B gas
- C hydroelectric
- D nuclear

- 10 A ball is dropped on to a hard surface and bounces. It does not bounce all the way back to where it started, so it has less gravitational potential energy than when it started.

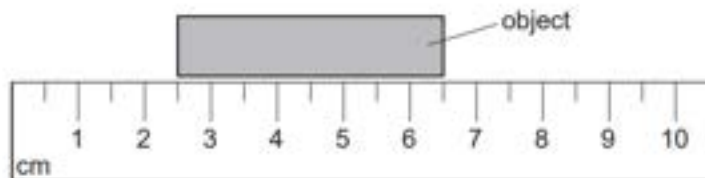


What happens to the 'lost' energy?

- A It is converted into chemical and strain energy.
 - B It is converted into internal (heat) energy and sound.
 - C It is destroyed as the ball rises upwards after hitting the ground.
 - D It is destroyed when the ball hits the ground.
- 11 What does a barometer measure?
- A atmospheric density
 - B atmospheric pressure
 - C liquid density
 - D liquid pressure
- 12 In which position would a boy exert the **most** pressure on the ground?
- A lying on his back
 - B sitting down
 - C standing on one foot
 - D standing on two feet

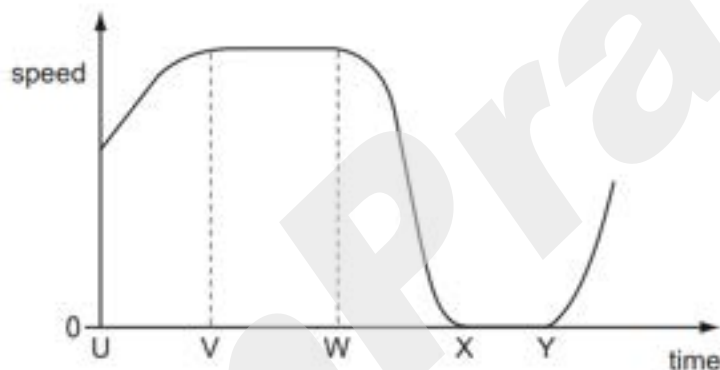
October/November 2011 (11)

- 1 A ruler is used to measure the length of an object.



What is the length of the object?

- A 3.0 cm B 4.0 cm C 5.0 cm D 6.5 cm
- 2 The graph shows how the speed of a car changes with time.



Between which two times is the car stationary?

- A U and V B V and W C W and X D X and Y
- 3 A child is standing on the platform of a station.

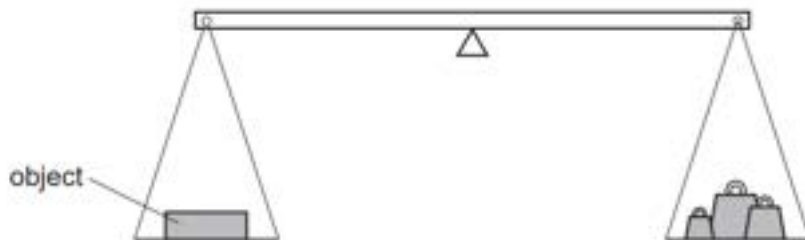


A train travelling at 30 m/s takes 3.0 s to pass the child.

What is the length of the train?

- A 10 m B 27 m C 30 m D 90 m

- 4 The weight of an object is to be found using the balance shown in the diagram.



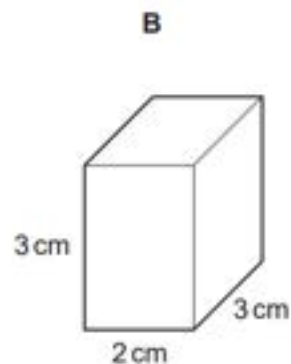
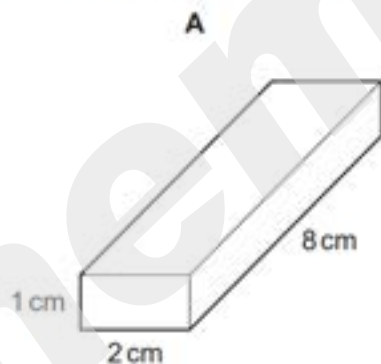
The object is put in the left-hand pan and various standard weights are put in the right-hand pan. These are the results.

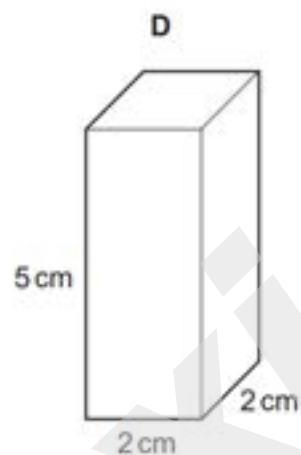
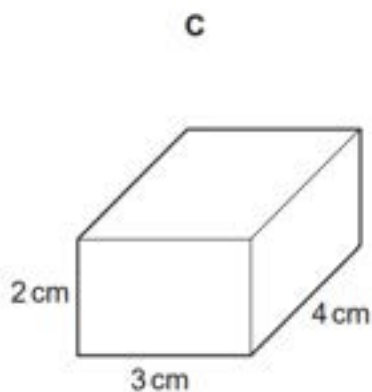
weights in the right-hand pan	effect
0.1 N, 0.1 N, 0.05 N, 0.02 N	balance tips down slightly on the left-hand side
0.2 N, 0.1 N, 0.01 N	balance tips down slightly on the right-hand side

What is the best estimate of the weight of the object?

- A 0.27 N B 0.29 N C 0.31 N D 0.58 N
- 5 The diagrams show four blocks with the same mass.

Which block is made from the least dense material?



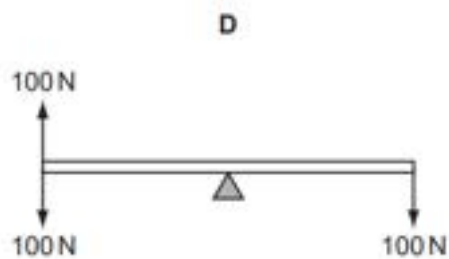
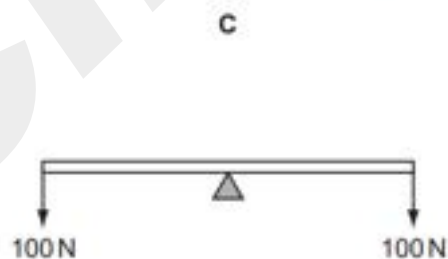
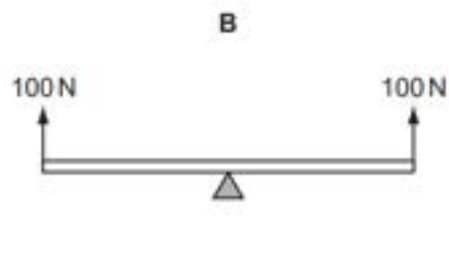


- 6** A student is told to measure the density of a liquid and also of a large cube of metal.
- Which pieces of equipment are sufficient to be able to take the measurements needed?

- A** balance, measuring cylinder and ruler
- B** balance and thermometer
- C** measuring cylinder and ruler
- D** measuring cylinder, ruler and thermometer

- 7** A uniform rod rests on a pivot at its centre. The rod is not attached to the pivot. Forces are then applied to the rod in four different ways, as shown. The weight of the rod can be ignored.

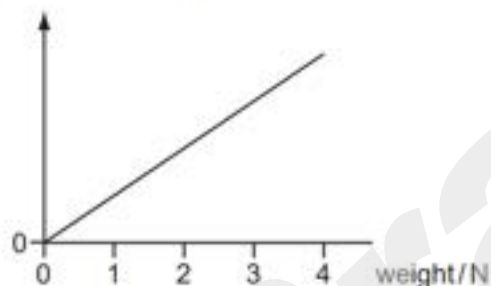
Which diagram shows the rod in equilibrium?



8 Which combination of forces produces a resultant force acting towards the right?



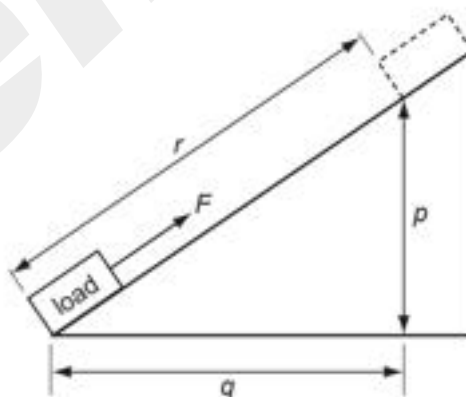
9 A student adds weights to an elastic cord. He measures the length of the cord for each weight. He then plots a graph from the results, as shown.



Which length has he plotted on the vertical axis?

- A measured length
- B original length
- C (measured length – original length)
- D (measured length + original length)

10 A force F moves a load from the bottom of a slope to the top.

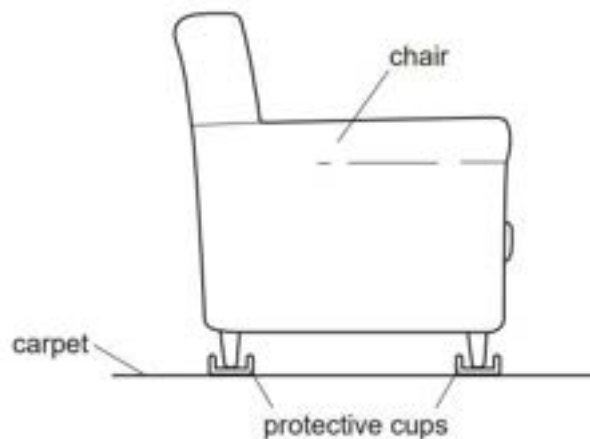


The work done by the force depends on the size of the force, and on a distance.

What is this distance?

- A p
- B q
- C r
- D $p + q$

12 A chair is placed on protective cups to prevent damage to the carpet underneath it.

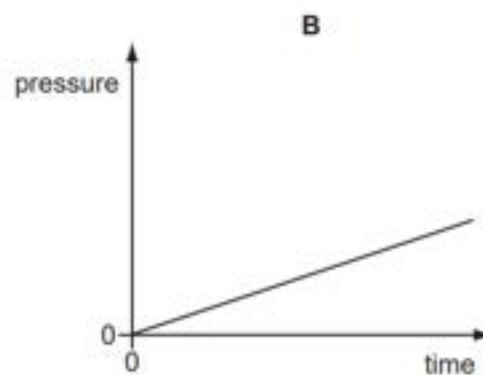
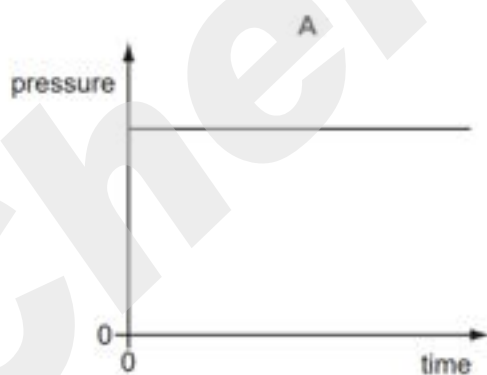


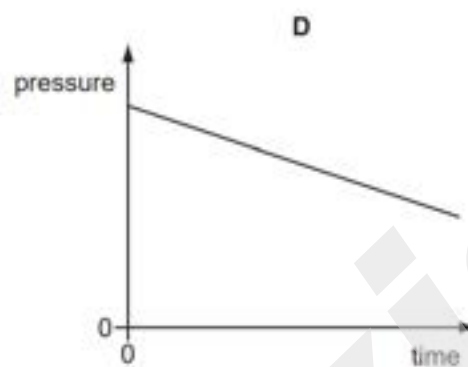
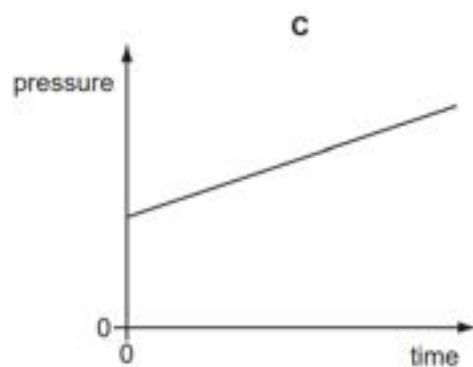
How do the cups change the area of contact with the carpet and the pressure on it?

	area of contact	pressure
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

14 The pressure of a fixed mass of gas in a cylinder is measured. The volume of the gas in the cylinder is then slowly decreased. The temperature of the gas does not change.

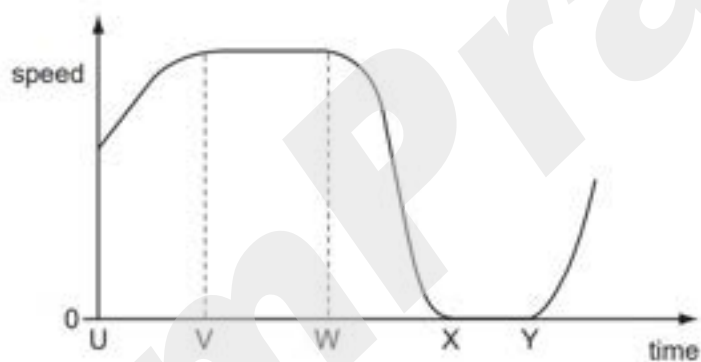
Which graph could show the change of pressure of the gas during this process?





October/November 2011 (12)

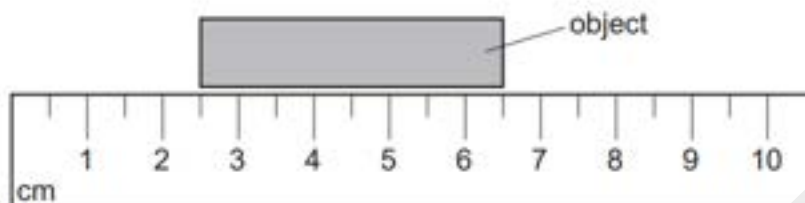
- 1 The graph shows how the speed of a car changes with time.



Between which two times is the car stationary?

- A** U and V **B** V and W **C** W and X **D** X and Y

- 2 A ruler is used to measure the length of an object.

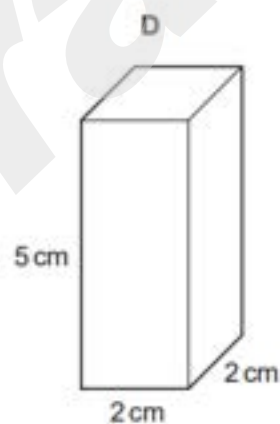
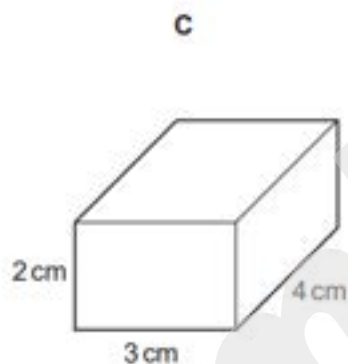
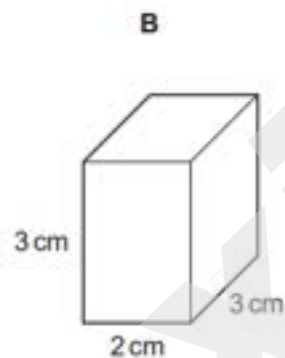
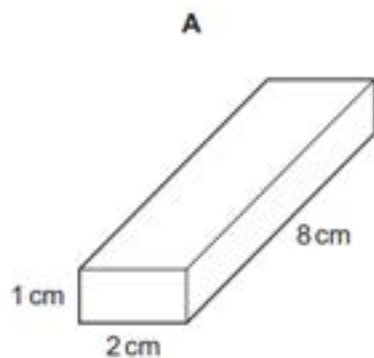


What is the length of the object?

- A** 3.0 cm **B** 4.0 cm **C** 5.0 cm **D** 6.5 cm
- 3 A student is told to measure the density of a liquid and also of a large cube of metal.
- Which pieces of equipment are sufficient to be able to take the measurements needed?
- A** balance, measuring cylinder and ruler
B balance and thermometer
C measuring cylinder and ruler
D measuring cylinder, ruler and thermometer

- 4 The diagrams show four blocks with the same mass.

Which block is made from the least dense material?



- 5 A child is standing on the platform of a station.



A train travelling at 30 m/s takes 3.0 s to pass the child.

What is the length of the train?

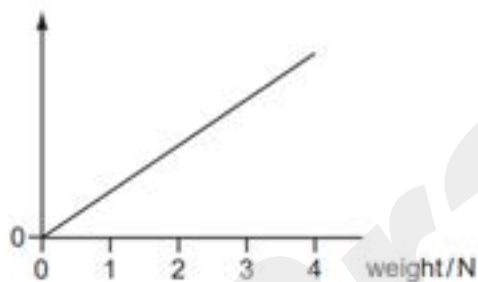
- A 10 m B 27 m C 30 m D 90 m

6 Which combination of forces produces a resultant force acting towards the right?



7 A student adds weights to an elastic cord. He measures the length of the cord for each weight.

He then plots a graph from the results, as shown.



Which length has he plotted on the vertical axis?

- A measured length
- B original length
- C (measured length – original length)
- D (measured length + original length)

- 8 The weight of an object is to be found using the balance shown in the diagram.

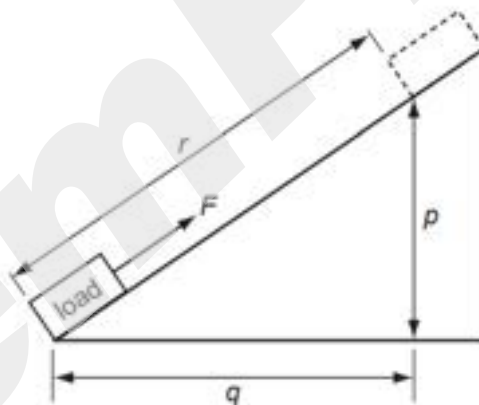


The object is put in the left-hand pan and various standard weights are put in the right-hand pan. These are the results.

weights in the right-hand pan	effect
0.1 N, 0.1 N, 0.05 N, 0.02 N	balance tips down slightly on the left-hand side
0.2 N, 0.1 N, 0.01 N	balance tips down slightly on the right-hand side

What is the best estimate of the weight of the object?

- A 0.27 N B 0.29 N C 0.31 N D 0.58 N
- 10 A force F moves a load from the bottom of a slope to the top.



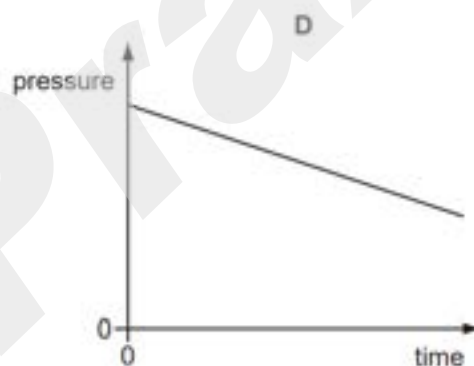
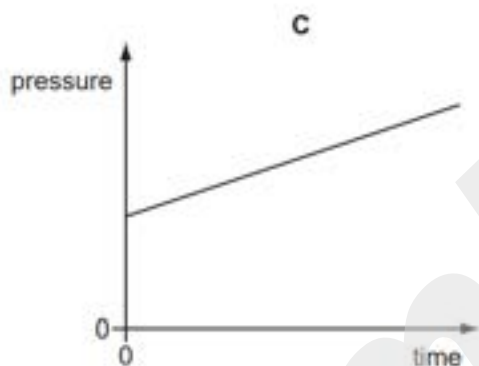
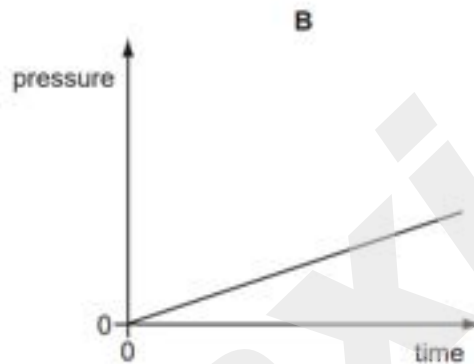
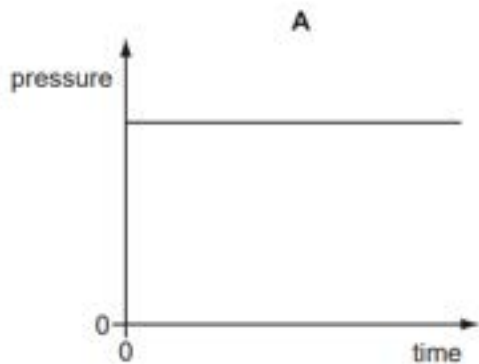
The work done by the force depends on the size of the force, and on a distance.

What is this distance?

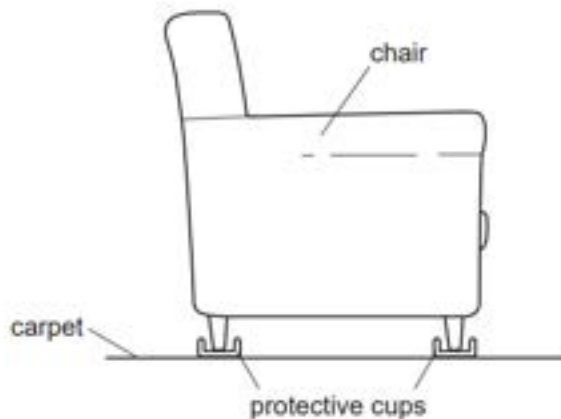
- A p B q C r D $p + q$

- 11 The pressure of a fixed mass of gas in a cylinder is measured. The volume of the gas in the cylinder is then slowly decreased. The temperature of the gas does not change.

Which graph could show the change of pressure of the gas during this process?



- 13 A chair is placed on protective cups to prevent damage to the carpet underneath it.

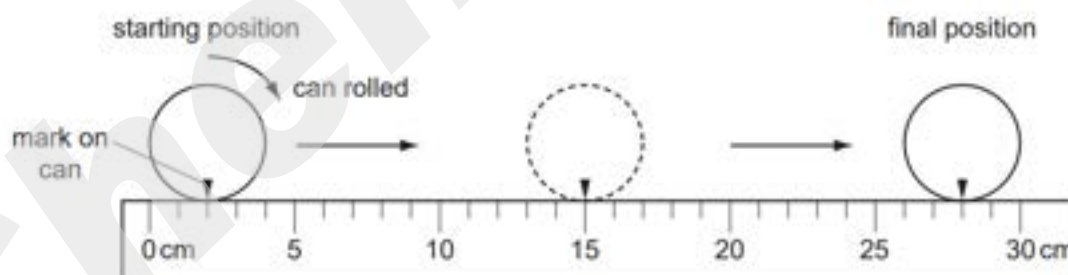


How do the cups change the area of contact with the carpet and the pressure on it?

	area of contact	pressure
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

May/June 2012 (11)

- 1 A cylindrical can is rolled along the ruler shown in the diagram.



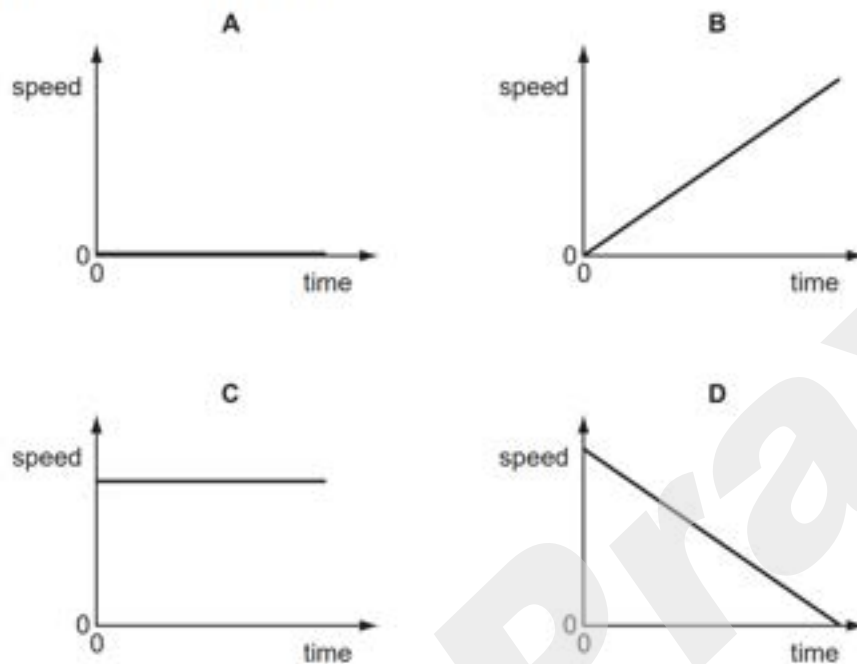
The can rolls over twice.

What is the circumference (distance all round) of the can?

- A** 13 cm **B** 14 cm **C** 26 cm **D** 28 cm

- 2 A car is moving downhill along a road at a constant speed.

Which graph is the speed/time graph for the car?



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

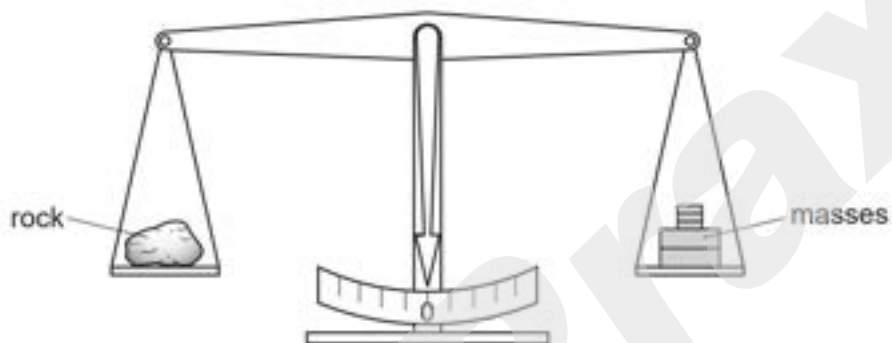
What is the average speed of the car?

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

4 Which quantity is measured in newtons?

- A density
- B energy
- C pressure
- D weight

5 A geologist places a small rock on the left-hand pan of a balance. The two pans are level as shown when masses with a total weight of 23 N are placed on the right-hand pan. Take the weight of 1.0 kg to be 10 N.



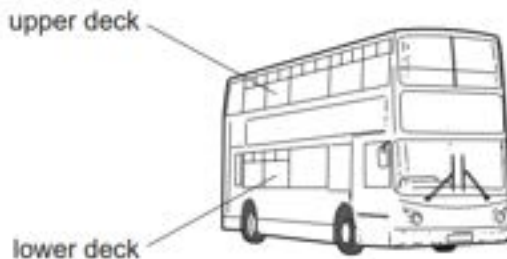
What is the mass of the small rock?

- A 0.023 kg
 - B 2.3 kg
 - C 23 kg
 - D 230 kg
- 6 A stone has a volume of 0.50 cm^3 and a mass of 2.0 g.

What is the density of the stone?

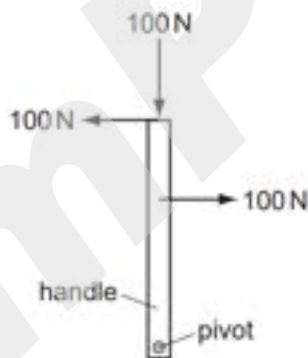
- A 0.25 g/cm^3
- B 1.5 g/cm^3
- C 2.5 g/cm^3
- D 4.0 g/cm^3

- 7 Passengers are **not** allowed to stand on the upper deck of double-decker buses.



Why is this?

- A They would cause the bus to become less stable.
 - B They would cause the bus to slow down.
 - C They would increase the kinetic energy of the bus.
 - D They would lower the centre of mass of the bus.
- 8 The diagram shows a handle with three forces, each 100 N, applied to it. The handle is free to move.



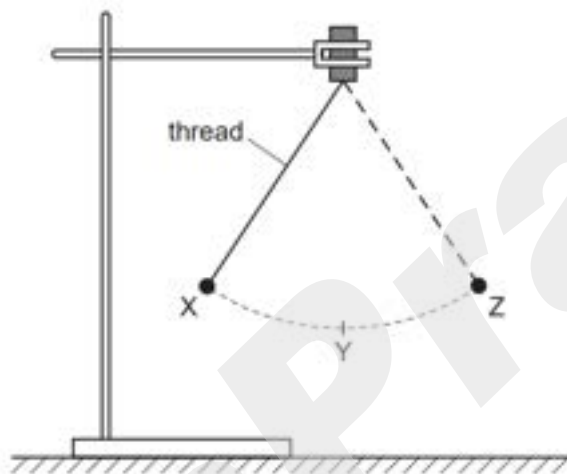
What is the effect of the forces on the handle?

- A The handle will move downwards.
- B The handle will not move.
- C The handle will turn anticlockwise (to the left).
- D The handle will turn clockwise (to the right).

9 In which pair of energy sources are both sources renewable?

- A oil and coal
- B oil and tidal
- C tidal and geothermal
- D tidal and nuclear fission

10 An object on a thread is swinging between X and Z, as shown in the diagram. It is momentarily at rest at X and at Z.



An incomplete word equation about the energy of the object is shown below.

$$\begin{array}{ccccccc} \text{gravitational potential energy} & = & \text{kinetic energy} & + & \text{..... energy} & + & \text{energy losses} \\ \text{at X} & & \text{at Y} & & \text{at Y} & & \end{array}$$

Which form of energy is needed to complete the word equation?

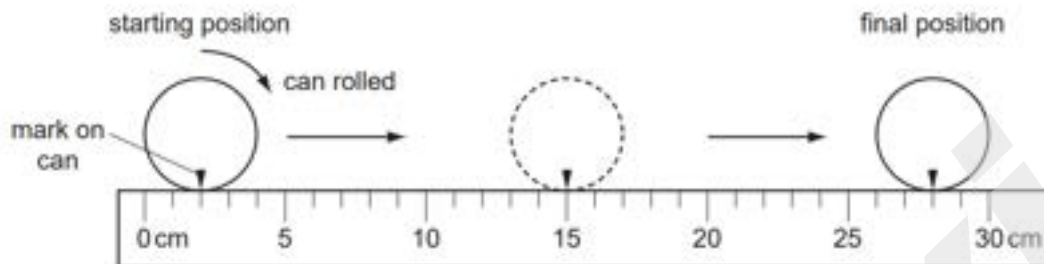
- A chemical
- B gravitational potential
- C internal
- D strain

11 Which statement is explained by reference to pressure?

- A Objects with greater mass have greater weight.
- B One kilogram of water occupies more volume than one kilogram of lead.
- C Spikes on running-shoes sink into the ground.
- D Water cooled to a low enough temperature turns to ice.

May/June 2012 (12)

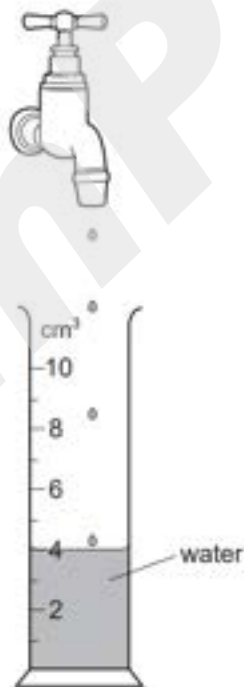
- 1 A cylindrical can is rolled along the ruler shown in the diagram.



The can rolls over twice.

What is the circumference (distance all round) of the can?

- A** 13 cm **B** 14 cm **C** 26 cm **D** 28 cm
- 2 Drops of water are dripping steadily from a tap (faucet). The diagram shows a measuring cylinder which has collected 120 drops of water.



How many drops in total will have been collected when the measuring cylinder reads 10 cm^3 ?

- A 48 B 60 C 180 D 300

- 3 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

- 4 A metal block is heated until it is completely melted. It is then allowed to solidify.

What happens to the mass of the metal during the changes of state?

	mass during melting	mass during solidification
A	decreases	increases
B	increases	decreases
C	increases	stays constant
D	stays constant	stays constant

- 5 Two objects X and Y are placed on a balance.

The balance tilts as shown.



What does this show about the masses and weights of objects X and Y?

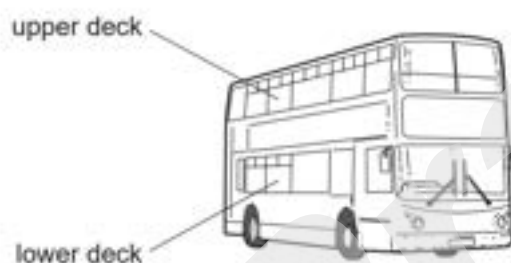
	masses	weights
A	X has less mass than Y	X has less weight than Y
B	X has less mass than Y	X has more weight than Y
C	X has the same mass as Y	X has less weight than Y
D	X has the same mass as Y	X has more weight than Y

- 6 A stone has a volume of 0.50 cm^3 and a mass of 2.0 g .

What is the density of the stone?

- A 0.25 g/cm^3
- B 1.5 g/cm^3
- C 2.5 g/cm^3
- D 4.0 g/cm^3

- 7 Passengers are **not** allowed to stand on the upper deck of double-decker buses.



Why is this?

- A They would cause the bus to become less stable.
- B They would cause the bus to slow down.
- C They would increase the kinetic energy of the bus.
- D They would lower the centre of mass of the bus.

8 On which ball is a non-zero resultant force acting?

A

a ball moving at constant speed on a smooth surface



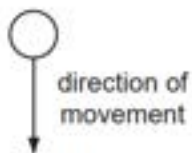
B

a ball at rest on a bench



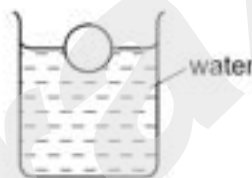
C

a free-falling ball which has just been released



D

a ball floating on water

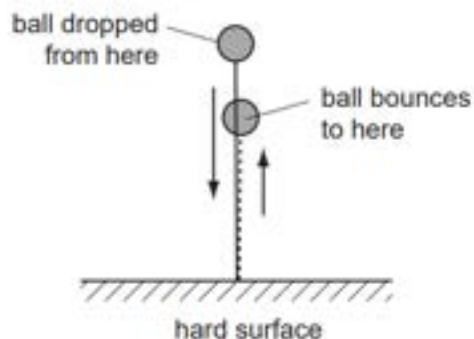


9 Electricity can be obtained from different energy resources.

Which energy resource is used to obtain electricity without producing heat to boil water?

- A coal
- B gas
- C hydroelectric
- D nuclear

- 10 A ball is dropped on to a hard surface and bounces. It does not bounce all the way back to where it started, so it has less gravitational potential energy than when it started.



What happens to the 'lost' energy?

- A It is converted into chemical and strain energy.
 - B It is converted into internal (heat) energy and sound.
 - C It is destroyed as the ball rises upwards after hitting the ground.
 - D It is destroyed when the ball hits the ground.
- 11 What does a barometer measure?
- A atmospheric density
 - B atmospheric pressure
 - C liquid density
 - D liquid pressure
- 12 In which position would a boy exert the **most** pressure on the ground?
- A lying on his back
 - B sitting down
 - C standing on one foot
 - D standing on two feet

October/November 2012 (11)

- 1 A pendulum is set in motion and timed. The time measured for 20 complete swings is 30 s.

What is the time for one complete swing of the pendulum?

- A 0.67 s B 0.75 s C 1.5 s D 3.0 s

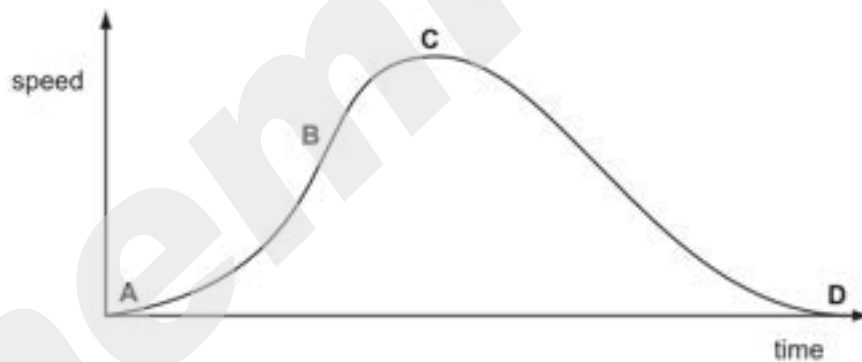
- 2 Two stones of different weight fall at the same time from a table. Air resistance may be ignored.

What will happen and why?

	what will happen	why
A	both stones hit the floor at the same time	acceleration of free fall is constant
B	both stones hit the floor at the same time	they fall at constant speed
C	the heavier stone hits the floor first	acceleration increases with weight
D	the heavier stone hits the floor first	speed increases with weight

- 3 The speed-time graph shown is for a bus travelling between stops.

Where on the graph is the acceleration of the bus greatest?



- 4 A large bag of feathers and a steel block balance each other on some scales.



What does this show about the masses and the weights of the bag of feathers and the steel block?

- A It shows that the masses are equal and the weights are equal.
 - B It shows that the masses are equal, but the weights might be different.
 - C It shows that the masses might be different and the weights might be different.
 - D It shows that the weights are equal, but the masses might be different.
- 5 A parachutist inside an aeroplane has a mass of 70 kg.



What is his mass after he has jumped from the aeroplane?

- A 0 kg
- B between 0 kg and 70 kg
- C 70 kg
- D greater than 70 kg

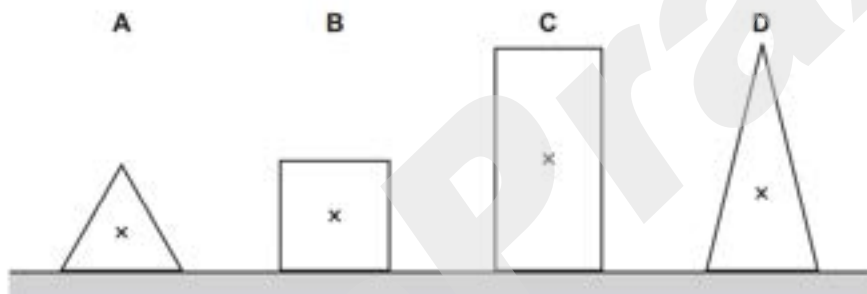
- 6 A liquid has a density of 0.80 g/cm^3 .

Which could be the volume and mass of this liquid?

	volume / cm^3	mass / g
A	2.0	16
B	8.0	10
C	10	8.0
D	16	2.0

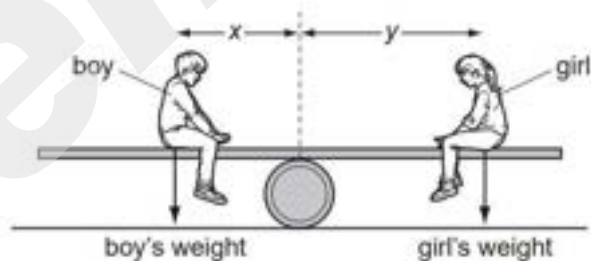
- 7 The diagram shows sections of four objects of equal mass. The position of the centre of mass of each object has been marked with a cross.

Which object is the most stable?



- 8 A see-saw is made by resting a long plank of wood with its centre of mass on a barrel.

A boy sits on one side of the barrel and a girl sits on the other side so that the see-saw is balanced.



Which statement **must** be true?

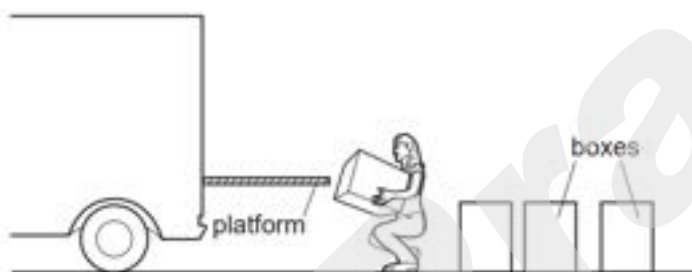
- A boy's weight = girl's weight
- B distance x = distance y
- C total downward force = total moment about the barrel
- D resultant force and resultant moment are both zero

9 A power station uses nuclear fission to obtain energy.

In this process, nuclear energy is **first** changed into

- A chemical energy.
- B electrical energy.
- C gravitational energy.
- D thermal (heat) energy.

10 A person lifts boxes of equal weight on to a platform.

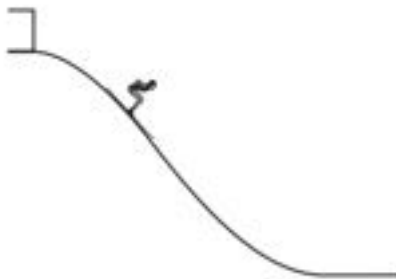


Which quantity will **not** affect the work done by the person?

- A the height of the platform above the ground
- B the number of boxes lifted
- C the time taken to lift the boxes
- D the weight of the boxes

- 11 A skier walks from the bottom of a ski slope to the top and gains 10 000 J of gravitational potential energy.

She skis down the slope. At the bottom of the slope, her kinetic energy is 2000 J.



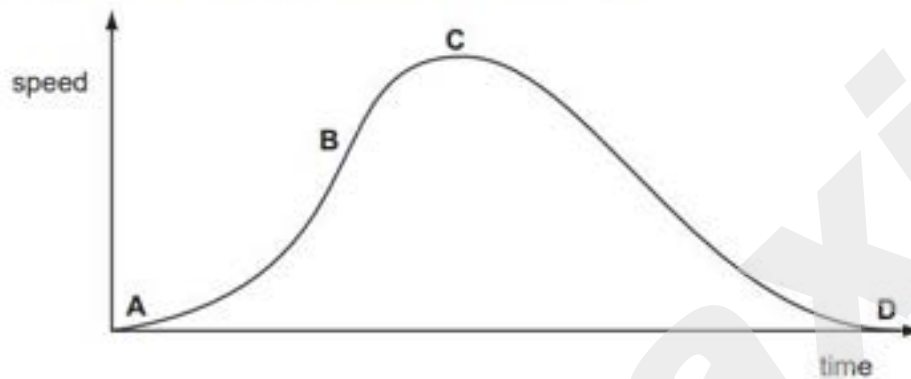
How much energy was converted into thermal energy and sound energy as the skier moved down the slope?

- A 2000 J B 8000 J C 10 000 J D 12 000 J
- 13 A heavy table has six legs. The area of cross-section of each leg is X .
- The legs of the table make marks in a carpet. These marks become deeper with increased pressure.
- What would reduce the depth of the marks for a table of a fixed weight?
- A using three legs, each of an area smaller than X
- B using four legs, each of an area the same as X
- C using six legs, each of an area smaller than X
- D using eight legs, each of an area the same as X

October/November 2012 (12)

- 1 The speed-time graph shown is for a bus travelling between stops.

Where on the graph is the acceleration of the bus greatest?



- 2 A parachutist inside an aeroplane has a mass of 70 kg.



What is his mass after he has jumped from the aeroplane?

- A 0 kg
- B between 0 kg and 70 kg
- C 70 kg
- D greater than 70 kg

- 3 A large bag of feathers and a steel block balance each other on some scales.



What does this show about the masses and the weights of the bag of feathers and the steel block?

- A It shows that the masses are equal and the weights are equal.
 - B It shows that the masses are equal, but the weights might be different.
 - C It shows that the masses might be different and the weights might be different.
 - D It shows that the weights are equal, but the masses might be different.
- 4 Two stones of different weight fall at the same time from a table. Air resistance may be ignored.

What will happen and why?

	what will happen	why
A	both stones hit the floor at the same time	acceleration of free fall is constant
B	both stones hit the floor at the same time	they fall at constant speed
C	the heavier stone hits the floor first	acceleration increases with weight
D	the heavier stone hits the floor first	speed increases with weight

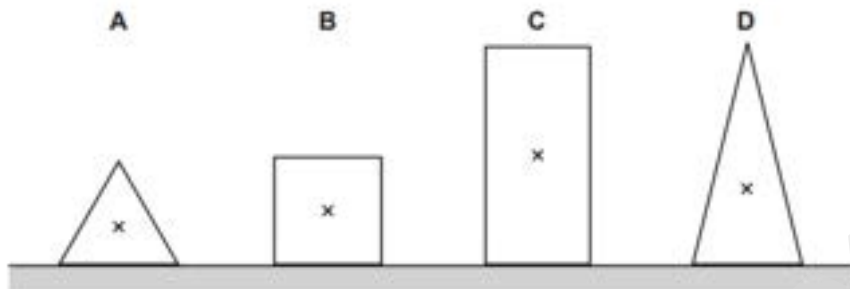
- 5 A pendulum is set in motion and timed. The time measured for 20 complete swings is 30 s.

What is the time for one complete swing of the pendulum?

- A** 0.67 s **B** 0.75 s **C** 1.5 s **D** 3.0 s

- 6 The diagram shows sections of four objects of equal mass. The position of the centre of mass of each object has been marked with a cross.

Which object is the most stable?



- 7 A heavy table has six legs. The area of cross-section of each leg is X .

The legs of the table make marks in a carpet. These marks become deeper with increased pressure.

What would reduce the depth of the marks for a table of a fixed weight?

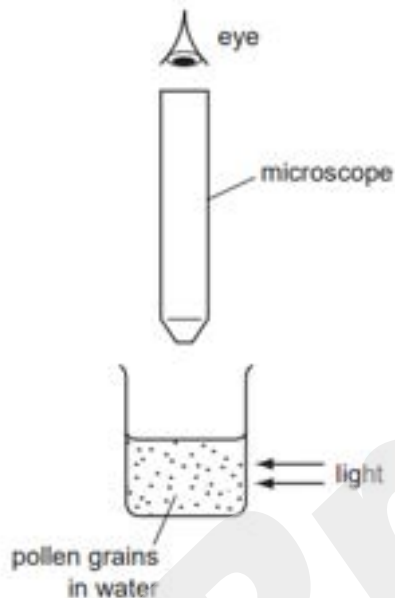
- A using three legs, each of an area smaller than X
 - B using four legs, each of an area the same as X
 - C using six legs, each of an area smaller than X
 - D using eight legs, each of an area the same as X
- 9 A liquid has a density of 0.80 g/cm^3 .

Which could be the volume and mass of this liquid?

	volume / cm^3	mass / g
A	2.0	16
B	8.0	10
C	10	8.0
D	16	2.0

10 Very small pollen grains are suspended in water. A bright light shines from the side.

Looking through a microscope, small specks of light are seen to be moving in a random, jerky manner.

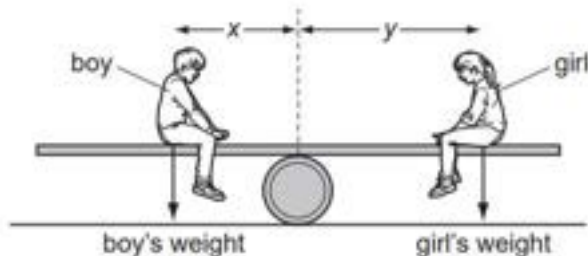


What are the moving specks of light?

- A pollen grains being hit by other pollen grains
- B pollen grains being hit by water molecules
- C water molecules being hit by other water molecules
- D water molecules being hit by pollen grains

11 A see-saw is made by resting a long plank of wood with its centre of mass on a barrel.

A boy sits on one side of the barrel and a girl sits on the other side so that the see-saw is balanced.



Which statement **must** be true?

- A boy's weight = girl's weight
 - B distance x = distance y
 - C total downward force = total moment about the barrel
 - D resultant force and resultant moment are both zero
- 12 A skier walks from the bottom of a ski slope to the top and gains 10 000 J of gravitational potential energy.

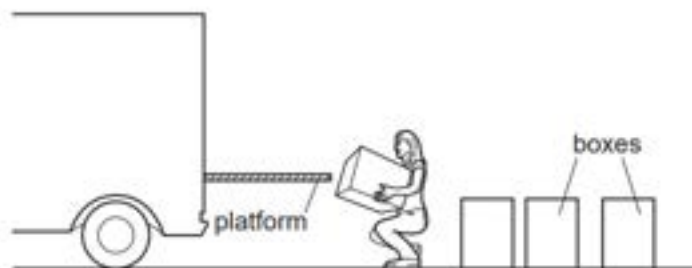
She skis down the slope. At the bottom of the slope, her kinetic energy is 2000 J.



How much energy was converted into thermal energy and sound energy as the skier moved down the slope?

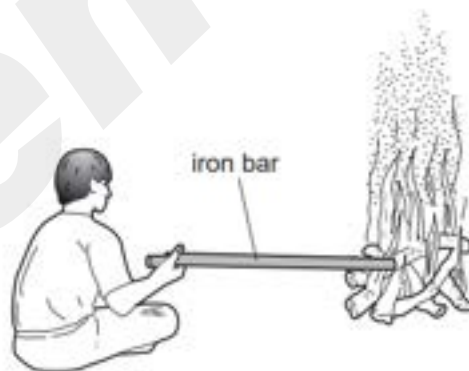
- A 2000 J
 - B 8000 J
 - C 10 000 J
 - D 12 000 J
- 13 A power station uses nuclear fission to obtain energy.
- In this process, nuclear energy is **first** changed into
- A chemical energy.
 - B electrical energy.
 - C gravitational energy.
 - D thermal (heat) energy.

- 14 A person lifts boxes of equal weight on to a platform.



Which quantity will **not** affect the work done by the person?

- A the height of the platform above the ground
 - B the number of boxes lifted
 - C the time taken to lift the boxes
 - D the weight of the boxes
- 15 Which physical property is used to measure temperature in a liquid-in-glass thermometer?
- A the length of the thermometer
 - B the thickness of the glass bulb
 - C the volume of the glass bulb
 - D the volume of the liquid
- 16 A boy sits near a campfire. He pokes the fire with an iron bar. His hand becomes hot.



In which ways does thermal energy (heat) from the fire reach his hand?

- A conduction and convection only
- B conduction and radiation only
- C convection and radiation only
- D conduction, convection and radiation

October/November 2012 (13)

- 1 A pendulum is set in motion and timed. The time measured for 20 complete swings is 30 s.

What is the time for one complete swing of the pendulum?

- A 0.67 s B 0.75 s C 1.5 s D 3.0 s

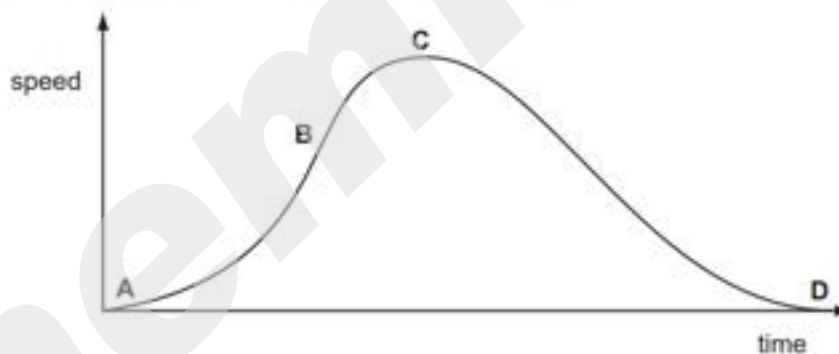
- 2 Two stones of different weight fall at the same time from a table. Air resistance may be ignored.

What will happen and why?

	what will happen	why
A	both stones hit the floor at the same time	acceleration of free fall is constant
B	both stones hit the floor at the same time	they fall at constant speed
C	the heavier stone hits the floor first	acceleration increases with weight
D	the heavier stone hits the floor first	speed increases with weight

- 3 The speed-time graph shown is for a bus travelling between stops.

Where on the graph is the acceleration of the bus greatest?



- 4 A large bag of feathers and a steel block balance each other on some scales.



What does this show about the masses and the weights of the bag of feathers and the steel block?

- A It shows that the masses are equal and the weights are equal.
- B It shows that the masses are equal, but the weights might be different.
- C It shows that the masses might be different and the weights might be different.
- D It shows that the weights are equal, but the masses might be different.

- 5 Which row identifies quantities that are measured in newtons?

	electromotive force (e.m.f.)	mass	weight
A	no	no	yes
B	no	yes	yes
C	yes	no	no
D	yes	yes	no

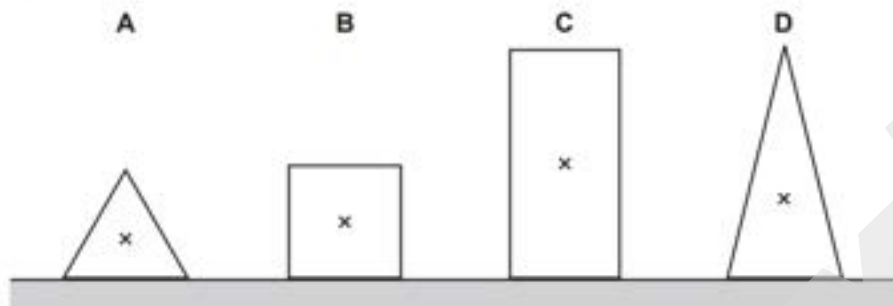
- 6 A liquid has a density of 0.80 g/cm^3 .

Which could be the volume and mass of this liquid?

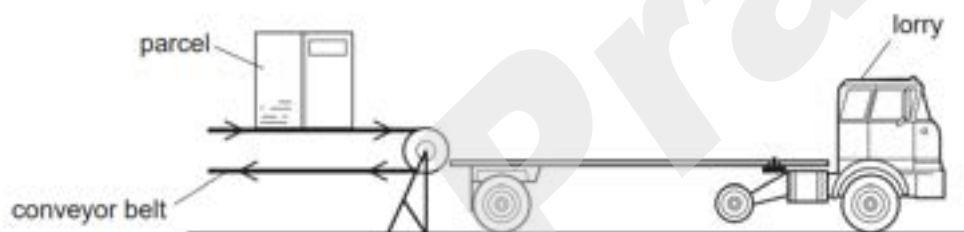
	volume / cm^3	mass / g
A	2.0	16
B	8.0	10
C	10	8.0
D	16	2.0

- 7 The diagram shows sections of four objects of equal mass. The position of the centre of mass of each object has been marked with a cross.

Which object is the most stable?



- 8 A large parcel is on a horizontal conveyor belt. The conveyor belt moves the parcel towards a lorry.



The parcel travels towards the lorry at a constant speed. Only two horizontal forces act on the parcel: air resistance, and friction with the conveyor belt.

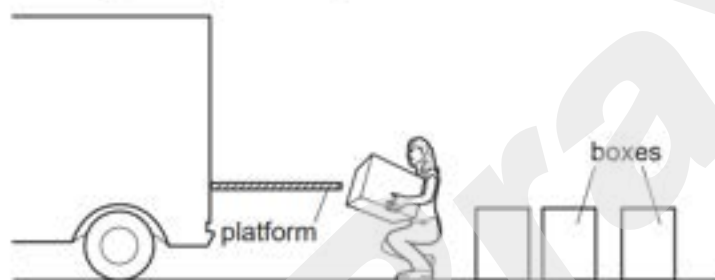
Which row correctly compares the directions and the sizes of these two forces?

	directions	sizes
A	opposite	different
B	opposite	the same
C	the same	different
D	the same	the same

- 9 A power station uses nuclear fission to obtain energy.

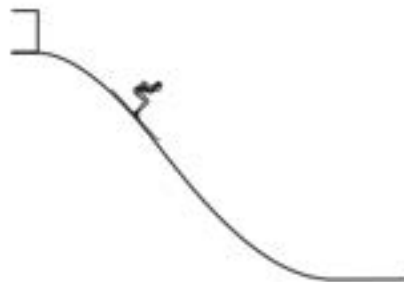
In this process, nuclear energy is **first** changed into

- A chemical energy.
 - B electrical energy.
 - C gravitational energy.
 - D thermal (heat) energy.
- 10 A person lifts boxes of equal weight on to a platform.



Which quantity will **not** affect the work done by the person?

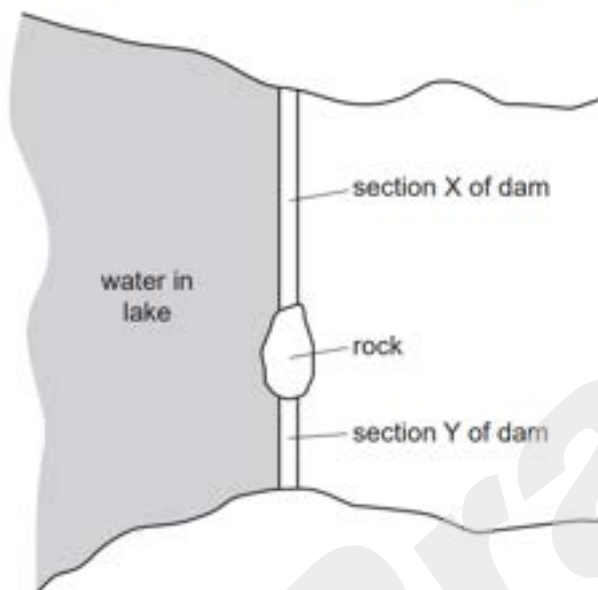
- A the height of the platform above the ground
 - B the number of boxes lifted
 - C the time taken to lift the boxes
 - D the weight of the boxes
- 11 A skier walks from the bottom of a ski slope to the top and gains 10 000 J of gravitational potential energy.
- She skis down the slope. At the bottom of the slope, her kinetic energy is 2000 J.



How much energy was converted into thermal energy and sound energy as the skier moved down the slope?

- A 2000 J
- B 8000 J
- C 10000 J
- D 12000 J

- 13 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 force on each section of the dam and a pressure on each section of the dam.

Which statement is correct?

- A The force on X equals the force on Y.
- B The force on X is less than the force on Y.
- C The pressure on X equals the pressure on Y.
- D The pressure on X is less than the pressure on Y.

14 A car tyre contains a constant volume of air.

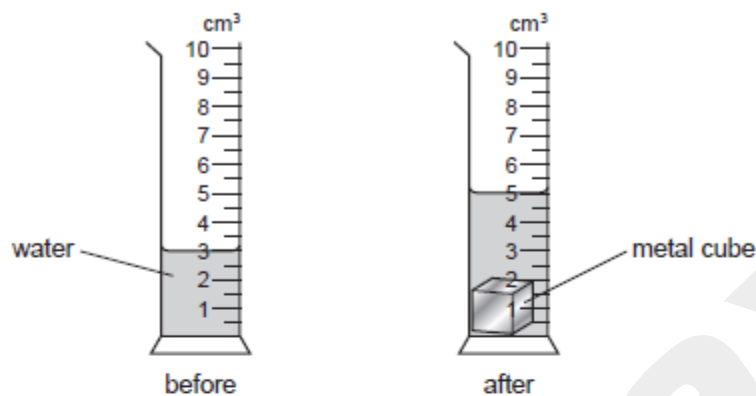
During use, the air gets hotter and the air pressure increases.

What explains this increase in pressure in terms of the motion of air molecules?

	number of air molecules in tyre	force between air molecules and tyre wall	number of collisions per second between air molecules and tyre wall
A	increased	increased	decreased
B	increased	unchanged	decreased
C	unchanged	increased	increased
D	unchanged	unchanged	increased

May/June 2013 (11)

- 1 The diagrams show the readings on a measuring cylinder before and after a small metal cube is added.



How many more identical cubes can be added to the cylinder, without causing the water to overflow? Do not include the cube already in the cylinder.

- A 1 B 2 C 3 D 4
- 2 Which person is experiencing an acceleration?
- A a driver of a car that is braking to stop at traffic lights
 B a passenger in a train that is stationary in a railway station
 C a shopper in a large store ascending an escalator (moving stairs) at a uniform rate
 D a skydiver falling at constant speed towards the Earth
- 3 A car travels at various speeds during a short journey.

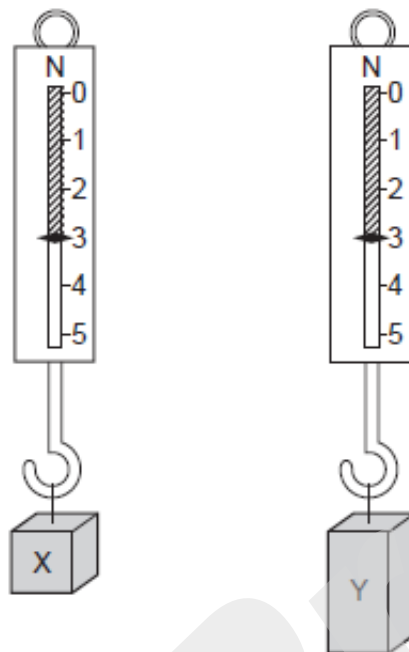
The table shows the distances travelled and the times taken during each of four stages P, Q, R and S.

stage	P	Q	R	S
distance travelled /km	1.8	3.6	2.7	2.7
time taken /minutes	2	2	4	3

During which two stages is the car travelling at the same average speed?

- A P and Q B P and S C Q and R D R and S

- 4 Two blocks of metal X and Y hang from spring balances, as shown in the diagrams.



What does the diagram show about X and Y?

- A They have the same mass and the same volume but different weights.
 - B They have the same mass and the same weight but different volumes.
 - C They have the same mass, the same volume and the same weight.
 - D They have the same weight and the same volume but different masses.
- 5 A 1 kg sample of aluminium is stored in a laboratory. In a different laboratory, in the same town, there is a 1 kg sample of iron.

Which quantity must these two samples **always** have in common?

- A the same density
- B the same temperature
- C the same volume
- D the same weight

- 6 A measuring cylinder has a mass of 120 g when empty.

When it contains 50 cm^3 of a liquid, the total mass of the measuring cylinder and the liquid is 160 g.

What is the density of the liquid?

- A $\frac{40}{50} \text{ g/cm}^3$
B $\frac{50}{40} \text{ g/cm}^3$
C $\frac{120}{50} \text{ g/cm}^3$
D $\frac{160}{50} \text{ g/cm}^3$
- 7 A car moves along a level road.

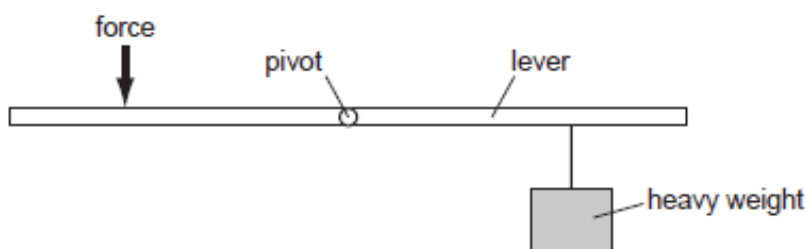
The diagram shows all of the horizontal forces acting on the car.



Which statement is correct?

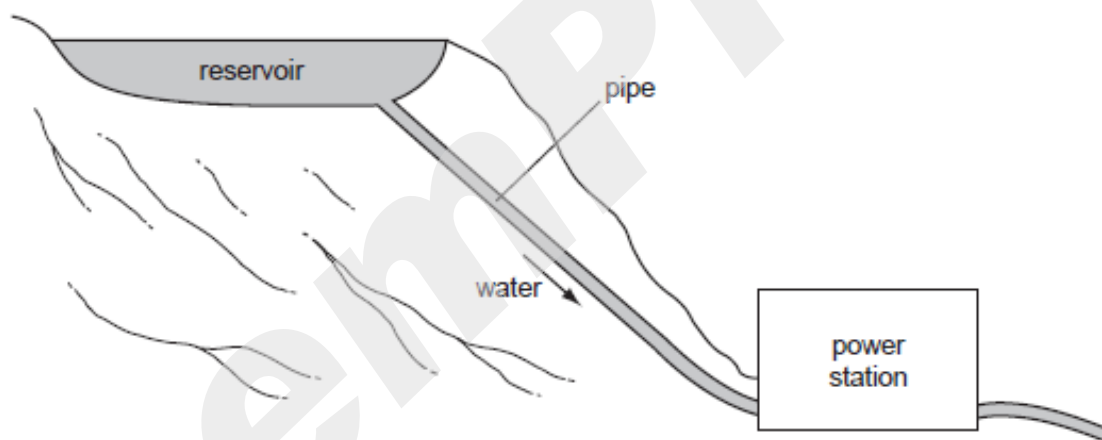
- A The car is slowing down.
B The car is speeding up.
C The car is moving at a constant speed.
D The car is moving backwards.

- 8 The diagram shows a force being applied to a lever to lift a heavy weight.



Which change would enable the heavy weight to be lifted with a smaller force?

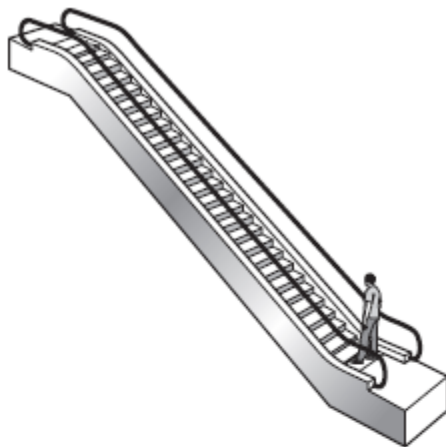
- A Move the force to the right.
 - B Move the heavy weight to the right.
 - C Move the force to the left.
 - D Move the pivot to the left.
- 9 The diagram shows a hydroelectric system.



What are the main energy changes taking place?

- A chemical energy → kinetic energy → electrical energy
- B electrical energy → gravitational energy → kinetic energy
- C gravitational energy → kinetic energy → electrical energy
- D kinetic energy → electrical energy → gravitational energy

- 10 An escalator (moving stairs) and a lift (elevator) are both used to carry passengers from the same underground railway platform up to street level.



escalator



lift

The escalator takes 20 seconds to carry a man to street level. The useful work done is W . The useful power developed is P . The lift takes 30 seconds to carry the same man to street level.

How much useful work is done by the lift, and how much useful power is developed by the lift?

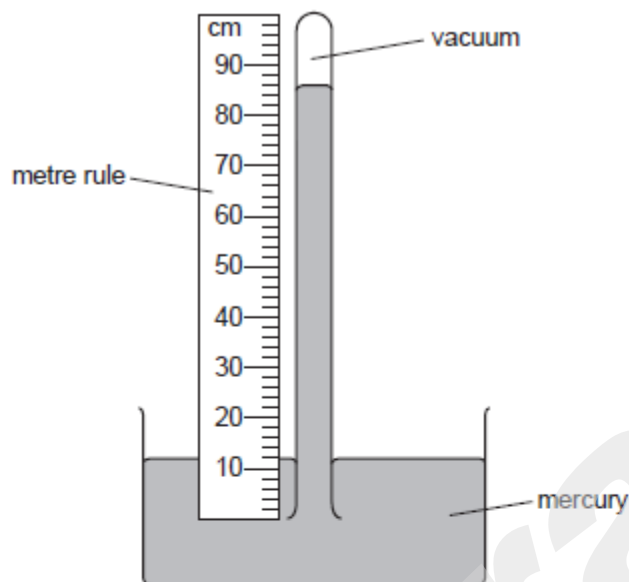
	useful work done by lift	useful power developed by lift
A	more than W	less than P
B	more than W	P
C	W	less than P
D	W	P

- 11 A man stands on the ground.

Which action will increase the pressure that the man exerts on the ground?

- A The man slowly bends his knees.
- B The man slowly lies down on the ground.
- C The man slowly raises his arms.
- D The man slowly raises one foot off the ground.

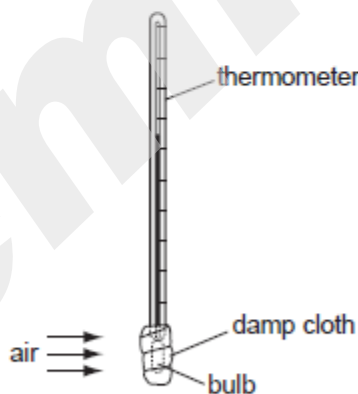
12 The diagram shows a simple mercury barometer.



Which length is used to find the value of atmospheric pressure?

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

13 A thermometer bulb is covered by a piece of damp absorbent cloth.



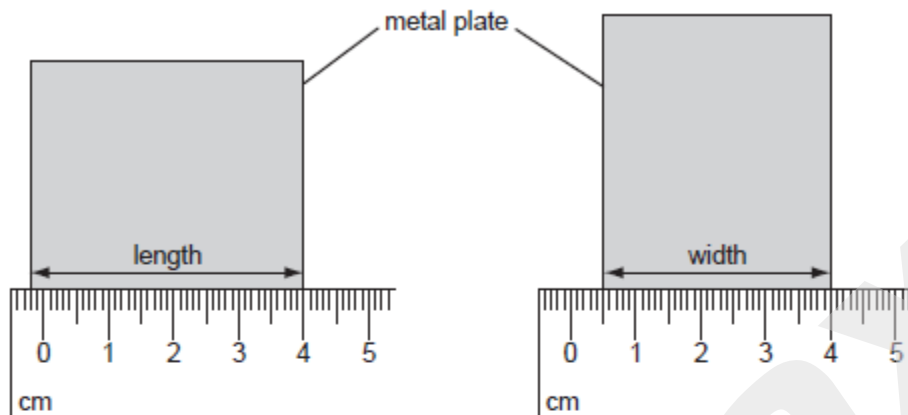
Air at room temperature is blown across the damp cloth.

What happens to the thermometer reading?

- A It remains constant.
 B It rises.
 C It rises then falls.
 D It falls.

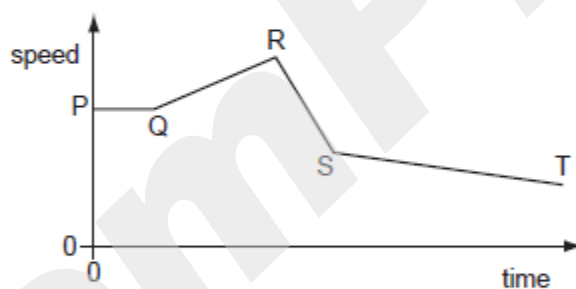
October/November 2013 (11)

- 1 A student uses a ruler to measure the length and the width of a small rectangular metal plate.



What is the area of the plate?

- A 14.0 cm² B 14.7 cm² C 16.0 cm² D 16.8 cm²
- 2 The diagram shows the speed/time graph for a train as it travels along a track.



For which part of the graph is the train's speed changing at the greatest rate?

- A PQ B QR C RS D ST
- 3 A small steel ball is dropped from a low balcony.

Ignoring air resistance, which statement describes its motion?

- A It falls with constant acceleration.
 B It falls with constant speed.
 C It falls with decreasing speed.
 D It falls with increasing acceleration.

- 4 Which is the unit for force and which is the unit for weight?

	force	weight
A	kg	kg
B	kg	N
C	N	kg
D	N	N

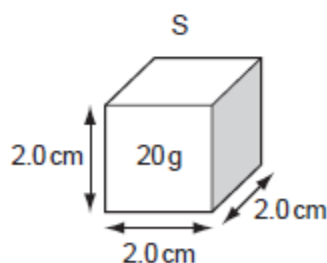
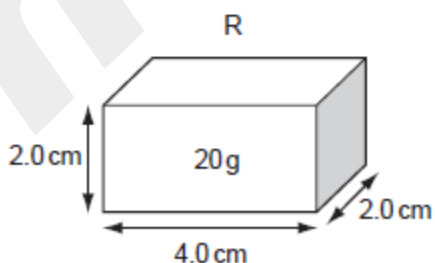
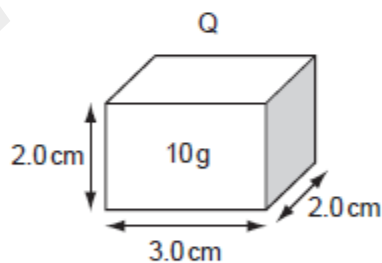
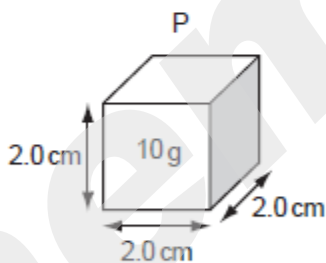
- 5 A cup contains hot liquid.

Some of the liquid evaporates.

What happens to the mass and to the weight of the liquid in the cup?

	mass	weight
A	decreases	decreases
B	decreases	stays the same
C	stays the same	decreases
D	stays the same	stays the same

- 6 Four rectangular blocks, P, Q, R and S are shown. Each block is labelled with its size and its mass.



Which two blocks have the same density?

- A** P and Q **B** P and R **C** Q and R **D** R and S

- 7 A force acting on an object causes some properties of the object to change.

Which list contains **only** properties that can be changed by the action of the force?

- A mass, motion and shape
 - B mass, motion and size
 - C mass, shape and size
 - D motion, shape and size
- 8 A box is being moved by a fork-lift truck. The total weight of the box is 3000 N.



The force exerted by the fork-lift truck on the box is 3500 N upwards.

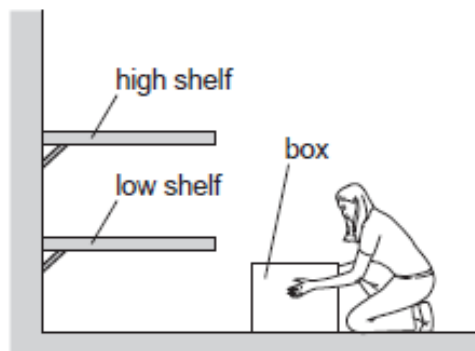
What is the resultant force on the box?

- A 500 N downwards
 - B 500 N upwards
 - C 6500 N downwards
 - D 6500 N upwards
- 9 Some energy sources are reliably available at all times, and some are not.

Which row shows three sources all in their correct columns?

	available at all times	not available at all times
A	geothermal	nuclear fission, solar
B	geothermal, nuclear fission	solar
C	solar, nuclear fission	geothermal
D	solar	nuclear fission, geothermal

10 A woman in a factory has to lift a box on to a shelf.



Which action involves the woman in doing the **least** amount of work?

- A lifting the box quickly to the high shelf
 - B lifting the box slowly to the high shelf
 - C lifting the box to the low shelf first then lifting it to the high shelf
 - D lifting the box to the low shelf instead of to the high shelf
- 11 A drawing pin (thumb tack) has a sharp point and a flat end.



The pin is pushed into a wooden board.

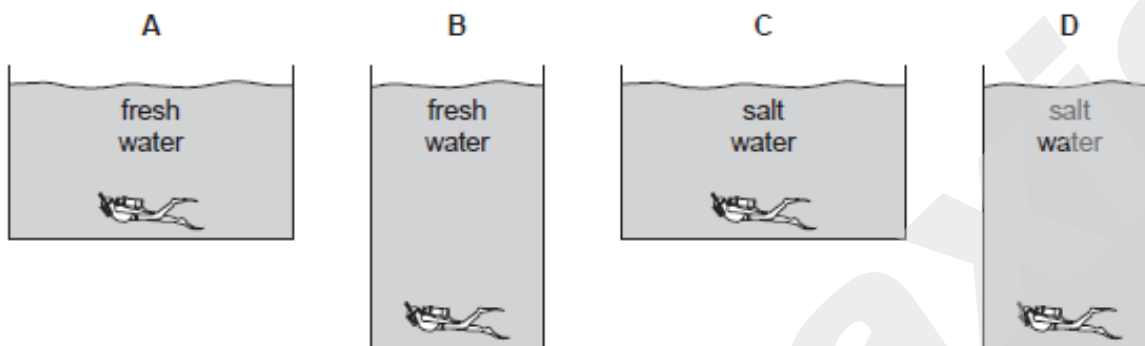
How do the pressure and the force at the sharp point compare with the pressure and the force at the flat end?

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

12 The diagrams show four divers at the bottom of four different swimming pools.

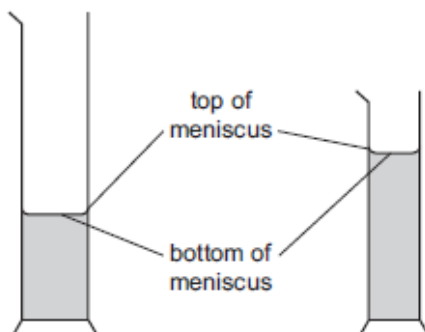
Two swimming pools contain fresh water and two contain salt water. Fresh water is less dense than salt water.

Which diver feels the least pressure from the water?



May/June 2014 (11)

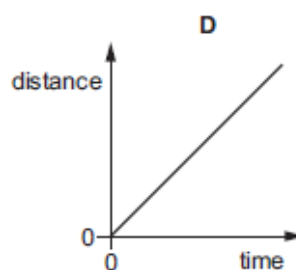
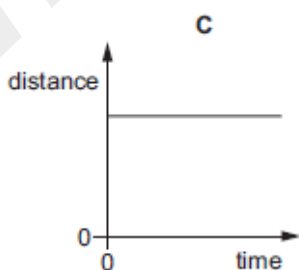
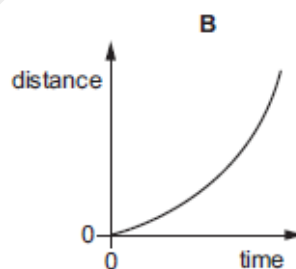
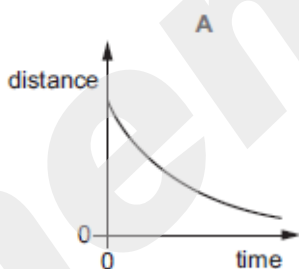
- 1 A student wishes to measure accurately the volume of approximately 40 cm^3 of water. She has two measuring cylinders, a larger one that can hold 100 cm^3 , and a smaller one that can hold 50 cm^3 . The water forms a meniscus where it touches the glass.



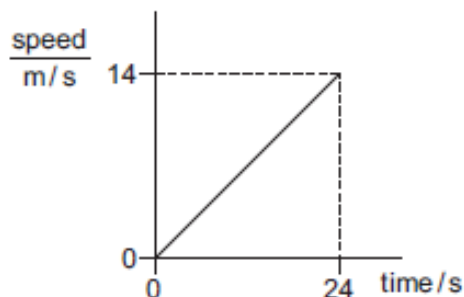
Which cylinder should the student use and which water level should she use to ensure an accurate result?

	cylinder	water level
A	larger one	bottom of meniscus
B	larger one	top of meniscus
C	smaller one	bottom of meniscus
D	smaller one	top of meniscus

- 2 Which distance /time graph represents the motion of an object moving at constant speed?



- 3 The graph shows how the speed of a car changes with time.

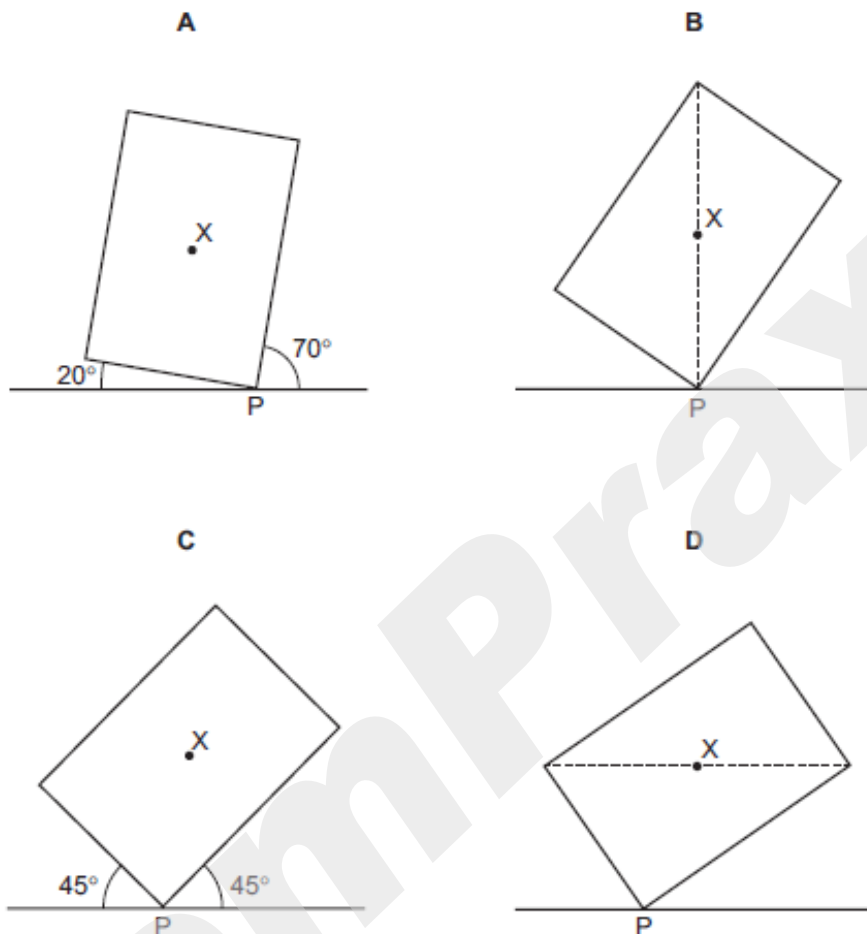


Which calculation gives the distance travelled by the car in 24 seconds?

- A $\left(\frac{14}{24}\right)\text{m}$
- B $\left(\frac{24}{14}\right)\text{m}$
- C $\left(\frac{24 \times 14}{2}\right)\text{m}$
- D $(24 \times 14)\text{m}$
- 4 Which instrument is used to compare the masses of objects?
- A a balance
- B a barometer
- C a manometer
- D a measuring cylinder
- 5 A liquid has a volume of 100 cm^3 and a mass of 85 g .
The density of water is 1.0 g/cm^3 .
How does the density of the liquid compare with the density of water?
- A Its density is higher than that of water.
- B Its density is lower than that of water.
- C Its density is the same as that of water.
- D It is impossible to say with only this data.

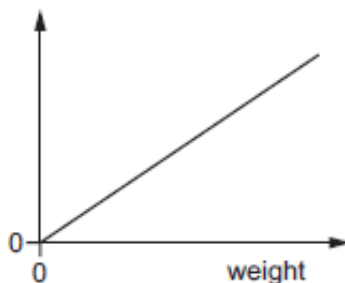
6 A plane lamina with centre of mass X touches the ground at point P .

Which diagram shows the lamina in equilibrium?



- 7 A student adds weights to an elastic cord. He measures the length of the cord for each weight.

He then plots a graph from the results, as shown.



What has he plotted on the vertical axis?

- A measured length
 - B original length
 - C (measured length + original length)
 - D (measured length – original length)
- 8 Which energy transfer takes place when a matchstick burns?
- A chemical to thermal
 - B chemical to nuclear
 - C nuclear to chemical
 - D thermal to chemical
- 9 Four cars are driven along a road.

The table shows the work done by the engine in each car and the time taken by each car.

Which engine produces the most power?

	work done by engine / J	time taken / s
A	50000	20
B	50000	40
C	100000	20
D	100000	40

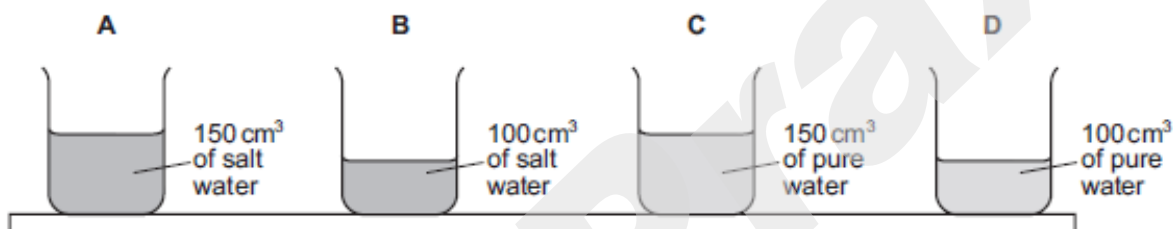
10 Which situation is an example of a force acting over a large area to produce a small pressure?

- A a builder hammering a nail into a piece of wood
- B a cook using a sharp knife to cut vegetables
- C a nurse pushing a needle into a patient's arm
- D a soldier marching in flat-soled boots

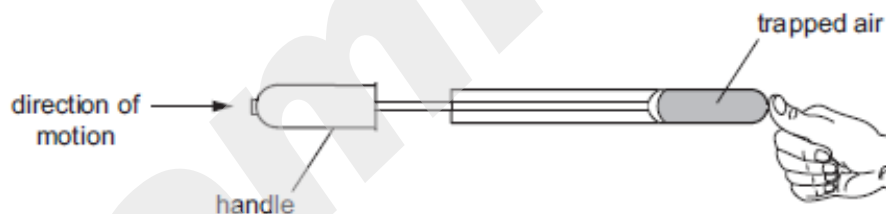
11 A student places four identical beakers on a bench.

Two beakers contain salt water of density 1.1 g/cm^3 and two beakers contain pure water of density 1.0 g/cm^3 .

Which beaker exerts the greatest pressure on the bench?



12 A student places his thumb firmly on the outlet of a bicycle pump, to stop the air coming out.



What happens to the pressure and what happens to the volume of the trapped air as the pump handle is pushed in?

	pressure	volume
A	decreases	decreases
B	decreases	remains the same
C	increases	decreases
D	increases	remains the same

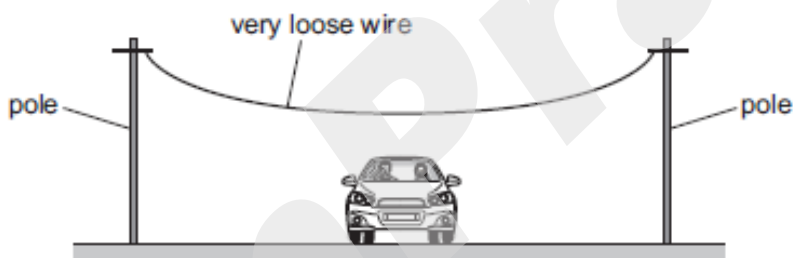
- 13 During evaporation, molecules escape rapidly from the surface of a liquid.

What happens to the average energy of the molecules of the remaining liquid and what happens to the temperature of the remaining liquid?

	average energy of remaining molecules	temperature of remaining liquid
A	decreases	decreases
B	decreases	increases
C	stays the same	decreases
D	stays the same	increases

- 14 A telephone engineer connects a wire between two poles when the weather is very cold.

He makes the wire very loose. The wire passes over a road.



The weather changes and it becomes very hot.

What could happen to the wire and why?

	what could happen	why
A	it breaks	it contracts
B	it breaks	it expands
C	it sags and touches cars on the road	it contracts
D	it sags and touches cars on the road	it expands

October/November 2014 (11)

- 1 Diagram 1 shows a measuring cylinder containing water.

Five identical steel balls are now lowered into the measuring cylinder. Diagram 2 shows the new water level in the cylinder.

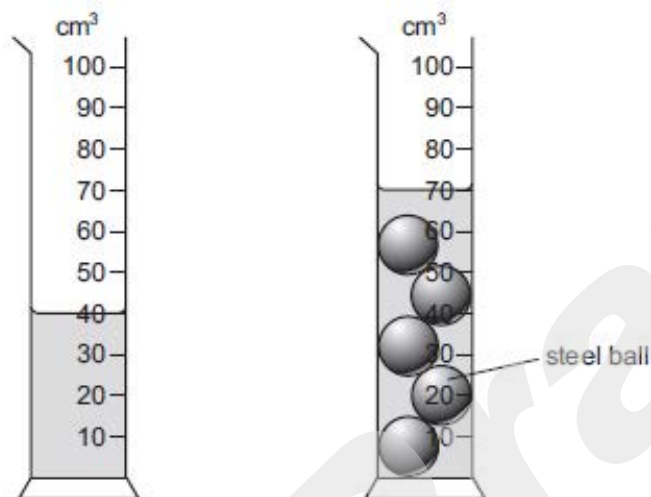
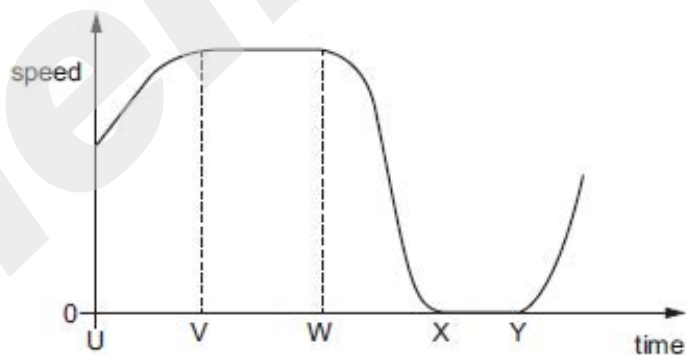


diagram 1

diagram 2

What is the volume of each steel ball?

- A 6 cm^3 B 14 cm^3 C 30 cm^3 D 70 cm^3
- 2 The graph shows how the speed of a car changes with time.



Between which two times is the car stationary?

- A U and V B V and W C W and X D X and Y

- 3 A man stands by a railway track.



A train travelling at 40 m/s takes 2.0 s to pass the man.

What is the length of the train?

- A 20 m B 38 m C 40 m D 80 m
- 4 The mass of an astronaut is 70 kg on the Moon.
What is the mass of the astronaut on the Earth?
- A 7 kg B 70 kg C 80 kg D 700 kg
- 5 The weight of an object is found using the balance shown in the diagram. The object is put in the left-hand pan and various weights are put in the right-hand pan.



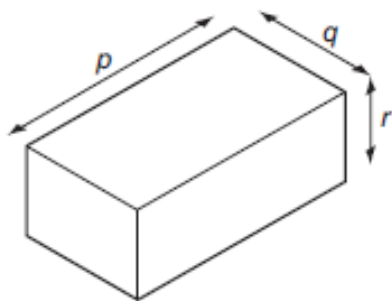
These are the results.

weights in the right-hand pan	effect
0.1 N, 0.1 N, 0.05 N, 0.02 N	balance tips down slightly on the left-hand side
0.2 N, 0.1 N, 0.01 N	balance tips down slightly on the right-hand side

What is the best estimate of the weight of the object?

- A 0.27 N B 0.29 N C 0.31 N D 0.58 N

- 6 The diagram shows the dimensions of a rectangular block of metal of mass m .



Which expression is used to calculate the density of the metal?

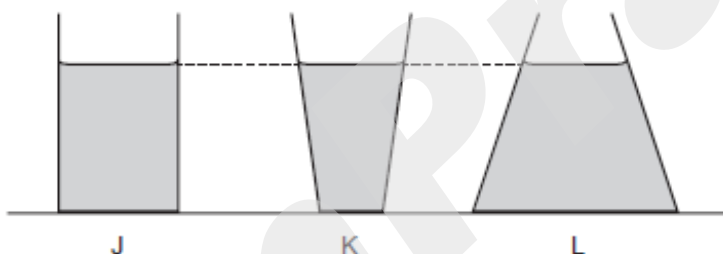
- A $m \times p \times q$
- B $m \times p \times q \times r$
- C $\frac{m}{(p \times q)}$
- D $\frac{m}{(p \times q \times r)}$
- 7 In which situation is **no** resultant force needed?
- A a car changing direction at a steady speed
- B a car moving in a straight line at a steady speed
- C a car slowing down
- D a car speeding up
- 8 Which properties of a body can be changed by applying a force to the body?
- A mass, motion and shape
- B mass and motion, but not shape
- C mass and shape, but not motion
- D motion and shape, but not mass

9 The list contains three energy resources P, Q and R.

- P geothermal energy from hot rocks
- Q nuclear fission in reactors
- R sunlight on solar panels

Which of these resources are renewable?

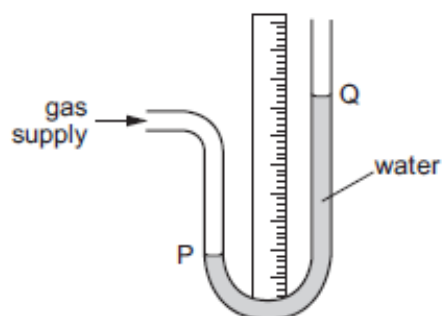
- A P and Q only
 - B P and R only
 - C Q and R only
 - D P, Q and R
- 10 The diagram shows three different containers J, K and L. Each container contains water of the same depth.



Which statement about the pressure of the water on the base of each container is correct?

- A The water pressure is greatest in container J.
 - B The water pressure is greatest in container K.
 - C The water pressure is greatest in container L.
 - D The water pressure is the same for all three containers.
- 11 Which movement will require the greatest amount of work to be done?
- A a force of 10 N moving an object a distance of 3.0 m
 - B a force of 10 N moving an object a distance of 5.0 m
 - C a force of 15 N moving an object a distance of 3.0 m
 - D a force of 15 N moving an object a distance of 5.0 m

12 A water manometer is connected to a gas supply.



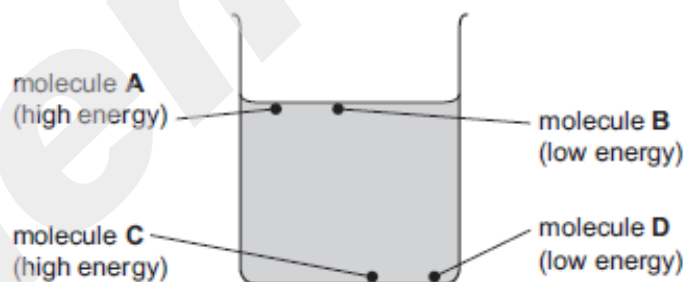
There is a gas leak and the pressure of the gas supply falls.

What happens to the water level at P and what happens to the water level at Q?

	water level at P	water level at Q
A	falls	falls
B	falls	rises
C	rises	falls
D	rises	rises

13 The diagram shows a beaker of water. Four molecules are labelled. The relative amount of energy of each molecule is shown.

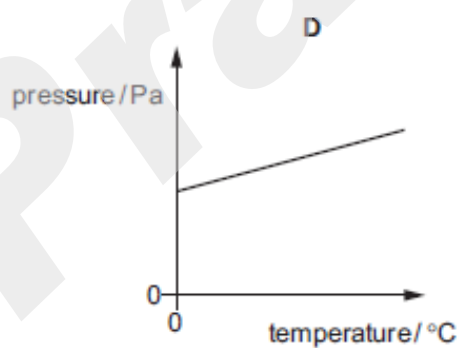
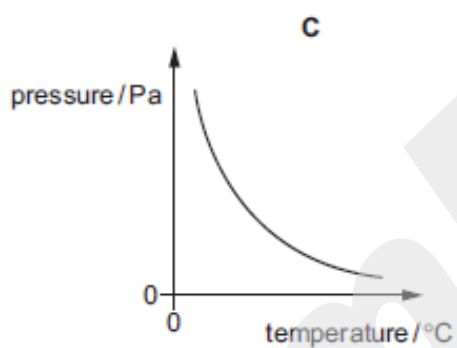
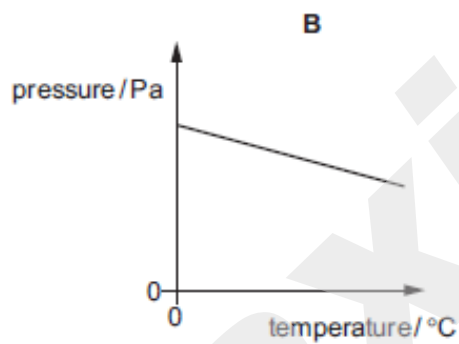
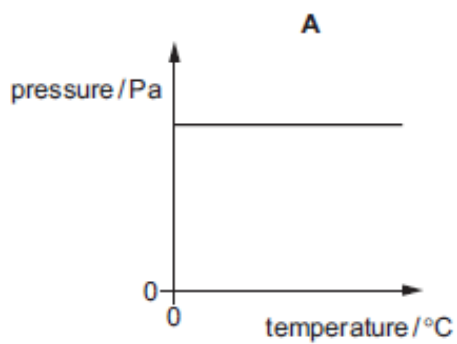
Which molecule is most likely to escape from the liquid?



14 Some gas is trapped in a container of fixed volume.

The temperature of the gas increases.

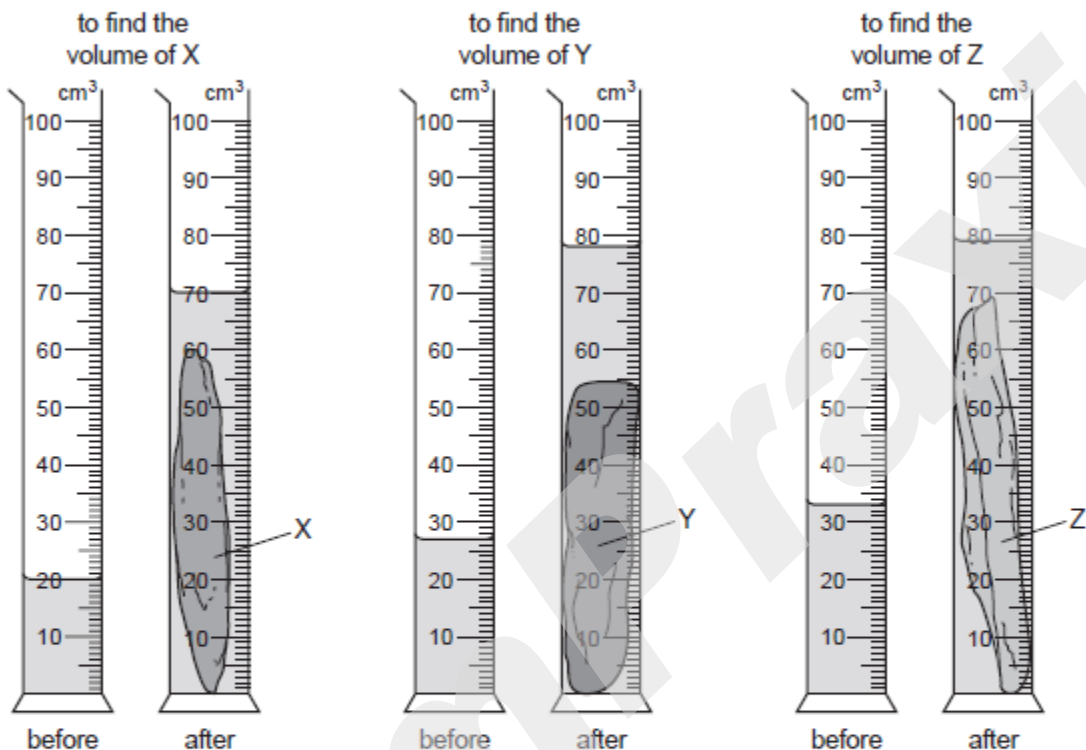
Which graph shows how the pressure of the gas changes with temperature?



May/June 2015 (11)

- 1 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.

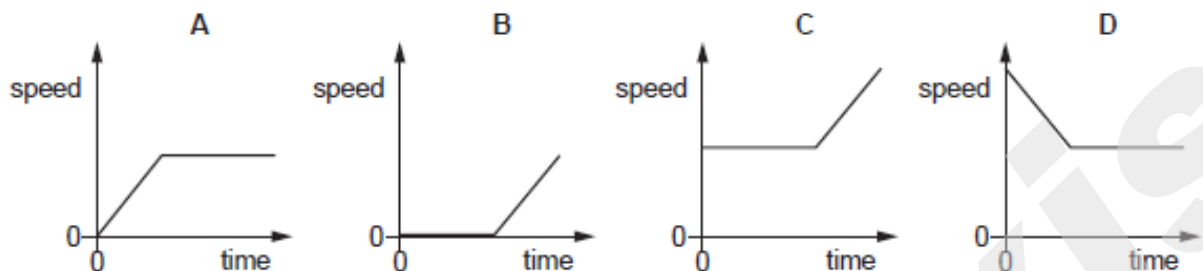


Which row shows the volumes of X, Y and Z in order, from largest to smallest?

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

- 2 A car moves with constant speed and then constant acceleration.

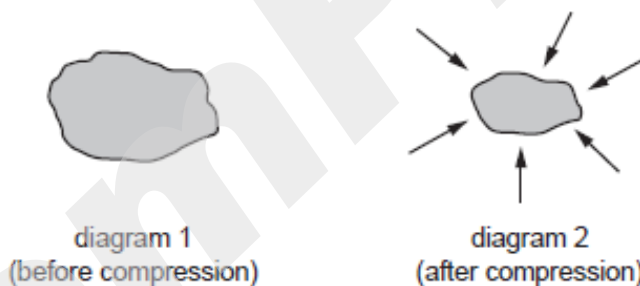
Which graph is the speed-time graph for the car?



- 3 A car travels 100 km. The journey takes two hours. The highest speed of the car is 80 km/h, and the lowest speed is 40 km/h.

What is the average speed for the journey?

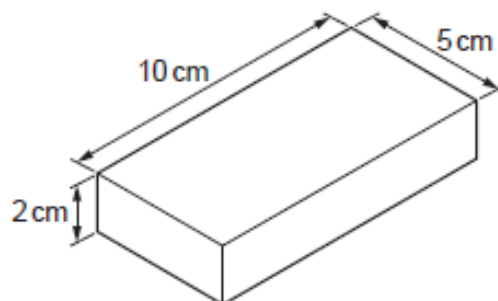
- A 40 km/h B 50 km/h C 60 km/h D 120 km/h
- 4 Diagram 1 shows a piece of foam rubber that contains many pockets of air. Diagram 2 shows the same piece of foam rubber after it has been compressed so that its volume decreases.



What happens to the mass and to the weight of the foam rubber when it is compressed?

	mass	weight
A	increases	increases
B	increases	no change
C	no change	increases
D	no change	no change

- 5 A metal block has the dimensions shown. Its mass is 1000g.

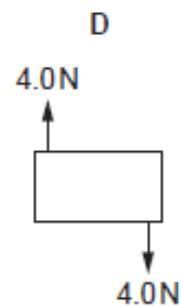
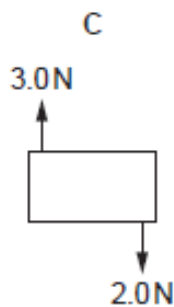
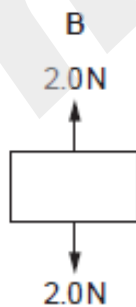
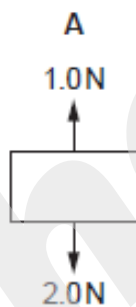


What is the density of the metal?

- A $\left(\frac{5 \times 10}{1000 \times 2}\right) \text{g/cm}^3$
 B $\left(\frac{2 \times 5 \times 10}{1000}\right) \text{g/cm}^3$
 C $\left(\frac{1000 \times 2}{5 \times 10}\right) \text{g/cm}^3$
 D $\left(\frac{1000}{2 \times 5 \times 10}\right) \text{g/cm}^3$

- 6 Four objects are each acted on by only two forces, as shown.

Which object is in equilibrium?



- 7 A student measures the length of a spring. She then hangs different weights from the spring. She measures the length of the spring for each different weight.

The table shows her results.

weight/ N	length/ mm
0	520
1.0	524
2.0	528
3.0	533
4.0	537
5.0	540

What is the extension of the spring when the weight hung from it is 3.0N?

- A 4 mm B 5 mm C 12mm D 13 mm
- 8 Which energy resource is used to generate electricity without using any moving parts?
- A geothermal
 B hydroelectric
 C nuclear
 D solar
- 9 A cyclist travels down a hill from rest at point X, without pedalling.

The cyclist applies his brakes and the cycle stops at point Y.

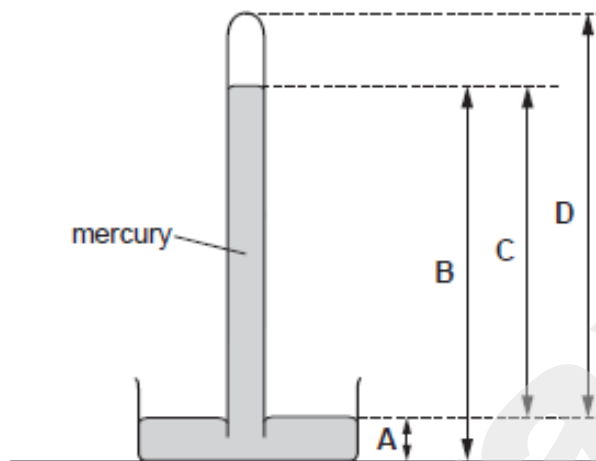


Which energy changes have taken place between X and Y?

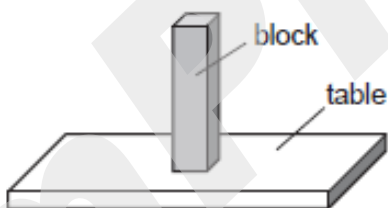
- A gravitational potential → kinetic → thermal (heat)
 B gravitational potential → thermal (heat) → kinetic
 C kinetic → gravitational potential → thermal (heat)
 D kinetic → thermal (heat) → gravitational potential

10 The diagram shows a simple mercury barometer.

Which height is used as a measurement of atmospheric pressure?



11 A block with flat, rectangular sides rests on a table.



The block is now turned so that it rests with its largest side on the table.



How has this change affected the force and the pressure exerted by the block on the table?

	force	pressure
A	decreased	decreased
B	decreased	unchanged
C	unchanged	decreased
D	unchanged	unchanged

12 Two states of matter are described as follows.

In state 1, the molecules are very far apart. They move about very quickly at random in straight lines until they hit something.

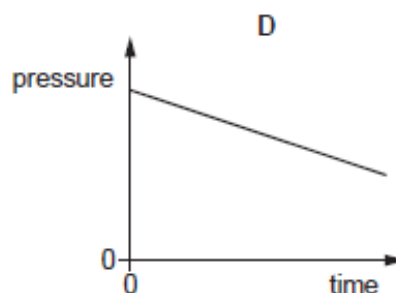
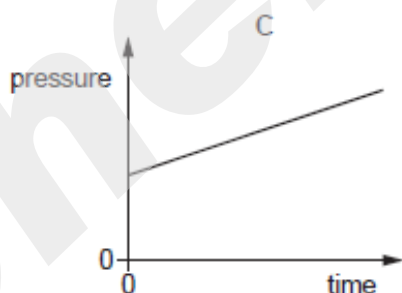
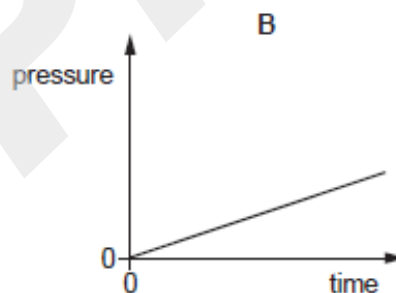
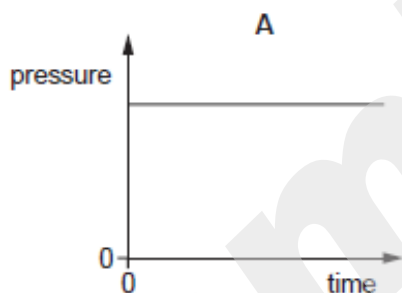
In state 2, the molecules are quite closely packed together. They move about at random. They do not have fixed positions.

What is state 1 and what is state 2?

	state 1	state 2
A	gas	liquid
B	gas	solid
C	liquid	gas
D	solid	liquid

13 The pressure of a fixed mass of gas in a cylinder is measured. The temperature of the gas in the cylinder is then slowly increased. The volume of the cylinder does not change.

Which graph shows the pressure of the gas during this process?

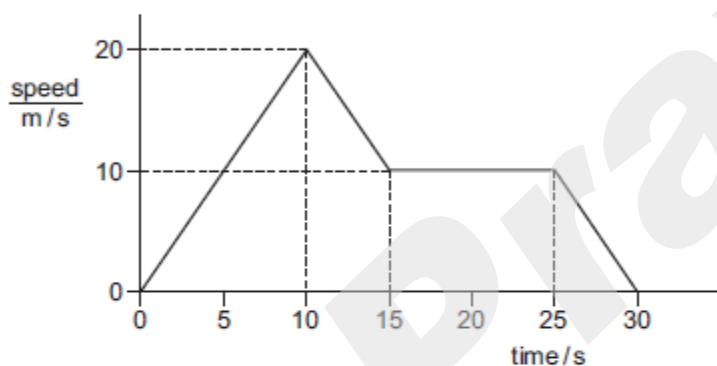


October/November 2015 (11)

1 Which option contains **only** apparatus that could be used to determine the volume of a small block of unknown material?

- A measuring cylinder, metre rule
- B measuring cylinder, stopwatch
- C metre rule, balance
- D metre rule, stopwatch

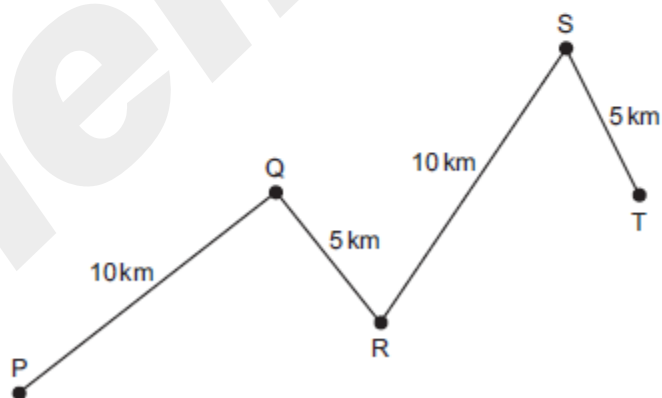
2 The graph represents the motion of a car.



What is the distance travelled by the car while it is moving at a constant speed?

- A 100 m
- B 150 m
- C 250 m
- D 300 m

3 A car travels along the route PQRST in 30 minutes.



What is the average speed of the car?

- A 10 km/hour
- B 20 km/hour
- C 30 km/hour
- D 60 km/hour

- 4 The mass of an object is measured on Earth. The mass is 5.0 kg.

The object is taken to the Moon. The mass of the object is measured on the Moon.

What is the mass of the object on the Moon?

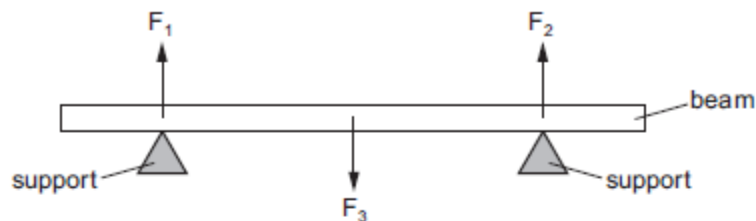
- A 0 kg
B more than 0 kg, but less than 5.0 kg
C 5.0 kg
D more than 5.0 kg
- 5 A student wishes to determine the density of the solid block shown.



Which quantities must be known?

- A the area of the shaded face and the volume of the block
B the area of the shaded face and the weight of the block
C the mass of the block and the height of the block
D the mass of the block and the volume of the block

- 6 A heavy beam rests on two supports. The diagram shows the only three forces F_1 , F_2 and F_3 acting on the beam.



The beam is in equilibrium.

Which statement is correct?

- A All the forces are equal in size.
 B The resultant force on the beam is in the opposite direction to the resultant turning effect.
 C The resultant force on the beam is zero and the resultant turning effect on the beam is zero.
 D The total upward force is twice the total downward force.
- 7 Which list contains only properties of an object that can be changed by a force?
- A direction of motion, mass, shape
 B direction of motion, mass, speed
 C direction of motion, shape, speed
 D mass, shape, speed
- 8 What needs to be known to calculate the work done by a force acting on an object?

	the size of the force	the distance the force moves the object	the time for which the force acts
A	✓	✓	✓
B	✓	✓	x
C	✓	x	✓
D	✓	x	x

key

✓ = needed

x = not needed

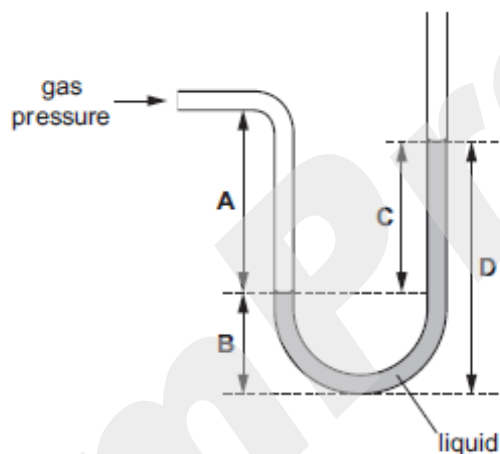
9 Electrical energy may be obtained from nuclear fission.

In which order is the energy transferred in this process?

- A nuclear fuel → generator → reactor and boiler → turbines
- B nuclear fuel → generator → turbines → reactor and boiler
- C nuclear fuel → reactor and boiler → generator → turbines
- D nuclear fuel → reactor and boiler → turbines → generator

10 The diagram shows a manometer containing a liquid. The manometer is used to find the difference between the pressure of a gas and atmospheric pressure.

Which distance represents this pressure difference?



11 Four physics teachers investigate pressure. They wear identical clothes and lie on different beds of nails.

The table gives the weight of each teacher and the total area of contact between the teacher and the nails.

Which teacher experiences the least pressure from the nails?

	weight of teacher/N	total area of contact/cm ²
A	700	13
B	800	20
C	900	14
D	1000	21

- 12 A cylinder of constant volume contains a fixed mass of gas. The gas is cooled.

What happens to the pressure of the gas and what happens to the kinetic energy of the gas molecules?

	pressure of gas	kinetic energy of molecules
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 13 A swimmer feels cold after leaving warm water on a warm, windy day.

Why does she feel cold even though the air is warm?

- A** The less energetic water molecules on her skin escape quickly.
- B** The more energetic water molecules on her skin do not escape quickly.
- C** The water on her skin does not evaporate quickly enough to keep her warm.
- D** The water on her skin evaporates quickly and cools her skin.