



上海光華學院劍橋國際中心(光華劍橋)
Guanghua Cambridge International School

Cambridge IGCSE/G1 PHYSICS

Multiple Choice Questions

Volume IGCSE/G1

- I Force, Motion, Energy
- II Thermal Physics
- III Waves

Cambridge IGCSE/G1 PHYSICS

Multiple Choice Questions

Grading Table

Preface

This book covers the entire syllabus of CIE Physics for IGCSE level. The main task of this book is to help you to test your understanding and prepare for the examinations.

This book has been written specifically for a student of Cambridge's 0625 syllabus by an experienced team with examiners who are very familiar with the syllabus and examinations.

All of the questions are chosen from past papers. When tackling questions, it is a good idea to make a first attempt without referring to your textbook or to your notes. This will help to reveal any gap in your understanding. By sorting out any problems at early stage you will progress faster.

We hope that this book will help you to succeed in examinations and we also hope you will learn from the past to take physics to ever greater heights.

Changes for the 2023-2025 Syllabus

Note that many of the questions are taken from past syllabuses which, on occasion, might contain subject material removed from later incarnations of the syllabus. These questions have not been removed from this book; rather, they have been marked with an open left bracket, as shown in the example below.

- 3 The diagram shows an instrument used to measure gas pressure.



What is the instrument called?

- A ammeter
- B barometer
- C manometer
- D thermometer

Questions marked as such, can be ignored, insofar as the 2023-2025 examinations are concerned.

At the same time, some content has been added to the 2023-2025 syllabus. Attempts have been made to include questions covering this new material. Note that students can also consult the 2023-2025 textbook for further sample problems.

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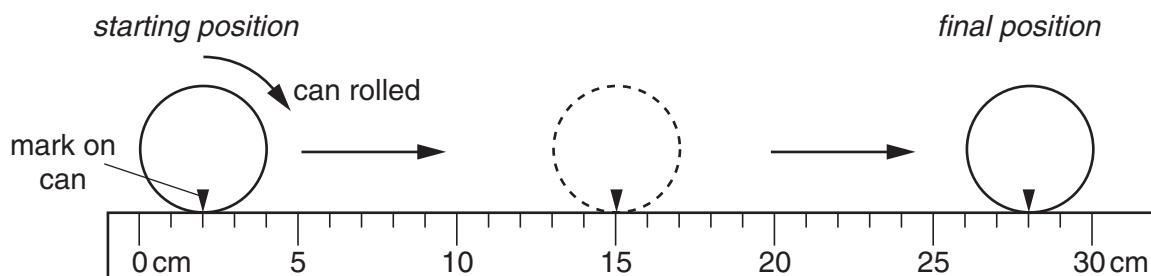
Part I

Force, Motion, Energy

Chapter 1. Making measurements

1.1 Measuring length

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

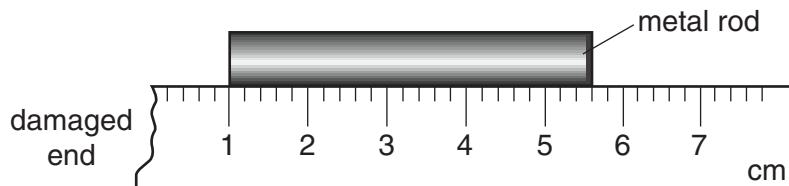


The can rolls over twice.

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

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

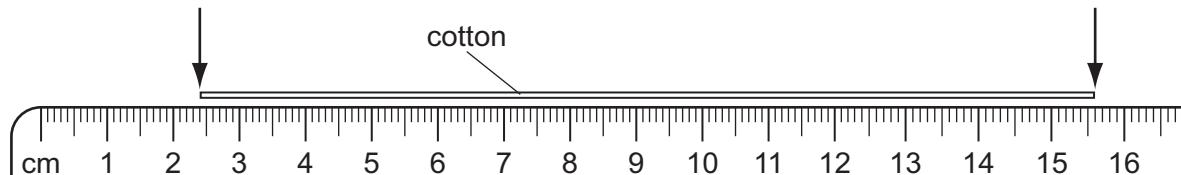
- 2 A girl uses a ruler to measure the length of a metal rod. Because the end of the rule is damaged, she places one end of the rod at the 1 cm mark as shown.



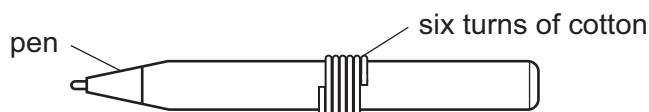
How long is the metal rod?

- A 43 mm B 46 mm C 53 mm D 56 mm

- 3 A piece of cotton is measured between two points on a ruler.



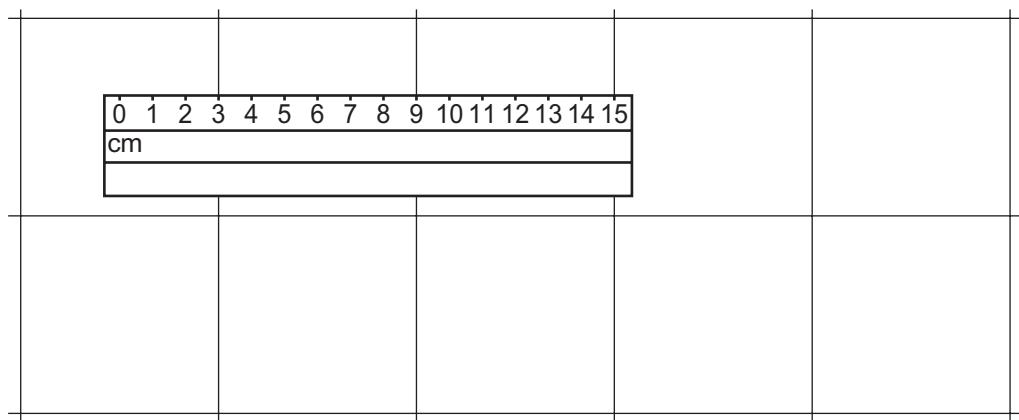
When the length of cotton is wound closely around a pen, it goes round six times.



What is the distance once round the pen?

- A 2.2 cm B 2.6 cm C 13.2 cm D 15.6 cm

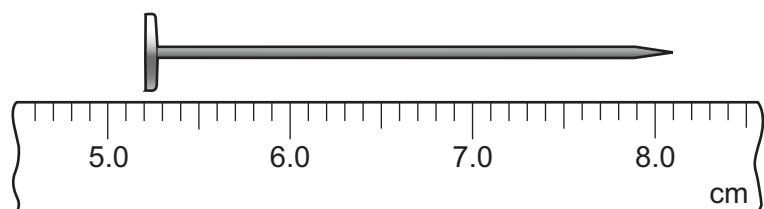
- 4 A floor is covered with square tiles. The diagram shows a ruler on the tiles.



How long is one tile?

- A 3 cm B 6 cm C 9 cm D 12 cm

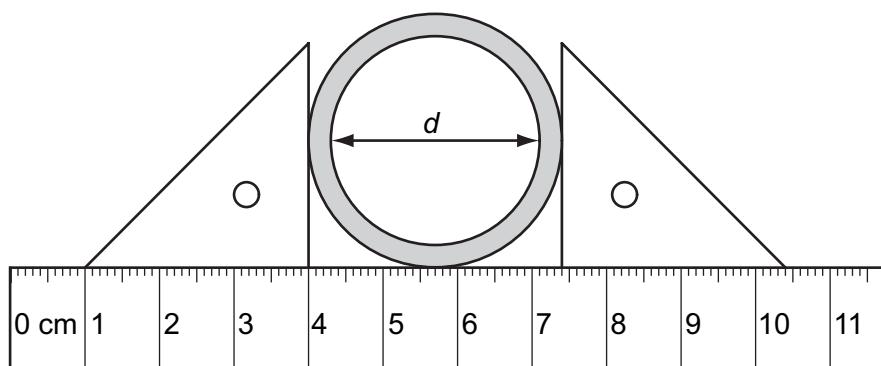
- 5 A ruler is used to measure the length of a nail.



What is the length of the nail?

- A 1.3 cm B 2.9 cm C 5.2 cm D 8.1 cm

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

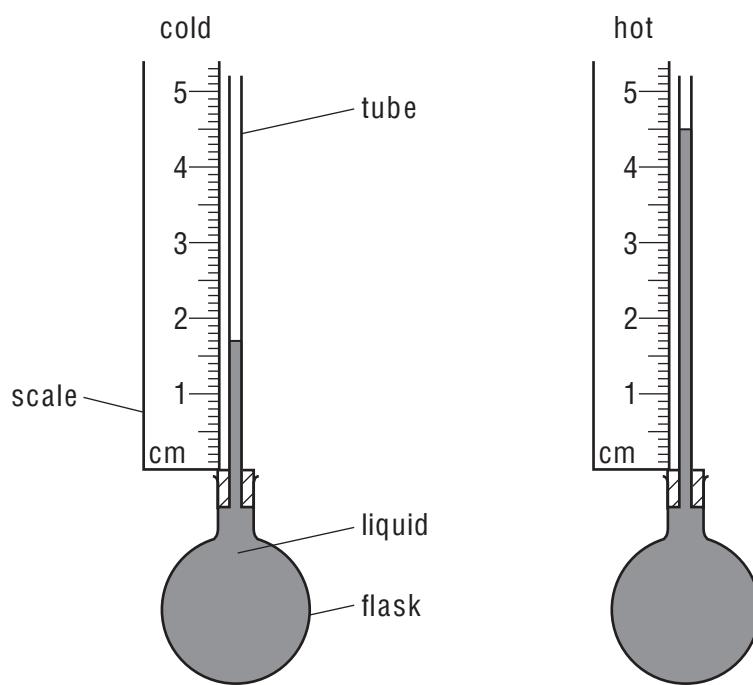


What is the internal diameter d of the tube?

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

- 7 Some liquid is heated in a flask.

The diagrams show the height of the liquid in the tube when the liquid is cold and when it is hot.



What is the difference in the heights?

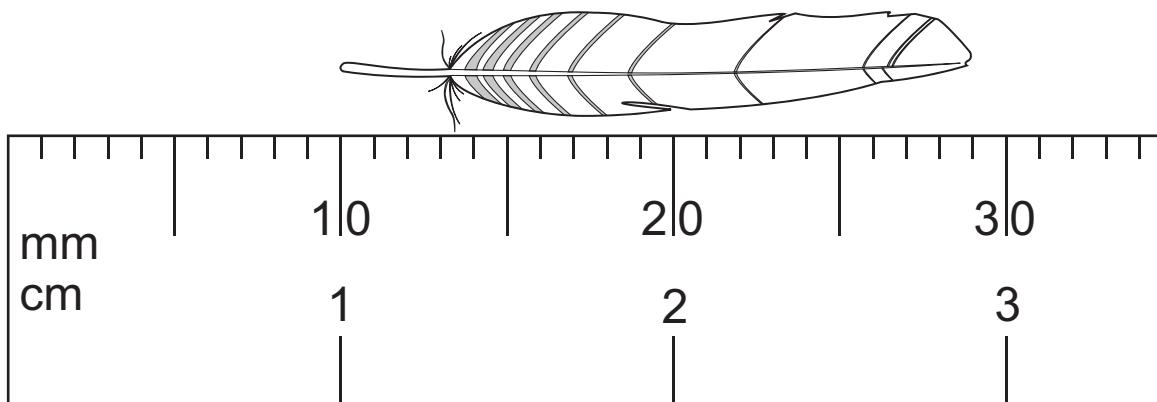
- A** 1.7 cm **B** 2.8 cm **C** 3.2 cm **D** 4.5 cm

- 8 A metre rule is used to measure a length.

Which reading is shown to the nearest millimetre?

- A** 0.7 m **B** 0.76 m **C** 0.761 m **D** 0.7614 m

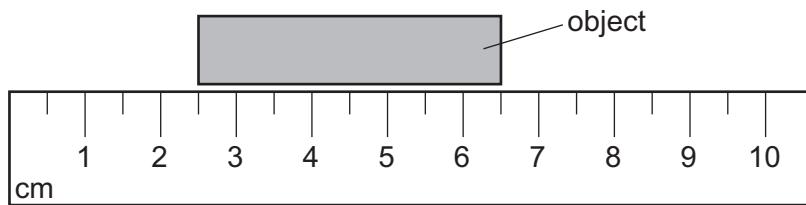
- 9 The diagram shows an enlarged drawing of the end of a metre rule. It is being used to measure the length of a small feather.



What is the length of the feather?

- A** 19 mm **B** 29 mm **C** 19 cm **D** 29 cm

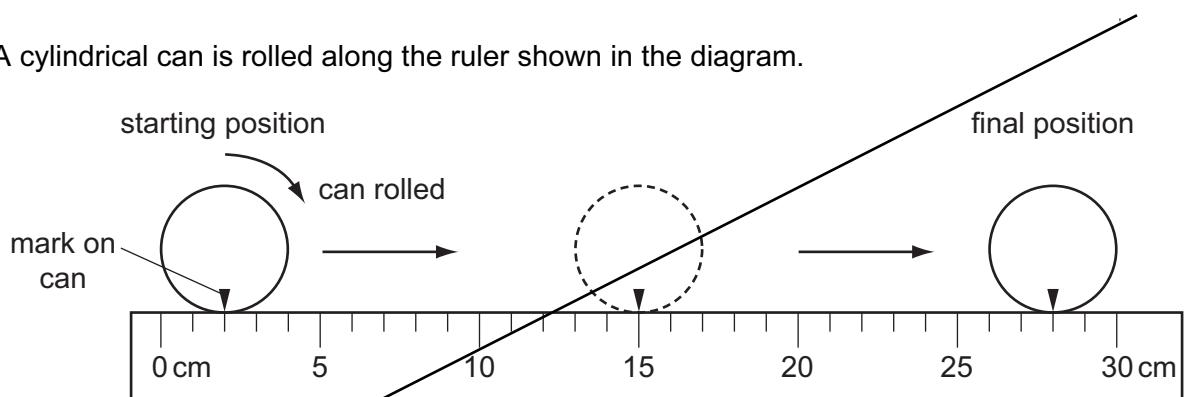
- 10 A ruler is used to measure the length of an object.



What is the length of the object?

- A 3.0 cm B 4.0 cm C 5.0 cm D 6.5 cm

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

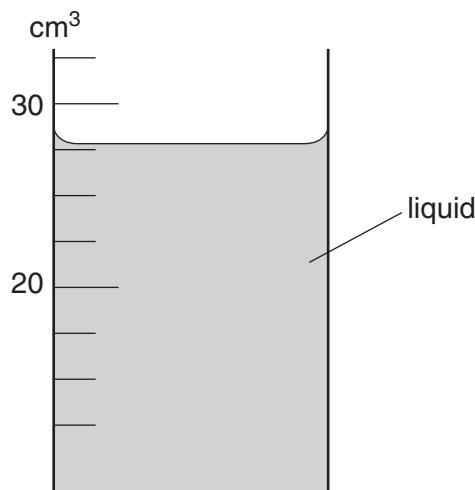


The can rolls over twice.
What is the circumference (distance all round) of the can?

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

1.2 Measuring volume

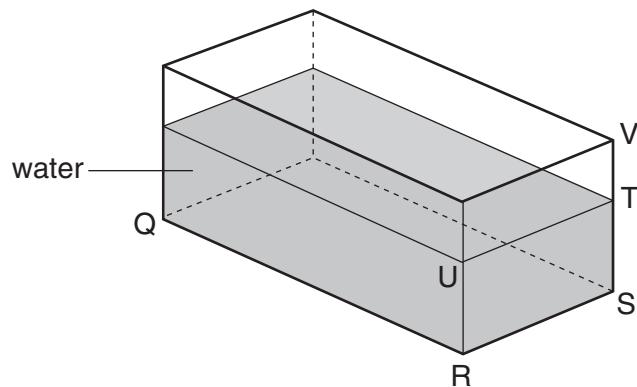
- 1 The diagram shows the level of liquid in a measuring cylinder.



What is the volume of the liquid?

- A** 24 cm^3 **B** 28 cm^3 **C** 29 cm^3 **D** 32 cm^3

- 2 A glass tank contains some water.

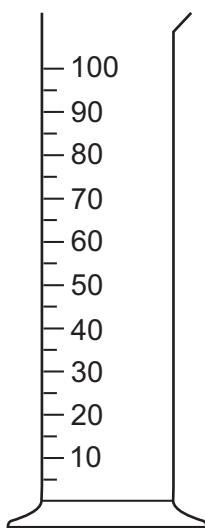


The length QR and the width RS of the tank are known.

What other distance needs to be measured in order to be able to calculate the volume of the water?

- A** ST **B** SV **C** TU **D** TV

- 3 Which of the following is **not** necessary when using a measuring cylinder to measure the volume of a quantity of water?
- A making sure that the measuring cylinder is vertical
B making sure that your eye is level with the liquid surface
C reading the bottom of the meniscus
D using the largest measuring cylinder possible
- 4 The diagram shows a measuring cylinder.



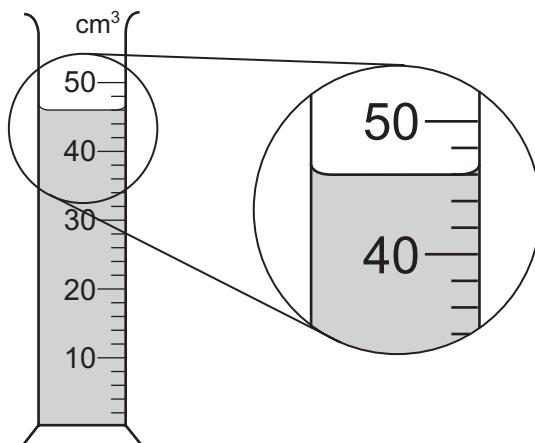
Which unit would be most suitable for its scale?

- A mm^2 B mm^3 C cm^2 D cm^3
- 5 A decorator wishes to calculate the area of a bathroom tile so that he can estimate the amount of adhesive that he needs to buy.

What must he use?

- A a measuring cylinder only
B a ruler only
C a measuring cylinder and a clock only
D a measuring cylinder and a ruler only

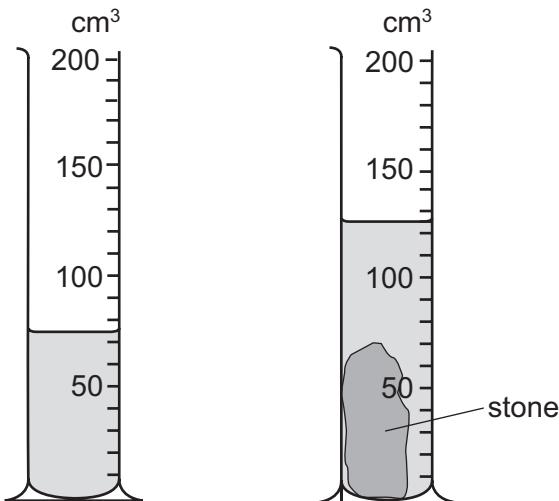
- 6 A measuring cylinder is used to measure the volume of a liquid.



What is the volume of the liquid?

- A 43 cm^3 B 46 cm^3 C 48 cm^3 D 54 cm^3

- 7 A measuring cylinder contains some water. When a stone is put in the water, the level rises.

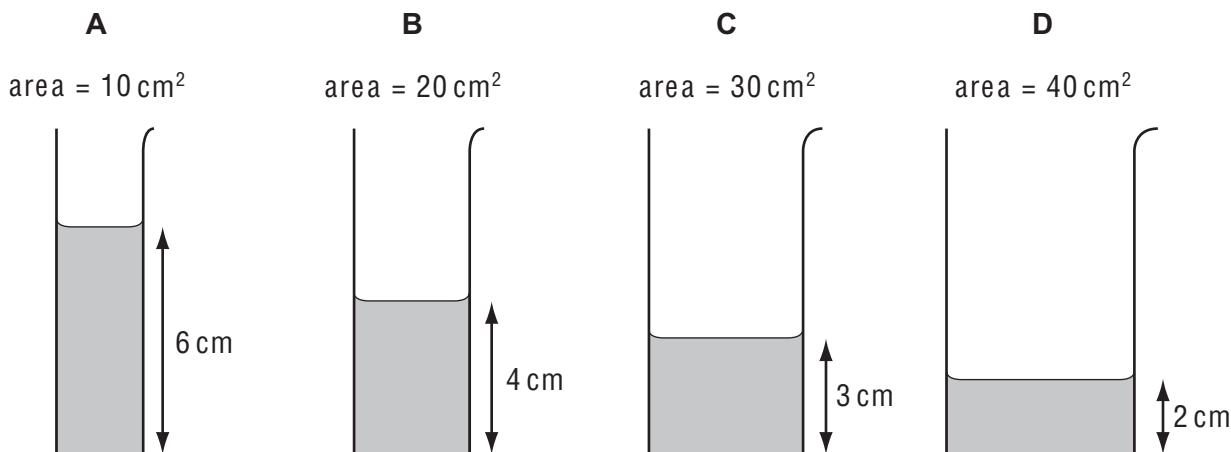


What is the volume of the stone?

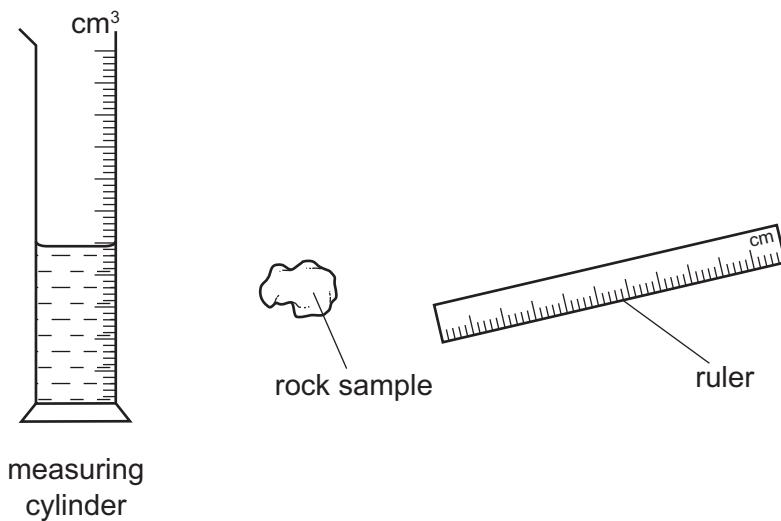
- A 50 cm^3 B 70 cm^3 C 75 cm^3 D 125 cm^3

- 8** Some water is poured into four tubes of different cross-sectional areas.

Which tube contains the largest volume of water?



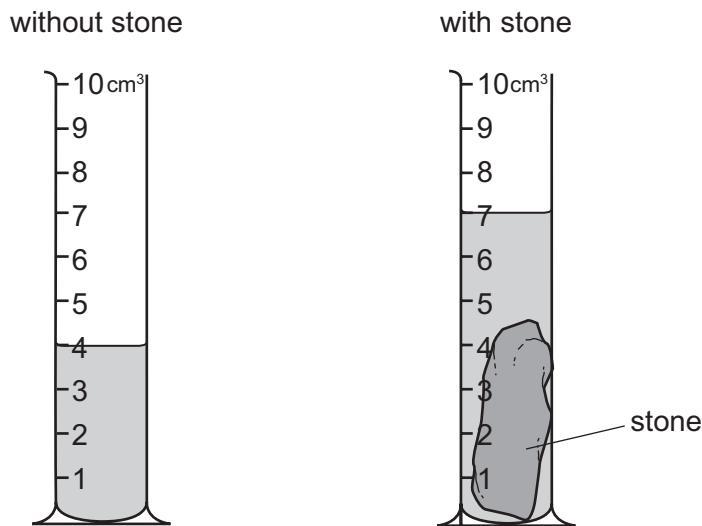
- 9** A scientist needs to determine the volume of a small, irregularly shaped rock sample. Only a ruler and a measuring cylinder, partially filled with water, are available.



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

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

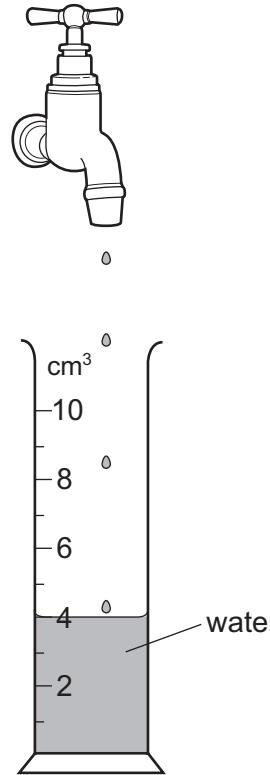
- 10** The diagrams show an experiment to determine the volume of a stone.



What is the volume of the stone?

- A** 3 cm³ **B** 4 cm³ **C** 7 cm³ **D** 11 cm³

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

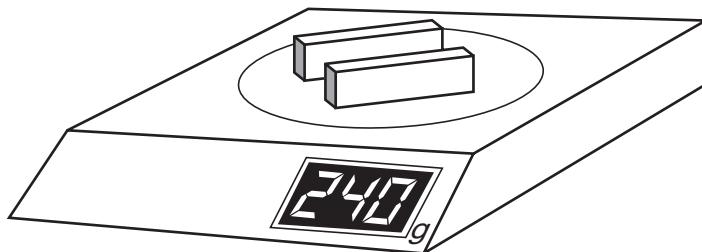


How many drops in total will have been collected when the measuring cylinder reads 10 cm³?

- A** 48 **B** 60 **C** 180 **D** 300

1.3 Measuring density

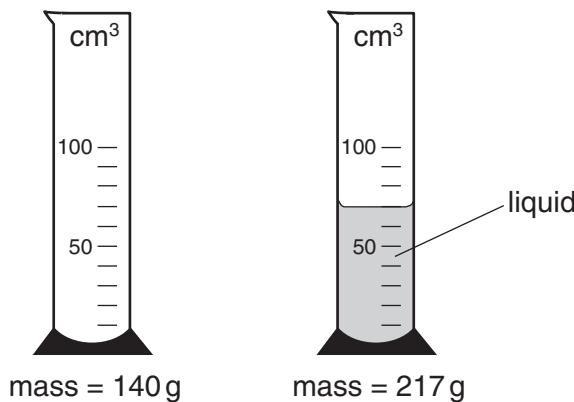
- 1 A shop-keeper places two identical blocks of cheese on a set of scales and notices that their combined mass is 240 g. Each block measures 2.0 cm x 5.0 cm x 10.0 cm.



What is the density of the cheese?

- A 0.42 g/cm³ B 0.83 g/cm³ C 1.2 g/cm³ D 2.4 g/cm³

- 2 The masses of a measuring cylinder before and after pouring some liquid are shown in the diagram.



What is the density of the liquid?

- A $\frac{217}{52}$ g/cm³ B $\frac{217}{70}$ g/cm³ C $\frac{77}{52}$ g/cm³ D $\frac{77}{70}$ g/cm³

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

- A a balance and a ruler
- B a balance and a forcemeter (spring balance)
- C a measuring cylinder and a ruler
- D a measuring cylinder and a beaker

- 4 The mass of a full bottle of cooking oil is 1.30 kg.

When exactly half of the oil has been used, the mass of the bottle plus the remaining oil is 0.90 kg.

What is the mass of the bottle?

- A 0.40 kg B 0.50 kg C 0.65 kg D 0.80 kg

- 5 A student tries to find the density of a metal block. First he measures the weight with a forcemeter (spring balance). Next he measures the sides of the block using a rule, in order to calculate the volume of the block. Finally he divides the weight by the volume to find the density.

The student has made a mistake.

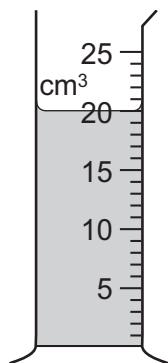
Why does his method **not** give the density?

- A Density is volume divided by weight.
B He should have measured the surface area, not the volume.
C He should have used the mass in his calculation, not the weight.
D Weight is not measured with a forcemeter (spring balance).

- 6 Which of the following is a unit of density?

- A cm^3/g
B g/cm^2
C g/cm^3
D kg/m^2

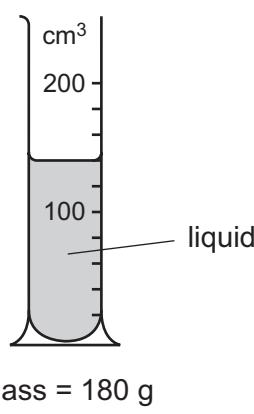
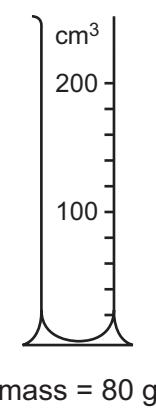
- 7 The diagram shows some liquid in a measuring cylinder. The mass of the liquid is 16 g.



What is the density of the liquid?

- A $320 \text{ g}/\text{cm}^3$ B $36 \text{ g}/\text{cm}^3$ C $1.25 \text{ g}/\text{cm}^3$ D $0.8 \text{ g}/\text{cm}^3$

- 8 The masses of a measuring cylinder before and after pouring some liquid into it are shown in the diagram.

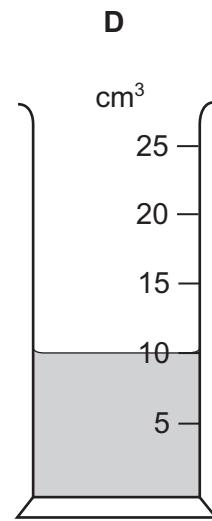
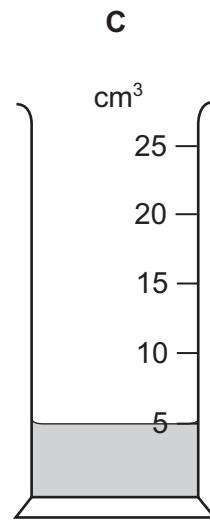
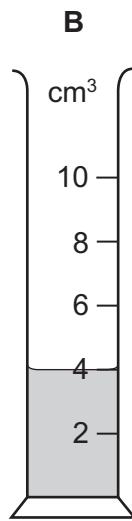
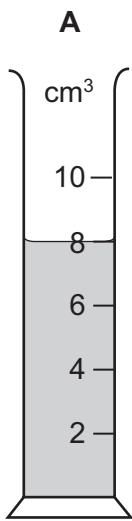


What is the density of the liquid?

- A $\frac{100}{120} \text{ g/cm}^3$ B $\frac{100}{140} \text{ g/cm}^3$ C $\frac{180}{120} \text{ g/cm}^3$ D $\frac{180}{140} \text{ g/cm}^3$

- 9 The same mass of four different liquids is placed in some measuring cylinders.

Which measuring cylinder contains the liquid with the greatest density?

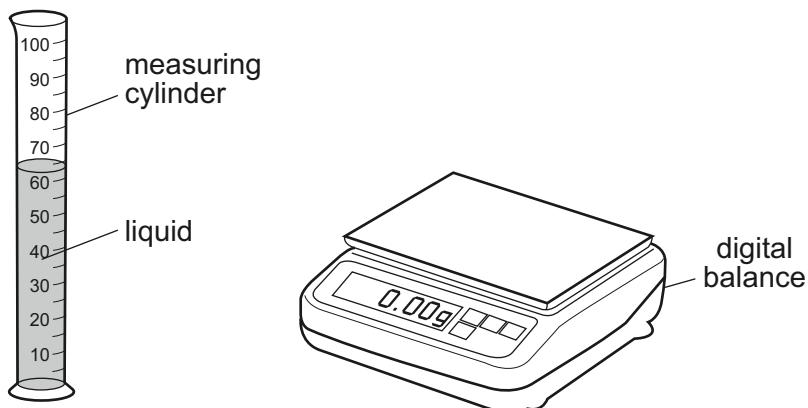


- 10 A person measures the length, width, height and mass of a rectangular metal block.

Which of these measurements are needed in order to calculate the density of the metal?

- A mass only
B height and mass only
C length, width and height only
D length, width, height and mass

- 11 A student pours liquid into a measuring cylinder.



The student records the volume of the liquid from the scale on the measuring cylinder. He then puts the measuring cylinder containing the liquid on a balance and records the mass.

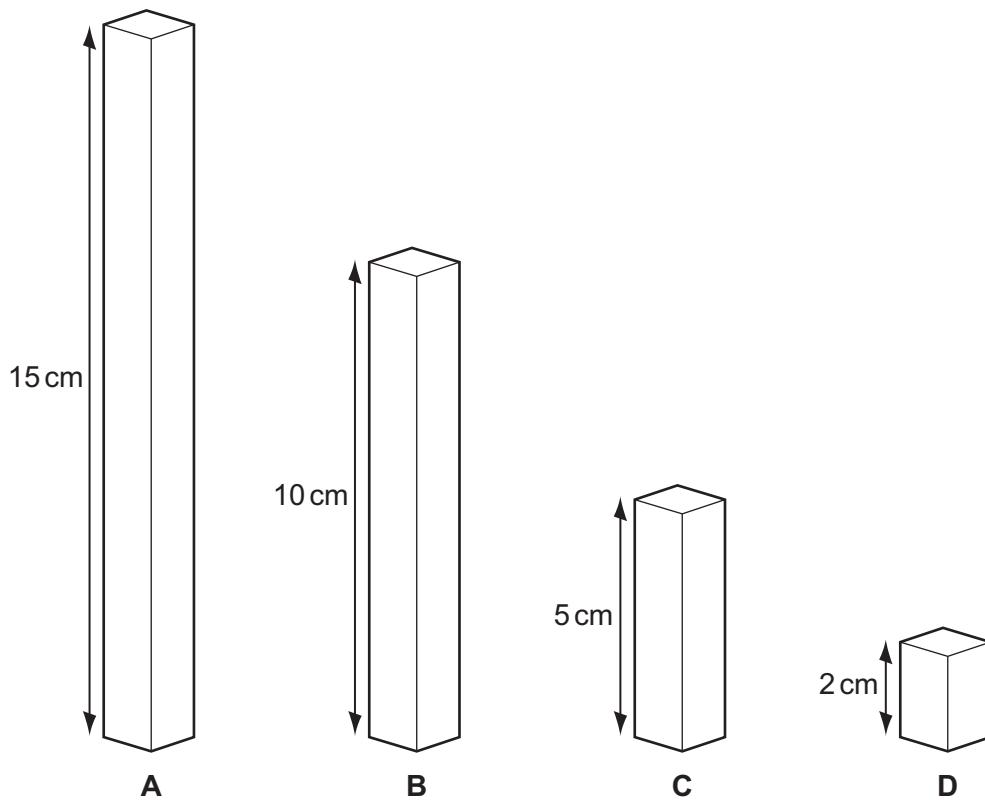
What else needs to be measured before the density of the liquid can be calculated?

- A the depth of the liquid in the measuring cylinder
- B the mass of the empty measuring cylinder
- C the temperature of the liquid in the measuring cylinder
- D the volume of the empty measuring cylinder

- 12** The diagram shows four blocks, each made of glass of density 2.6 g/cm^3 .

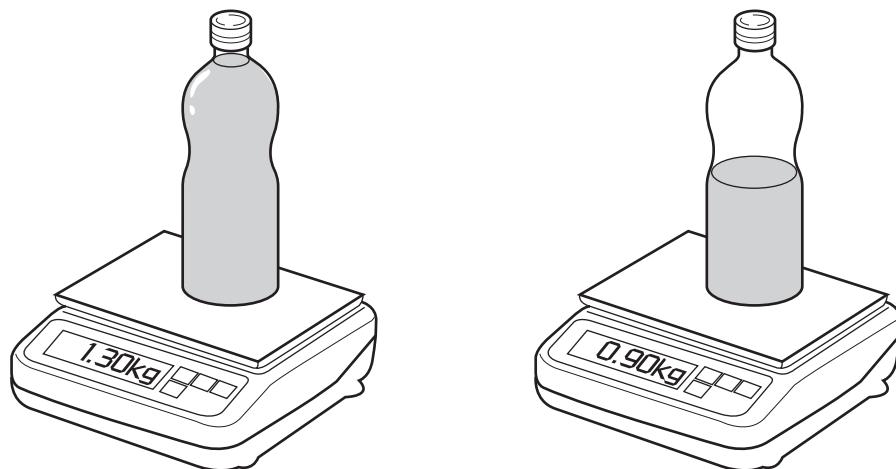
The top of each block has an area of 1 cm^2 .

Which block has a mass of 13 g?



- 13** The mass of a full bottle of cooking oil is 1.30 kg.

When exactly half of the oil has been used, the mass of the bottle plus the remaining oil is 0.90 kg.



What is the mass of the empty bottle?

A 0.40 kg

B 0.50 kg

C 0.65 kg

D 0.80 kg

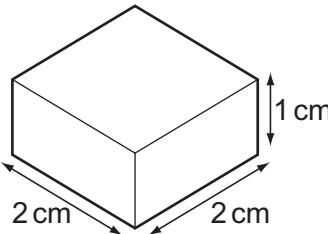
14 Which of the following is a unit of density?

- A cm^3/g B g/cm^2 C g/cm^3 D kg/m^2

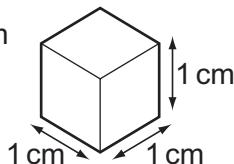
15 Each of the solids shown in the diagram has the same mass.

Which solid has the greatest density?

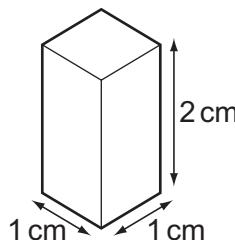
A



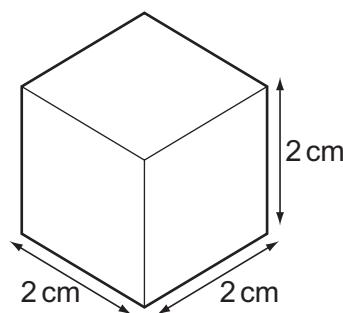
B



C



D



16 A student is trying to find the density of water and of a large, regularly-shaped solid.

Which apparatus is needed to find the density of **both**?

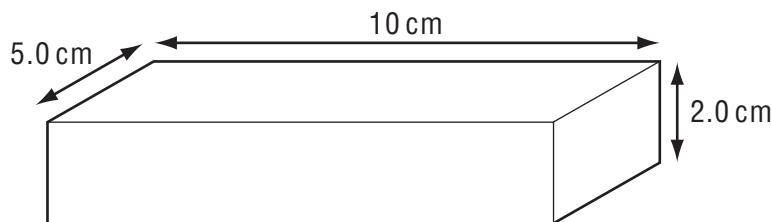
- A balance, clock, ruler
B balance, measuring cylinder, ruler
C balance, measuring cylinder, string
D clock, ruler, string

17 A metal drum has a mass of 200 kg when empty and 1000 kg when filled with 1.0 m^3 of methylated spirit.

What is the density of methylated spirit?

- A $0.0050 \text{ kg}/\text{m}^3$
B $0.11 \text{ kg}/\text{m}^3$
C $800 \text{ kg}/\text{m}^3$
D $1000 \text{ kg}/\text{m}^3$

- 18 The diagram shows a rectangular metal block measuring $10\text{ cm} \times 5.0\text{ cm} \times 2.0\text{ cm}$.

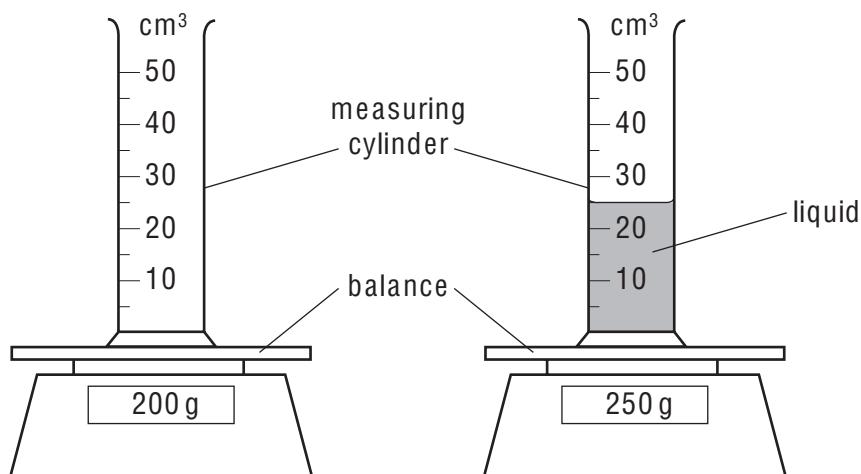


Its mass is 250 g.

What is the density of the metal?

- A** 0.20 g/cm^3 **B** 0.40 g/cm^3 **C** 2.5 g/cm^3 **D** 5.0 g/cm^3

- 19 The diagram shows an experiment to find the density of a liquid.



What is the density of the liquid?

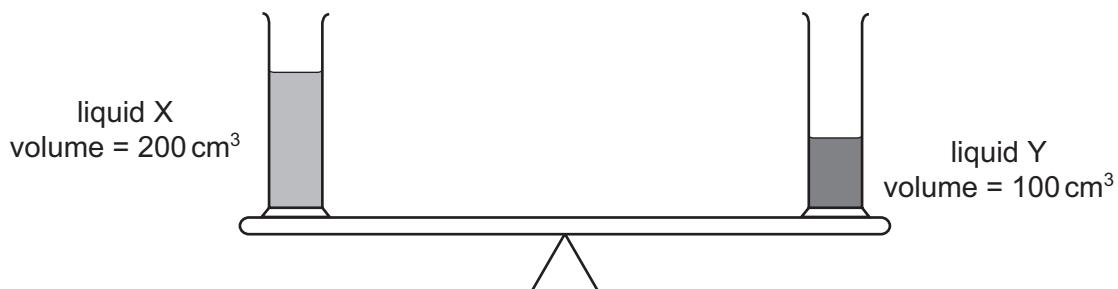
- A** 0.5 g/cm^3 **B** 2.0 g/cm^3 **C** 8.0 g/cm^3 **D** 10.0 g/cm^3

- 20 A student needs to find the density of a cubic block of wood.

Which two pieces of apparatus should she use?

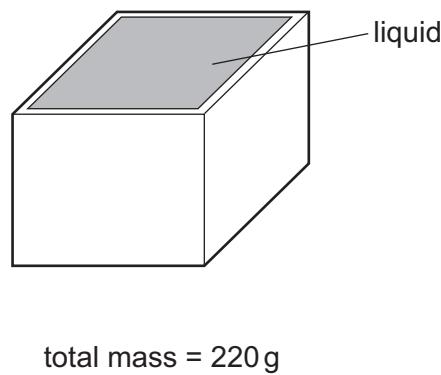
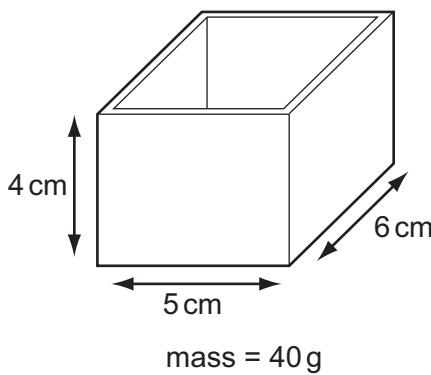
- A** balance and metre rule
- B** balance and thermometer
- C** measuring cylinder and metre rule
- D** measuring cylinder and thermometer

- 21 Two identical measuring cylinders containing different liquids are placed on a simple balance. They balance as shown.



- How does the density of X compare with the density of Y?
- A density of X = $\frac{1}{2} \times$ density of Y
B density of X = density of Y
C density of X = 2 × density of Y
D density of X = 4 × density of Y
- 22 Which items of apparatus are required to determine the density of a liquid?
- A balance and measuring cylinder
B balance and thermometer
C metre rule and measuring cylinder
D metre rule and thermometer

- 23 The diagrams show a rectangular box with inside measurements of $5\text{ cm} \times 6\text{ cm} \times 4\text{ cm}$.



The box has a mass of 40 g when empty. When filled with a liquid, it has a total mass of 220 g.

What is the density of the liquid?

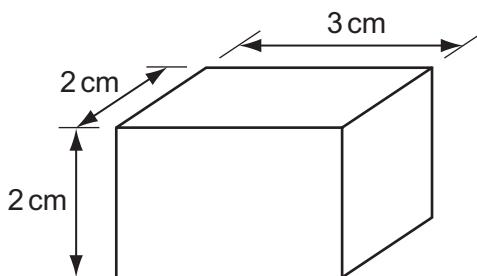
A $\frac{220}{(5 \times 6 \times 4)} \text{ g/cm}^3$

B $\frac{(220 - 40)}{(5 \times 6 \times 4)} \text{ g/cm}^3$

C $\frac{(5 \times 6 \times 4)}{220} \text{ g/cm}^3$

D $\frac{(5 \times 6 \times 4)}{(220 - 40)} \text{ g/cm}^3$

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



What is the mass of the block?

A 2 g

B 6 g

C 14 g

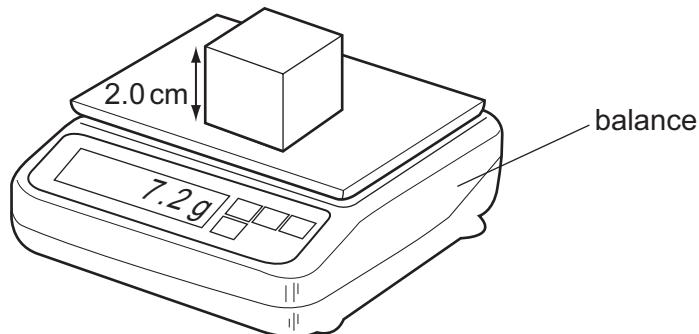
D 24 g

25 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

26 A cube of side 2.0 cm is placed on a balance.



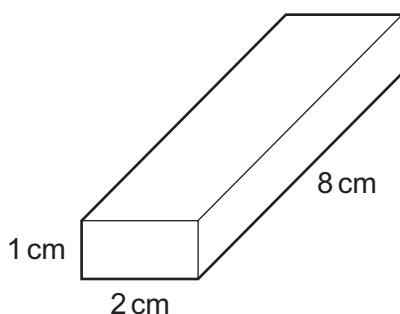
What is the density of the cube?

- A 0.90 g/cm^3
- B 1.2 g/cm^3
- C 1.8 g/cm^3
- D 3.6 g/cm^3

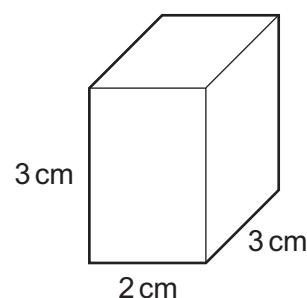
- 27 The diagrams show four blocks with the same mass.

Which block is made from the least dense material?

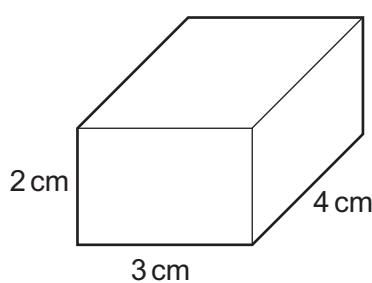
A



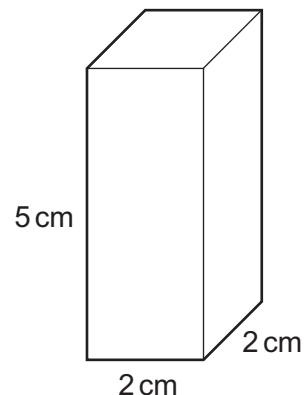
B



C



D



- 28 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

- 29 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

- 30 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

- 31 Two identical glasses are filled to the same level with water. One of the two glasses has ice cubes floating in it. When the ice cubes melt, in which glass is the level of the water higher?

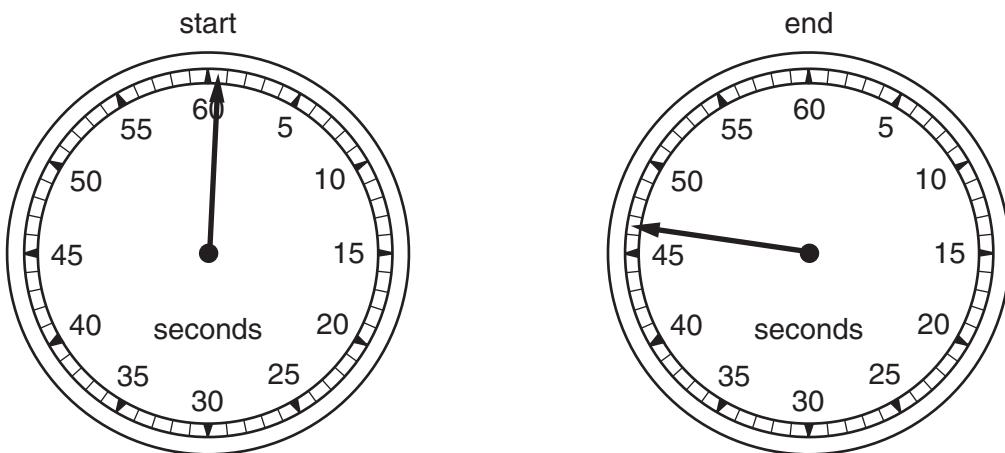
- A the glass without ice cubes
- B the glass with ice cubes
- C the same in both
- D insufficient information

- 32 Fresh water ice cubes are put into a glass of saltwater. Once the ice cubes have melted, how will the water level in the glass compare to what was before the ice melted?

- A level increases
- B level decreases
- C level stays the same
- D insufficient information

1.4 Measuring time

- 1 A stopwatch is used to time a race. The diagrams show the watch at the start and at the end of the race.



How long did the race take?

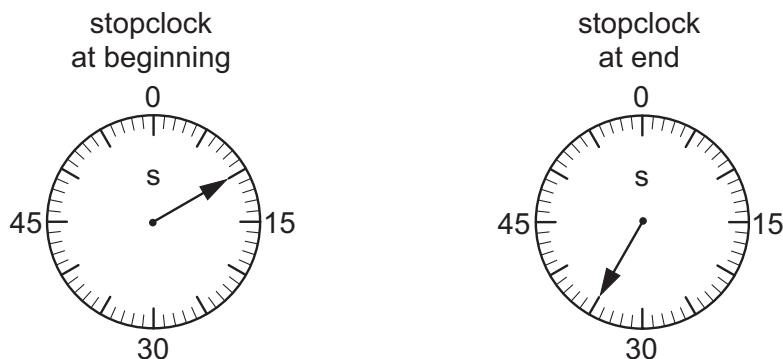
- A** 45.7 s **B** 46.0 s **C** 46.5 s **D** 47.0 s

- 2 A pendulum is set in motion and 20 complete swings are timed. The time measured 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

- 3 The diagrams show the times on a stopclock at the beginning and at the end of an experiment.



How long did the experiment take?

- A** 10 s **B** 25 s **C** 35 s **D** 45 s

- 4 Two digital stopwatches X and Y, which record in minutes and seconds, are used to time a race.

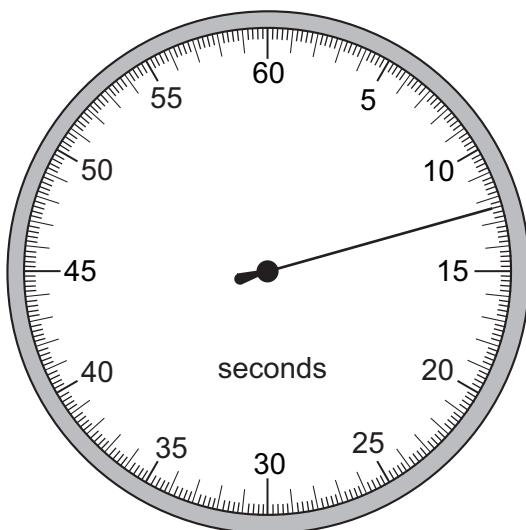
The readings of the two stopwatches, at the start and at the end of the race, are shown.

	start	end
stopwatch X	00:00	00:40

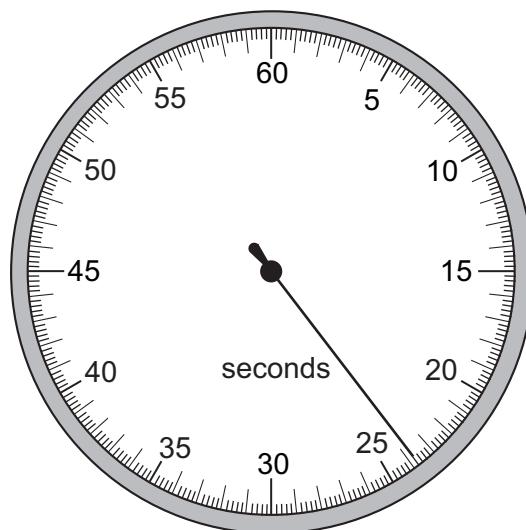
	start	end
stopwatch Y	01:30	02:20

Which statement about the time of the race is correct?

- A Both stopwatches record the same time interval.
B Stopwatch X recorded 10 s longer than stopwatch Y.
C Stopwatch Y recorded 10 s longer than stopwatch X.
D Stopwatch Y recorded 50 s longer than stopwatch X.
- 5 A stopwatch is used to time an athlete running 100 m. The timekeeper forgets to reset the watch to zero before using it to time another athlete running 100 m.



stopwatch at
end of first
athlete's run

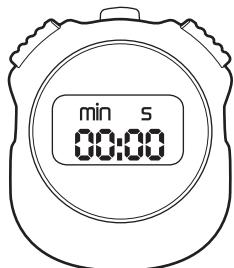


stopwatch at
end of second
athlete's run

How long does the second athlete take to run 100 m?

- A 11.2 s B 11.4 s C 12.4 s D 23.8 s

- 6 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

- 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 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~~

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

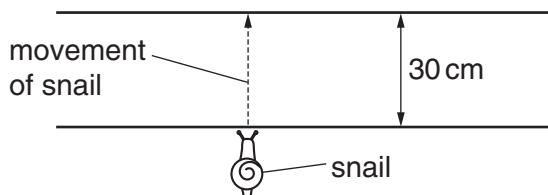
What is the time for one ~~complete swing~~ of the pendulum?

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

Chapter 2. Describing motion

2.1 Understanding speed

- 1 A snail crosses a garden path 30 cm wide at a speed of 0.2 cm/s.



How long does the snail take?

- A 0.0067 s B 6.0 s C 15 s D 150 s

- 2 A child is standing on the platform of a station, watching the trains.



A train travelling at 30 m/s takes 3 s to pass the child.

What is the length of the train?

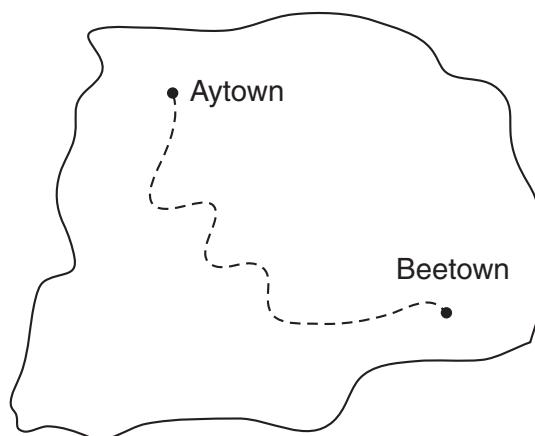
- A 10 m B 30 m C 90 m D 270 m

- 3 A tunnel has a length of 50 km. A car takes 20 min to travel between the two ends of the tunnel.

What is the average speed of the car?

- A 2.5 km/h
B 16.6 km/h
C 150 km/h
D 1000 km/h

- 4 A train travels along a track from Aytown to Beetown. The map shows the route.

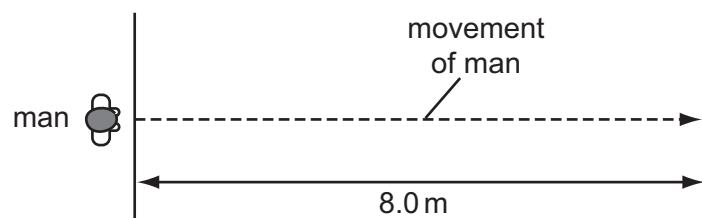


The distance travelled by the train between the towns is 210 km. It moves at an average speed of 70 km/h.

How long does the journey take?

- A less than $\frac{70}{210}$ hours, because the journey is not in a straight line
- B exactly $\frac{70}{210}$ hours
- C exactly $\frac{210}{70}$ hours
- D more than $\frac{210}{70}$ hours, because the journey is not in a straight line

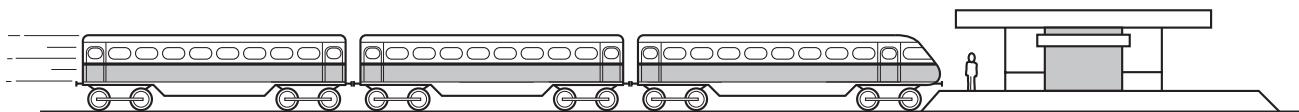
- 5 A man crosses a road 8.0 m wide at a speed of 2.0 m/s.



How long does the man take to cross the road?

- A 4.0 s
- B 6.0 s
- C 10 s
- D 16 s

- 6 A child is standing on the platform of a station, watching the trains.



A train travelling at 30 m/s takes 3 s to pass the child.

What is the length of the train?

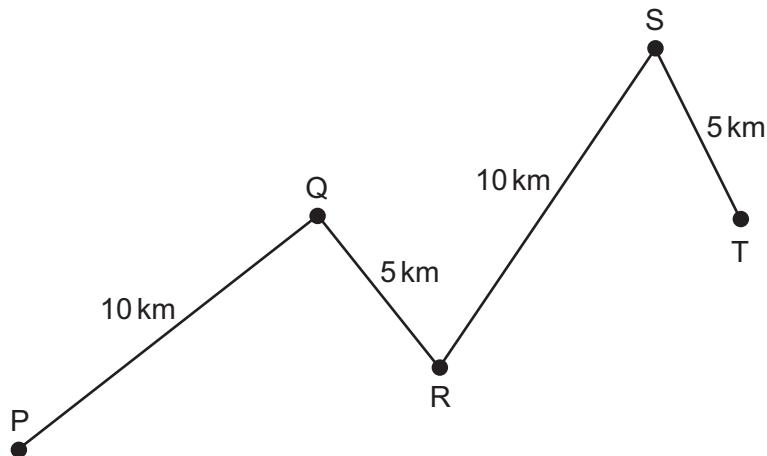
A 10 m

B 30 m

C 90 m

D 135 m

- 7 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

- 8 A tennis player hits a ball hard and 0.4 s later hears an echo from a wall.



The speed of sound in air is 330 m/s.

How far away is the player from the wall?

- A 66 m B 132 m C 264 m D 825 m

- 9 The circuit of a motor racing track is 3 km in length. In a race, a car goes 25 times round the circuit in 30 minutes.

What is the average speed of the car?

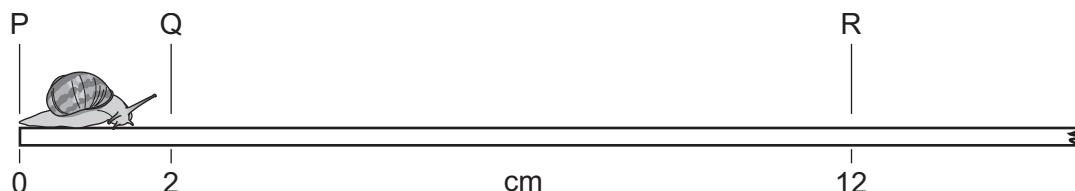
- A 75 km/hour
B 90 km/hour
C 150 km/hour
D 750 km/hour

- 10 A car travels 100 km. The highest speed of the car is 90 km/h, and the lowest speed is 30 km/h. The journey takes two hours.

What is the average speed for the journey?

- A 30 km/h B 50 km/h C 60 km/h D 90 km/h

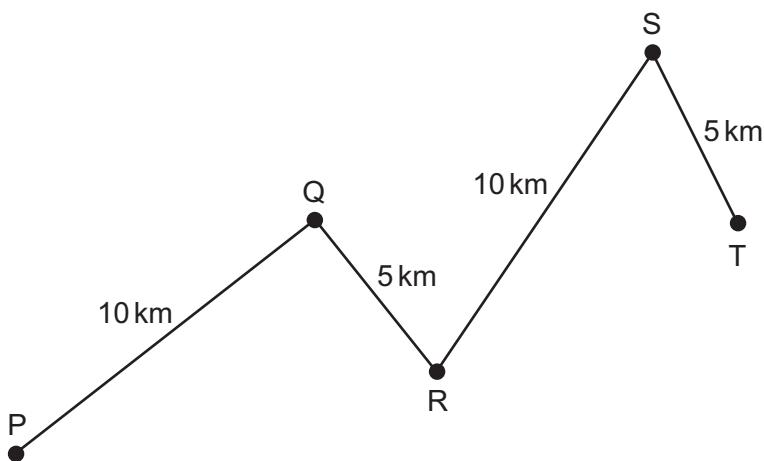
- 11 A snail moves along a ruler. It takes 20 s to move from Q to R.



What is its average speed from Q to R?

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

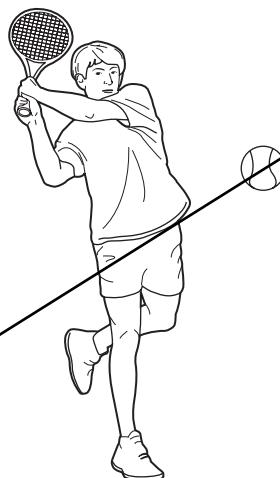
- 12 A car travels along the route PQRST in 30 minutes.



What is the average speed of the car?

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

- 13 A tennis player hits a ball hard and 0.40 s later hears the echo from a wall.

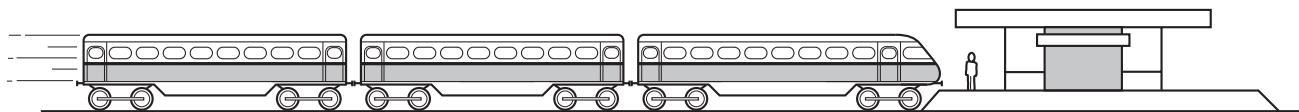


The speed of sound in air is 330 m/s.

How far away is the player from the wall?

- A 66 m B 132 m C 264 m D 825 m

- 14 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

- 15 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

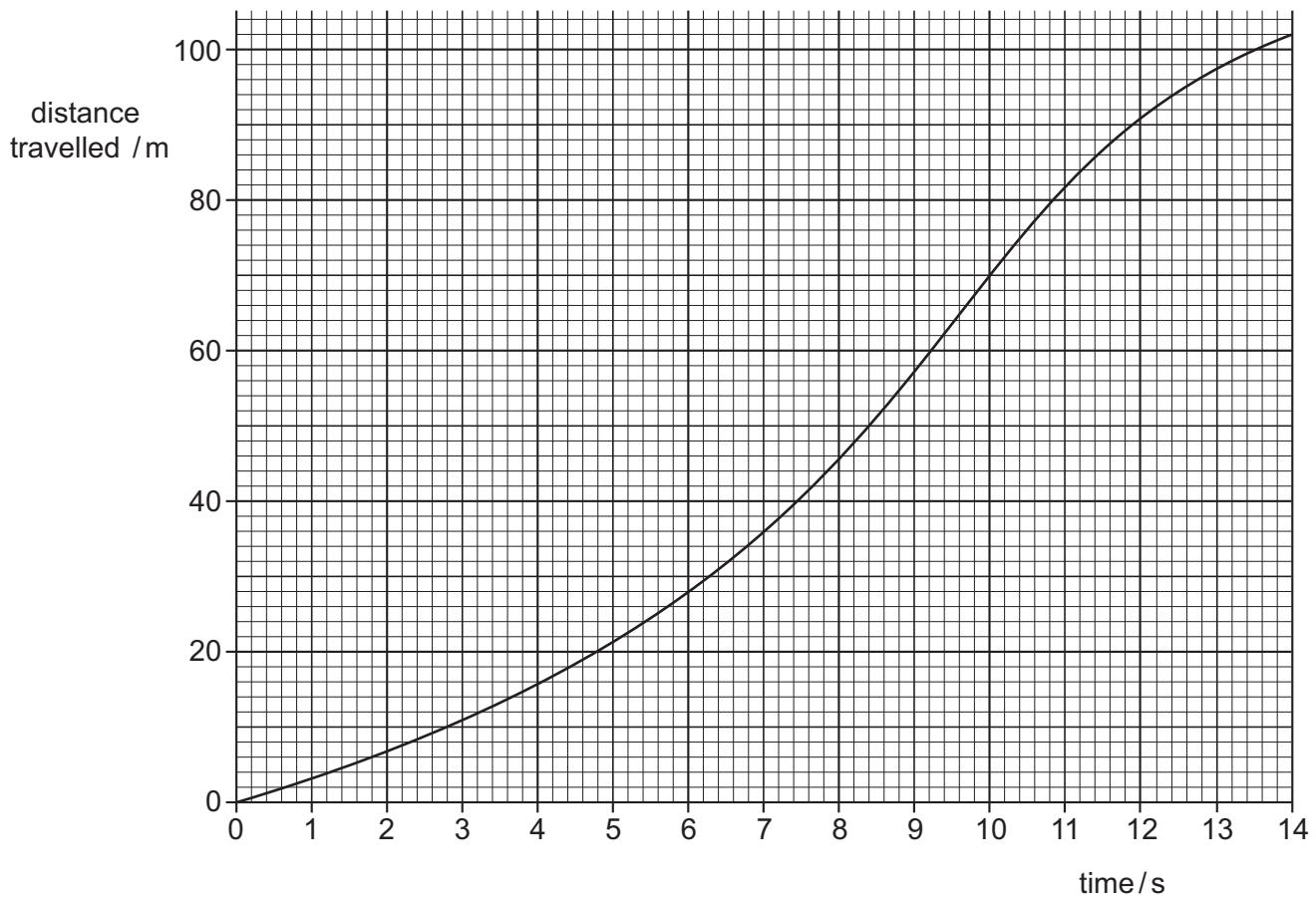
- 16 In a race, a car travels 60 times around a 3.6 km track. This takes 2.4 hours.

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

2.2 Displacement - time graph

- 1 The graph shows the progress of an athlete in a 100 m race.



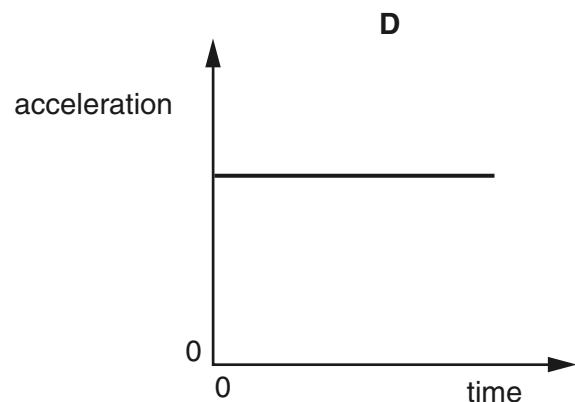
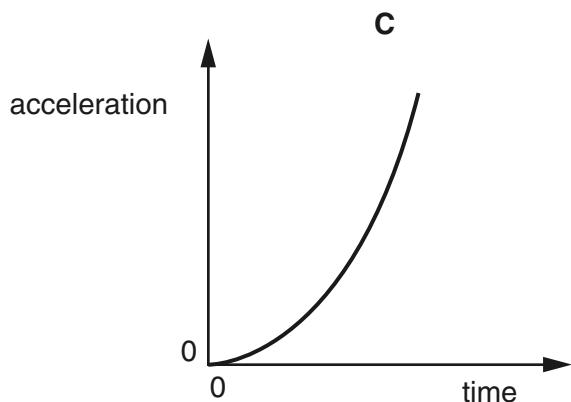
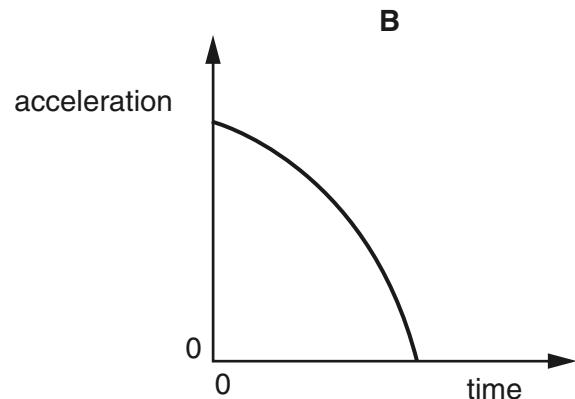
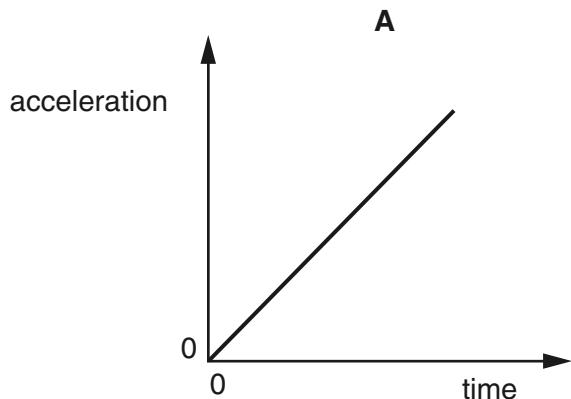
What time was taken to travel 10 m from the start?

- A** 2.4 s **B** 2.8 s **C** 65 s **D** 70 s

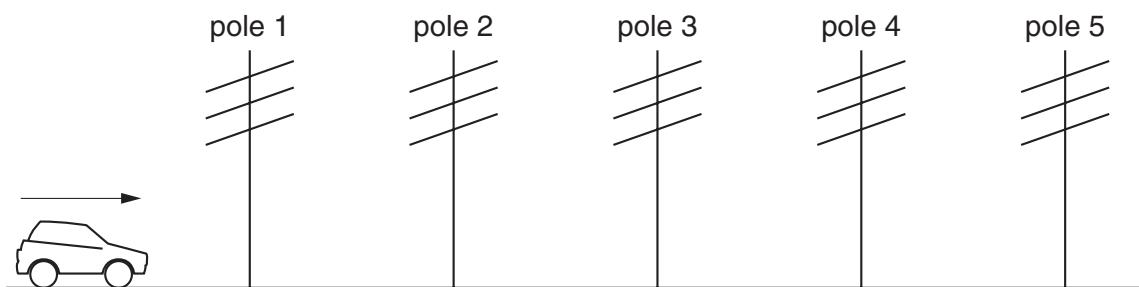
2.3 Understanding acceleration

- 1 A stone falls freely from the top of a cliff into the sea. Air resistance may be ignored.

Which graph shows how the acceleration of the stone varies with time as it falls?



- 2 Five telegraph poles are positioned at equal distances along the side of a road.



A car accelerates until it is level with pole 4. The car then continues along the road at a steady speed. The times taken to travel between one pole and the next are measured.

Which time is the greatest?

The time between

- A pole 1 and pole 2.
- B pole 2 and pole 3.
- C pole 3 and pole 4.
- D pole 4 and pole 5.

- 3 A racing car is fitted with an on-board computer. Every time the car passes the starting line, the computer records the distance travelled in the next 2 seconds.

Which set of data shows that the car is increasing in speed during the 2 seconds?

A

time / s	distance travelled / m
0	0
1	100
2	200

B

time / s	distance travelled / m
0	0
1	90
2	180

C

time / s	distance travelled / m
0	0
1	80
2	190

D

time / s	distance travelled / m
0	0
1	100
2	180

- 4 Four students try to explain what is meant by acceleration.

Which student makes a correct statement?

- A It is related to the changing speed of an object.
- B It is the distance an object travels in one second.
- C It is the force acting on an object divided by the distance it travels in one second.
- D It is the force acting on an object when it is near to the Earth.

- 5 A car travels at various speeds during a short journey.

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

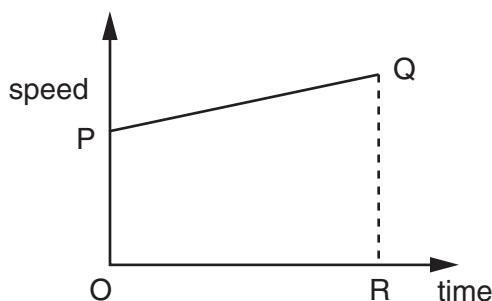
stage	P	Q	R	S
distance travelled/km	1.8	3.6	2.7	2.7
time taken/minutes	2	2	4	3

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

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

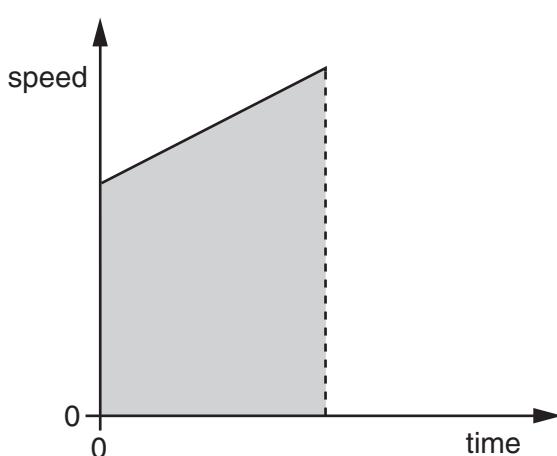
2.4 Velocity - time graphs

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



Which of the following gives the distance travelled in time interval OR?

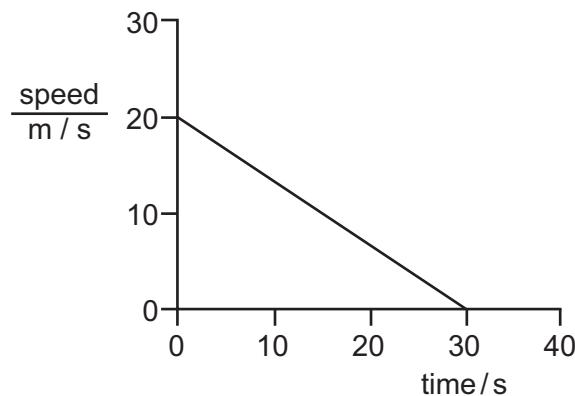
- A the area OPQR
 - B the length PQ
 - C the length (QR – PO)
 - D the ratio QR/PO
- 2 The diagram shows a speed-time graph for a body moving with constant acceleration.



What is represented by the shaded area under the graph?

- A acceleration
- B distance
- C speed
- D time

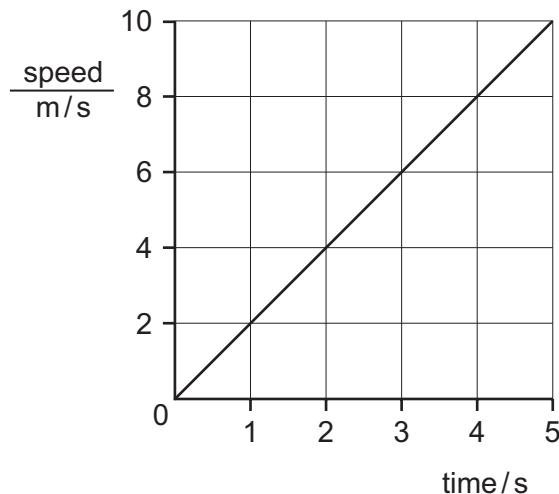
- 6 The graph represents part of the journey of a car.



What distance does the car travel during this part of the journey?

- A 150 m B 300 m C 600 m D 1200 m

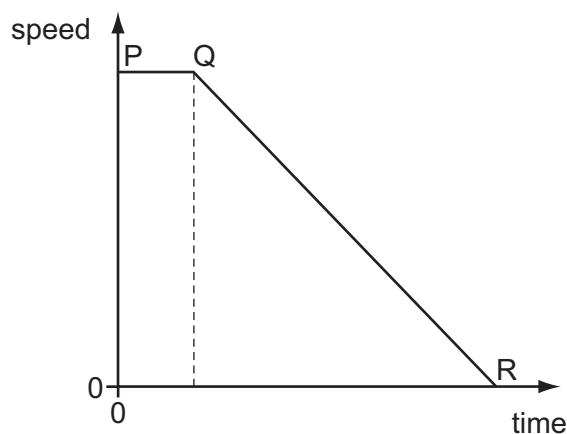
- 7 The graph represents the movement of a body accelerating from rest.



After 5 seconds how far has the body moved?

- A 2 m B 10 m C 25 m D 50 m

- 8 A cyclist is riding along a road when an animal runs in front of him. The graph shows the cyclist's motion. He sees the animal at P, starts to brake at Q and stops at R.

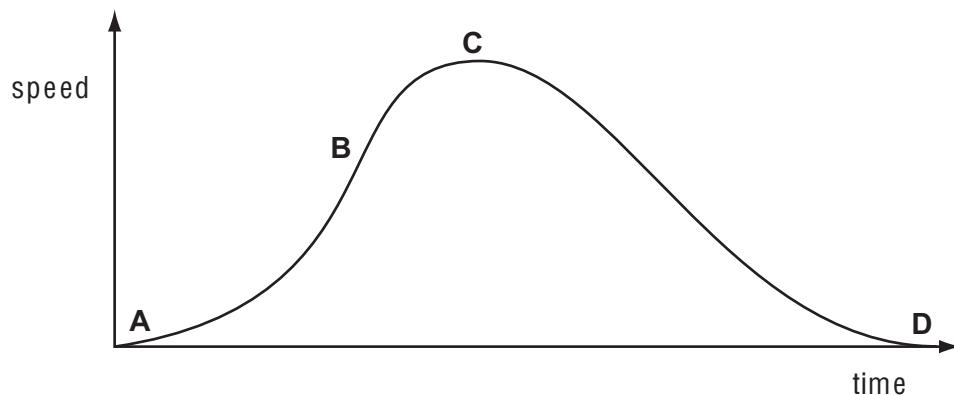


What is used to find the distance travelled after he applies the brakes?

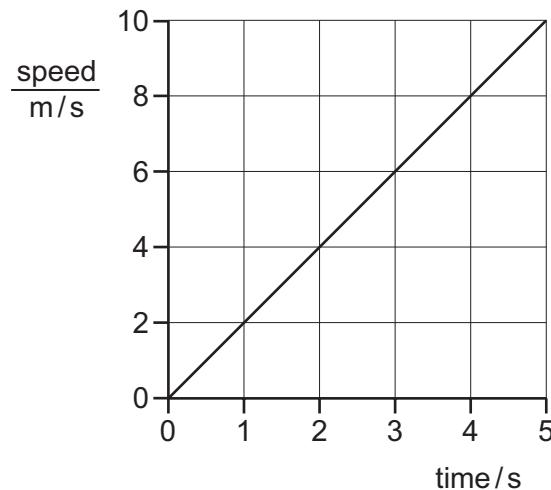
- A the area under line PQ
- B the area under line QR
- C the gradient of line PQ
- D the gradient of line QR

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

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



- 10 The graph represents the movement of a body.



How far has the body moved after 5 s?

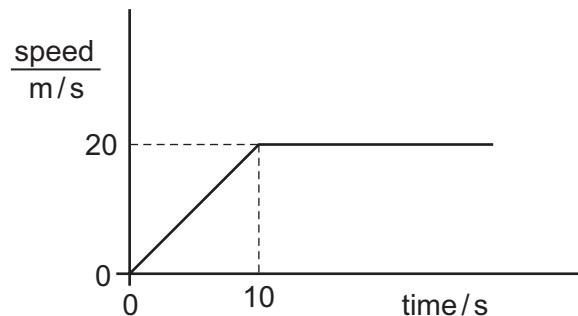
A 2 m

B 10 m

C 25 m

D 50 m

- 11 A car accelerates from traffic lights. The graph shows the car's speed plotted against time.



How far does the car travel before it reaches a constant speed?

A 10 m

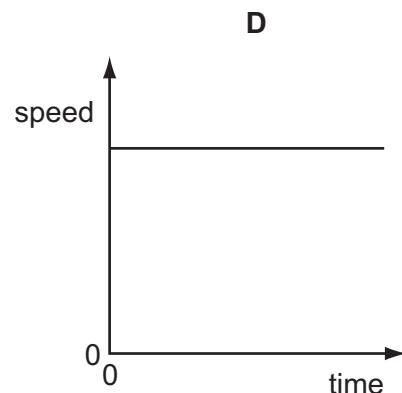
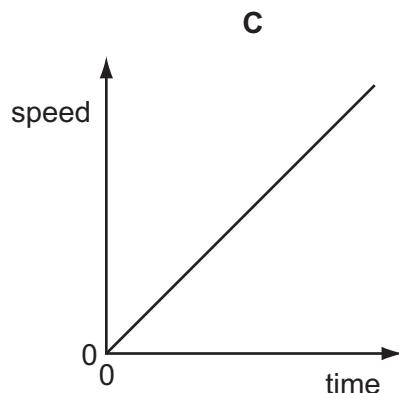
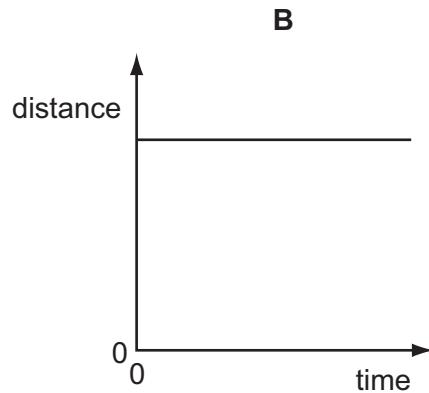
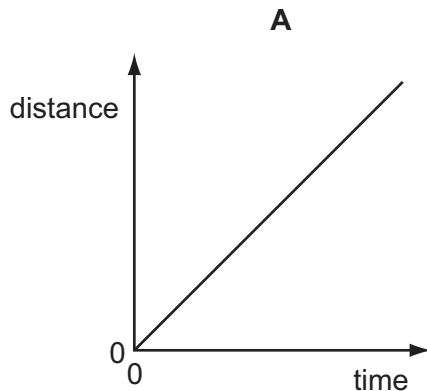
B 20 m

C 100 m

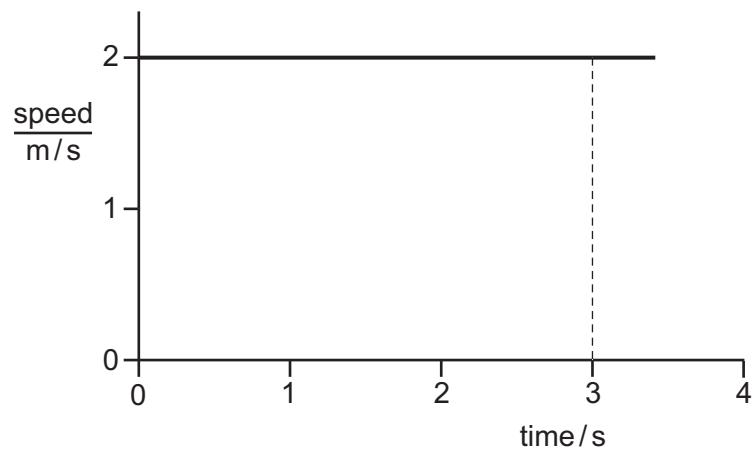
D 200 m

- 12 Two distance/time graphs and two speed/time graphs are shown.

Which graph represents an object that is at rest?



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

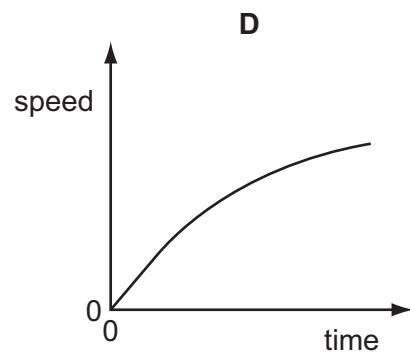
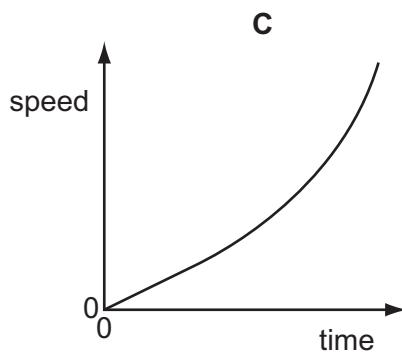
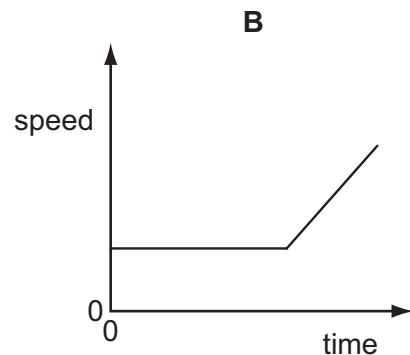
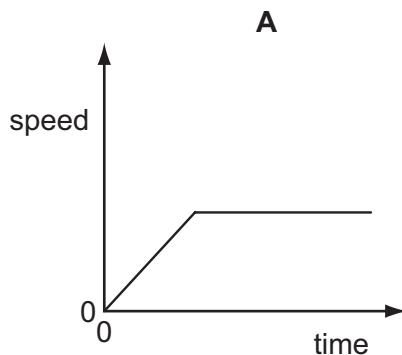


What is the distance travelled by the object in the first 3 s?

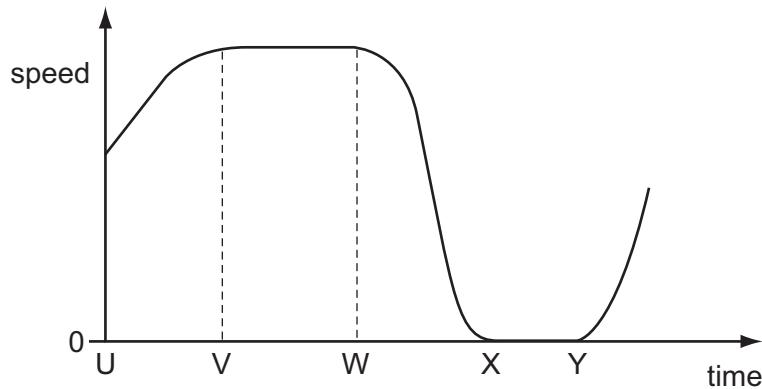
- A 1.5 m B 2.0 m C 3.0 m D 6.0 m

- 14 An object moves initially with constant speed and then with constant acceleration.

Which graph shows this motion?



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

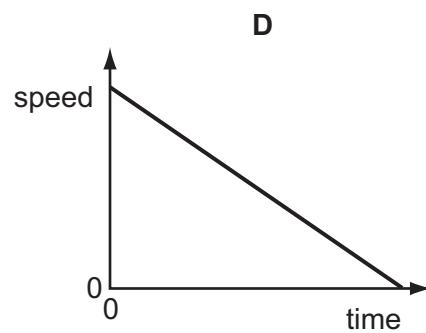
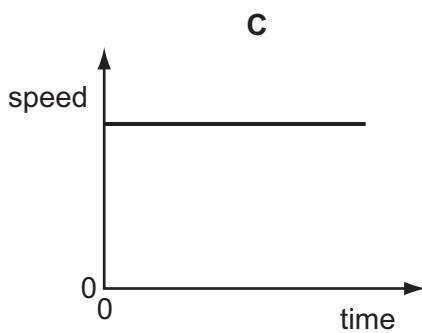
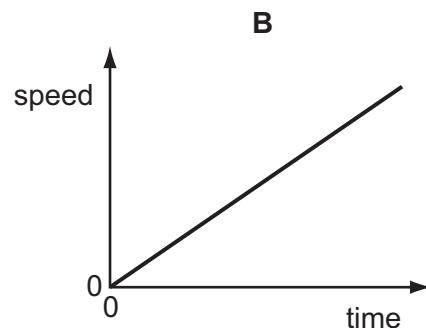
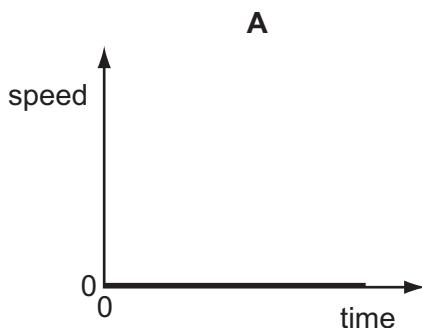


Between which two times is the car stationary?

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

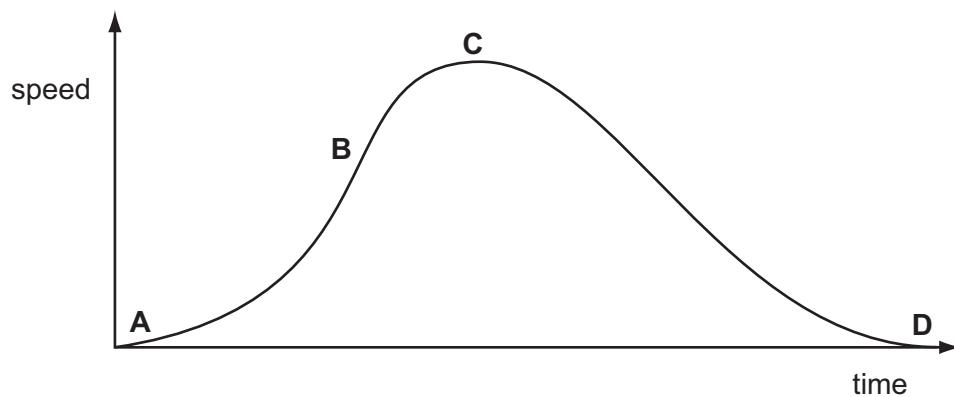
- 16 A car is moving downhill along a road at a constant speed.

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



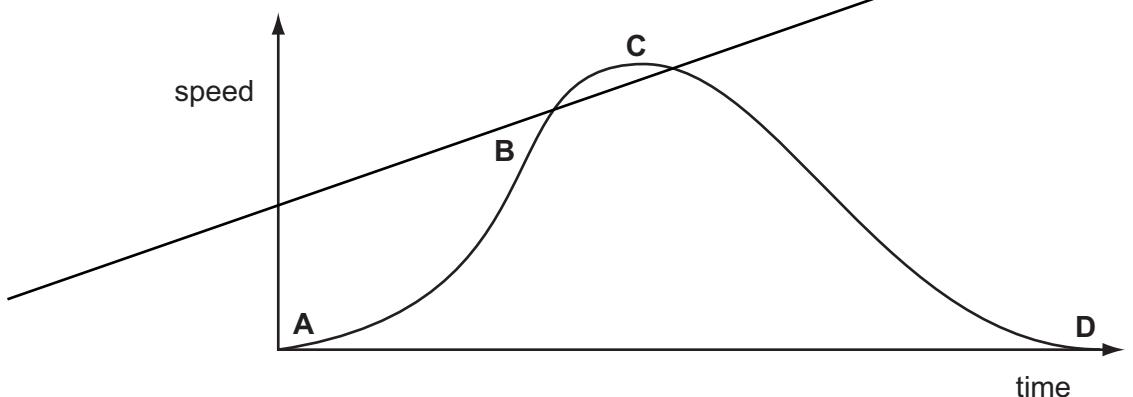
- 17 The speed-time graph shown is for a bus travelling between stops.

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



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

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



Chapter 3. Dynamics

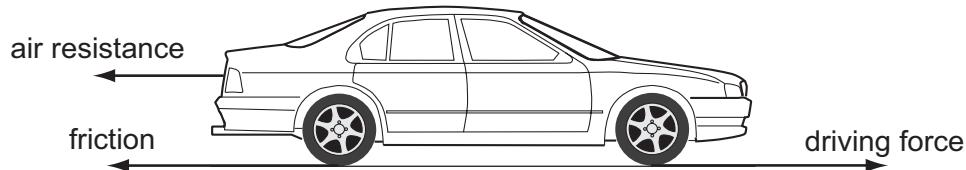
3.1 Net force

1 Two forces act on an object.

In which situation is it **impossible** for the object to be in equilibrium?

- A The two forces act in the same direction.
- B The two forces act through the same point.
- C The two forces are of the same type.
- D The two forces are the same size.

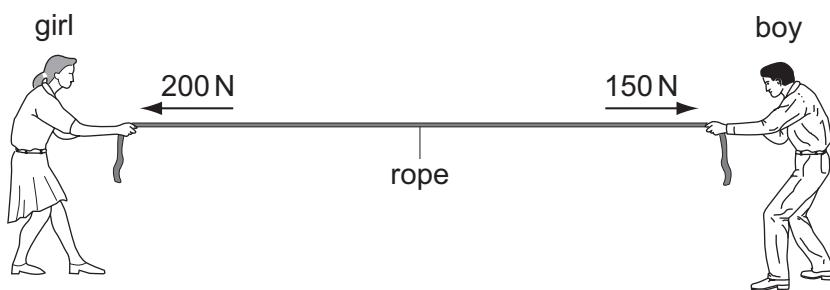
2 Three horizontal forces act on a car that is moving along a straight, level road.



Which combination of forces would result in the car moving at constant speed?

	air resistance	friction	driving force
A	200 N	1000 N	800 N
B	800 N	1000 N	200 N
C	800 N	200 N	1000 N
D	1000 N	200 N	800 N

- 3 A girl and a boy are pulling in opposite directions on a rope. The forces acting on the rope are shown in the diagram.



Which single force has the same effect as the two forces shown?

- A 50 N acting towards the girl
- B 350 N acting towards the girl
- C 50 N acting towards the boy
- D 350 N acting towards the boy

- 4 Two forces act on an object.

In which situation is it **impossible** for the object to be in equilibrium?

- A The two forces act in the same direction.
- B The two forces act through the same point.
- C The two forces are of the same type.
- D The two forces are the same size.

- 5 A force acts on a moving rubber ball.

How many of the following changes could happen to the ball because of the force?

- a change in direction
- a change in shape
- a change in mass
- a change in speed

A 1

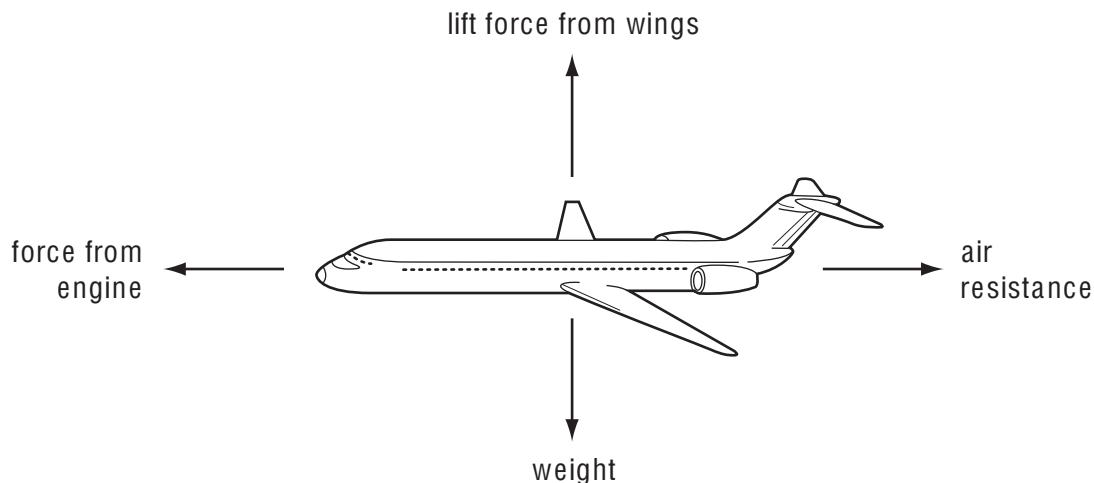
B 2

C 3

D 4

- 6 An aeroplane is in equilibrium.

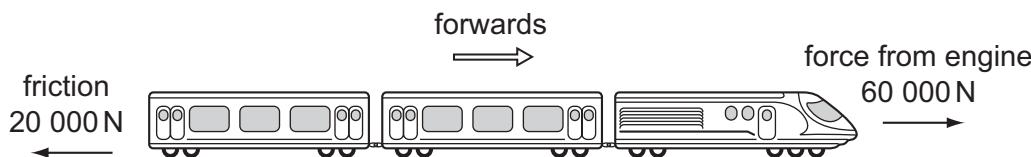
The diagram shows the forces acting on the aeroplane.



Which statement about the forces is correct?

	force from engine	lift force from wings
A	equal to air resistance	equal to weight
B	equal to air resistance	greater than weight
C	greater than air resistance	equal to weight
D	greater than air resistance	greater than weight

- 7 A train is travelling along a horizontal track at constant speed. Two of the forces acting on the train are shown in the diagram.



A force of air resistance is also acting on the train to give it a resultant force of zero.

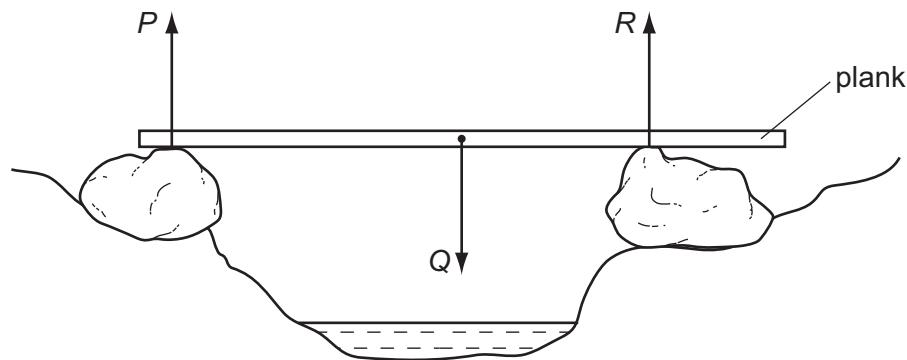
What is this air resistance force?

- A 40 000 N backwards
- B 80 000 N backwards
- C 40 000 N forwards
- D 80 000 N forwards

8 Which property of an object **cannot** be changed by a force?

- A its mass
- B its motion
- C its shape
- D its size

9 A wooden plank rests in equilibrium on two boulders on opposite sides of a narrow stream. Three forces of size P , Q and R act on the plank.



How are the sizes of the forces related?

- A $P + Q = R$
- B $P + R = Q$
- C $P = Q = R$
- D $P = Q + R$

10 Which property of a body can be measured in newtons?

- A density
- B mass
- C volume
- D weight

11 Which list contains the name of a force?

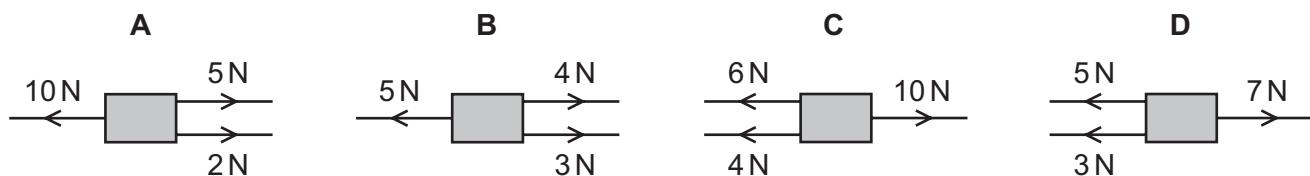
- A acceleration, charge, temperature
- B density, resistance, speed
- C distance, frequency, mass
- D energy, power, weight

12 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

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



14 Which quantity is measured in newtons?

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

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

A

a ball moving at constant speed on a smooth surface



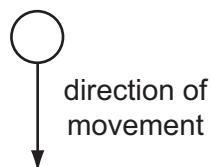
B

a ball at rest on a bench



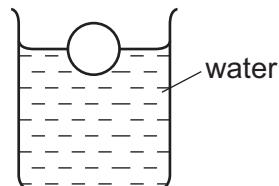
C

a free-falling ball which has just been released



D

a ball floating on water



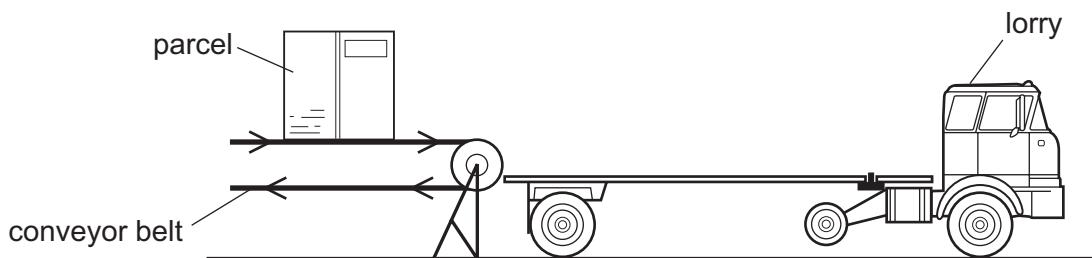
15-2 Two metal spheres have different surface textures: one smooth; the other, rough. They are indistinguishable, otherwise. The spheres are released, simultaneously, from the top of a tall structure. What will happen to their speed difference as they fall?

- A** The difference will increase with the smooth sphere outpacing the rough sphere.
- B** The difference will increase with the rough sphere outpacing the smooth sphere.
- C** They will remain the same speed.
- D** The difference will depend on the substance through which they fall.

- 16 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

- 17 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

3.2 Mass and weight

1 What are correct units used for mass and for weight?

	mass	weight
A	kg	kg
B	kg	N
C	N	kg
D	N	N

2 Which of the following statements is correct?

- A Mass and weight are different names for the same thing.
- B The mass of an object is different if the object is taken to the Moon.
- C The weight of a car is one of the forces acting on the car.
- D The weight of a chocolate bar is measured in kilograms.

3 Which statement is correct?

- A Mass is a force, measured in kilograms.
- B Mass is a force, measured in newtons.
- C Weight is a force, measured in kilograms.
- D Weight is a force, measured in newtons.

4 A small steel ball is dropped from a low balcony.

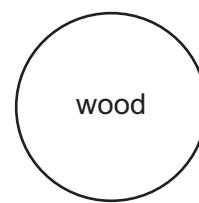
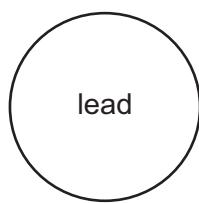
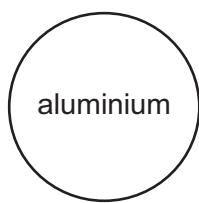
Ignoring air resistance, which statement describes its motion?

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

5 Which statement about the mass of a falling object is correct?

- A It decreases as the object falls.
- B It is equal to the weight of the object.
- C It is measured in newtons.
- D It stays the same as the object falls.

6 The three balls shown are dropped from a bench.



Which balls have the same acceleration?

- A aluminium and lead only
- B aluminium and wood only
- C lead and wood only
- D aluminium, lead and wood

7 Which statement is correct?

- A The mass of a bottle of water at the North Pole is different from its mass at the Equator.
- B The mass of a bottle of water is measured in newtons.
- C The weight of a bottle of water and its mass are the same thing.
- D The weight of a bottle of water is one of the forces acting on it.

8 What is the gravitational force that the Earth exerts on an object?

- A the density of the object
- B the mass of the object
- C the volume of the object
- D the weight of the object

9 A newton is a unit of force.

Which quantity is measured in newtons?

- A acceleration
- B density
- C mass
- D weight

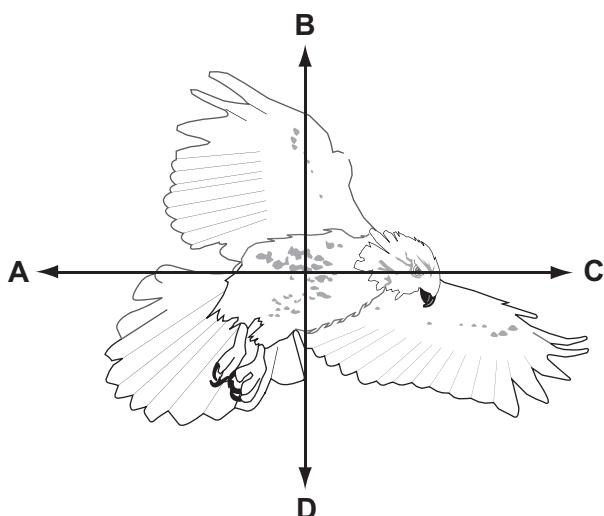
- 10 Two stones of different weight fall at the same time from a table. Air resistance may be ignored.

What will happen and why?

	what will happen	why
A	both stones hit the floor at the same time	the 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

- 11 The diagram shows a bird in flight.

In which direction does the weight of the bird act?



- 12 What are the correct units for force and for weight?

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

- 13 The table shows the weight of a 10 kg mass on each of five planets.

planet	weight of a 10 kg mass/N
Mercury	40
Venus	90
Earth	100
Mars	40
Jupiter	250

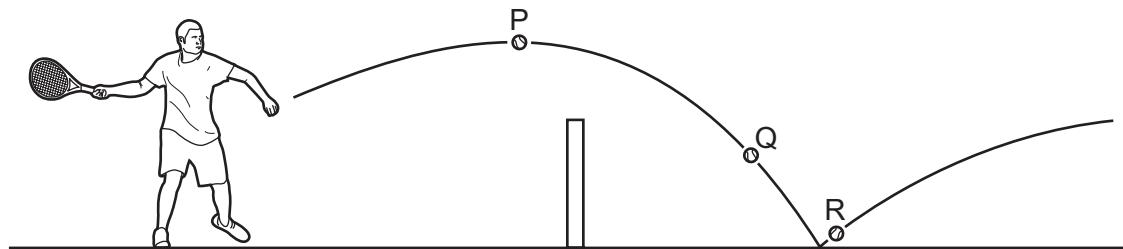
On which planets would an astronaut have a smaller weight than on Earth?

- A Mercury, Mars and Jupiter
B Mercury, Venus and Mars
C Mercury, Venus and Jupiter
D Venus, Mars and Jupiter
- 14 The force of gravity acting on an astronaut in an orbiting spacecraft is less than when she is on the Earth's surface.

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

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

- 15 A tennis player hits a ball over the net.



In which position is the ball accelerating?

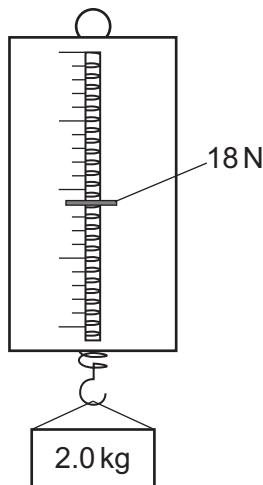
- A P and Q only
 - B P and R only
 - C Q and R only
 - D P, Q and R
- 16 What is the meaning of the *weight* of an object?
- A the density of the material from which it is made
 - B the force exerted on it by gravity
 - C the mass of the matter it contains
 - D the pressure it exerts on the floor

- 17 Which statement about the masses and weights of objects on the Earth is correct?
- A A balance can only be used to compare weights, not masses.
 - B Heavy objects always have more mass than light ones.
 - C Large objects always have more mass than small ones.
 - D Mass is a force but weight is not.

- 18 The table shows the weight in newtons of a 10 kg mass on each of four planets.

planet	weight of a 10 kg mass / N
Earth	100
Jupiter	250
Mercury	40
Venus	90

The diagram shows a force meter (spring balance) being used.



On which planet is the force meter (spring balance) being used?

- A Earth
- B Jupiter
- C Mercury
- D Venus

- 19 A ball is thrown upwards.

What effect does the force of gravity have on the ball?

- A It produces a constant acceleration downwards.
- B It produces a constant acceleration upwards.
- C It produces a decreasing acceleration upwards.
- D It produces an increasing acceleration downwards.

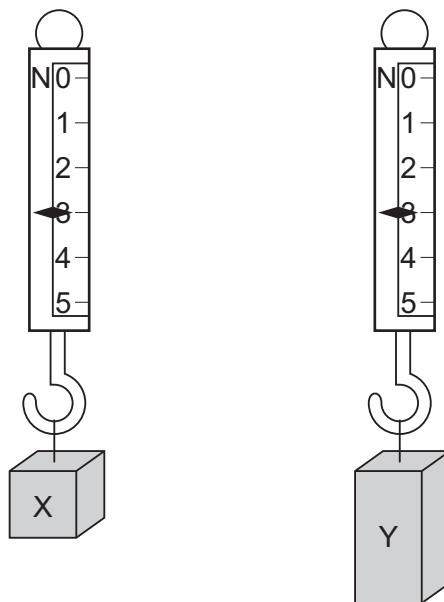
- 20 A cup contains hot liquid.

Some of the liquid evaporates as it cools.

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

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

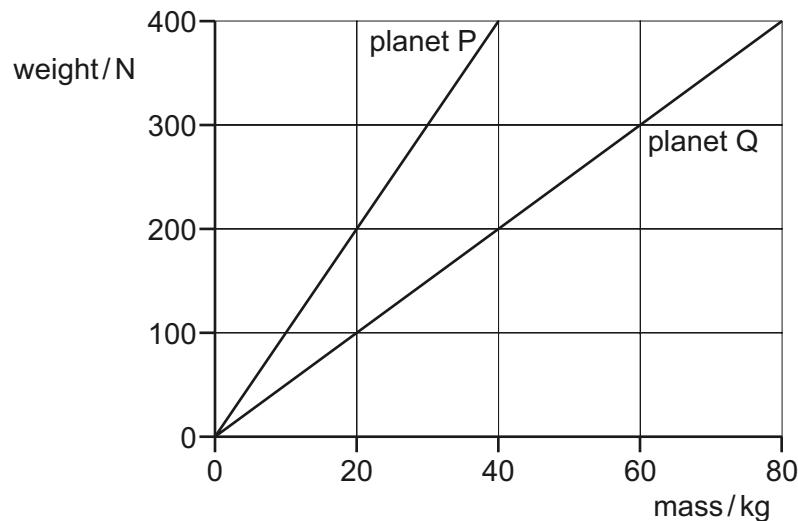
- 21 Two blocks of metal X and Y hang from spring balances as shown in the diagram.



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.

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



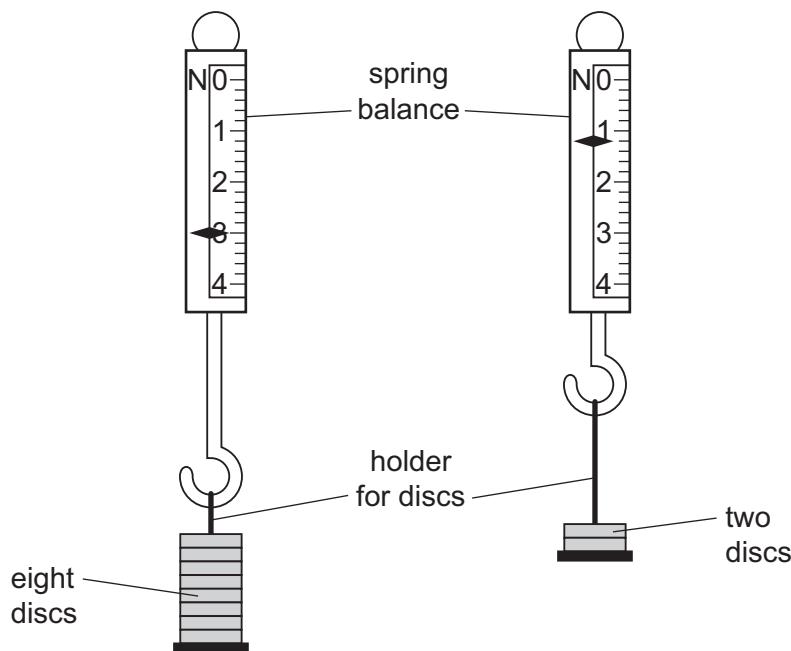
An object weighs 400 N on planet P. The object is taken to planet Q.

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

- 23 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

- 24 Which statement about mass and weight is correct?

- A Mass and weight are both forces.
 B Neither mass nor weight is a force.
 C Only mass is a force.
 D Only weight is a force.

- 25 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?

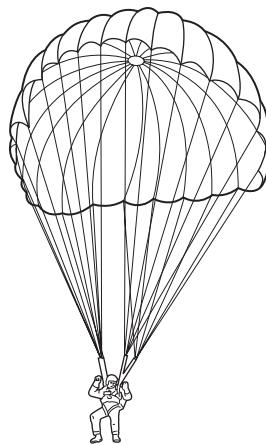
	mass during melting	mass during solidification
A	decreases	increases
B	increases	decreases
C	increases	stays constant
D	stays constant	stays constant

- 26** 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

- 27** 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

- 28** 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

29 Which of the following statements most accurately describes mass.

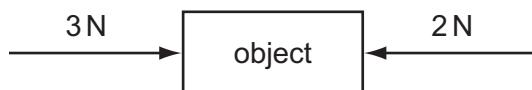
- A Mass is the weight of an object.
- B Mass measures the amount of matter in a object.
- C Mass is measure in Newtons.
- D Mass is conserved.

30 What is meant by gravitational field strength?

- A force on a mass
- B force on an object
- C force multiplied by mass
- D force per unit mass

3.3 Force and acceleration

- 1 In which of these situations is no resultant force needed?
- A a car changing direction
 - B a car moving in a straight line at a steady speed
 - C a car slowing down
 - D a car speeding up
- 2 Below are four statements about the effects of forces on objects.
- Three of the statements are correct.
- Which statement is **incorrect**?
- A A force can change the length of an object.
 - B A force can change the mass of an object.
 - C A force can change the shape of an object.
 - D A force can change the speed of an object.
- 3 The object in the diagram is acted upon by the two forces shown.



- What is the effect of these forces?
- A The object moves to the left with constant speed.
 - B The object moves to the left with constant acceleration.
 - C The object moves to the right with constant speed.
 - D The object moves to the right with constant acceleration.
- 4 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.

3.4 Momentum and Impulse

- 1 A 100 g ball moving at velocity $v = 10 \text{ m/s}$ rebounds off a wall, moving away at the same speed. What impulse did the wall deliver to the ball?
 - A $-2 \text{ kg} \cdot \text{m/s}$
 - B $-1 \text{ kg} \cdot \text{m/s}$
 - C $+1 \text{ kg} \cdot \text{m/s}$
 - D $+2 \text{ kg} \cdot \text{m/s}$

- 2 In the event of a car accident, in order to reduce the impact force experienced by a motor vehicle driver, safety airbags are often installed in the vehicle. In one scenario, a driver swerves their car, thus narrowly avoiding hitting a cat in the street, but then promptly crashes head-on into a brick wall. How is the reduced force experienced by the driver best explained by the presence of the safety airbags.
 - A The time in which the driver decelerates during the collision is increased.
 - B The force is not reduced; rather, the impact to the driver is softened by the air cushion.
 - C The force is not reduced; the airbag does nothing to reduce the force of impact.
 - D The driver experiences a smaller change in momentum, and thus a reduced force.

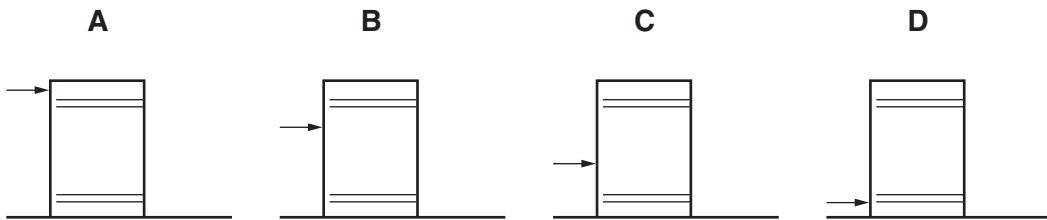
- 3 A 250 g stone ascending freely under the influence of Earth's gravitational field has its momentum increase by $5 \text{ kg} \cdot \text{m/s}$. What time interval does this represent, assuming that air resistance can be completely ignored.
 - A 12.3 s
 - B 0.5 s
 - C 2.0 s
 - D The stone cannot be in free fall while it's ascending.

Chapter 4. Moment

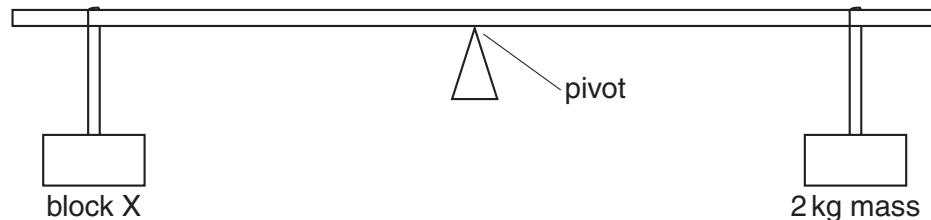
4.1 Turning effect

- 1 A child tries to push over a large empty oil drum.

Where should the drum be pushed to topple it over with least force?



- 2 A beam is pivoted at its centre. Two masses are suspended at equal distances from the pivot as shown in the diagram.

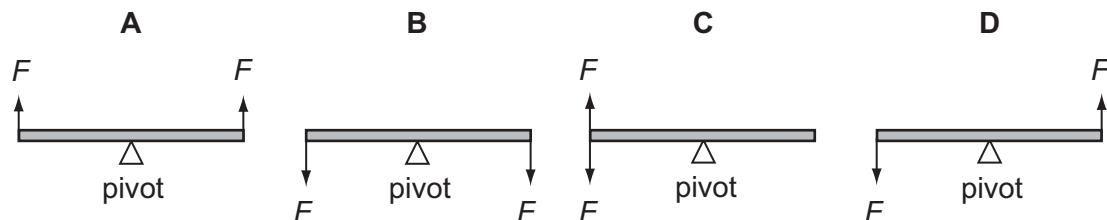


Which statement is correct?

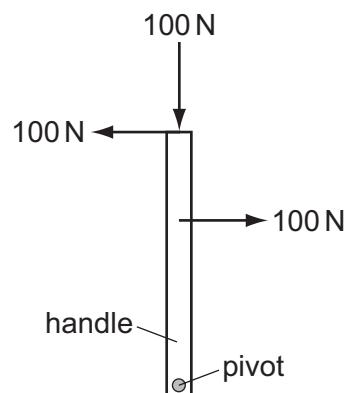
- A** If X has a mass of exactly 2 kg, it will rise.
- B** If X has a mass of less than 2 kg, it will fall.
- C** If X has a mass of more than 2 kg, it will fall.
- D** If X has a mass of more than 2 kg, it will rise.

- 3 Two equal forces F act on each of four planks.

Which plank turns?



- 4 The diagram shows a handle with three forces, each 100 N, applied to it. The handle is free to move.



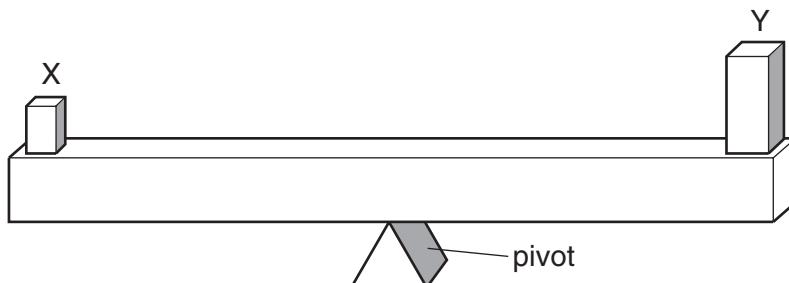
What is the effect of the forces on the handle?

- 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).
- 5 Given force F and moment arm d , how is the moment of the force defined?

- A $F \times d$
- B F / d
- C d / F
- D $F \times d/2$

4.2 Equilibrium

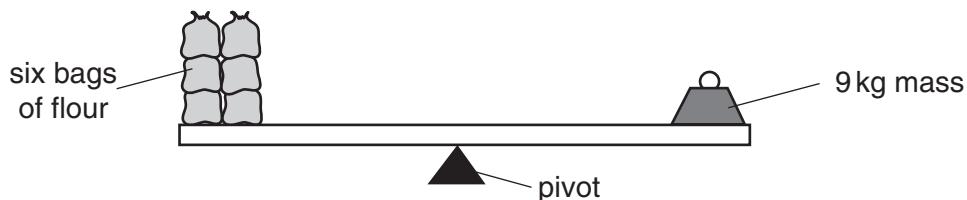
- 1 Two objects X and Y are placed on a beam as shown. The beam balances on a pivot at its centre.



What does this show about X and Y?

- A** They have the same mass and the same density.
- B** They have the same mass and the same weight.
- C** They have the same volume and the same density.
- D** They have the same volume and the same weight.

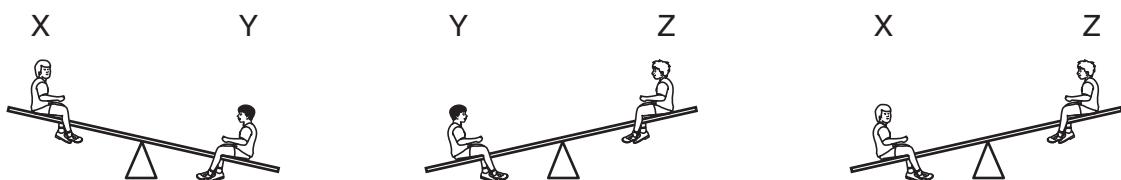
- 2 In an experiment, six identical bags of flour are balanced by a 9 kg mass.



Two bags of flour are removed. What mass will balance the remaining bags?

- A** 3 kg
- B** 6 kg
- C** 7 kg
- D** 9 kg

- 3 Three children, X, Y and Z, are using a see-saw to compare their weights.



Which line in the table shows the correct order of the children's weights?

	heaviest	\longleftrightarrow	lightest
A	X	Y	Z
B	X	Z	Y
C	Y	X	Z
D	Y	Z	X

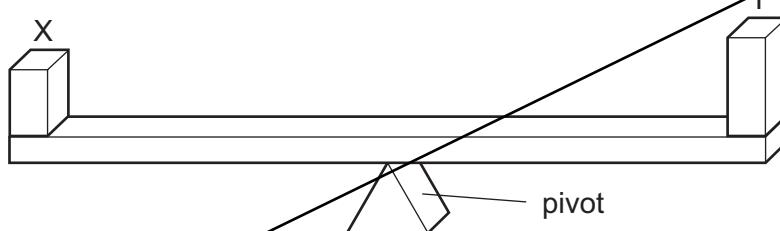
- 4 The weights of four objects, 1 to 4, are compared using a balance.



Which object is the lightest?

- A object 1 B object 2 C object 3 D object 4

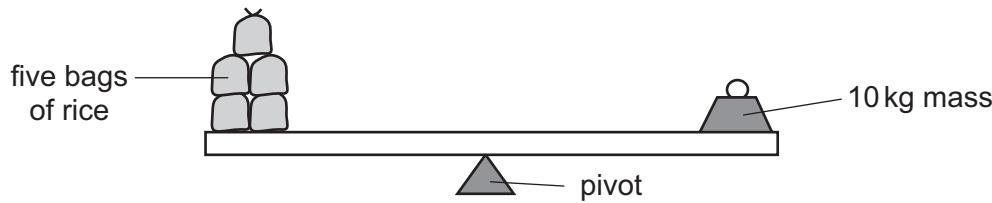
- 5 Two blocks X and Y are placed on a beam as shown. The beam balances on a pivot at its centre.



What does this show about X and Y?

- A They have the same mass and the same density.
- B They have the same mass and the same weight.
- C They have the same volume and the same density.
- D They have the same volume and the same weight.

- 6 In an experiment, five identical bags of rice are balanced by a 10 kg mass.

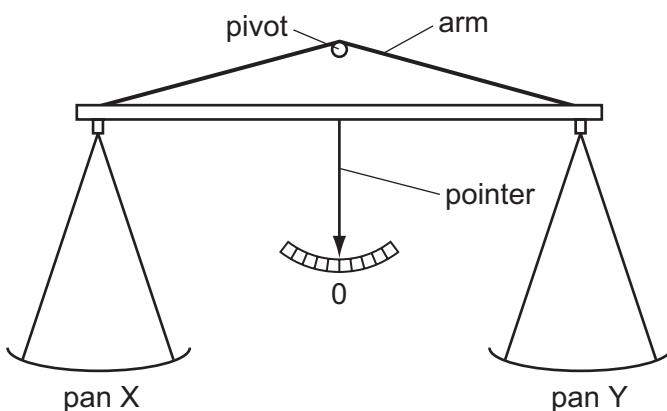


Two bags of rice are added to the other five.

What mass will now balance the bags?

- A 3.5 kg
- B 7.0 kg
- C 10 kg
- D 14 kg

- 7 A simple balance has two pans suspended from the ends of arms of equal length. When it is balanced, the pointer is at 0.

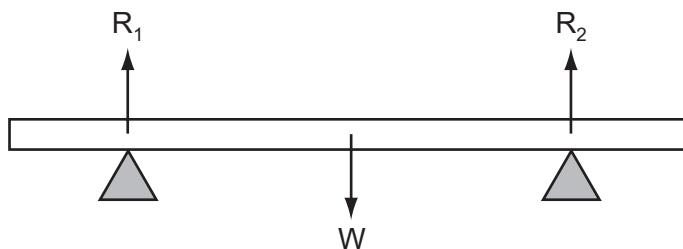


Four masses (in total) are placed on the pans, with one or more on pan X and the rest on pan Y.

Which combination of masses can be used to balance the pans?

- A 1g, 1g, 5g, 10g
- B 1g, 2g, 2g, 5g
- C 2g, 5g, 5g, 10g
- D 2g, 5g, 10g, 10g

- 8 A heavy beam is resting on two supports, so that there are three forces acting on it.

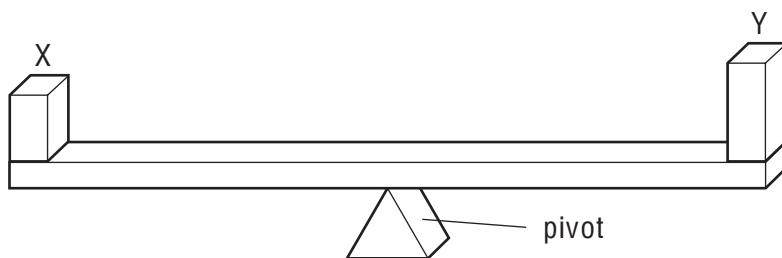


The beam is in equilibrium.

Which statement is correct?

- A All the forces are equal in value.
- B The forces are in one direction and their turning effects are in the opposite direction.
- C The resultant force is zero and the resultant turning effect is zero.
- D The total upward force is twice the total downward force.

- 9 When two blocks X and Y are placed on a uniform beam, the beam balances on a pivot at its centre as shown.



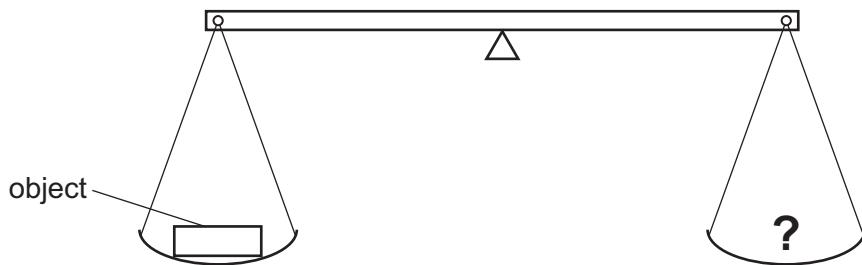
What does this show about X and Y?

- A They have the same mass and the same density.
- B They have the same mass and the same weight.
- C They have the same volume and the same density.
- D They have the same volume and the same weight.

- 10 What are the conditions for equilibrium?

	resultant force acting	resultant turning effect acting
A	yes	yes
B	yes	no
C	no	yes
D	no	no

- 11 The weight of an object is to be found using the beam 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, with the following 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

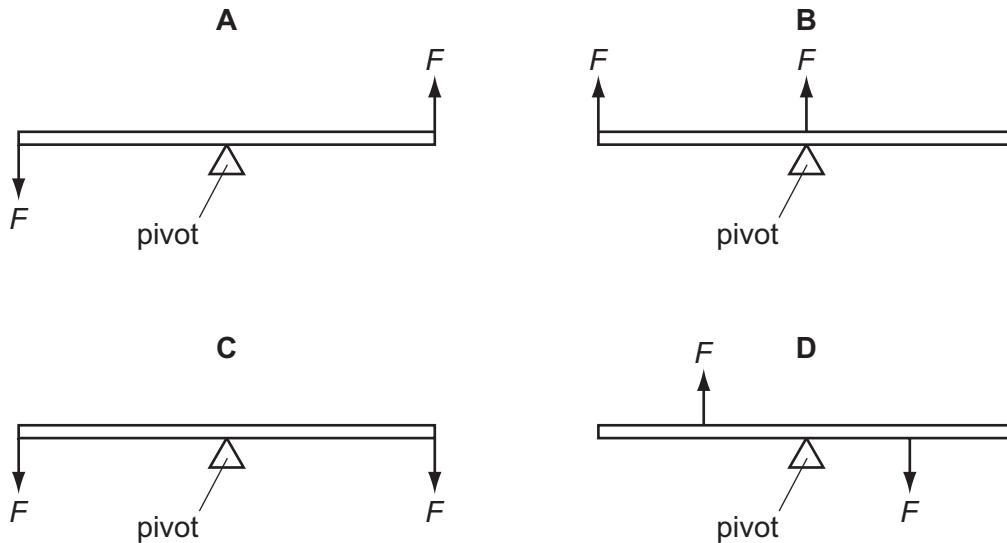
What is the best estimate of the weight of the object?

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

- 12 The diagrams show a uniform rod with its midpoint on a pivot.

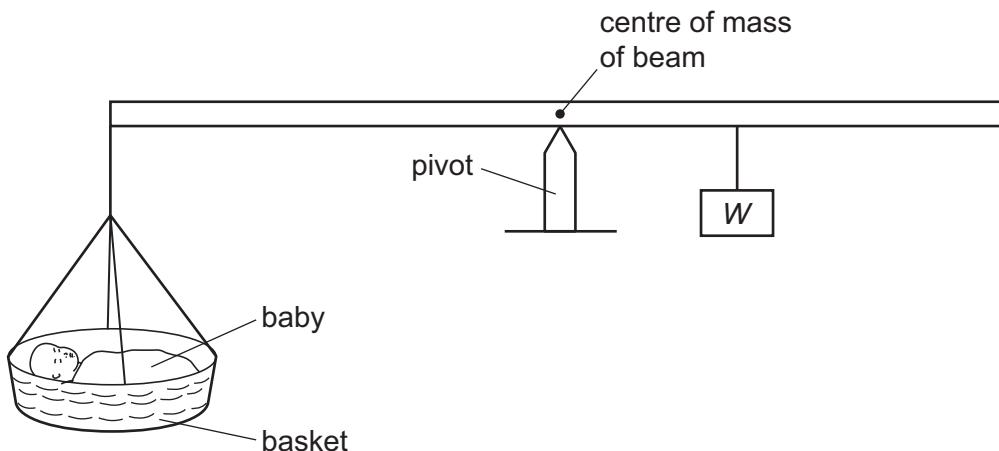
Two equal forces F are applied to the rod, as shown.

Which diagram shows the rod in equilibrium?



- 13 The diagram shows a balance being used to find the weight of a baby. The weight of the basket can be ignored.

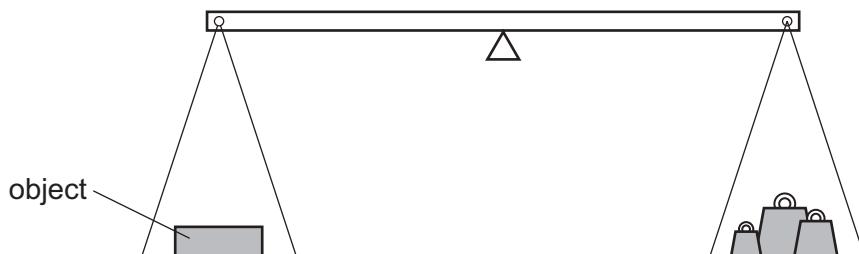
At equilibrium, the pivot is nearer to the weight W than to the baby.



What is the weight of the baby?

- A less than W
- B more than W
- C W
- D impossible to tell

- 14 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.

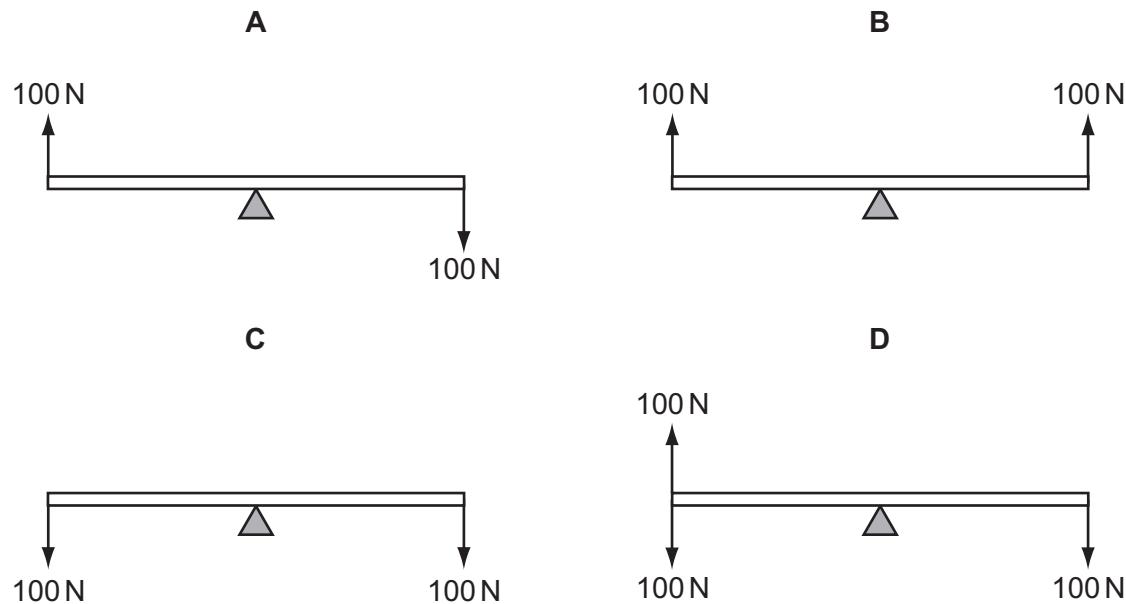
weights in the right-hand pan	effect
0.1 N, 0.1 N, 0.05 N, 0.02 N	balance tips down slightly on the left-hand side
0.2 N, 0.1 N, 0.01 N	balance tips down slightly on the right-hand side

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

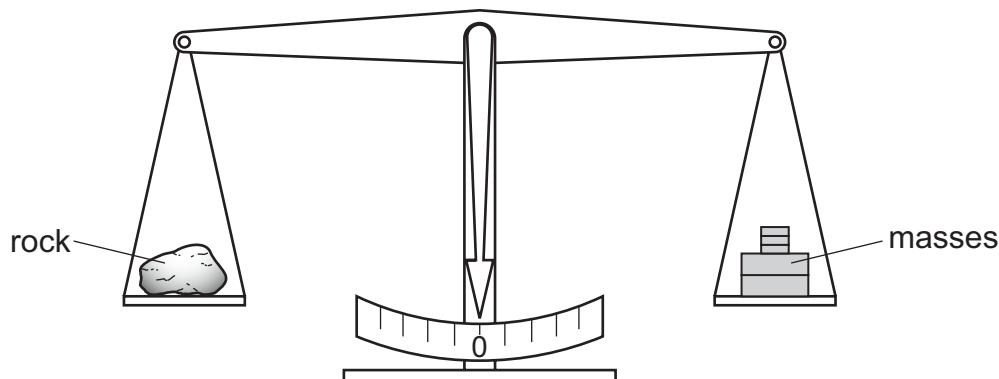
- A 0.27 N
- B 0.29 N
- C 0.31 N
- D 0.58 N

- 15 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?



- 16 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.

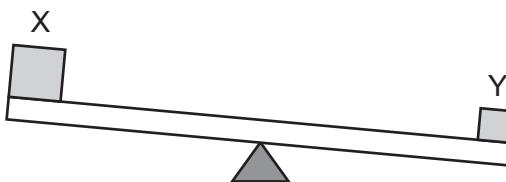


What is the mass of the small rock?

- A** 0.023 kg **B** 2.3 kg **C** 23 kg **D** 230 kg

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

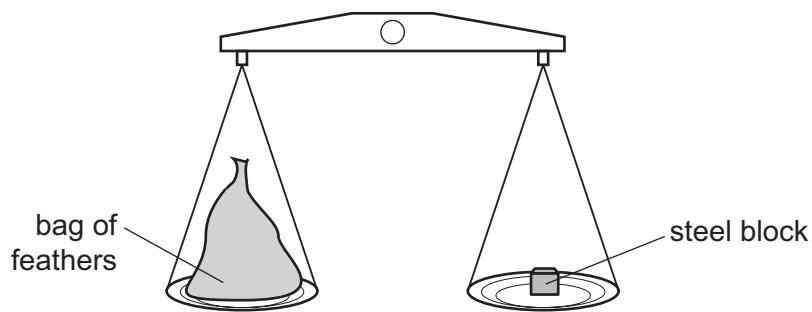
The balance tilts as shown.



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

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

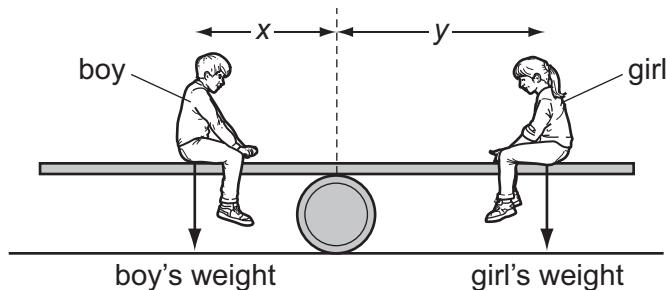


What does this show about the masses and the weights of the bag of feathers and the steel block?

- 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.

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

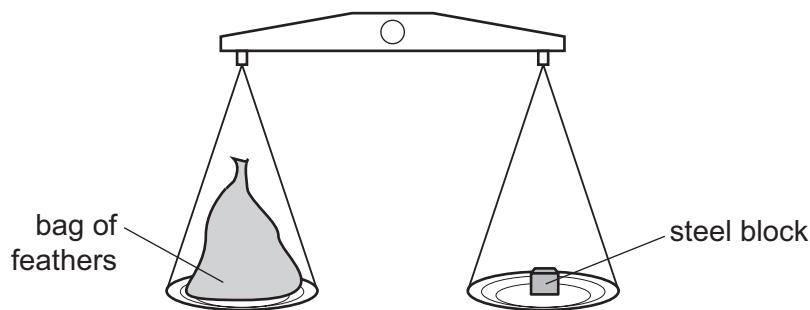
A boy sits on one side of the barrel and a girl sits on the other side so that the see-saw is balanced.



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

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



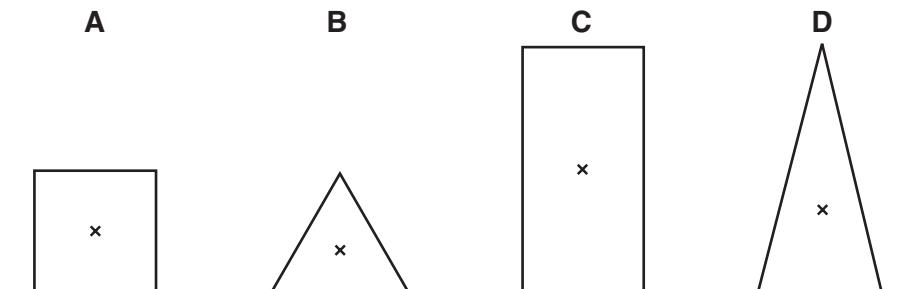
What does this show about the masses and the weights of the bag of feathers and the steel block?

- 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.

4.3 Stability

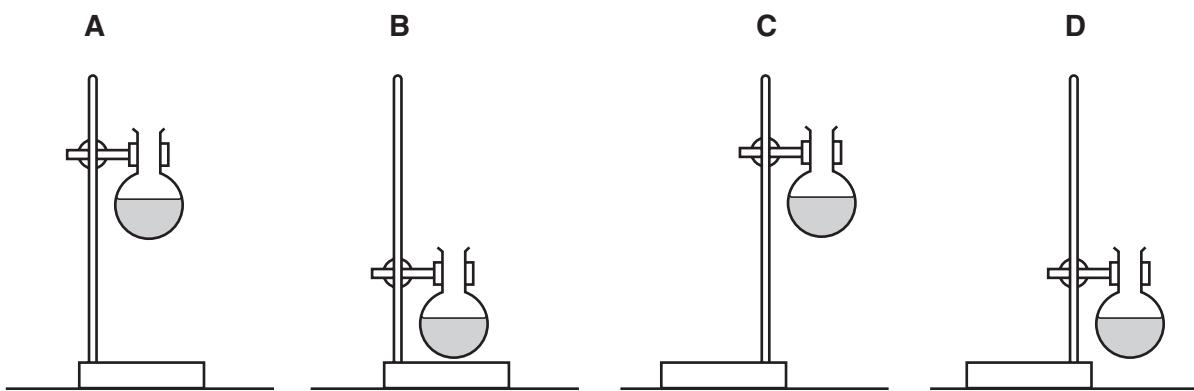
- 1 The diagram shows sections of four objects, all of equal mass. The position of the centre of gravity of each object has been marked with a cross.

Which object is the most stable?



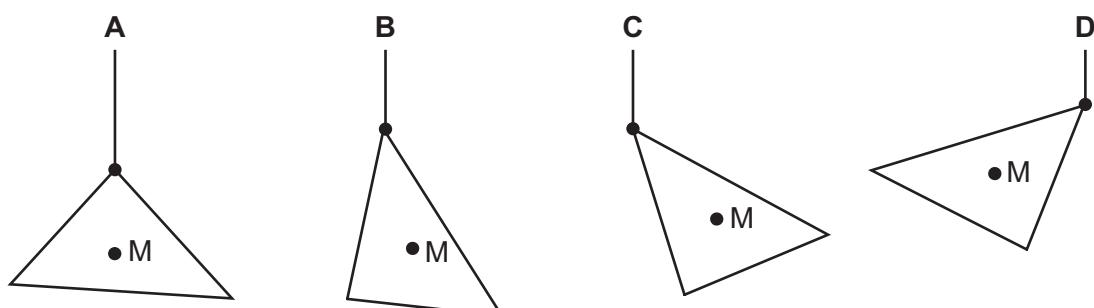
- 2 A student uses a stand and clamp to hold a flask of liquid.

Which diagram shows the most stable arrangement?

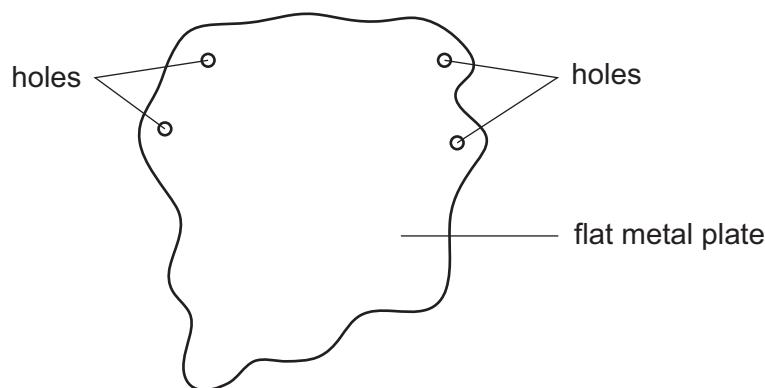


- 3 A piece of card has its centre of gravity at M.

Which diagram shows how it hangs when suspended by a thread?



- 4 The diagram shows a flat metal plate that may be hung from a nail so that it can rotate about any of four holes.



What is the smallest number of holes from which the flat metal plate should be hung in order to find its centre of gravity?

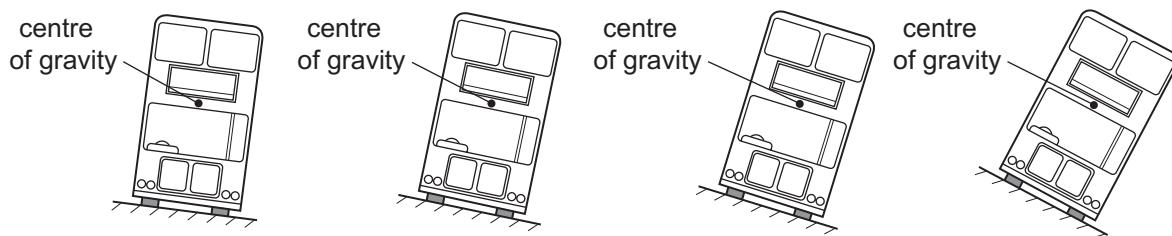
A 1

B 2

C 3

D 4

- 5 The diagram shows four models of buses placed on different ramps.



How many of these models will fall over?

A 1

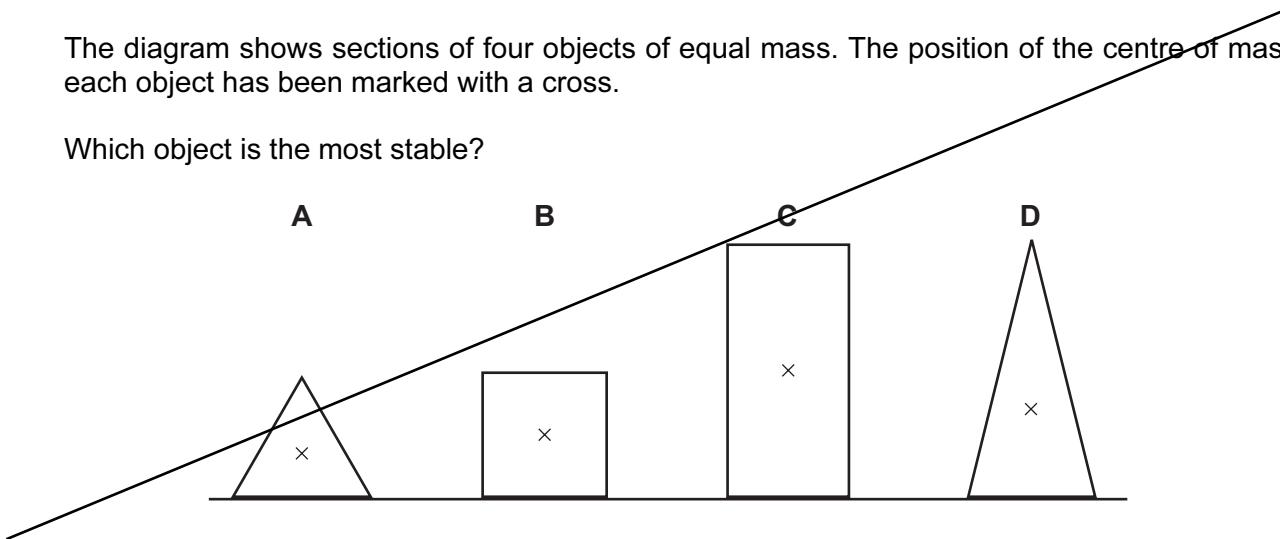
B 2

C 3

D 4

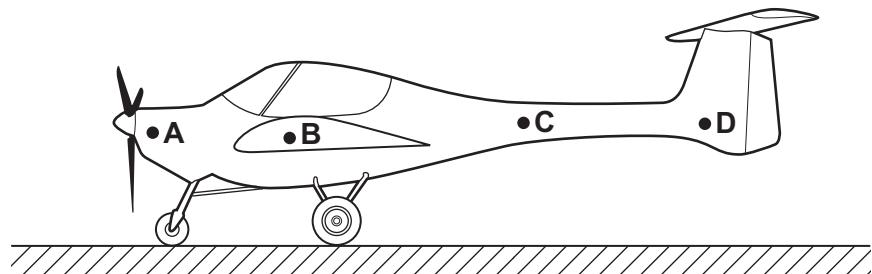
- 6 The diagram shows sections of four objects of equal mass. The position of the centre of mass of each object has been marked with a cross.

Which object is the most stable?



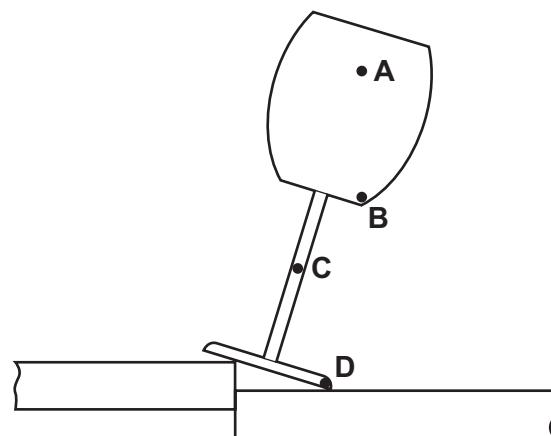
- 7 A light aircraft stands at rest on the ground. It stands on three wheels, one at the front and two further back.

Which point could be its centre of gravity?



- 8 An empty glass is placed on a join between two tables as shown. The glass remains stable.

Which point is the centre of gravity of the glass?



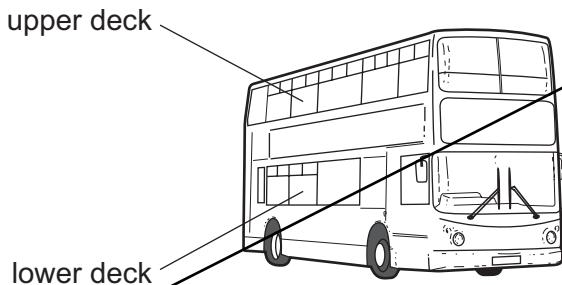
- 9 The diagram shows four objects standing on a flat surface.

The centre of gravity of each object is marked M.

Which object will fall over?



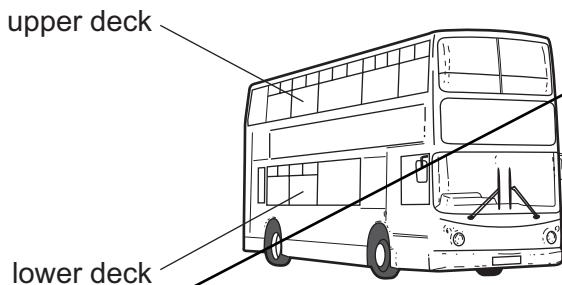
- 10 Passengers are **not** allowed to stand on the upper deck of double-decker buses.



Why is this?

- A They would cause the bus to become unstable.
- 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 gravity of the bus.

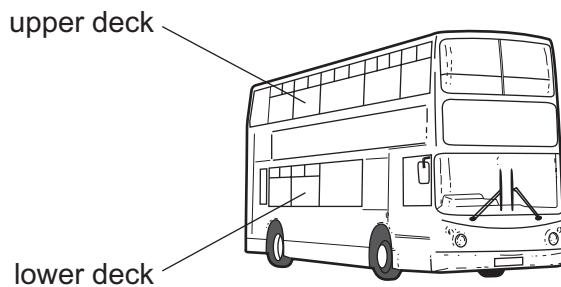
- 11 Passengers are **not** allowed to stand on the upper deck of double-decker buses.



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.

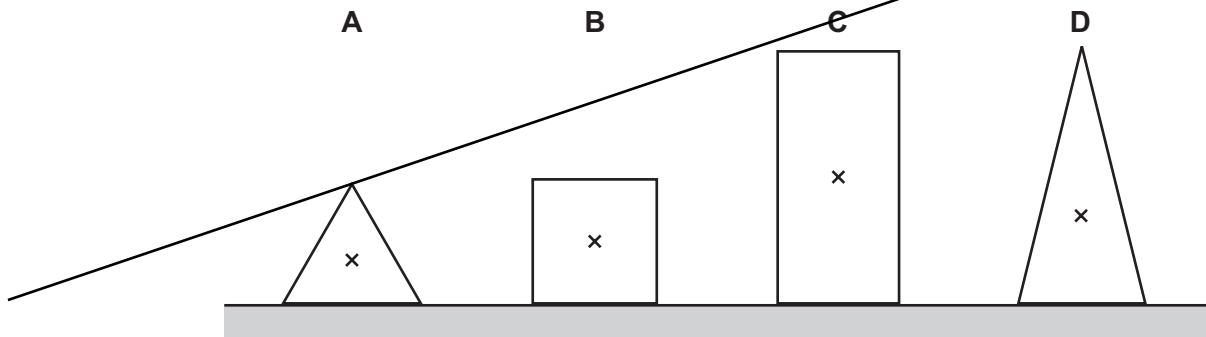
- 12 Passengers are **not** allowed to stand on the upper deck of double-decker buses.



Why is this?

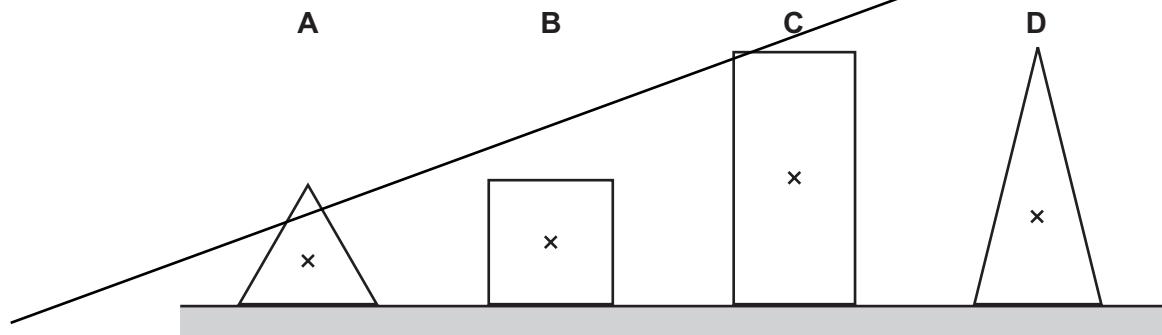
- A They would cause the bus to become less stable.
 - B They would cause the bus to slow down.
 - C They would increase the kinetic energy of the bus.
 - D They would lower the centre of gravity of the bus.
- 13 The diagram shows sections of four objects of equal mass. The position of the centre of mass of each object has been marked with a cross.

Which object is the most stable?



- 14 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.

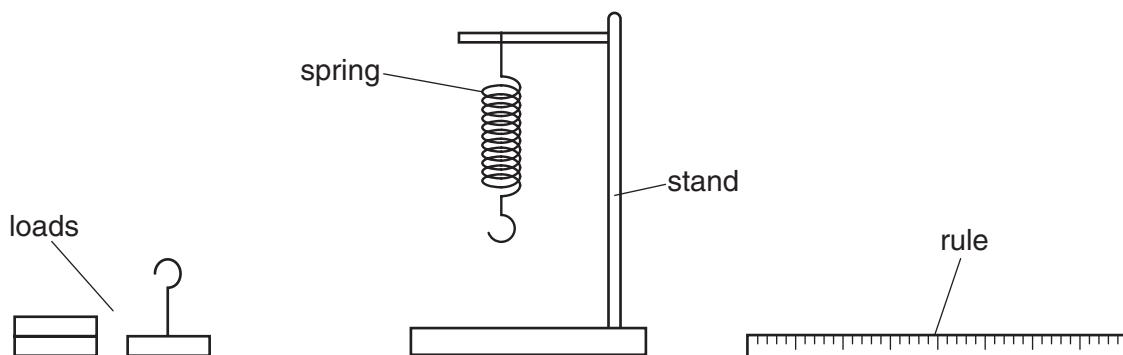
Which object is the most stable?



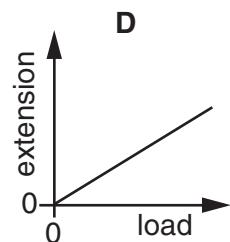
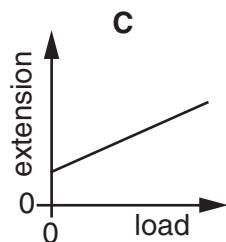
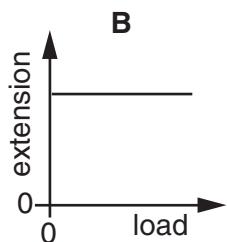
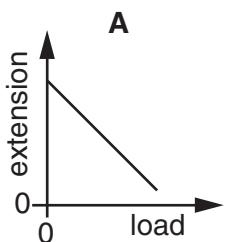
Chapter 5. Force and matter

5.1 Spring

- 1 A spring is suspended from a stand. Loads are added and the extensions are measured.



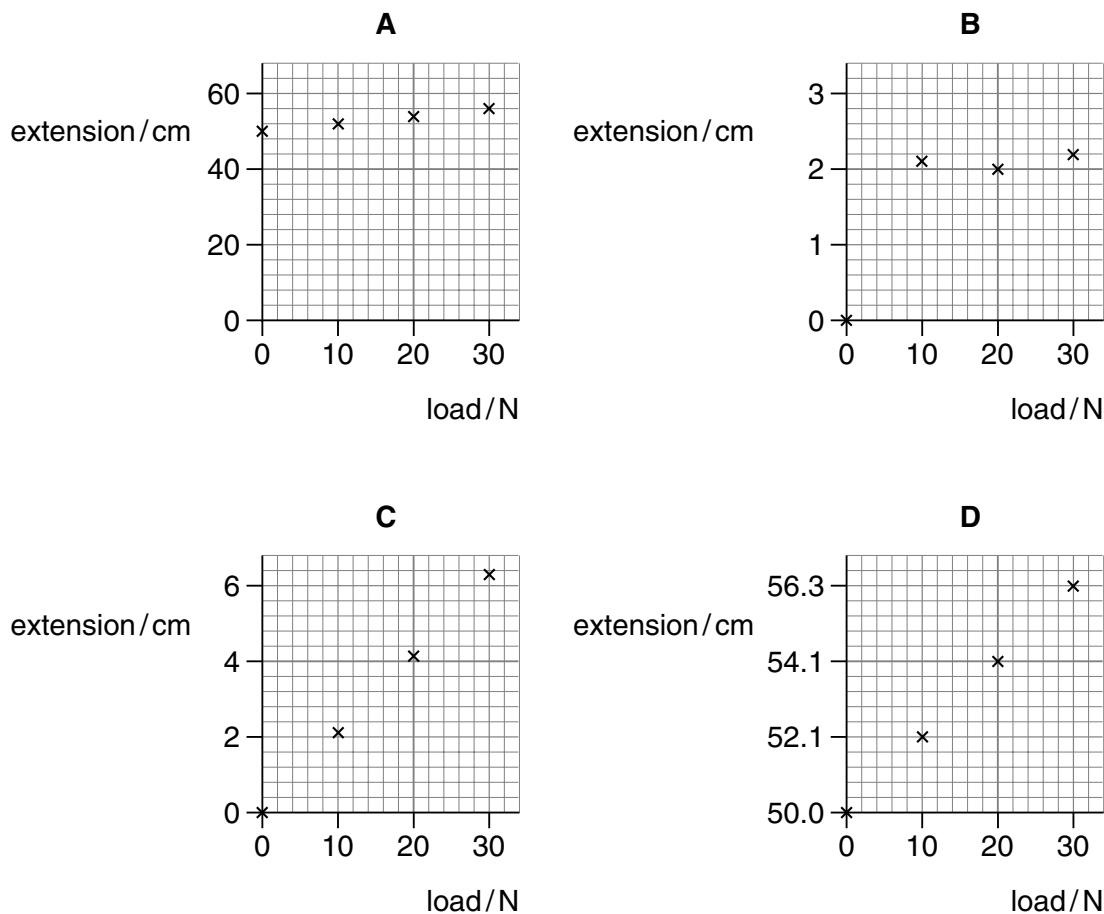
Which graph shows the result of plotting extension against load?



- 2 The table below shows the length of a wire as the load on it is increased.

load/N	0	10	20	30
length/cm	50.0	52.1	54.1	56.3

Which graph correctly shows the extension of the wire plotted against load?



- 3 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?

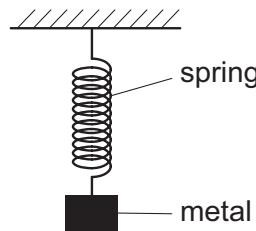
A 16.5

B 17.3

C 17.4

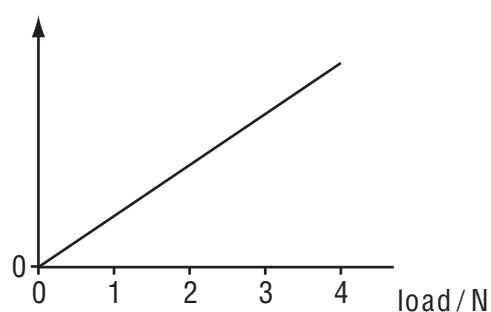
D 18.3

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



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

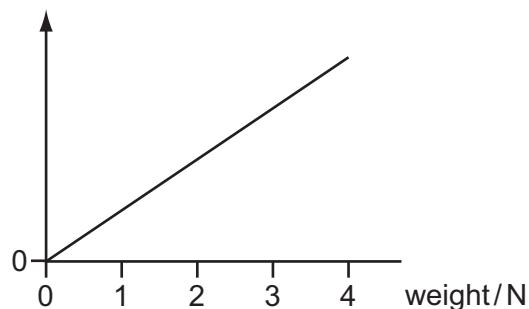
- A friction
 - B mass
 - C pressure
 - D weight
- 5 A student adds loads to an elastic cord. He measures the length of the cord for each load. He then plots a graph from the results.



Which length is plotted on the vertical axis?

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

- 6 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 $(\text{measured length} - \text{original length})$
- D $(\text{measured length} + \text{original length})$

5.2 [Hooke's law]

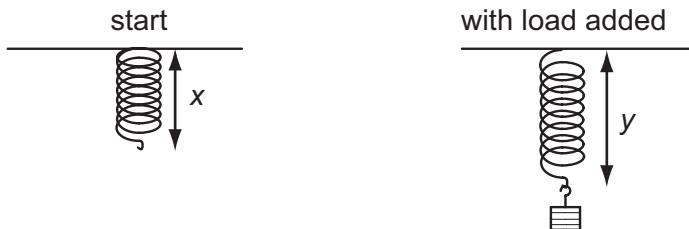
- 1 The table shows the length of a wire as the load on it is increased.

load/N	0	10	20	30
length/cm	50.0	52.1	54.1	56.3

Which subtraction should be made to find the extension caused by the 20 N load?

- A $54.1 \text{ cm} - 0 \text{ cm}$
- B $54.1 \text{ cm} - 50.0 \text{ cm}$
- C $54.1 \text{ cm} - 52.1 \text{ cm}$
- D $56.3 \text{ cm} - 54.1 \text{ cm}$

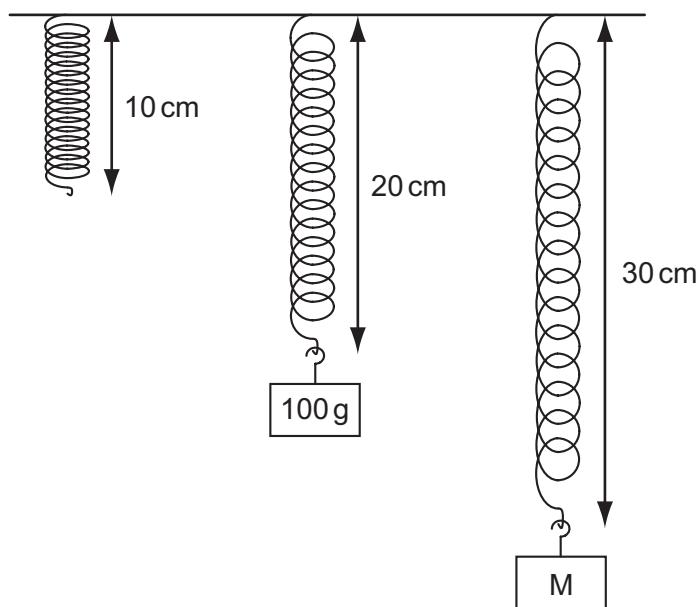
- 2 A student carries out an experiment to plot an extension / load graph for a spring. The diagrams show the apparatus at the start of the experiment and with a load added.



What is the extension caused by the load?

- A x
- B y
- C $y + x$
- D $y - x$

- 3 Objects with different masses are hung on a 10 cm spring. The diagram shows how much the spring stretches.



The extension of the spring is directly proportional to the mass hung on it.

What is the mass of object M?

- A 110 g B 150 g C 200 g D 300 g

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

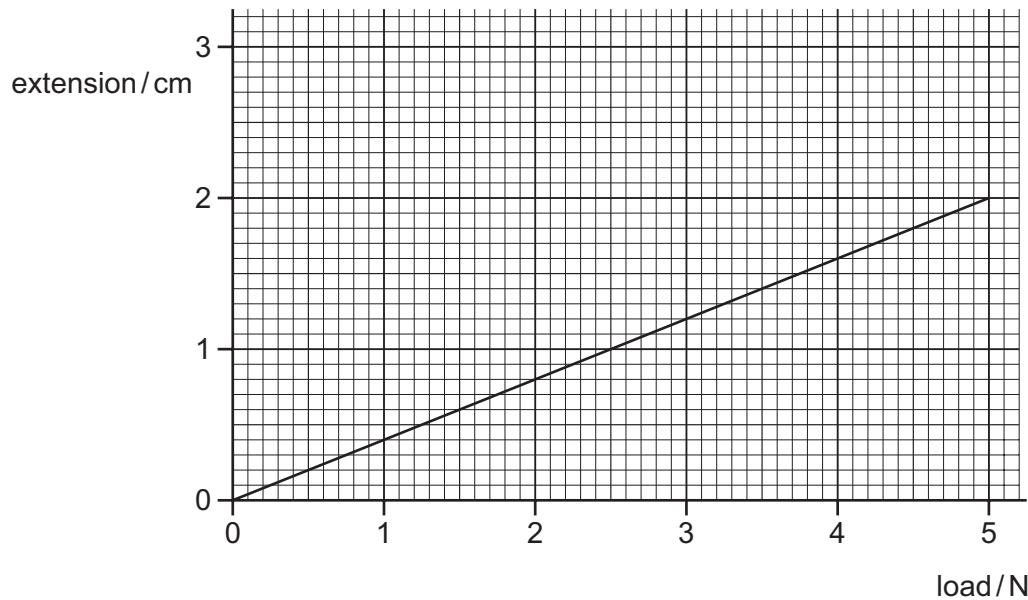
The results are shown below.

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

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

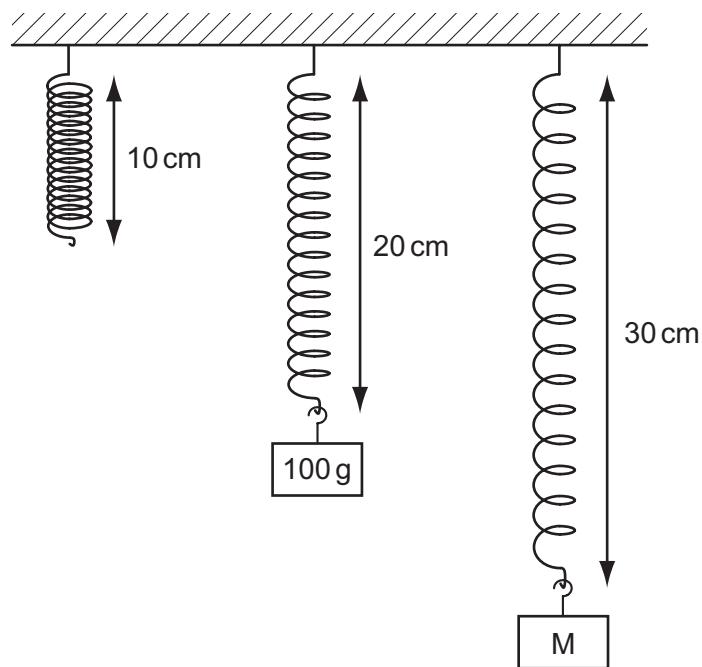


When an object of unknown weight is hung on the spring, the length of the spring is 16.4 cm.

What is the weight of the object?

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

- 6 Objects with different masses are hung on a spring. The diagram shows how much the spring stretches.



The extension of the spring is directly proportional to the mass hung on it.

What is the mass of object M?

A 110g

B 150g

C 200g

D 300g

7 An ball is said to behave elastically. What does this mean?

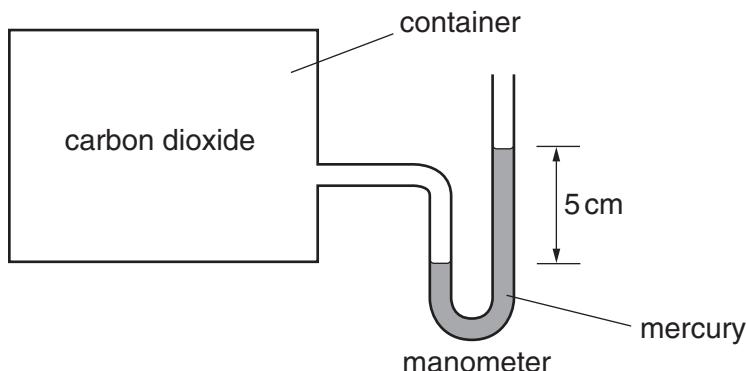
- A The ball will bounce very high when dropped on a hard surface.
- B The ball is easily deformable.
- C The ball will return to its original shape once external forces are removed.
- D Once stretched, the ball will not return to its original shape.

8 What is meant by the elastic limit of a material.

- A It is the point beyond which a material can be deformed elastically.
- B It is the point at which a material will break when deformed beyond this limit.
- C It is the point at which a material will melt when heated beyond this limit.
- D It is the point at which material load no longer produces an extension in direct proportion to this load.

5.3 Pressure

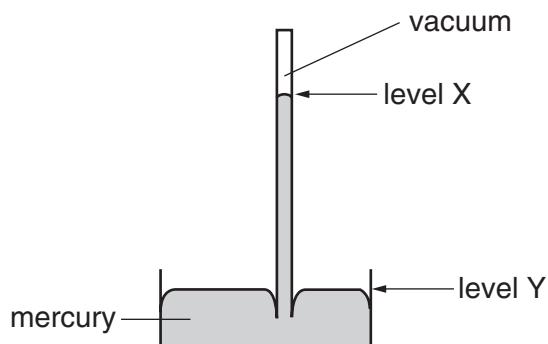
- 1 The diagram shows a manometer connected to a container of carbon dioxide.



Which statement correctly describes the pressure exerted by the carbon dioxide?

- A It is equal to the atmospheric pressure.
- B It is equal to 5 cm of mercury.
- C It is equal to 5 cm of mercury above atmospheric pressure.
- D It is equal to 5 cm of mercury below atmospheric pressure.

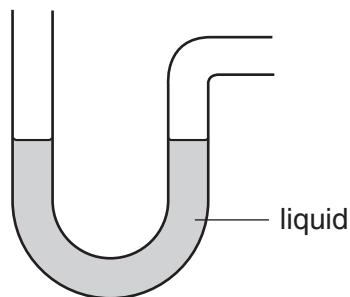
- 2 The diagram shows a simple mercury barometer.



If atmospheric pressure increases, what happens to level X and to level Y?

	level X	level Y
A	goes down	goes down
B	goes down	goes up
C	goes up	goes down
D	goes up	goes up

- 3 The diagram shows an instrument used to measure gas pressure.

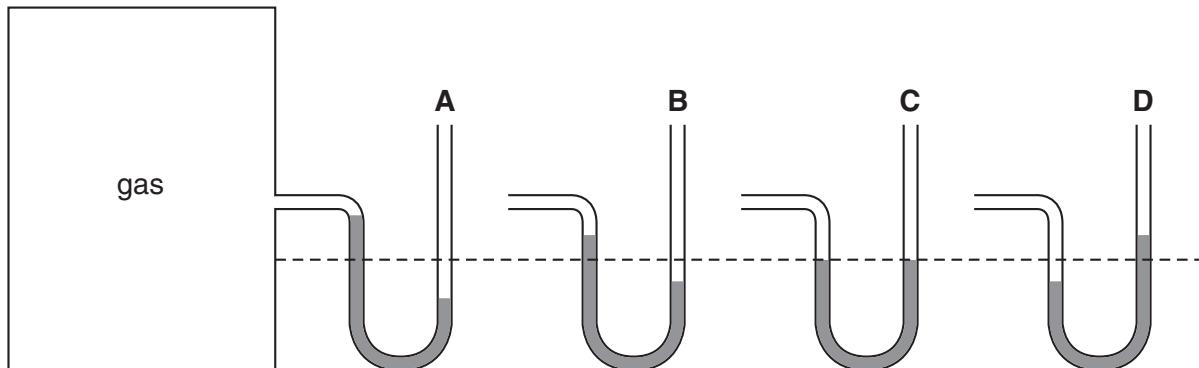


What is the instrument called?

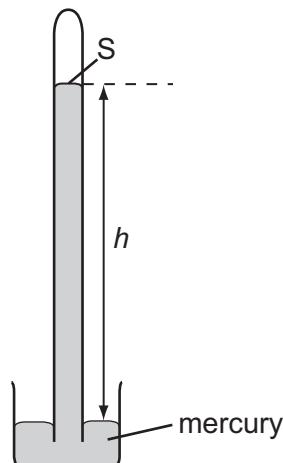
- A ammeter
- B barometer
- C manometer
- D thermometer

- 4 A manometer is being used to measure the pressure of the gas inside a tank. A, B, C and D show the manometer at different times.

At which time is the gas pressure inside the tank greatest?



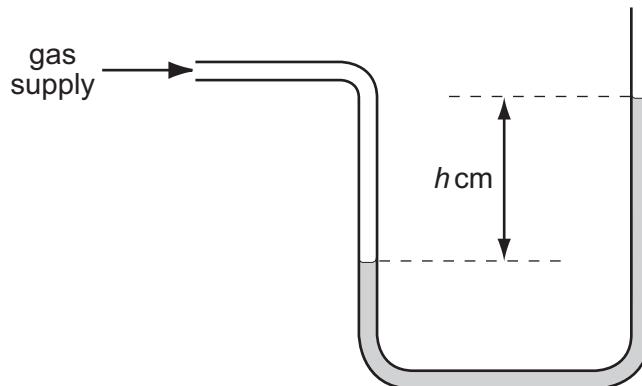
- 5 The diagram shows a simple mercury barometer. The barometer reading is h cm of mercury.



What is the pressure at S?

- A approximately zero
- B atmospheric pressure
- C atmospheric pressure + h cm of mercury
- D h cm of mercury

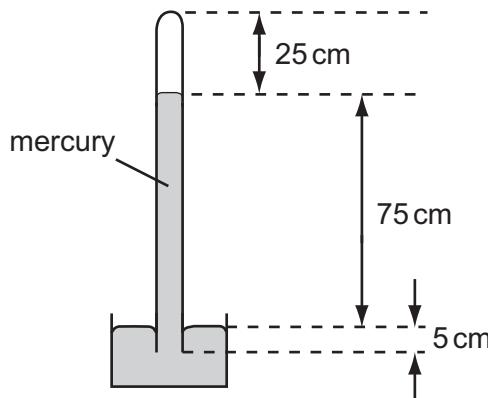
- 6 A water manometer is used to measure the pressure of a gas supply to a house. It gives a reading of h cm of water.



Why is it better to use water rather than mercury in this manometer?

- A h would be too large if mercury were used.
- B h would be too small if mercury were used.
- C The tube would need to be narrower if mercury were used.
- D The tube would need to be wider if mercury were used.

- 7 The diagram shows a mercury barometer.

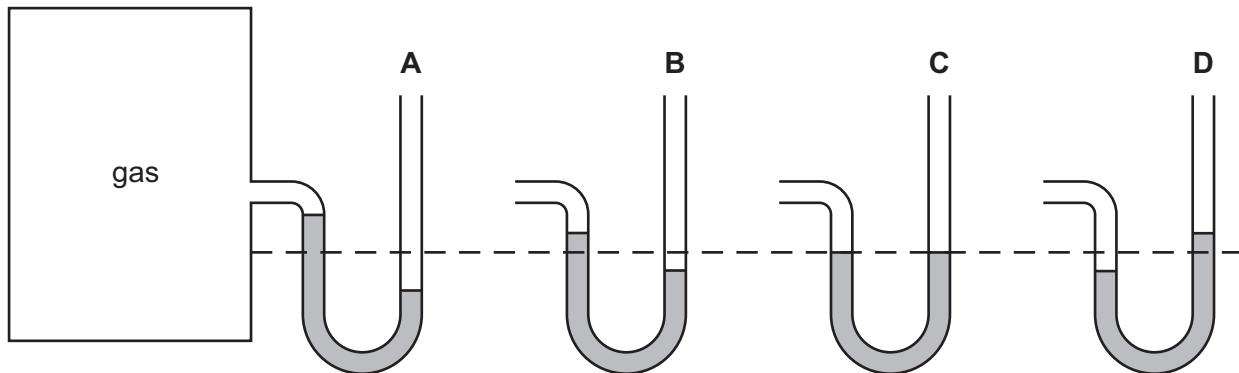


Which distance is used to calculate the pressure of the atmosphere?

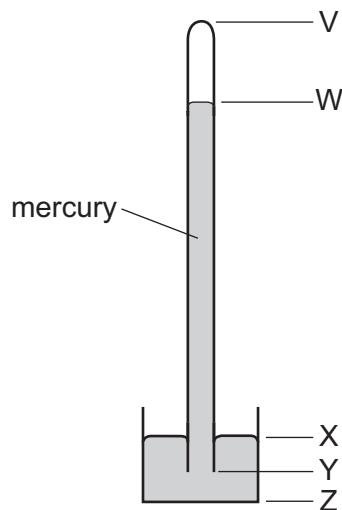
- A 25 cm B 75 cm C 80 cm D 100 cm

- 8 A manometer is being used to measure the pressure of the gas inside a tank. A, B, C and D show the manometer at different times.

At which time is the gas pressure inside the tank greatest?



- 9 The diagram shows a simple mercury barometer.

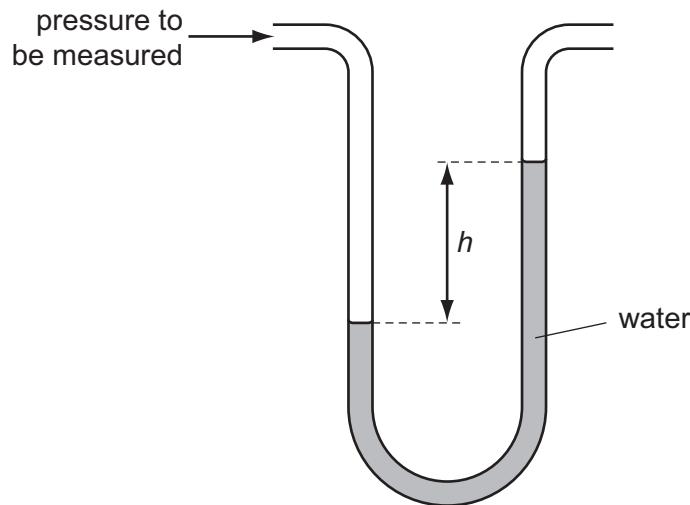


The atmospheric pressure increases.

Which distance increases?

- A VW B WY C XY D XZ

- 10 A pressure is measured using a manometer as shown in the diagram.

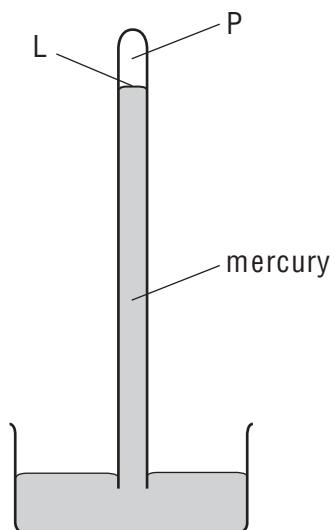


The water in the manometer is replaced with a liquid which is more dense.

How does the value of h change?

- A It becomes zero.
B It decreases, but not to zero.
C It stays the same.
D It increases.

- 11 The diagram shows a simple mercury barometer, used to measure atmospheric pressure.

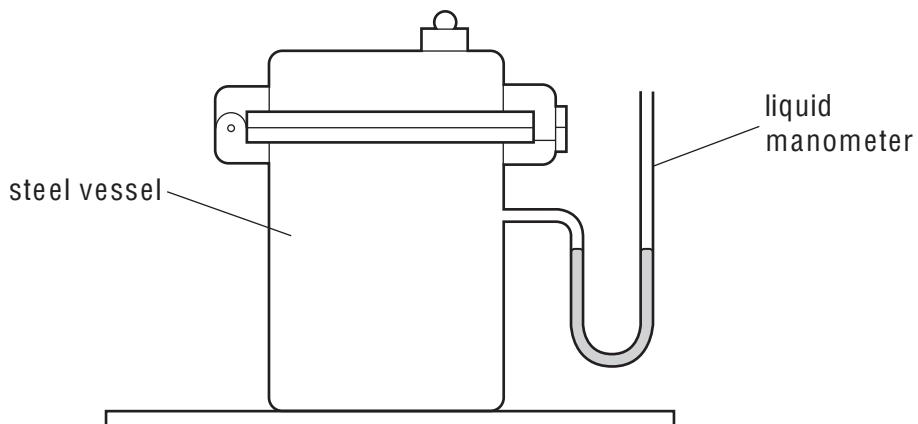


Atmospheric pressure increases.

What happens to the level L and to the pressure at P?

	level L	pressure at P
A	falls	increases
B	falls	stays the same
C	rises	increases
D	rises	stays the same

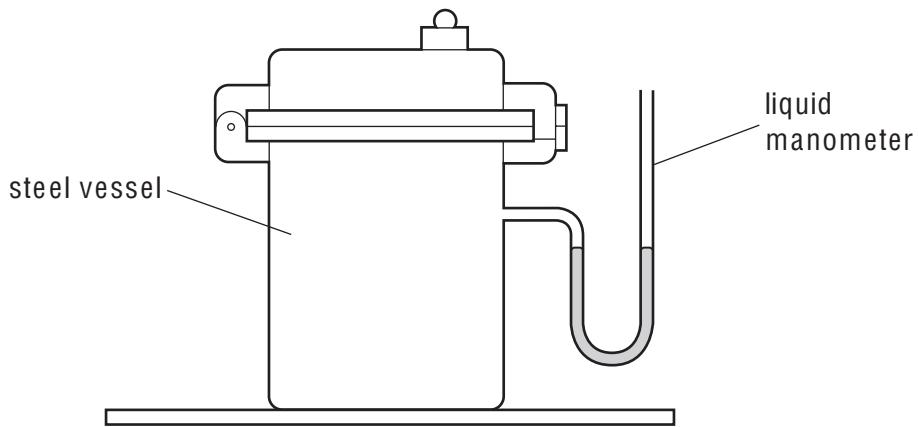
- 12 A manometer is used to indicate the pressure in a steel vessel, as shown in the diagram.



What value does the liquid manometer give for the pressure in the vessel?

- A It is zero.
- B It is between zero and atmospheric pressure.
- C It is equal to atmospheric pressure.
- D It is greater than atmospheric pressure.

- 13 A manometer is used to indicate the pressure in a steel vessel, as shown in the diagram.

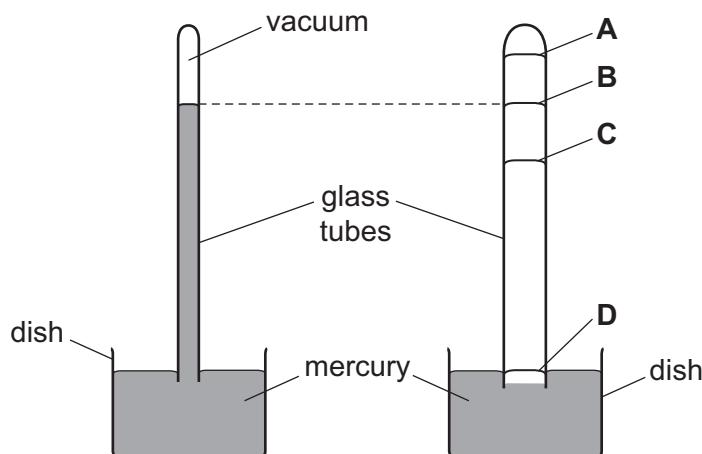


What value does the liquid manometer give for the pressure in the vessel?

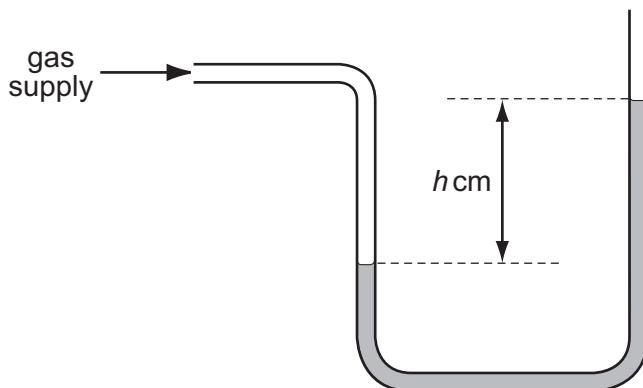
- A It is zero.
- B It is between zero and atmospheric pressure.
- C It is equal to atmospheric pressure.
- D It is greater than atmospheric pressure.

- 14 The diagrams show two mercury barometers standing side by side. The right-hand diagram shows a tube of bigger diameter, but the diagram is incomplete. There is a vacuum above the mercury in both tubes.

Which labelled position on the right-hand tube could show the mercury level in that tube?



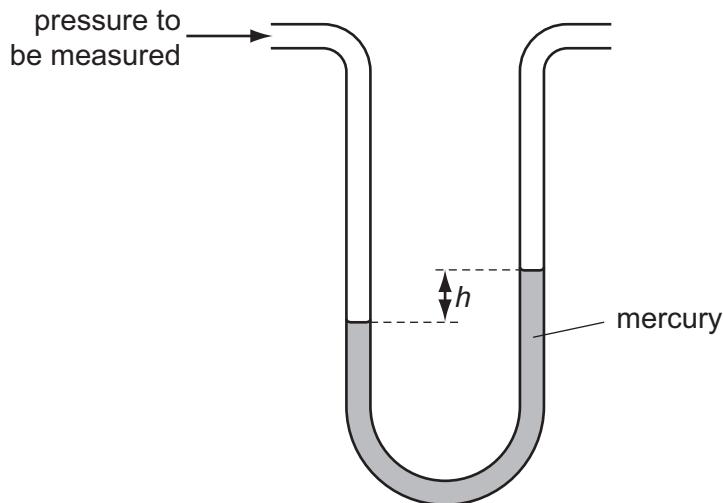
- 15 A water manometer is used to measure the pressure of a gas supply to a house. It gives a reading of h cm of water.



Why is it better to use water rather than mercury in this manometer?

- A h would be too large if mercury were used.
- B h would be too small if mercury were used.
- C The tube would need to be narrower if mercury were used.
- D The tube would need to be wider if mercury were used.

- 16 The pressure of a gas is measured using a manometer as shown in the diagram.



The mercury in the manometer is replaced with a liquid which is less dense.

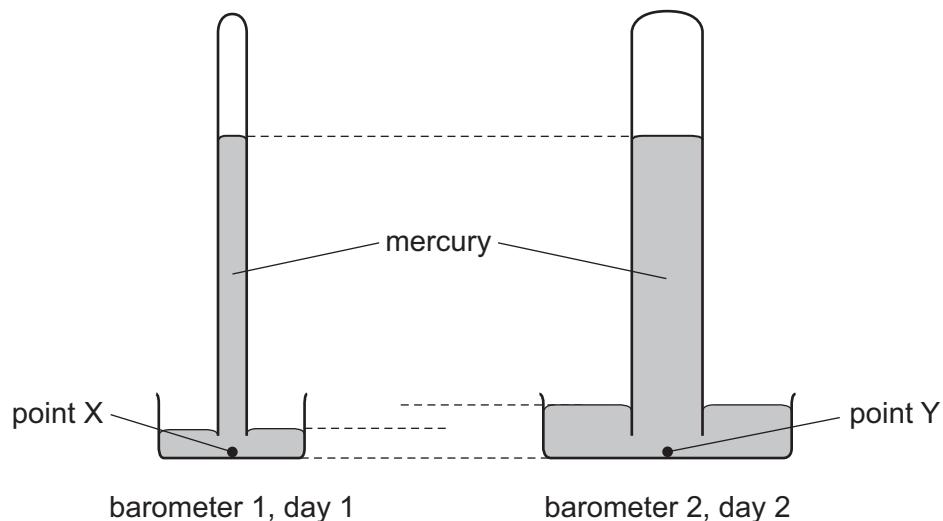
How does the value of h change?

- A It becomes zero.
 - B It decreases, but not to zero.
 - C It stays the same.
 - D It increases.
- 17 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

- 18 The diagram shows two mercury barometers.

Barometer 1 is measuring atmospheric pressure on day 1.

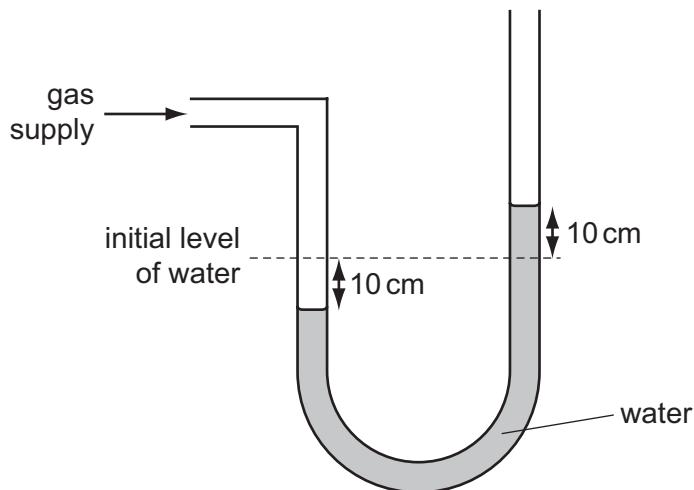
Barometer 2 is measuring atmospheric pressure on day 2.



Which statement is true?

- A The atmospheric pressure on day 1 is less than the atmospheric pressure on day 2.
- B The atmospheric pressure on day 1 is the same as the atmospheric pressure on day 2.
- C The pressure at point X is less than the pressure at point Y.
- D The pressure at point X is the same as the pressure at point Y.

- 19 A water manometer is used to measure the pressure of a gas supply.

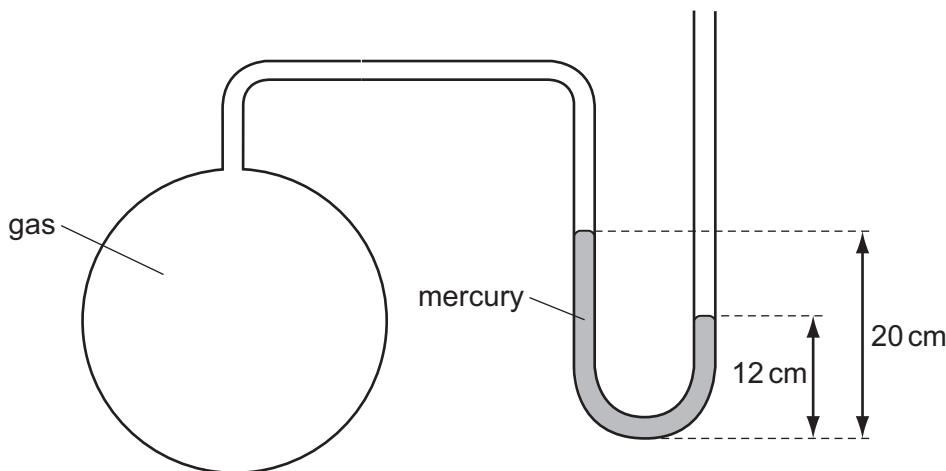


When it is attached to the gas supply, the water falls on the left side and rises on the right side. The difference in the levels of water on the two sides is now 20 cm.

What is the pressure of the gas supply?

- A the pressure due to 10 cm depth of water
- B the pressure due to 20 cm depth of water
- C the pressure due to 10 cm depth of water plus atmospheric pressure
- D the pressure due to 20 cm depth of water plus atmospheric pressure

- 20 The diagram shows a mercury manometer used to measure the pressure of gas in a container. Atmospheric pressure is 76 cm of mercury.



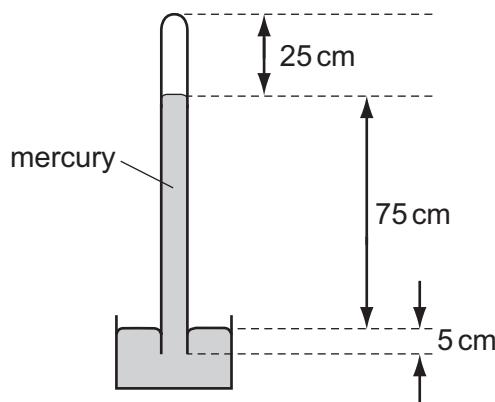
What is the pressure of the gas?

- A 56 cm of mercury
- B 68 cm of mercury
- C 84 cm of mercury
- D 96 cm of mercury

- 21 What does a barometer measure?

- A atmospheric density
- B atmospheric pressure
- C liquid density
- D liquid pressure

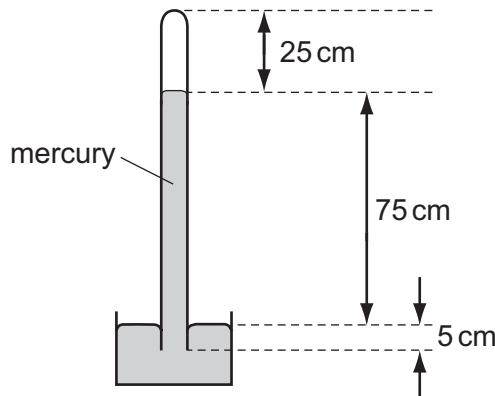
- 22 The diagram shows a mercury barometer.



Which distance is used to calculate the pressure of the atmosphere?

- A 25 cm
- B 75 cm
- C 80 cm
- D 100 cm

- 23 The diagram shows a mercury barometer.



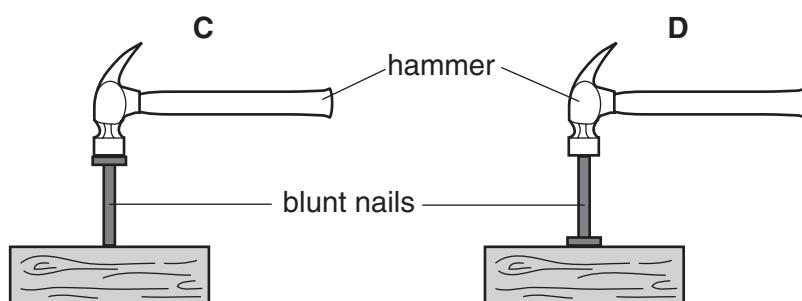
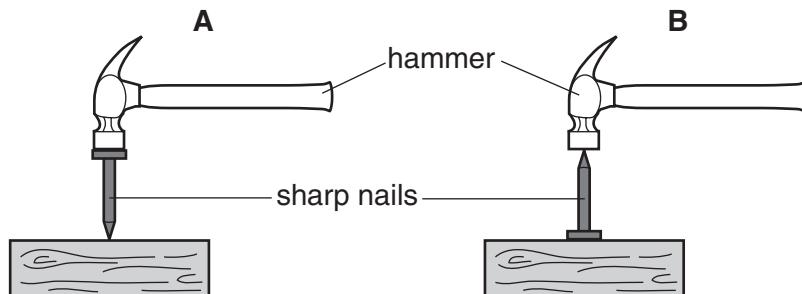
Which distance is used to calculate the pressure of the atmosphere?

- A 25 cm B 75 cm C 80 cm D 100 cm

5.4 Calculating pressure

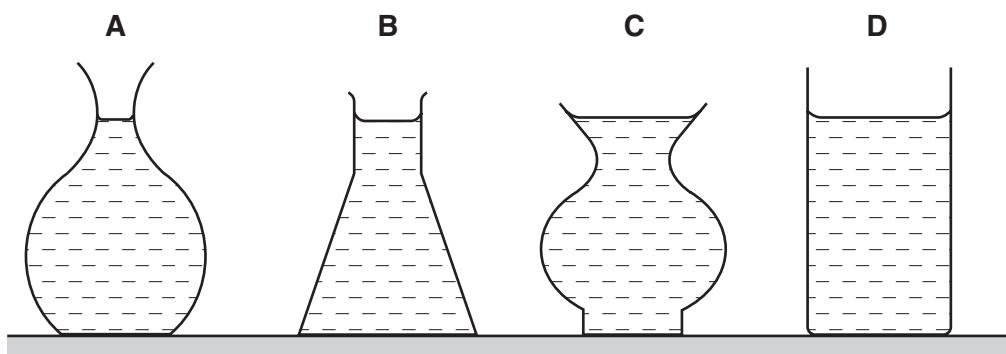
- 1 Two sharp nails and two blunt nails are held on a piece of wood. Each nail is hit with the same hammer with the same amount of force.

When it is hit, which nail causes the greatest pressure on the wood?



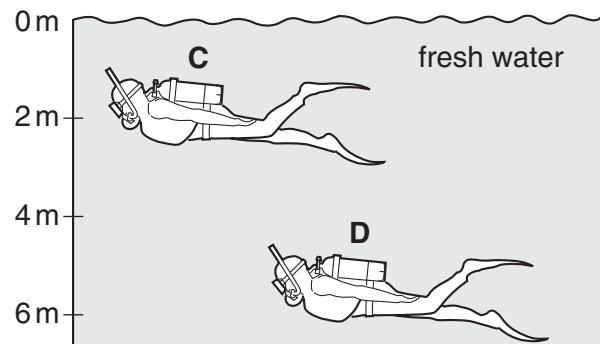
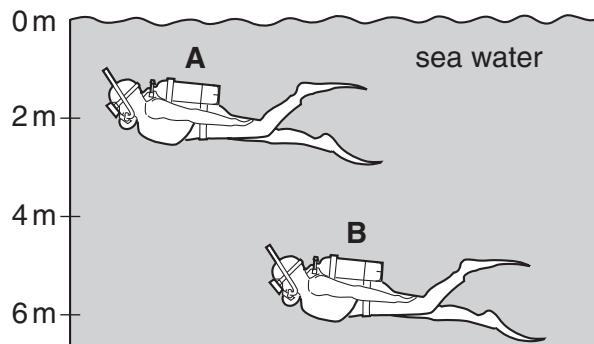
- 2 Four flower vases have circular bases. They are filled with water so that they all have the same weight.

Which vase exerts the greatest pressure on its base?



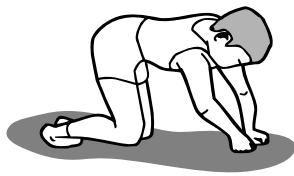
- 3 The diagrams show two divers swimming in the sea and two divers swimming in fresh water. Sea water is more dense than fresh water.

On which diver is there the greatest pressure?

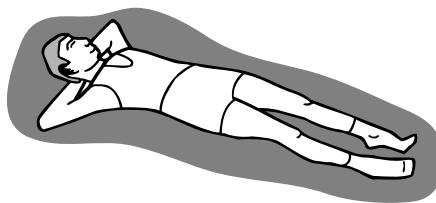


- 4 Which diagram shows the child exerting **least** pressure on the ground?

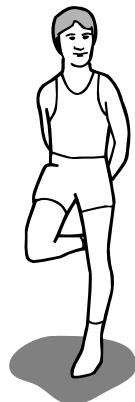
A



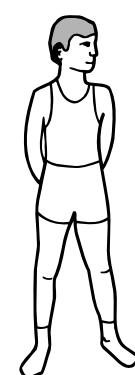
B



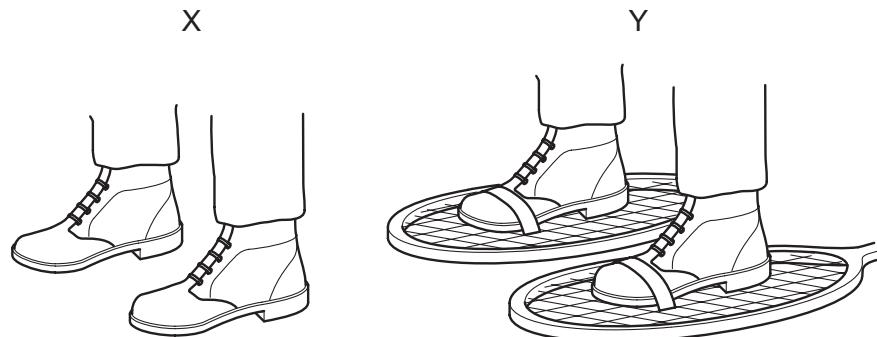
C



D



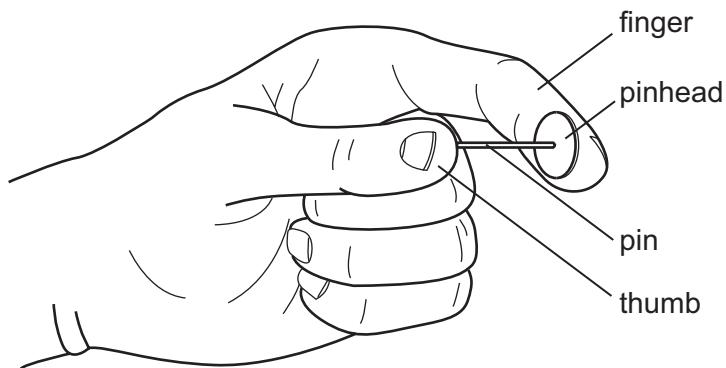
- 5 Two boys X and Y each have the same total weight and are standing on soft ground.



Which boy is more likely to sink into the soft ground and why?

	boy more likely to sink	pressure on soft ground
A	X	larger than Y
B	X	smaller than Y
C	Y	larger than X
D	Y	smaller than X

- 6 A pin is squeezed between finger and thumb.



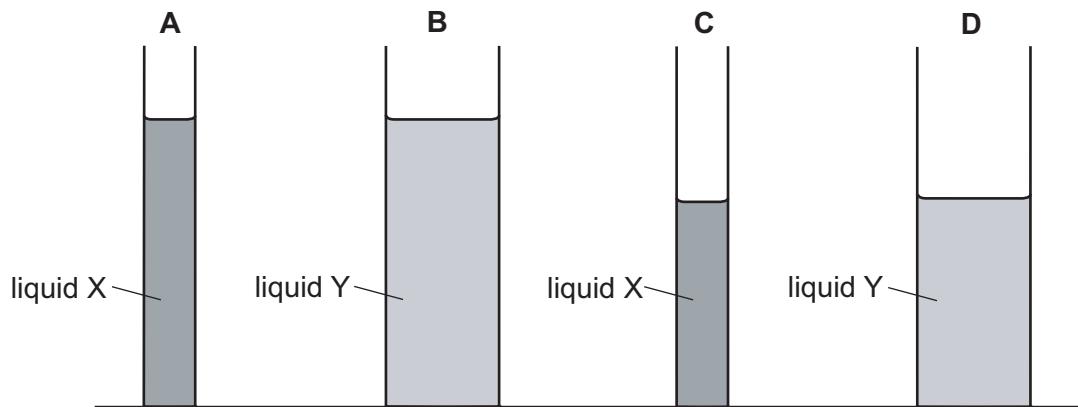
Which statement is correct?

- A The force of the pin is larger on the finger than on the thumb.
- B The force of the pin is larger on the thumb than on the finger.
- C The pressure of the pin is larger on the finger than on the thumb.
- D The pressure of the pin is larger on the thumb than on the finger.

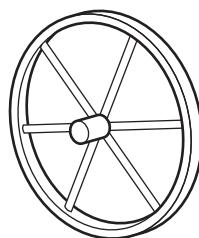
- 7 Liquid X has a density of 1010 kg/m^3 . Liquid Y has a density of 950 kg/m^3 .

The liquids are poured into tubes as shown.

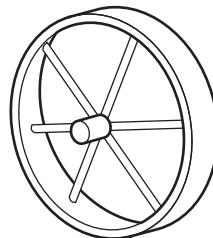
Which tube has the greatest pressure on its base?



- 8 A farmer has two carts. The carts have the same weight, but one has four narrow wheels and the other has four wide wheels.



narrow wheel



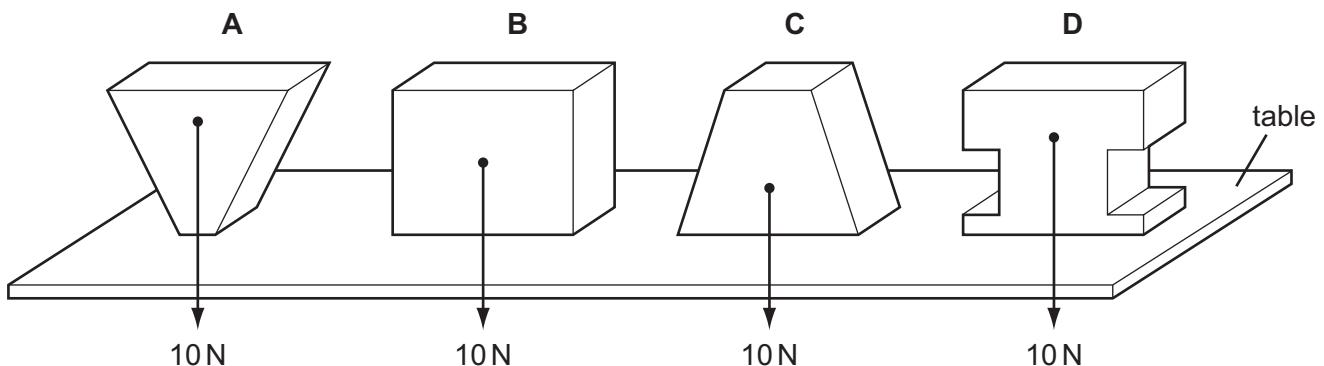
wide wheel

In rainy weather, which cart sinks **less** into soft ground, and why?

	cart wheels	why
A	narrow	greater pressure on the ground
B	narrow	less pressure on the ground
C	wide	greater pressure on the ground
D	wide	less pressure on the ground

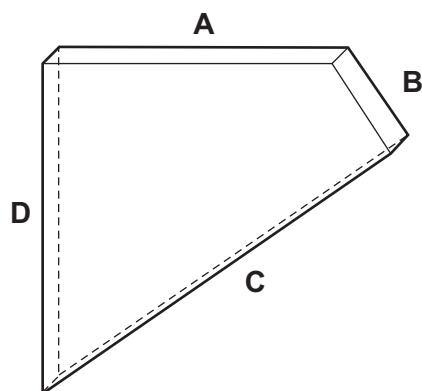
- 9 Four blocks, each weighing 10 N, rest on a horizontal table.

Which block applies the greatest pressure on the table?

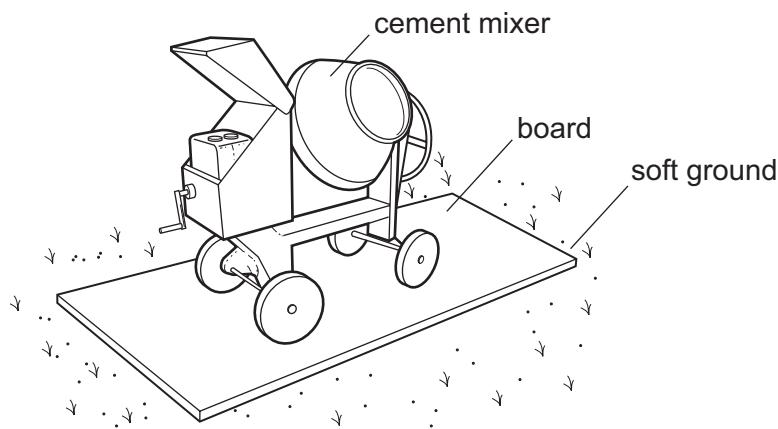


- 10 The diagram shows a thick sheet of glass.

Which edge must it stand on to cause the greatest pressure?



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

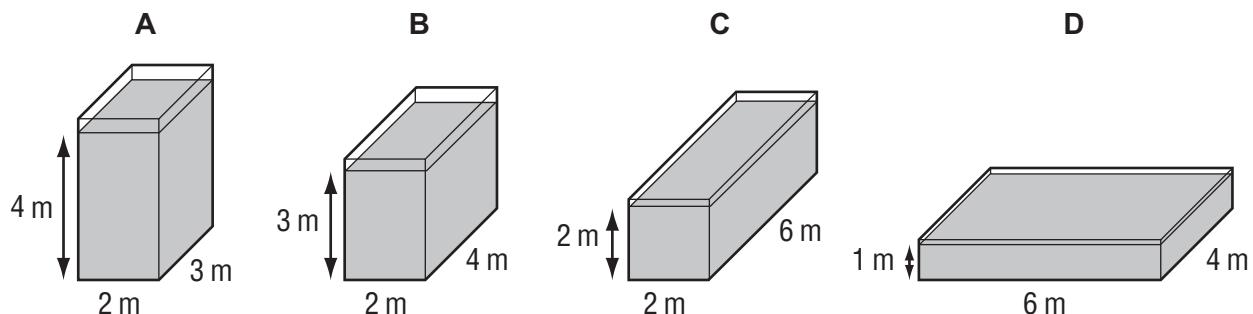


Why does this prevent the mixer sinking?

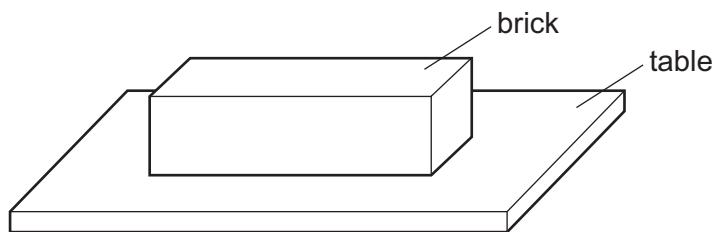
- A The large area decreases the pressure on the ground.
- B The large area increases the pressure on the ground.
- C The large area decreases the weight on the ground.
- D The large area increases the weight on the ground.

- 12 Four glass tanks contain water.

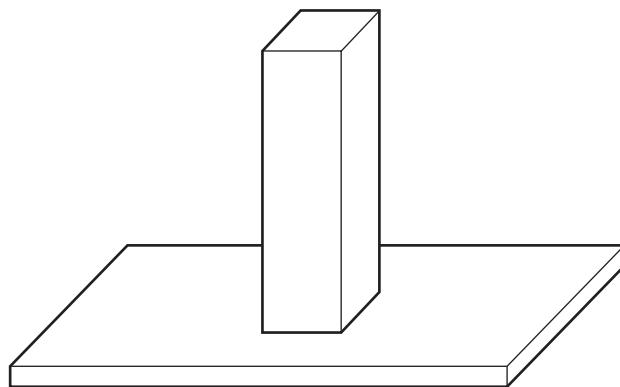
In which tank is the pressure of the water on the base greatest?



- 13 A brick with rectangular sides rests on a table.



The brick is now turned so that it rests on the table on its smallest face.

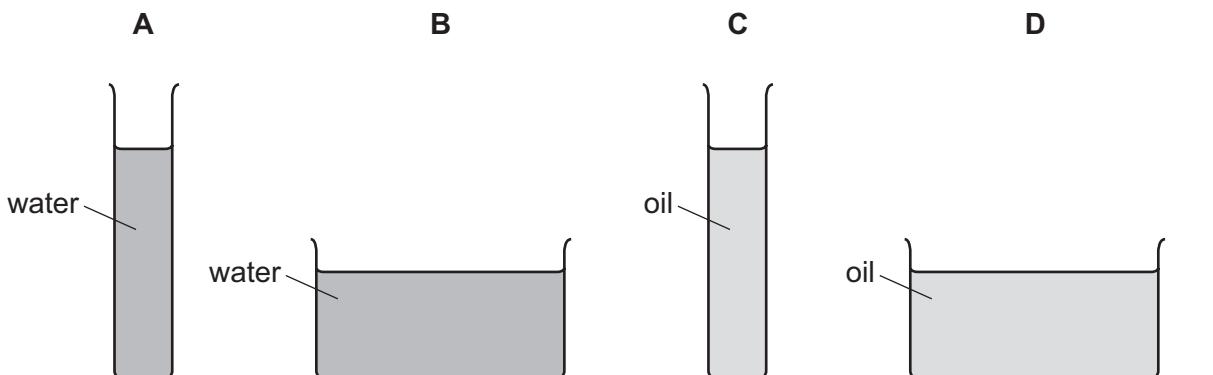


How has this change affected the force and the pressure exerted by the brick on the table?

	force	pressure
A	unchanged	unchanged
B	increased	unchanged
C	unchanged	increased
D	increased	increased

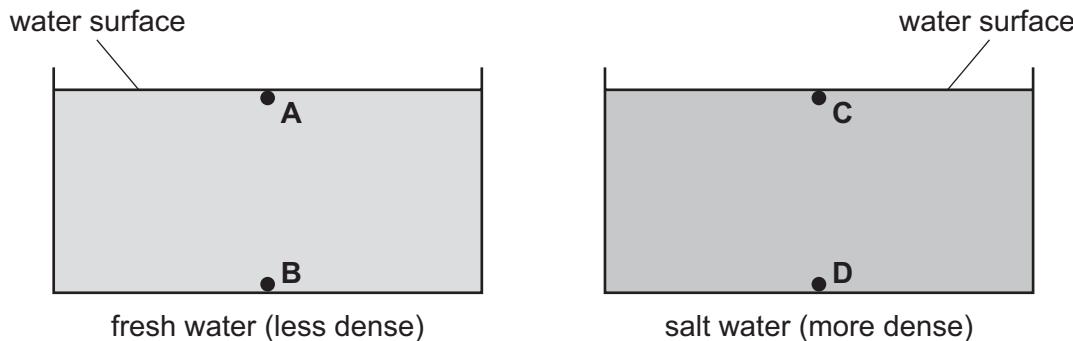
- 14 A student fills two containers with water (density 1.0 g/cm^3) and two with oil (density 0.8 g/cm^3), as shown in the diagrams.

In which container is the pressure on the base the greatest?

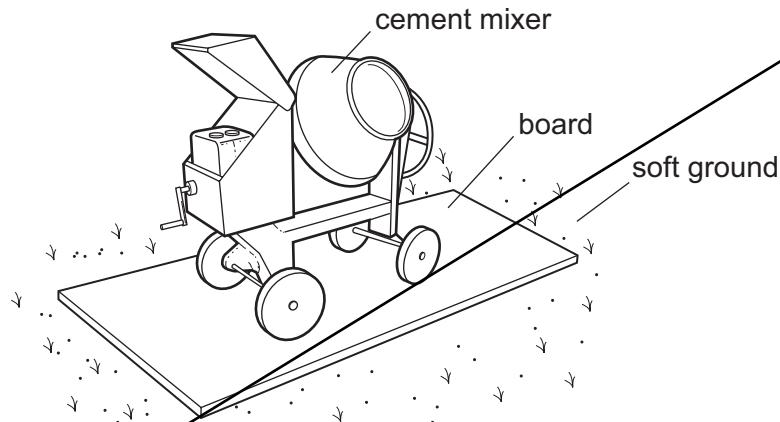


- 15 The diagrams show two swimming pools. One contains fresh water and the other contains salt water. Salt water is more dense than fresh water.

At which labelled point is the pressure the greatest?



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



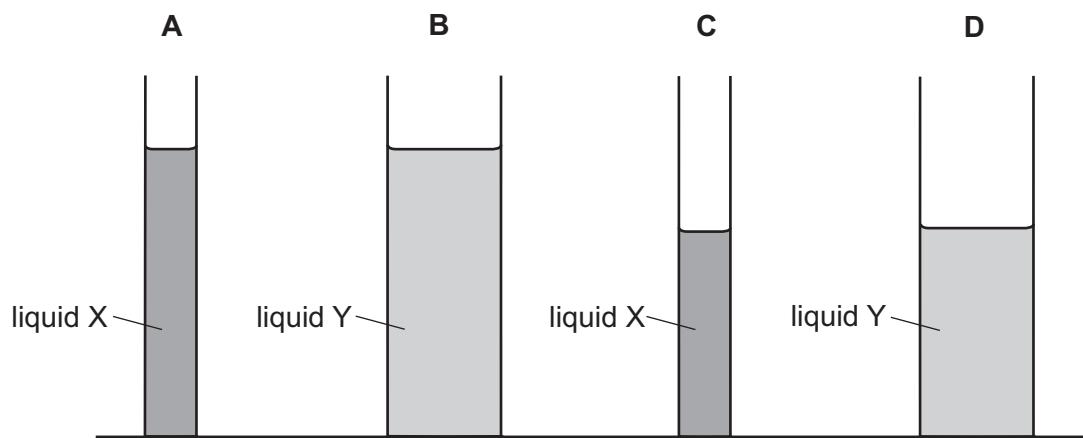
Why does this prevent the mixer sinking?

- 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.

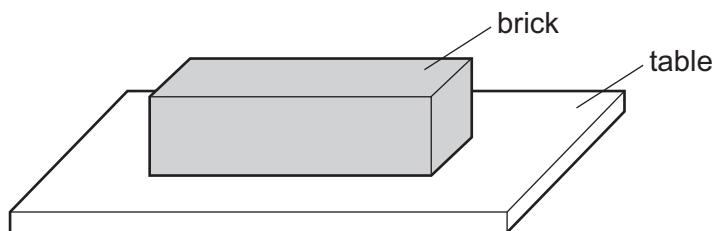
- 17 Liquid X has a density of 1010 kg/m^3 . Liquid Y has a density of 950 kg/m^3 .

The liquids are poured into tubes as shown.

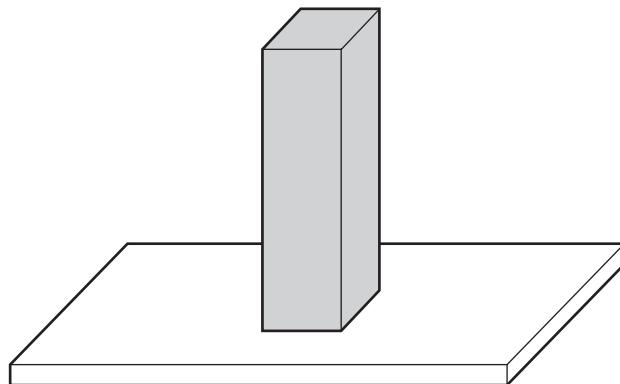
Which tube has the greatest pressure on its base?



- 18 A brick with flat, rectangular sides rests on a table.



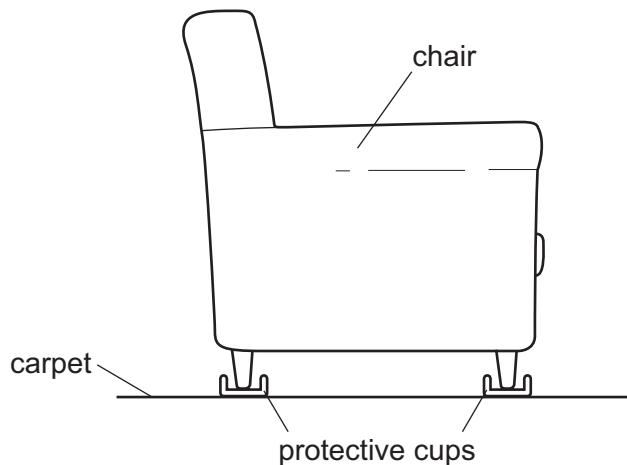
The brick is now turned so that it rests on the table on its smallest face.



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

	force	pressure
A	increased	increased
B	increased	unchanged
C	unchanged	increased
D	unchanged	unchanged

- 19 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

- 20 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.

- 21 In which position would a boy exert the **most** pressure on the ground?

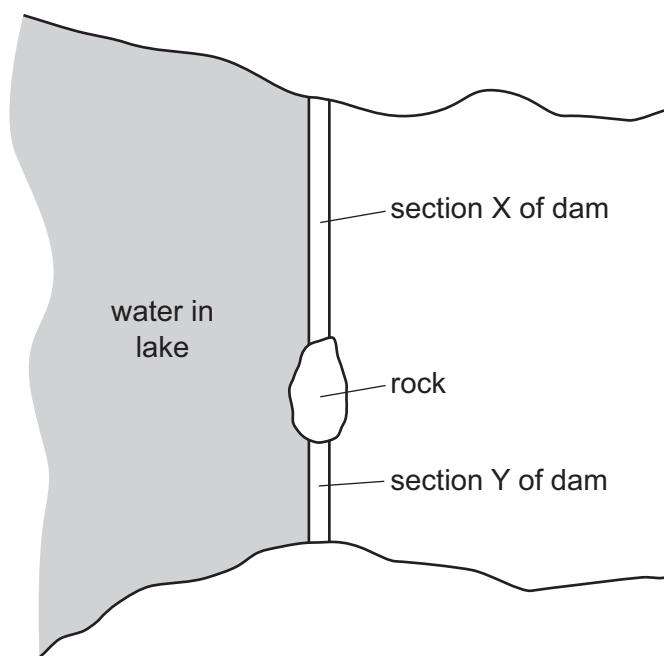
- A lying on his back
- B sitting down
- C standing on one foot
- D standing on two feet

- 22 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
- 23 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.

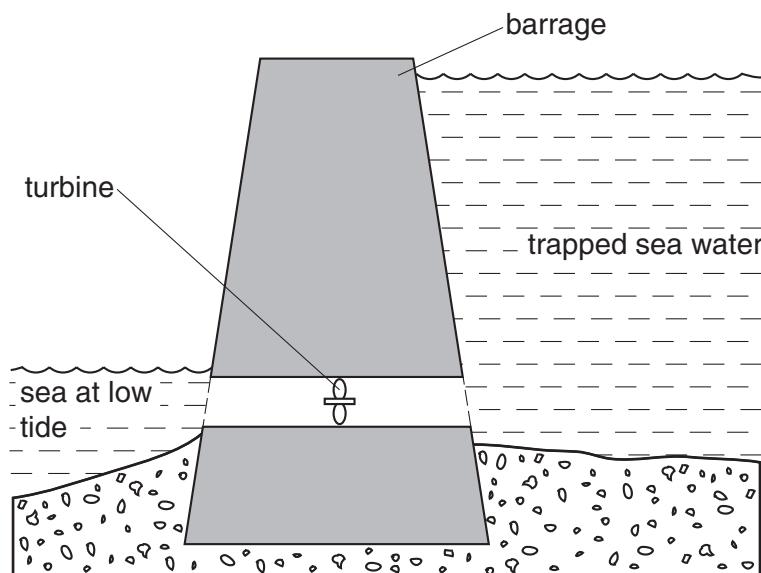
Chapter 6. Energy transformations

6.1 Energy conversion

- 1 Which device is designed to convert chemical energy into kinetic energy (energy of motion)?
 - A** an a.c. generator
 - B** a battery-powered torch
 - C** a car engine
 - D** a wind-up mechanical clock

- 2 What is the source of the energy converted by a hydro-electric power station?
 - A** hot rocks
 - B** falling water
 - C** oil
 - D** waves

- 3 A tidal power station is made by building a barrage across the mouth of a river. At high tide the sea water is trapped behind the barrage.

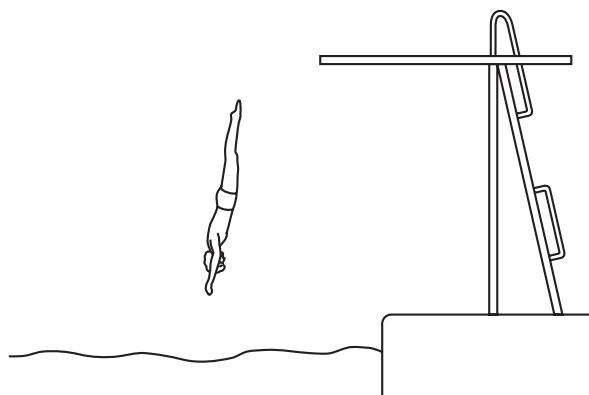


At low tide the water is allowed to flow back into the sea through a turbine.

What is the useful energy change in a tidal power station?

- A** electrical energy → energy of position (potential)
- B** electrical energy → energy of motion (kinetic)
- C** energy of motion (kinetic) → energy of position (potential)
- D** energy of position (potential) → electrical energy

- 4 The diagram shows a man diving into water.



Which form of energy is increasing as he falls?

- A chemical
 - B gravitational
 - C kinetic
 - D strain
- 5 A child pushes a toy car along a level floor and then lets it go.

As the car slows down, what is the main energy change?

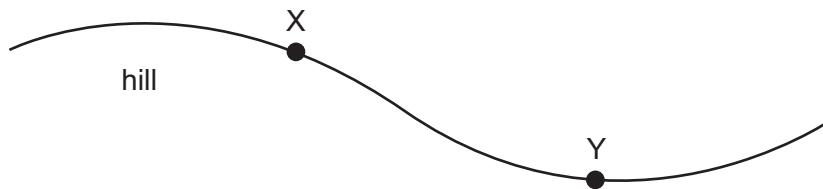
- A from chemical to heat
 - B from chemical to kinetic
 - C from kinetic to gravitational (potential)
 - D from kinetic to heat
- 6 What is designed to change electrical energy into kinetic energy?

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

- 7 Which source of energy uses the production of steam to generate electricity?
- A hydroelectric
 - B nuclear
 - C tides
 - D waves

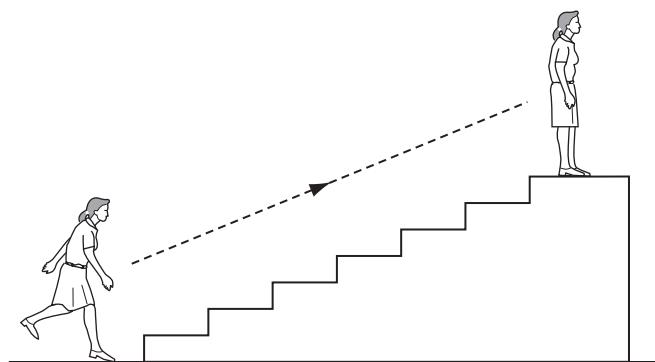
- 8 A cyclist travels down a hill from rest at point X without pedalling.

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



Which energy changes have taken place between X and Y?

- A kinetic → internal (heat) → gravitational potential
 - B kinetic → gravitational potential → internal (heat)
 - C gravitational potential → internal (heat) → kinetic
 - D gravitational potential → kinetic → internal (heat)
- 9 Which form of energy is used to generate electrical energy in a tidal power station?
- A chemical energy
 - B gravitational energy
 - C internal energy (thermal energy)
 - D nuclear energy
- 10 A person uses chemical energy to run up some stairs.

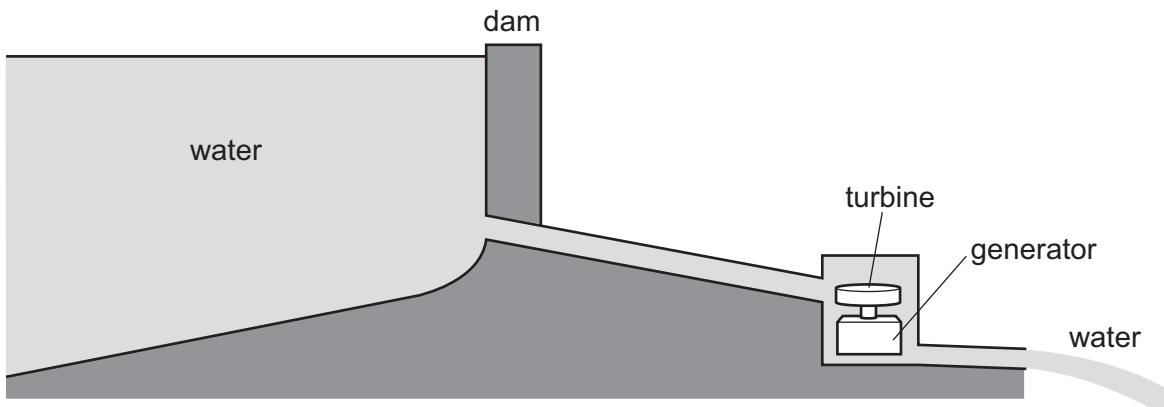


She stops at the top of the stairs.

What has the chemical energy been converted to when she is at the top of the stairs?

- A kinetic energy and gravitational energy
- B kinetic energy and strain energy
- C gravitational energy and heat energy
- D strain energy and heat energy

- 11 The diagram shows water stored behind a dam.



The water flows to a turbine and turns a generator.

Which sequence for the conversion of energy is correct?

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

- 12 The diagram shows a microphone being used in an interview.



Which energy change takes place in the microphone?

	input energy	output energy
A	chemical	electrical
B	electrical	chemical
C	electrical	sound
D	sound	electrical

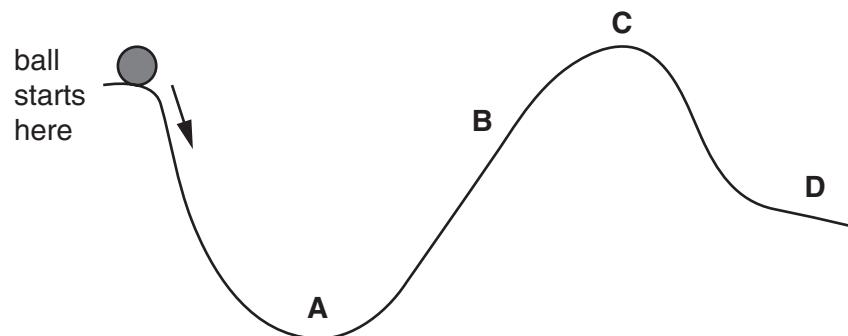
13 Which of these is designed to change electrical energy into kinetic energy?

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

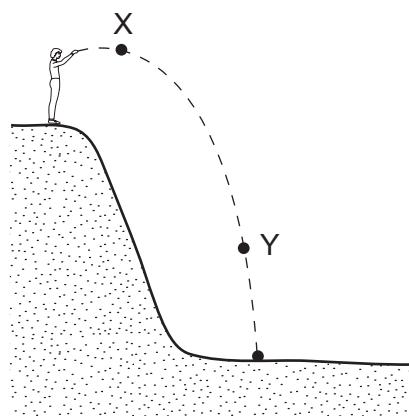
6.2 Conservation of energy

1 A ball is released from rest and rolls down a track from the position shown.

What is the furthest position the ball could reach?



2 A man standing at the top of a cliff throws a stone.



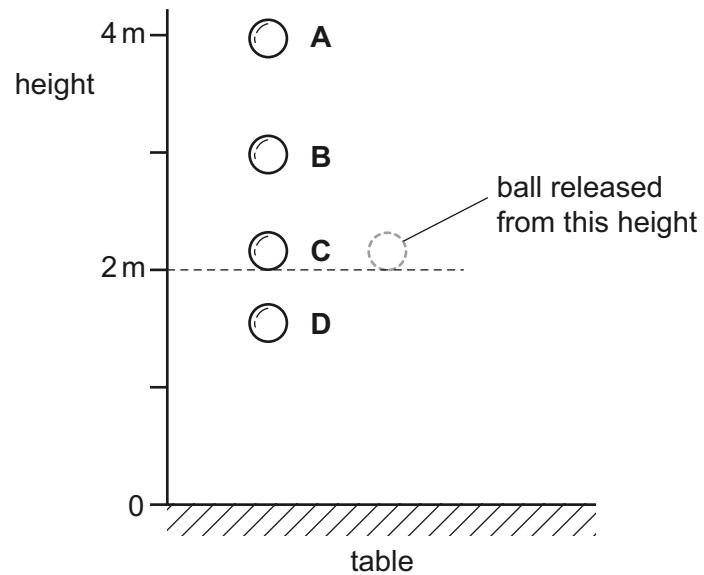
Which forms of energy does the stone have at X and at Y?

	energy at X	energy at Y
A	gravitational only	kinetic only
B	kinetic only	gravitational only
C	gravitational only	gravitational and kinetic
D	gravitational and kinetic	gravitational and kinetic

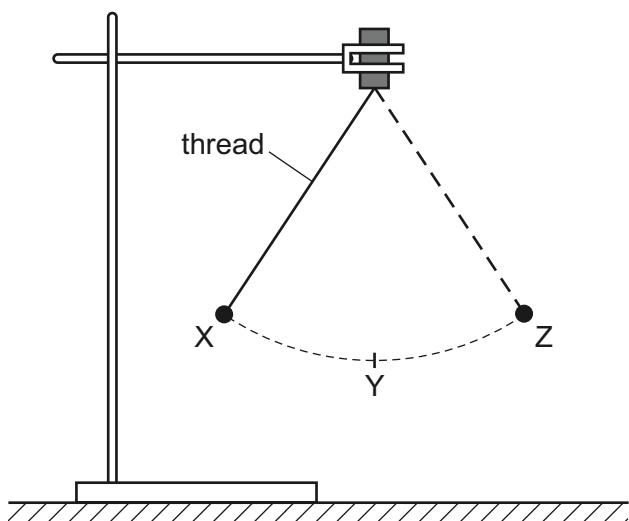
- 3 A rubber ball is dropped from a height of 2 m on to a table.

Whilst in contact with the table, some of its energy is converted into internal energy.

What is the highest possible point the ball could reach after bouncing?



- 4 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.

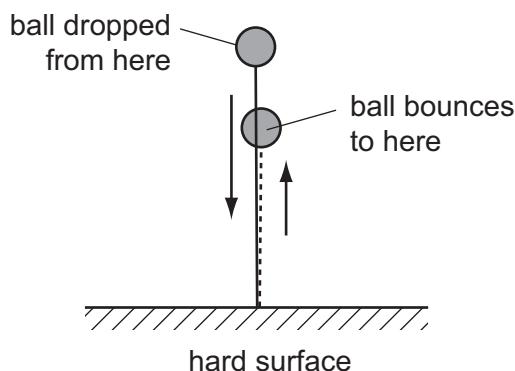
$$\text{gravitational potential energy} = \text{kinetic energy} + \dots \text{energy} + \text{energy losses}$$

at X at Y at Y

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

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

- 5 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?

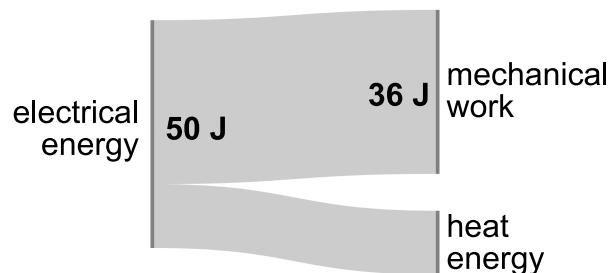
- A It is converted into chemical and strain energy.
- B It is converted into internal (heat) energy and sound.
- C It is destroyed as the ball rises upwards after hitting the ground.
- D It is destroyed when the ball hits the ground.

- 6 Which appliance could the following Sankey diagram represent?



- A light bulb
- B television
- C hair dryer
- D toaster

- 7 Examining the Sankey diagram for an electrical motor lifting a load, below, how much thermal energy does the motor produce?



- A** 14 J
- B** 50 J
- C** 86 J
- D** 36 J

Chapter 7. Energy resources

7.1 The forms of energy

- 1 In a car engine, energy stored in the fuel is converted into thermal energy (heat energy) and energy of motion (kinetic energy).

In which form is the energy stored in the fuel?

- A chemical
- B geothermal
- C hydroelectric
- D nuclear

- 2 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 internal energy.

- 3 Which type of power station does **not** use steam from boiling water to generate electricity?

- A geothermal
- B hydroelectric
- C nuclear
- D oil-fired

- 4 Electrical energy may be obtained from nuclear fission.

In what 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

5 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 geothermal
- C hydroelectric
- D nuclear

6 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)

7 Which energy resource is used to generate electricity by first boiling water?

- A hydroelectric
- B nuclear fission
- C tides
- D waves

8 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

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 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.

11 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.

12 How might thermal power generation be classified?

- A conventional, renewable, polluting
- B conventional, nonrenewable, polluting
- C nonconventional, nonrenewable, nonpolluting
- D conventional, renewable, nonpolluting

13 Aerobic digestion of sewage is used to produce which of the following?

- A biomass
- B biofuels
- C synthetic fuels
- D metallic substances

14 Biofuels are which of the following?

- A pollution producing
- B organic waste
- C renewable
- D orthodox

15 The amount of oil that may become available for use is called which of the following?

- A reserves
- B reservoirs
- C resources
- D traps

16 Nuclear energy is derived from _____ ?

- A uranium combustion
- B uranium fusion
- C uranium fission
- D breaking of uranium bonds

17 What type of energy is derived from heated groundwater?

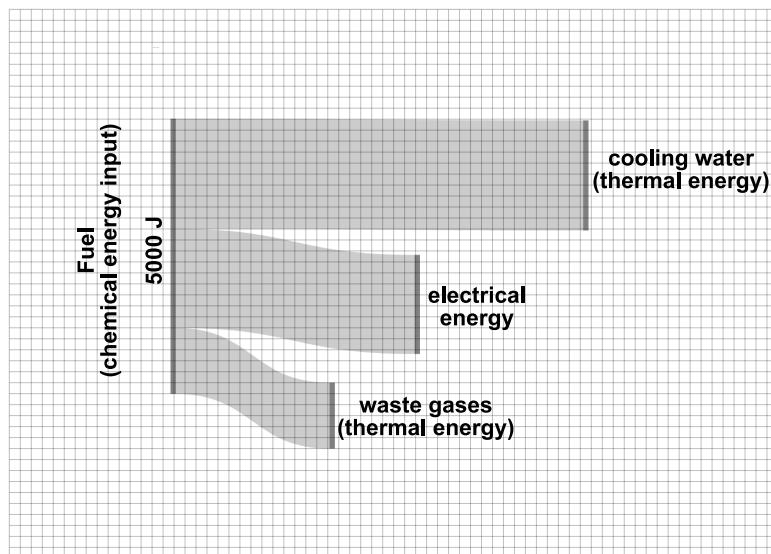
- A solar
- B geothermal
- C hydroelectric
- D nuclear

18 What does the word photovoltaic mean?

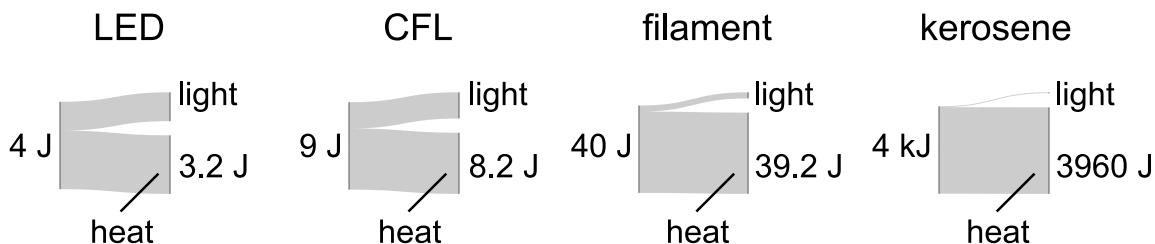
- A sun powered
- B light cells
- C light electricity
- D solar energy

- 19 The Sankey diagram for a thermal power station is shown below, where one small square represents 200 joules. How much useful energy is produced by this power station?

- A 0.9 kJ
- B 1.8 kJ
- C 2.0 kJ
- D 1.2 kJ



- 20 The Sankey diagrams for four different lights (traditional filament lamp, LED, CFL, old-school kerosene) are shown below. Energy input is to the left. Which lamp has the highest efficiency?



- A LED
- B CFL
- C filament
- D kerosene

7.2 Energy from the Sun

- 1 Which form of energy do we receive directly from the Sun?

- A chemical
- B light
- C nuclear
- D sound

Chapter 8. Work and power

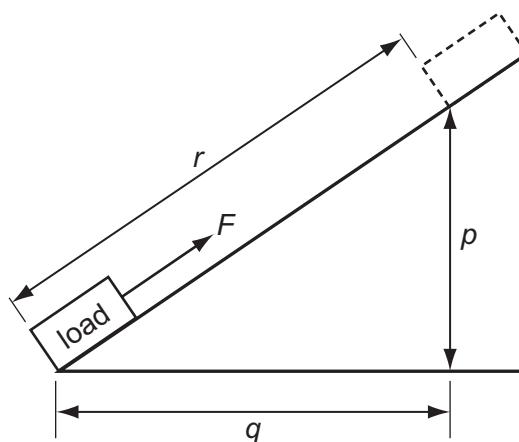
8.1 Calculating work

- 1 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

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

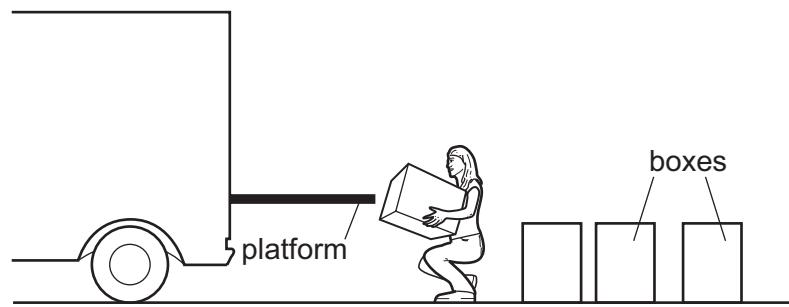


The work done by the force depends on the size of the force, and on a distance.

What is this distance?

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

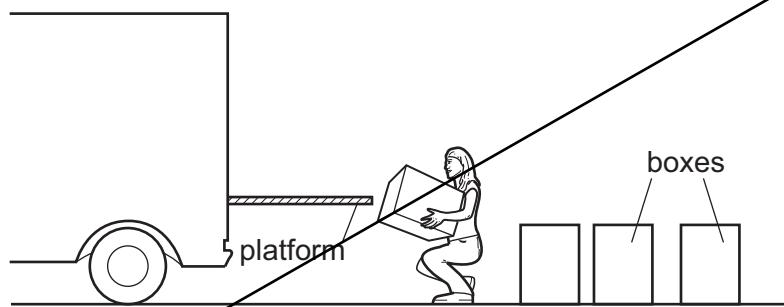
- 3 A person lifts boxes of equal weight on to a platform.



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

- 4 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

- 5 A given force F moves an object through displacement d . How is work W done by force F defined?

- A $F \times d$
- B F / d
- C d / F
- D $F \times d/2$

- 6 Both the moment of a force and the work done by a force have the same dimensions of newtons x metres. What, if anything, differentiates these two concepts?

- A One refers to displacement; the other, distance.
- B They are distinct: one is a vector; the other, a scalar.
- C They can both be used to analyze physical problems.
- D All of the above are applicable.

- 7 According to the work-energy theorem, how can one calculate the change in kinetic energy of an object?
- A Calculate the force on an object that points in the same direction as the motion of that object.
- B Find the change in potential energy of the object.
- C Equate it to the work done on the object.
- D Calculate the net force on an object.
- 8 A construction worker holds a heavy brick of mass m a distance h above Earth's surface. How much work is done?
- A mgh
- B zero
- C $-mgh$
- D It is impossible to calculate.

8.2 Power

- 1 A labourer on a building site lifts heavy concrete blocks onto a lorry. Lighter blocks are now lifted the same distance in the same time.

What happens to the work done in lifting each block and the power exerted by the labourer?

	work done in lifting each block	power exerted by labourer
A	decreases	decreases
B	decreases	remains the same
C	increases	increases
D	remains the same	increases

- 2 A labourer on a building site lifts a heavy concrete block onto a lorry. He then lifts a light block the same distance in the same time.

Which of the following is true?

	work done in lifting the blocks	power exerted by labourer
A	less for the light block	less for the light block
B	less for the light block	the same for both blocks
C	more for the light block	more for the light block
D	the same for both blocks	more for the light block

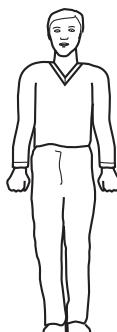
8.3 Calculating power

1 A large electric motor is used to lift a container off a ship.

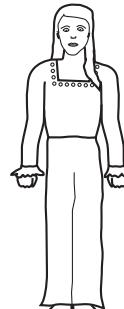
Which of the following values are enough to allow the power of the motor to be calculated?

- A the mass of the container and the distance moved
- B the force used and the distance moved
- C the current used and the work done
- D the work done and the time taken

2 A boy and a girl run up a hill in the same time.



boy weighs 600 N



girl weighs 500 N

The boy weighs more than the girl.

Which statement is true about the power produced?

- A The boy produces more power.
- B The girl produces more power.
- C They both produce the same power.
- D It is impossible to tell who produces more power.

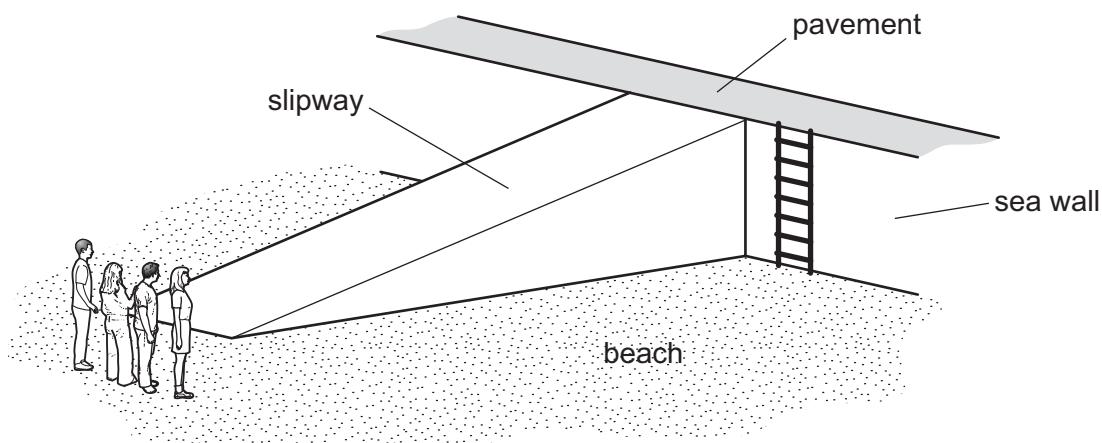
3 A worker is lifting boxes of identical weight from the ground onto a moving belt.

At first, it takes him 2 s to lift each box. Later in the day, it takes him 3 s.

Which statement is correct?

- A Later in the day, less work is done in lifting each box.
- B Later in the day, more work is done in lifting each box.
- C Later in the day, less power is developed in lifting each box.
- D Later in the day, more power is developed in lifting each box.

- 4 Four people of equal weight on a beach use different routes to get to the top of a sea wall.



Which person produces the **greatest** average power?

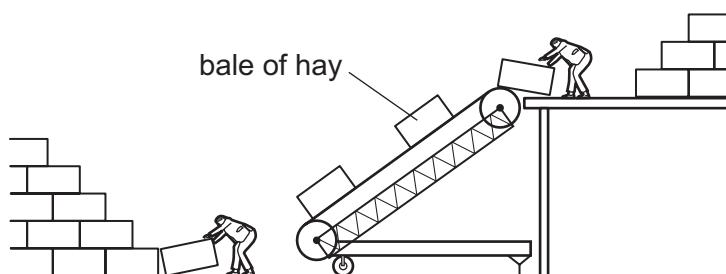
person	route	time taken
A	runs across the beach, then climbs the ladder	8 s
B	walks across the beach, then climbs the ladder	16 s
C	runs up the slipway	5 s
D	walks up the slipway	10 s

- 5 The table shows the times taken for four children to run up a set of stairs.

Which child's power is greatest?

	mass of child / kg	time / s
A	40	10
B	40	20
C	60	10
D	60	20

- 6 Two farmers use an electrically powered elevator to lift bales of hay. All the bales of hay have the same mass.



As sunset approaches, they increase the speed of the motor so that more bales are lifted up in a given time.

How does this affect the work done in lifting each bale and the useful output power of the motor?

	work done in lifting each bale	useful output power of the motor
A	increases	decreases
B	increases	increases
C	no change	decreases
D	no change	increases

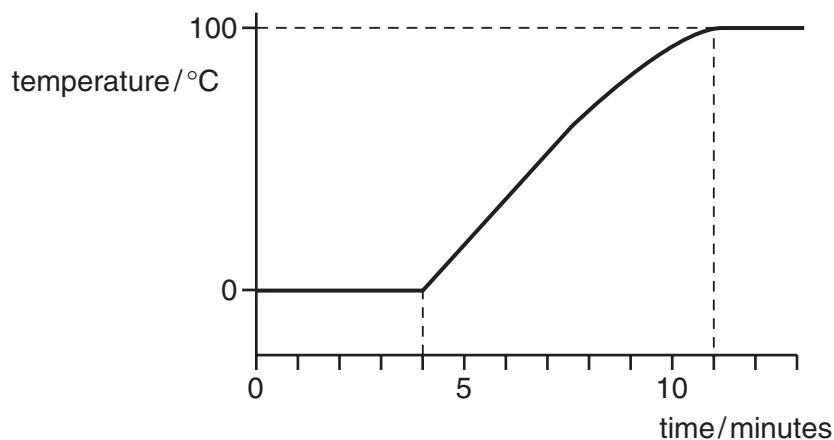
Part II**Thermal physics**

Chapter 9. The kinetic model of matter

9.1 States of matter

- 1 A block of ice is heated at a constant rate. Eventually the melted ice boils.

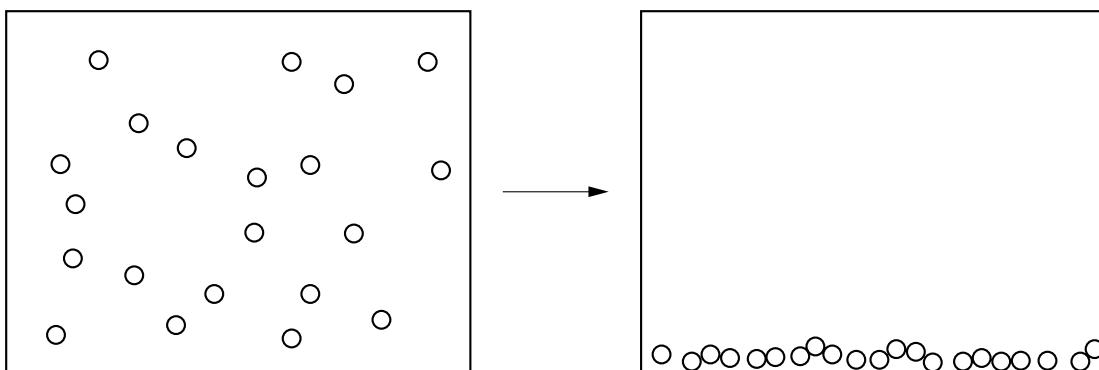
The graph shows how the temperature changes with time.



How many minutes did it take to melt all the ice?

- A 4 B 7 C 11 D 13

- 2 The diagram shows how the atoms in a substance rearrange themselves during a change of state.

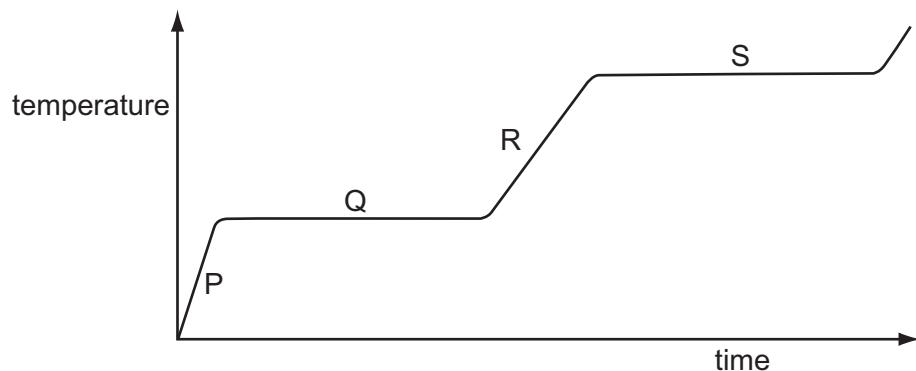


Which change of state is shown?

- A gas to liquid
B liquid to gas
C liquid to solid
D solid to liquid

- 3 A substance is heated at a steady rate. It changes from a solid to a liquid, and then to a gas.

The graph shows how its temperature changes with time.

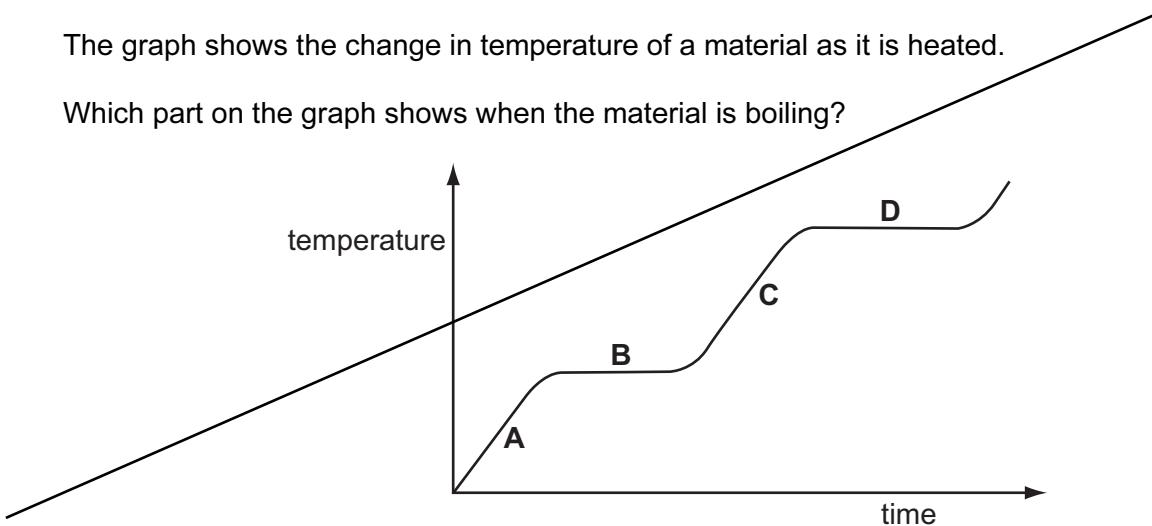


Which parts of the graph show a change of state taking place?

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

- 4 The graph shows the change in temperature of a material as it is heated.

Which part on the graph shows when the material is boiling?



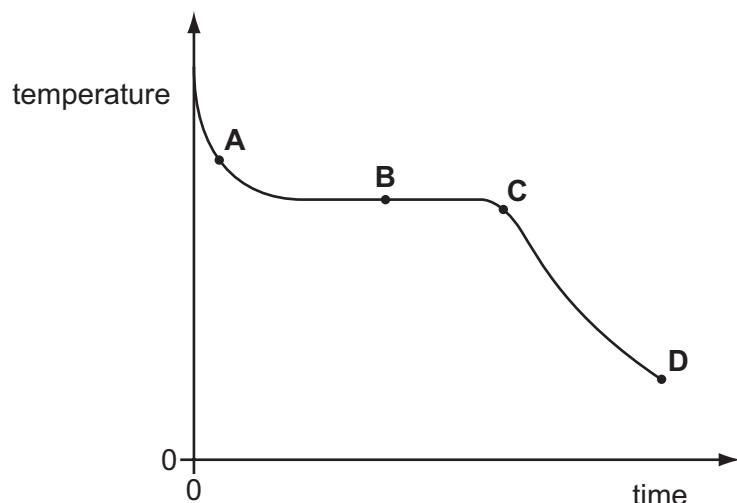
- 5 A block of ice is heated until it has all melted. The water that is produced is then heated until it boils.

Which line in the table states what happens to the temperature of the ice while it is melting, and to the temperature of the water while it is boiling?

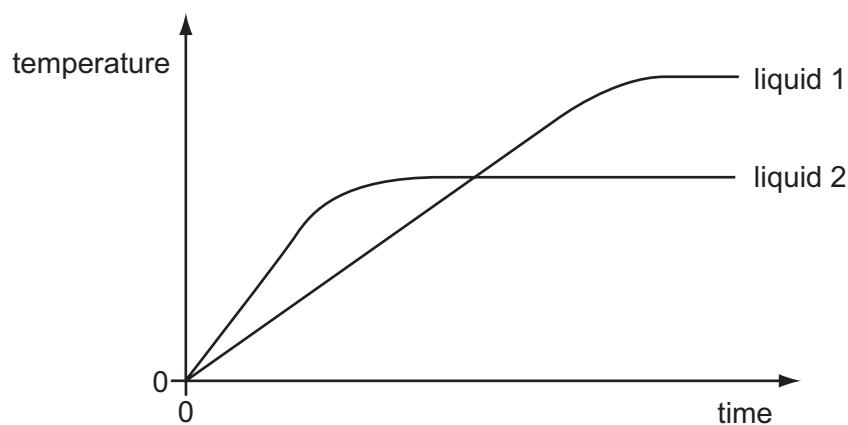
	temperature of ice while it is melting	temperature of water while it is boiling
A	increases	increases
B	increases	stays the same
C	stays the same	increases
D	stays the same	stays the same

- 6 The graph shows how the temperature of hot liquid wax changes with time as the wax is allowed to cool.

At which labelled point on the graph are both liquid wax and solid wax present?



- 7 Equal masses of two different liquids are heated using the same heater. The graph shows how the temperature of each liquid changes with time.



What does the graph tell us about the liquids?

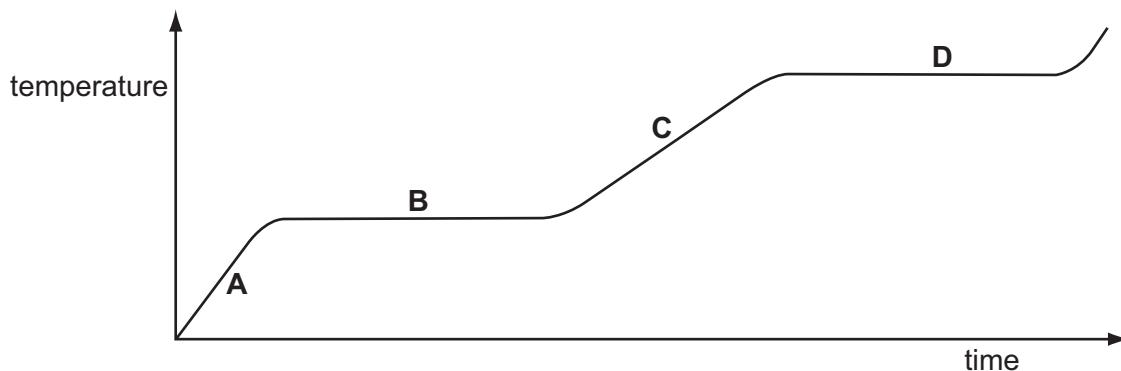
- A Liquid 1 has a higher melting point than liquid 2.
 - B Liquid 1 has a higher boiling point than liquid 2.
 - C Liquid 1 starts to melt sooner than liquid 2.
 - D Liquid 1 starts to boil sooner than liquid 2.
- 8 In an experiment, some of a substance changes from a liquid to a gas. The temperature of the remaining liquid changes because of this.

What is the name for this change of state and how does the temperature change?

	change of state	how temperature changes
A	condensation	decreases
B	condensation	increases
C	evaporation	decreases
D	evaporation	increases

- 9 The graph shows the change in temperature of a substance as it is heated steadily.

Which part of the graph shows when the substance is boiling?

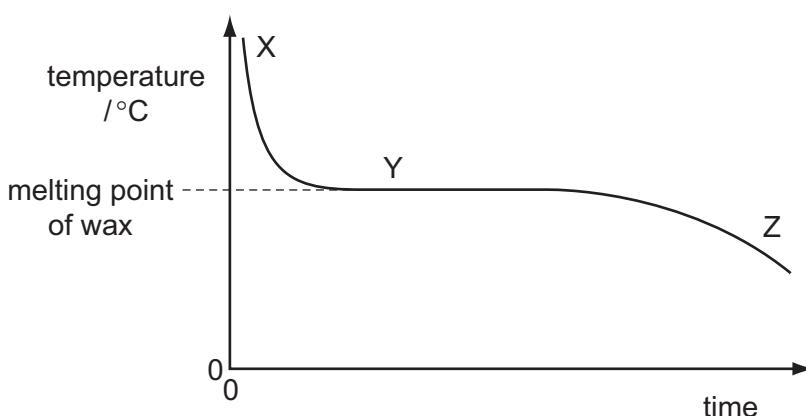


- 10 The table gives the melting points and boiling points of glycerine and benzene.

	melting point	boiling point
glycerine	18 °C	290 °C
benzene	5.4 °C	80 °C

At which temperature will both glycerine and benzene be liquid?

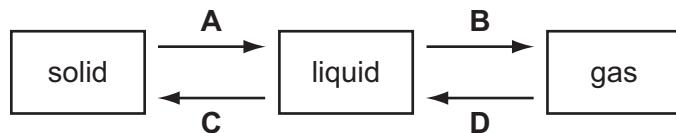
- A 0 °C B 50 °C C 100 °C D 150 °C
- 11 A student carries out an experiment to find the melting point of wax. The graph shows how the temperature of the wax changes as it cools.



Which statement is correct?

- A At X the temperature drops more slowly than at Z.
 B At Y all the wax is solid.
 C At Y thermal energy is being given out by the wax.
 D At Z the wax molecules are not moving.

- 12 Which change is condensation?



- 13 An ice cube at a temperature of 0°C is put into a drink at a temperature of 10°C .

After a short time, some of the ice has melted and the drink has cooled to a temperature of 8°C .

What is the temperature of the remaining ice?

- A** 0°C **B** 2°C **C** 4°C **D** 8°C

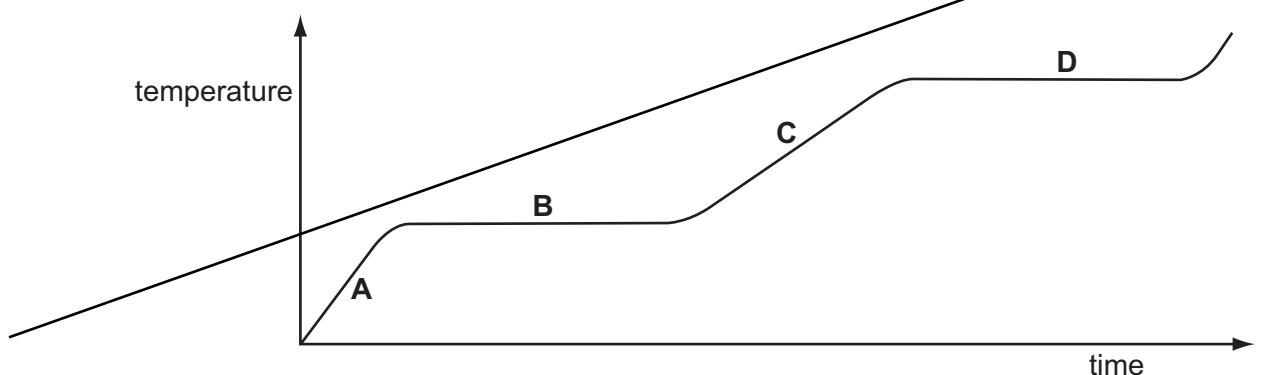
- 14 The particles of a substance become more closely packed and move more quickly.

What is happening to the substance?

- A** A gas is being heated and compressed.
B A gas is being heated and is expanding.
C A liquid is boiling.
D A liquid is evaporating at room temperature.

- 15 The graph shows the temperature of a substance as it is heated steadily.

In which part of the graph is the substance boiling?



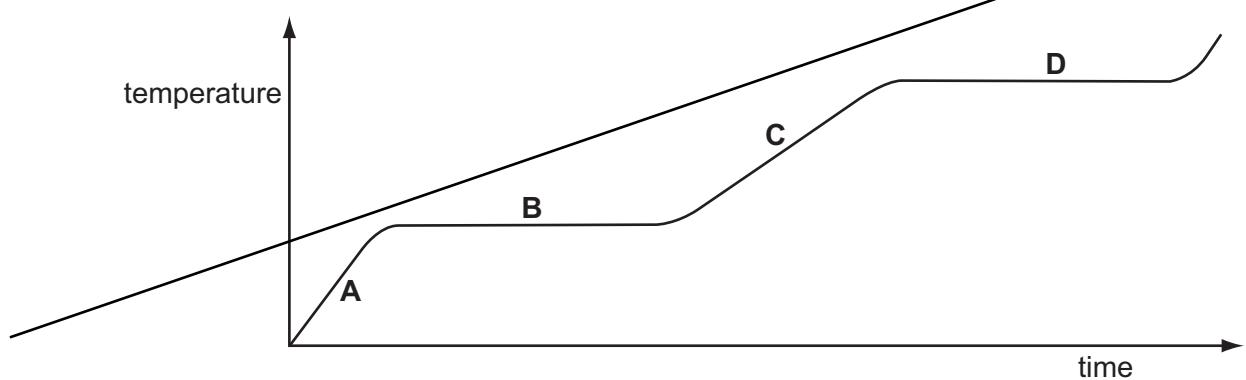
- 16 The table lists the melting points and the boiling points of four different substances.

Which substance is a liquid at 0°C ?

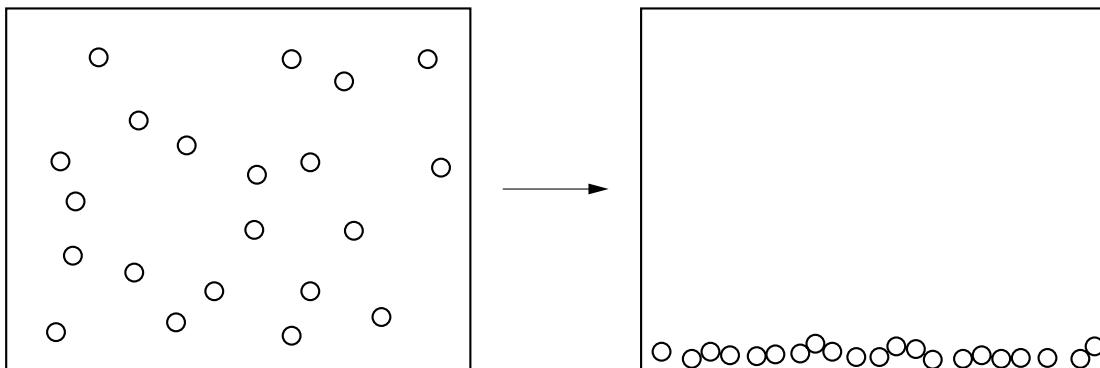
	melting point/ $^{\circ}\text{C}$	boiling point/ $^{\circ}\text{C}$
A	-219	-183
B	-7	58
C	98	890
D	1083	2582

- 17 The graph shows the temperature of a substance as it is heated steadily.

In which part of the graph is the substance boiling?



- 18 The diagram shows how the atoms in a substance rearrange themselves during a change of state.

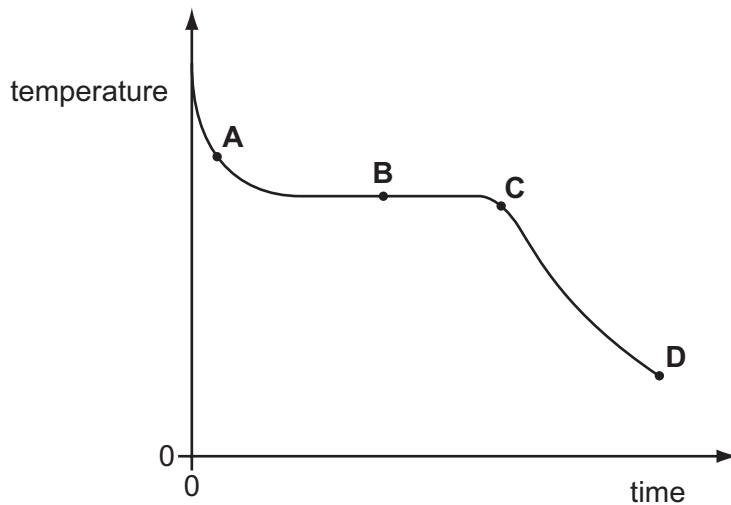


Which process accurately describes this transition?

- A** freezing
- B** condensing
- C** melting
- D** boiling

- 19 The graph shows how the temperature of hot liquid wax changes with time as the wax is allowed to cool.

At which labelled point on the graph is the wax freezing?



- 17 The air in a sealed container has a temperature of 20°C . If the air were to have twice as much energy, what would its temperature be?

- A 40°C
- B 313°C
- C 546°C
- D 586°C

- 18 Which statement best describes the motion of the particles in a substance at absolute zero temperature?

- A The particles are stationary.
- B The particles cannot gain any kinetic energy.
- C The particles cannot lose any kinetic energy.
- D The particles are frozen.

- 19 Which option below best characterises the strength of the interparticle forces present in solids, liquids, and gases?

- A gas > liquid > solid
- B gas > solid > liquid
- C liquid > gas > solid
- D solid > liquid > gas

9.2 The kinetic model of matter

- 1 When water evaporates, some molecules* escape.

Which molecules escape?

- A the molecules at the bottom of the liquid with less energy than others
- B the molecules at the bottom of the liquid with more energy than others
- C the molecules at the surface with less energy than others
- D the molecules at the surface with more energy than others

- 2 Which line in the table correctly describes whether the molecules of a solid, liquid and gas are moving or stationary?

	solid	liquid	gas
A	stationary	stationary	stationary
B	stationary	stationary	moving
C	stationary	moving	moving
D	moving	moving	moving

- 3 Some water molecules* escape from the surface of a lake.

Which name is given to this process?

- A boiling
- B convection
- C evaporation
- D radiation

- 4 Viewed through a microscope, very small particles can be seen moving with Brownian motion.

Which line in the table is correct?

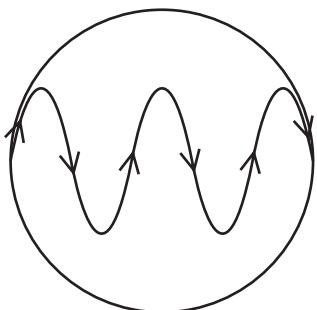
	type of motion of particles	particles are suspended in
A	vibration	a liquid or a gas
B	vibration	a solid, a liquid or a gas
C	random	a liquid or a gas
D	random	a solid, a liquid or a gas

*For questions referring to "molecules", you can usually replace the word with "particles composing the substance". Indeed, they might be atoms.

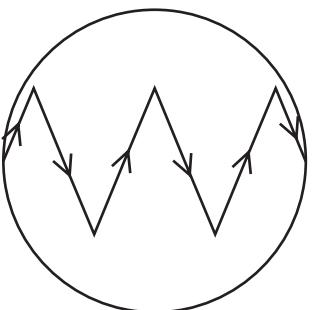
- 5 A suspension of pollen grains in water is observed under a microscope. The pollen grains are seen to be moving all the time.

Which diagram illustrates this motion?

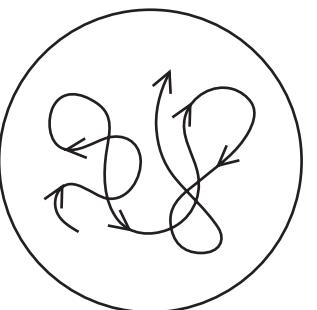
A



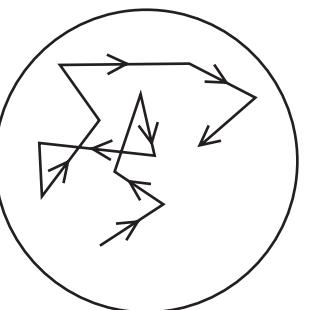
B



C



D



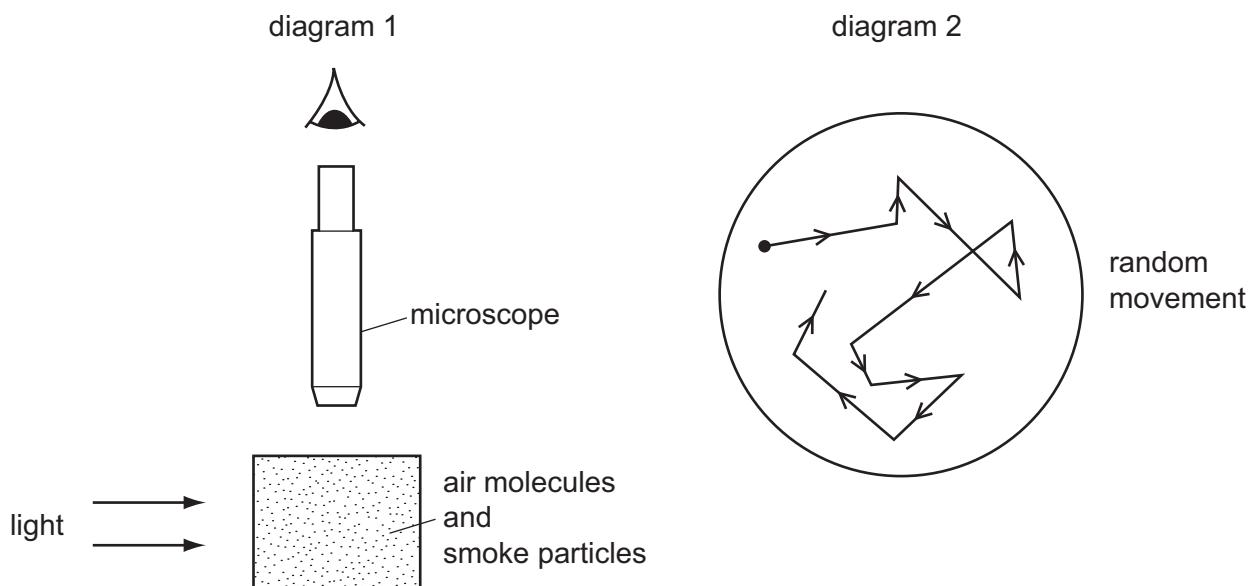
- 6 Brownian motion is seen by looking at smoke particles through a microscope.

How do the smoke particles move in Brownian motion?

- A all in the same direction
- B at random
- C in circles
- D vibrating about fixed points

7 Diagram 1 shows apparatus being used to observe smoke particles.

Diagram 2 shows how a smoke particle moves randomly.



Why do the smoke particles move randomly?

- A They are hit by air molecules.*
- B They are less dense than air.
- C They are moved by convection currents.
- D They gain energy from the light.

8 Which line in the table describes the properties of solids and of liquids at a fixed temperature?

	solids	liquids
A	definite volume and definite shape	no definite volume but definite shape
B	no definite volume but definite shape	definite volume and definite shape
C	definite volume and definite shape	definite volume but no definite shape
D	no definite volume but definite shape	no definite volume and no definite shape

- 9 Viewed through a microscope, very small particles can be seen moving with Brownian motion.

Which line in the table is correct?

	type of motion of particles	particles are suspended in
A	vibration	a liquid or a gas
B	vibration	a solid, a liquid or a gas
C	random	a liquid or a gas
D	random	a solid, a liquid or a gas

- 10 Brownian motion is observed by looking at smoke particles through a microscope.

How do the smoke particles move in Brownian motion?

- A all in the same direction
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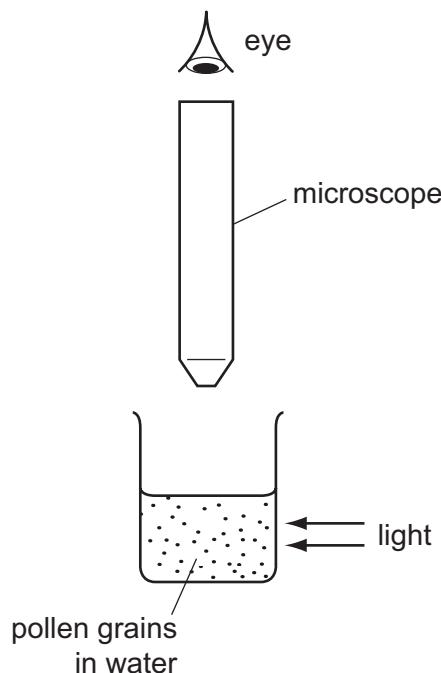
- 11 Brownian motion is observed when looking at smoke particles in air using a microscope.

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.

12 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

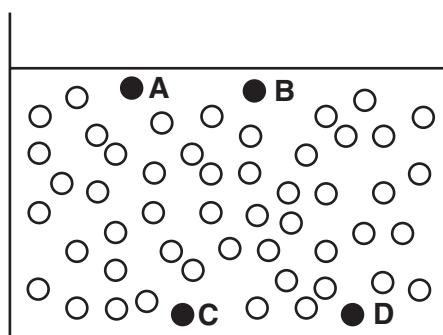
9.3 Evaporation

- 1 The diagram represents molecules* in a liquid.

A and **C** are molecules with a high amount of energy.

B and **D** are molecules with a low amount of energy.

Which molecule* is most likely to be leaving the liquid by evaporation?



- 2 A drop of liquid falls on a student's skin and quickly evaporates.

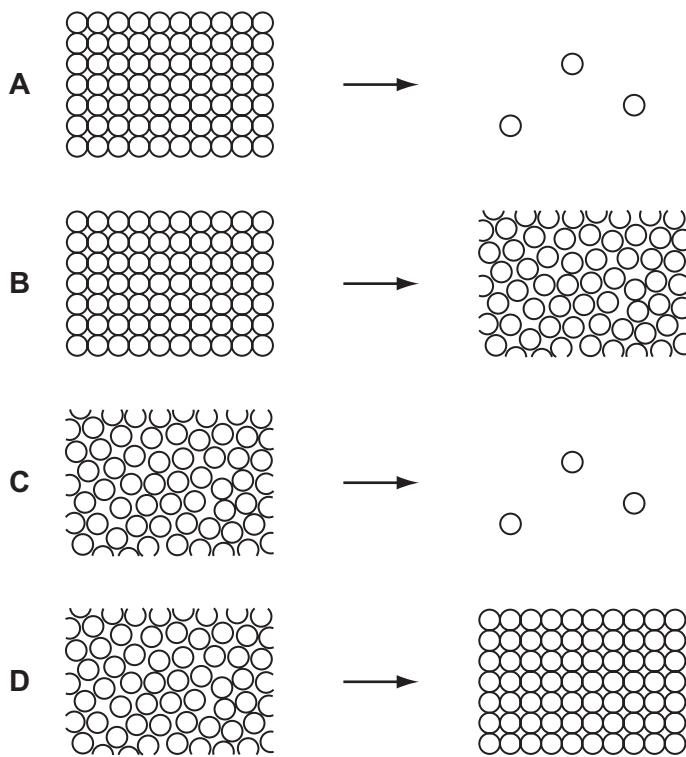
What is the effect on the skin and the reason?

- A** The skin cools because the most energetic molecules escape from the liquid.
- B** The skin cools because the most energetic molecules remain in the liquid.
- C** The skin warms because the most energetic molecules escape from the liquid.
- D** The skin warms because the most energetic molecules remain in the liquid.

*For questions referring to "molecules", you can usually replace the word with "particles composing the substance". Indeed, they might be atoms.

- 3 Water spilled on the ground on a hot day evaporates.

Which diagram represents the change in arrangement of the particles in the water as it evaporates?



- 4 A liquid is left in an open dish. After several days there is less liquid in the dish.

Which statement explains this?

- A** The least energetic molecules* leave the surface and escape into the air.
- B** The least energetic molecules* leave the surface and return.
- C** The most energetic molecules* leave the surface and escape into the air.
- D** The most energetic molecules* leave the surface and return.

- 5 A block of ice cream is prevented from melting by wrapping it in newspaper soaked in water. The water evaporates from the newspaper.

Which molecules* escape from the water and what happens to the average speed of the water molecules that remain in the newspaper?

	escaping molecules*	average speed of the remaining water molecules*
A	the more energetic ones	decreases
B	the more energetic ones	increases
C	the less energetic ones	decreases
D	the less energetic ones	increases

- 6 When a liquid evaporates, some molecules* escape from it and its temperature changes.

From where do the molecules* escape and what is the effect on the temperature of the liquid?

	molecules* escape from	temperature of liquid
A	all parts of the liquid	decreases
B	all parts of the liquid	increases
C	only the liquid surface	decreases
D	only the liquid surface	increases

- 7 Evaporation occurs when molecules* escape from a liquid surface into the air above it. During this process the temperature of the liquid falls.

Why does the temperature of the liquid fall?

- A The molecules* in the vapour expand because the pressure is less.
- B The molecules* left in the liquid have more space to move around.
- C The molecules* move more slowly when they escape into the air.
- D The molecules* with the highest energies escape into the air.

- 8 On a warm day, a swimmer climbs out of a swimming pool into the open air and water evaporates from his skin.

As the water evaporates, which molecules^{*} escape into the air first and what happens to the average speed of the remaining water molecules?

	first molecules to escape	average speed of the remaining molecules
A	least energetic	decreases
B	least energetic	increases
C	most energetic	decreases
D	most energetic	increases

- 9 A hot drink is left in a room that is at a temperature of 20 °C.

What has happened to the drink after ten minutes?

- A Its density is lower.
- B Its internal energy is lower.
- C Its particles have equal energies.
- D Its particles move more quickly.

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

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

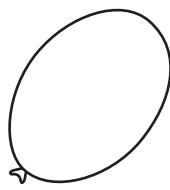
- A The less energetic water molecules^{*} on her skin escape quickly.
- B The more energetic water molecules^{*} on her skin do not escape quickly.
- C The water on her skin does not evaporate quickly enough to keep her warm.
- D The water on her skin evaporates quickly and cools her skin.

9.4 The kinetic theory*

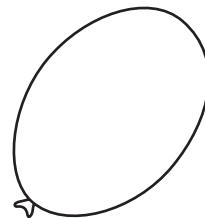
- 1 The size of a balloon increases when the pressure inside it increases.

The balloon gets bigger when it is left in the heat from the Sun.

cool balloon



hot balloon



Why does this happen?

- A The air molecules inside the balloon all move outwards when it is heated.
- B The air molecules inside the balloon are bigger when it is heated.
- C The air molecules inside the balloon move more quickly when it is heated.
- D The number of air molecules inside the balloon increases when it is heated.

- 2 Some gas in a sealed plastic bag is placed in a refrigerator to cool down.

How do the gas molecules behave when this happens?

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

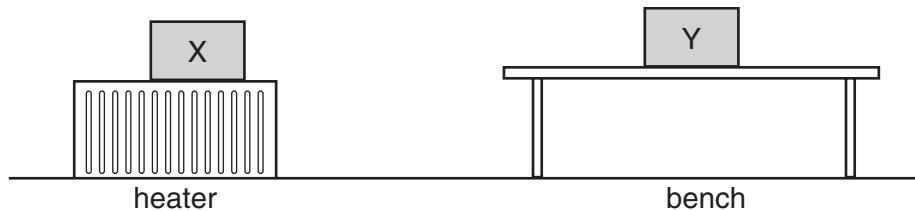
*For questions referring to "molecules", you can usually replace the word with "particles composing the substance". Indeed, they might be atoms.

- 3 A measured mass of gas is placed in a cylinder at atmospheric pressure and is then slowly compressed.



If the temperature of the gas does not change, what happens to the pressure of the gas?

- A It drops to zero.
 - B It decreases, but not to zero.
 - C It stays the same.
 - D It increases.
- 4 Two metal boxes containing air are standing in a room. Box X is on top of a heater. Box Y is on a bench. The boxes are left for a long time.



Which line in the table best describes the average speed of the molecules in the containers?

	box X	box Y
A	fast	zero
B	fast	slow
C	slow	fast
D	zero	fast

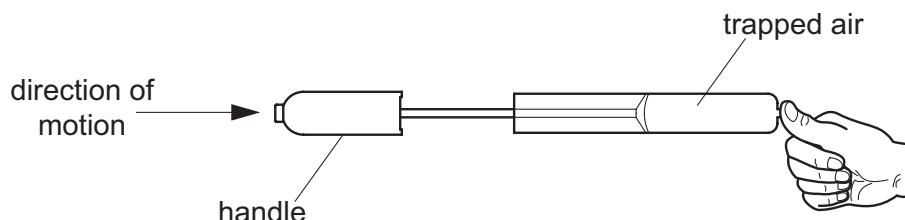
- 5 Driving a car raises the temperature of the tyres.

This causes the pressure of the air in the tyres to increase.

Why is this?

- A Air molecules break up to form separate atoms.
- B Air molecules expand with the rise in temperature.
- C The force between the air molecules increases.
- D The speed of the air molecules increases.

- 6 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 to the volume of the trapped air as the pump handle is pushed in?

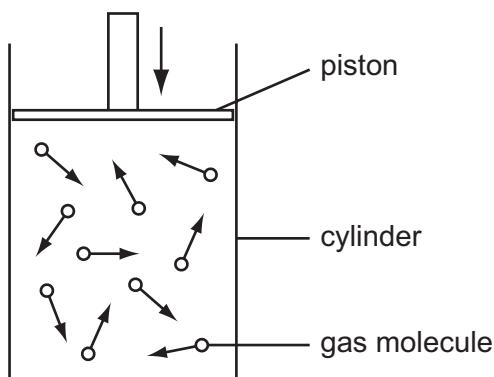
	pressure	volume
A	decreases	decreases
B	decreases	remains the same
C	increases	decreases
D	increases	remains the same

- 7 A balloon is inflated in a cold room. When the room becomes much warmer, the balloon becomes larger.

How does the behaviour of the air molecules in the balloon explain this?

- A The molecules become larger.
- B The molecules evaporate.
- C The molecules move more quickly.
- D The molecules repel each other.

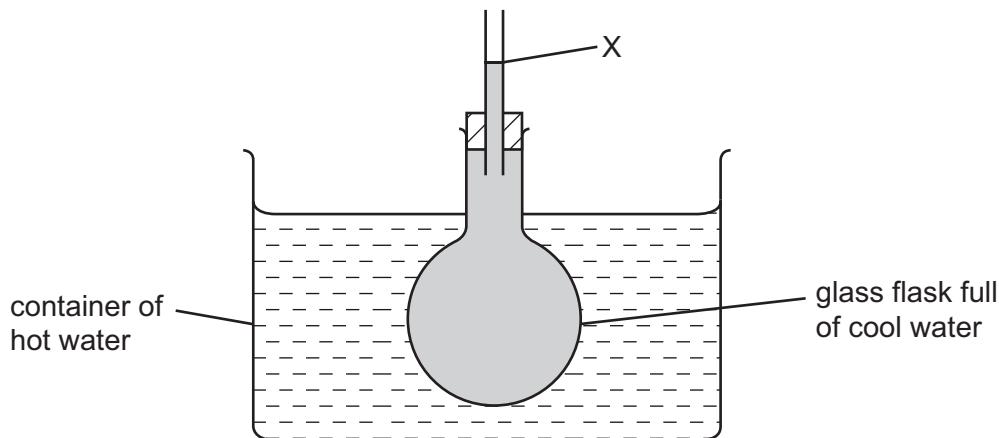
- 8 The diagram represents gas molecules contained in a cylinder. The piston is moved slowly downwards and the temperature of the gas stays the same.



Why does the pressure of the gas increase?

- A The molecules collide harder with the walls.
- B The molecules collide more often with the walls.
- C The molecules move more quickly.
- D The number of molecules increases.

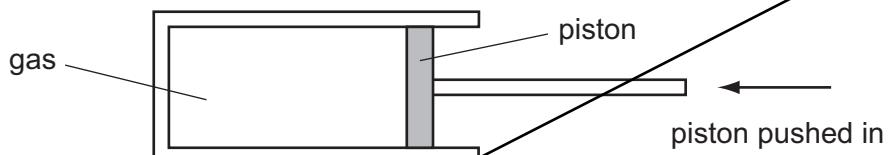
- 9 A glass flask full of cool water is placed in a container of hot water.



What will happen to the level of water at X as the cool water becomes warmer?

- A It will fall.
- B It will rise.
- C It will rise then fall.
- D It will stay the same.

- 10 A measured mass of gas is placed in a cylinder at atmospheric pressure and is then slowly compressed.

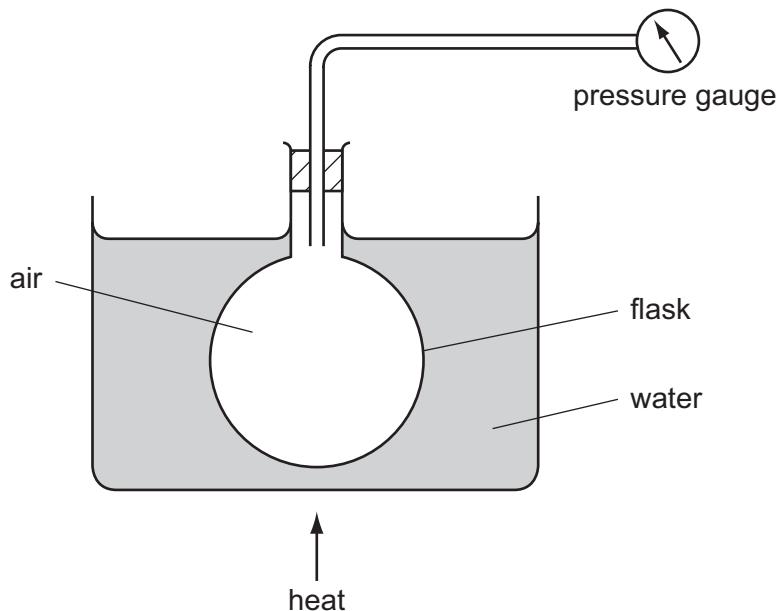


The temperature of the gas does not change.

What happens to the pressure of the gas?

- A It drops to zero.
- B It decreases, but not to zero.
- C It stays the same.
- D It increases.

- 11 An experiment is set up as shown.



What does the pressure gauge show as the air in the flask becomes hotter?

- A a steady pressure
- B a decrease in pressure
- C an increase in pressure
- D an increase and then a decrease in pressure

- 12 Driving a car raises the temperature of the tyres.

This causes the pressure of the air in the tyres to increase.

Why is this?

- A Air molecules break up to form separate atoms.
- B Air molecules expand with the rise in temperature.
- C The force between the air molecules increases.
- D The speed of the air molecules increases.

- 13 A gas cylinder is left outside on a sunny day.

The Sun heats the gas inside the cylinder.

What happens to the gas molecules?

- A They collide less often.
- B They expand.
- C They move closer together.
- D They move more rapidly.

- 14 A cylinder is filled with a gas and then sealed, so that the gas has a fixed volume.

The gas molecules are given energy so that their average speed increases.

What happens to the pressure and to the temperature of the gas in the cylinder?

	pressure	temperature
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 15 The gas in a container is heated but is kept at constant volume.

Why does the gas pressure increase?

- A The molecules expand.
- B The molecules increase in mass.
- C The molecules move further apart.
- D The molecules move more rapidly.

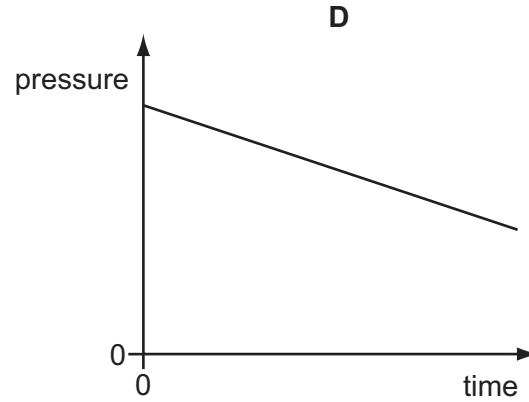
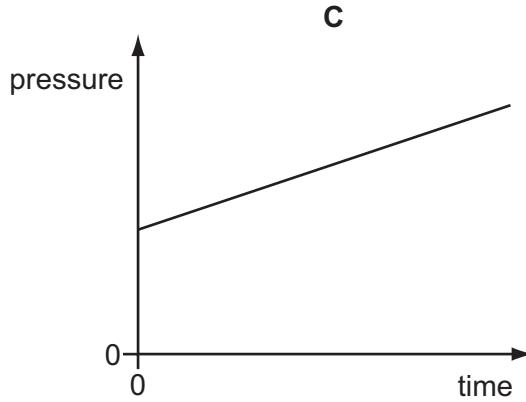
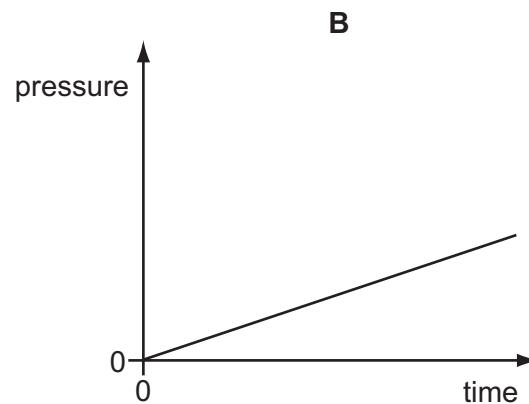
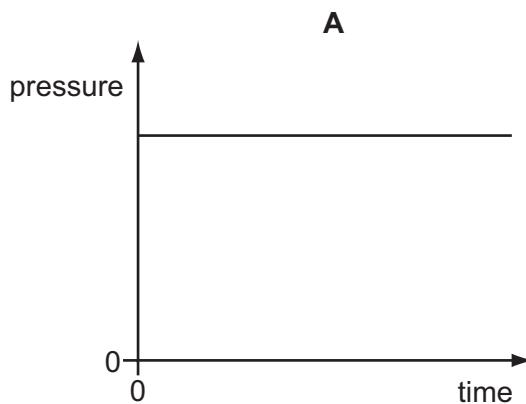
- 16 Air is pumped slowly into a car tyre to increase the pressure. The temperature of the air does not change.

Which line in the table is correct?

	number of molecules hitting 1 cm^2 of the tyre each second	average speed at which molecules hit the tyre
A	increases	increases
B	increases	unchanged
C	unchanged	increases
D	unchanged	unchanged

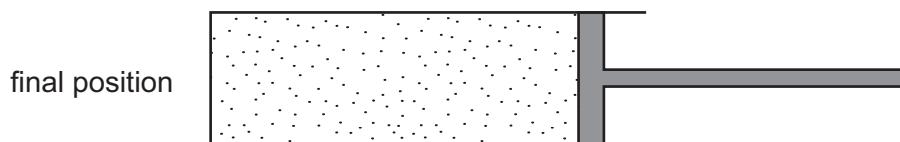
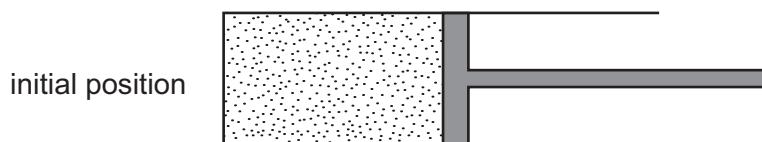
- 17 The pressure of a fixed mass of gas in a cylinder is measured. The volume of the gas in the cylinder is then slowly decreased.

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



- 18** A piston traps a certain mass of gas inside a cylinder. Initially the piston is halfway along the length of the cylinder.

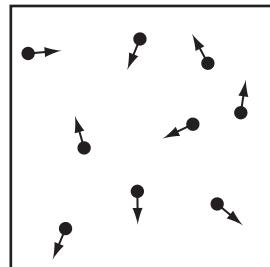
The piston is now moved towards the open end of the cylinder. The temperature of the gas remains constant.



How are the density and the pressure of the gas affected by moving the piston?

	density	pressure
A	decreases	decreases
B	decreases	unchanged
C	increases	decreases
D	increases	unchanged

- 19** The diagram represents the molecules of a gas in a closed container of constant volume.



What happens to the molecules when the gas is heated?

- A** They expand.
- B** They hit the walls less often.
- C** They move further apart.
- D** They move more quickly.

- 20 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.

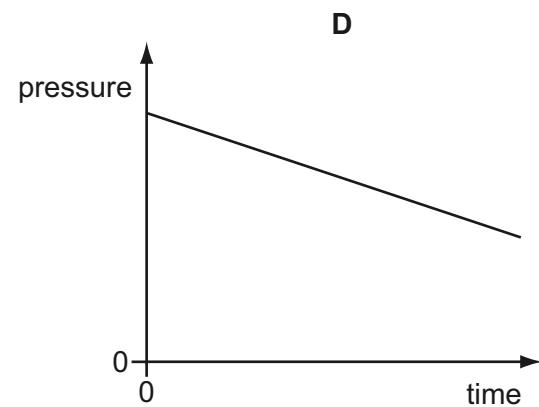
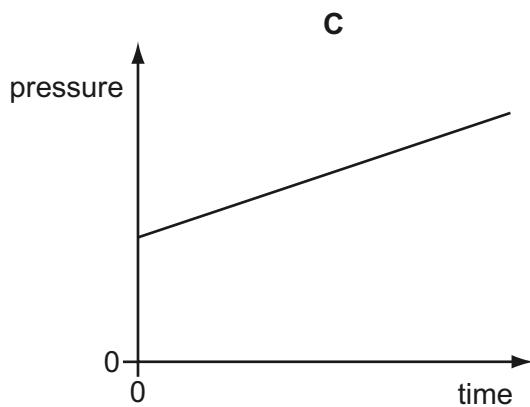
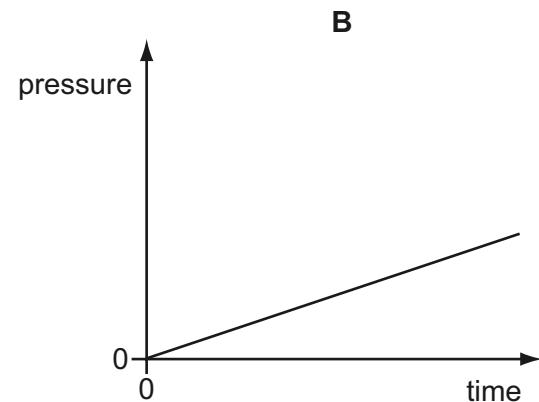
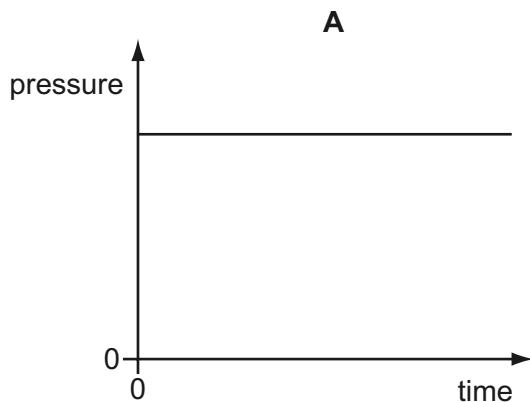
- 21 A sealed gas cylinder is left outside on a hot, sunny day.

What happens to the average speed of the molecules and to the pressure of the gas in the cylinder as the temperature rises?

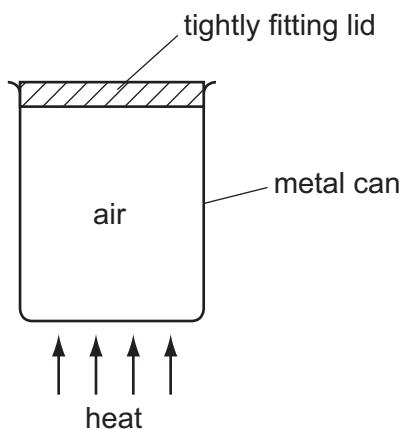
	average speed of the gas molecules	gas pressure
A	falls	falls
B	falls	rises
C	rises	falls
D	rises	rises

- 22 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?



- 23 Some air is trapped inside a metal can with a tightly fitting lid.



When the can is heated strongly behind a safety screen, the lid is blown off by the increased pressure inside the can.

What causes the increase in pressure of the air inside the can?

- A The air molecules expand and take up more room.
- B The air molecules move more quickly.
- C The number of molecules inside the can increases.
- D The volume occupied by the molecules decreases.

- 24 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

convert deg C Kelvin

Chapter 10. Thermal properties of matter

10.1 Temperature and temperature scale

1 What must expand in order to show the temperature rise in a mercury-in-glass thermometer?

- A the glass bulb
- B the glass stem
- C the mercury
- D the vacuum

2 The table shows the melting points and boiling points of four substances.

Which substance is a liquid at a room temperature of 20 °C?

substance	melting point / °C	boiling point / °C
A	-101	-35
B	-39	357
C	30	2100
D	327	1750

3 A mercury-in-glass thermometer is to be used to measure temperatures from 0 °C to 100 °C.

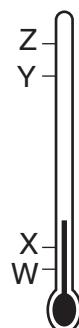
Why is mercury suitable?

- A Mercury expands when heated.
- B Mercury has a boiling point below 100 °C.
- C Mercury has a melting point above 0 °C.
- D Mercury is a poor conductor.

3-2 Which line gives the correct values for the melting and boiling points of water?

	melting point / °C	boiling point / K
A	0	100
B	-273	100
C	0	373
D	-273	373

- 4 The top of the mercury thread in a mercury-in-glass thermometer reaches point X at 0°C and point Z at 100°C .



Where might it be at a temperature below the ice-point?

- A point W
- B point X
- C point Y
- D point Z

- 5 To mark the lower fixed point of a Celsius scale on a thermometer, the thermometer should be placed in
- A pure alcohol.
 - B pure distilled water.
 - C pure melting ice.
 - D pure mercury.
- 6 Which substance is a liquid at a room temperature of 25°C ?

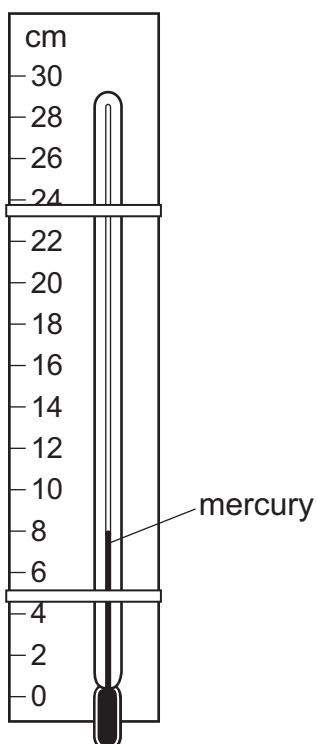
substance	melting point/ $^{\circ}\text{C}$	boiling point/ $^{\circ}\text{C}$
A	-218	-183
B	-39	357
C	44	280
D	119	444

- 7 To mark a temperature scale on a thermometer, fixed points are needed.

Which is a fixed point?

- A the bottom end of the thermometer tube
- B the top end of the thermometer tube
- C the temperature of pure melting ice
- D the temperature of pure warm water

- 8 A thermometer with no scale is taped to a ruler as shown. When placed in steam, the mercury level rises to 22 cm. When placed in pure melting ice, the mercury level falls to 2 cm.



Which temperature is shown by the mercury level in the diagram?

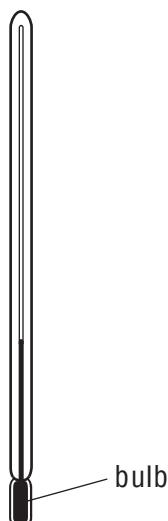
- A 6 °C
- B 8 °C
- C 30 °C
- D 40 °C

- 9 The table lists the melting points and the boiling points of four different substances **A**, **B**, **C** and **D**.

Which substance is a gas at 25 °C?

substance	melting point/°C	boiling point/°C
A	-219	-183
B	-7	58
C	98	890
D	1083	2582

- 10 The thermometer in the diagram has no scale.



Where must the bulb be placed so that 0°C can be marked on the stem?

- A in boiling water
- B in cold water
- C in a freezer
- D in melting ice

- 11 A small amount of air is introduced into the vacuum above the mercury in a mercury barometer tube.

The mercury level goes down.

Why does the mercury level go down?

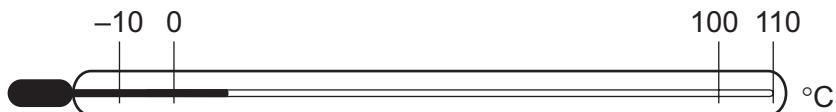
- A The air molecules cool the mercury and make it contract.
- B The air molecules decrease the pressure above the mercury.
- C The air molecules heat the mercury and make it expand.
- D The air molecules increase the pressure above the mercury.

- 12 To mark a temperature scale on a thermometer, standard temperatures known as fixed points are needed.

Which of these is a fixed point?

- A room temperature
- B the temperature inside a freezer
- C the temperature of pure melting ice
- D the temperature of pure warm water

- 13 A thermometer has a scale which starts at -10°C and ends at 110°C .

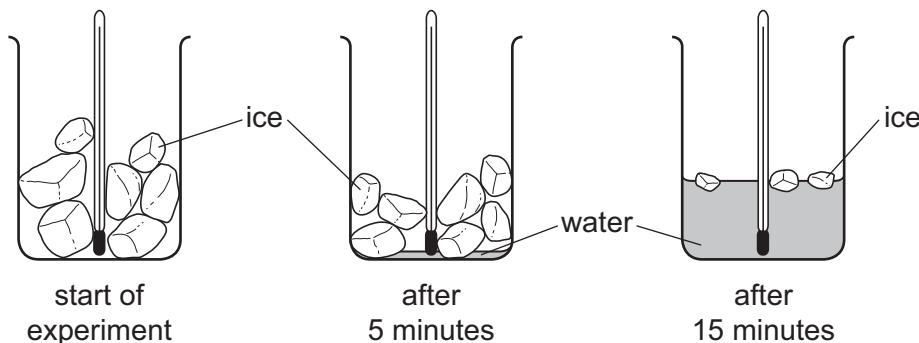


What is the value of the lower fixed point and of the upper fixed point of the scale?

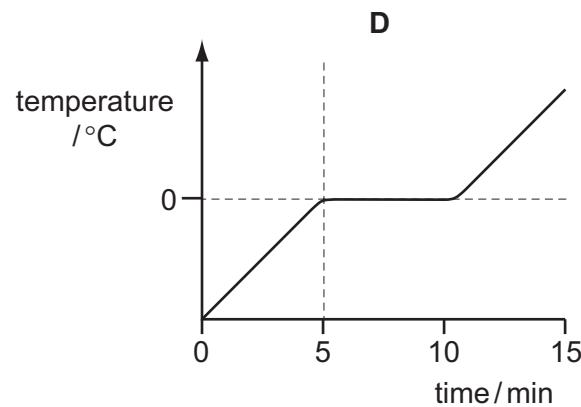
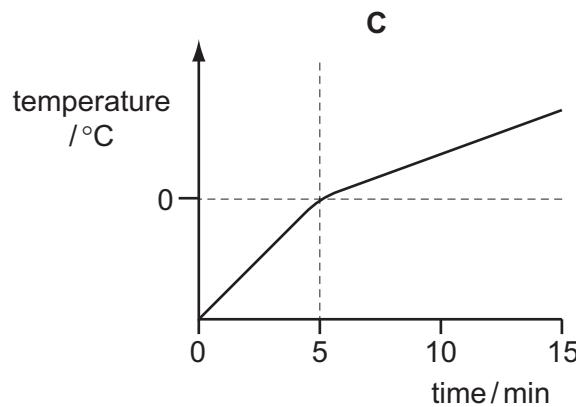
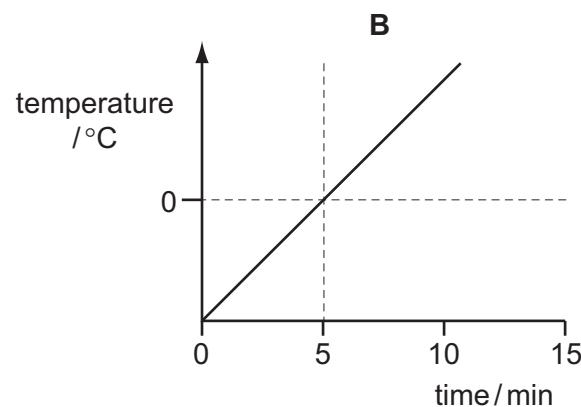
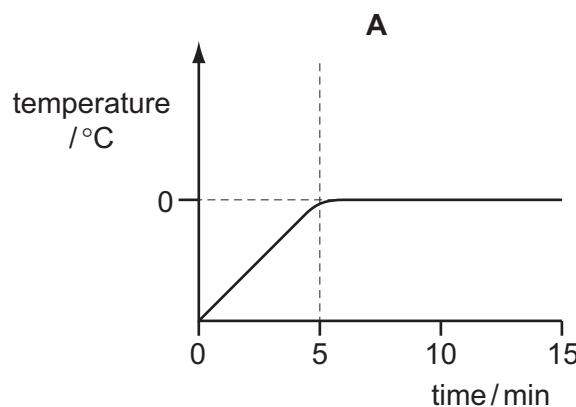
	lower fixed point $^{\circ}\text{C}$	upper fixed point $^{\circ}\text{C}$
A	-10	100
B	-10	110
C	0	100
D	0	110

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

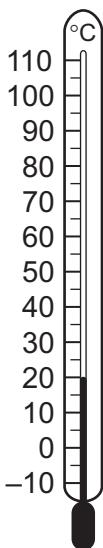
No water is visible in the beaker until 5 minutes has passed. After 15 minutes some ice is still visible.



Which graph shows how the thermometer reading changes?



- 15 The diagram shows a thermometer calibrated in degrees Celsius.



What are the values of the lower fixed point and of the upper fixed point on the Celsius scale?

	lower fixed point/°C	upper fixed point/°C
A	-10	110
B	0	20
C	0	100
D	20	100

- 16 To mark the lower fixed point of a Celsius scale on a thermometer, the thermometer should be placed in
- A pure alcohol.
 - B pure distilled water.
 - C pure melting ice.
 - D pure mercury.
- 17 Which pair contains **only** physical quantities that vary with temperature and so could be used in making a thermometer?
- A activity of a radioactive source, volume of a gas
 - B mass of a liquid, volume of a liquid
 - C activity of a radioactive source, mass of a solid
 - D volume of a gas, volume of a liquid

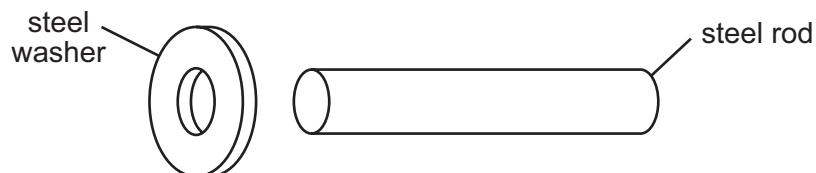
- 18 Which physical property is used to measure temperature in a liquid-in-glass thermometer?
- A the length of the thermometer
 - B the thickness of the glass bulb
 - C the volume of the glass bulb
 - D the volume of the liquid
- 19 A student wishes to calibrate a mercury-in-glass thermometer with a °C scale.

Which values should she use for the lower fixed point and for the upper fixed point?

	lower fixed point	upper fixed point
A	freezing point of mercury	boiling point of mercury
B	freezing point of mercury	boiling point of water
C	freezing point of water	boiling point of mercury
D	freezing point of water	boiling point of water

10.2 Thermal expansion

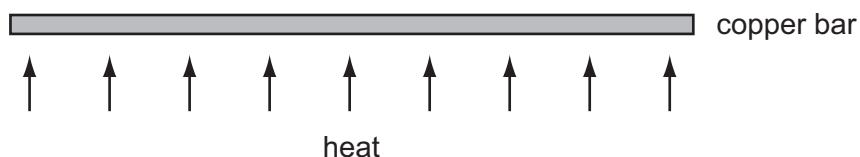
- 1 An engineer wants to fix a steel washer on to a steel rod. The rod is just too big to fit into the hole of the washer.



How can the engineer fit the washer onto the rod?

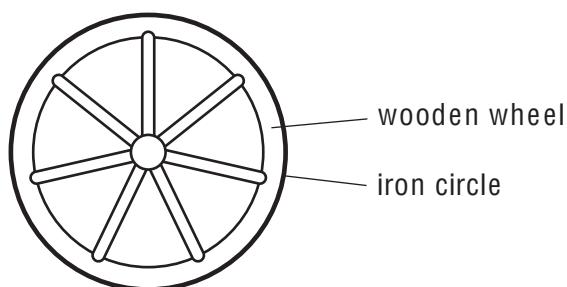
- A cool the washer and put it over the rod
- B cool the washer and rod to the same temperature and push them together
- C heat the rod and then place it in the hole
- D heat the washer and place it over the rod

- 2 A long thin bar of copper is heated evenly along its length.



What happens to the bar?

- A It becomes lighter.
 - B It becomes longer.
 - C It becomes shorter.
 - D It bends at the ends.
- 3 A wooden wheel can be strengthened by putting a tight circle of iron around it.



Which action would make it easier to fit the circle over the wood?

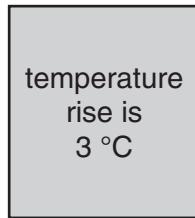
- A cooling the iron circle
- B heating the iron circle
- C heating the wooden wheel
- D heating the wooden wheel and cooling the iron circle

10.3 Thermal capacity

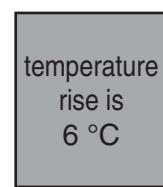
- 1 The same quantity of heat energy is applied to four different blocks. The temperature rise produced is shown on each block.

Which block has the highest thermal capacity?

A



B



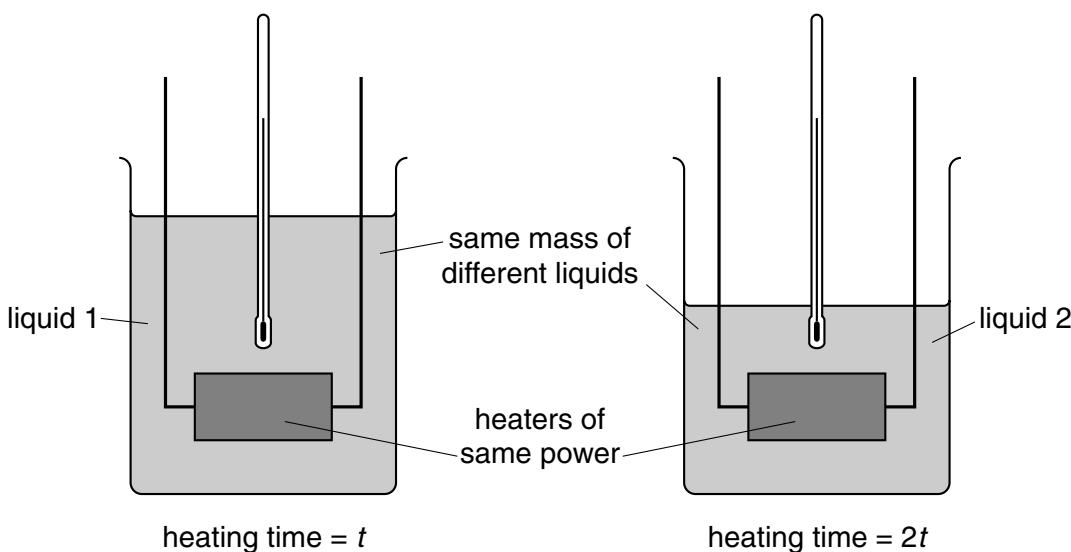
C



D



- 2** Equal masses of two different liquids are put into identical beakers. They are heated from 20 °C to 30 °C by heaters of the same power. Liquid 2 takes twice as long to heat as liquid 1.



Which statement is correct?

- A** Both liquids receive the same amount of energy.
- B** Liquid 1 receives more energy than liquid 2.
- C** The thermal capacity of liquid 1 is equal to the thermal capacity of liquid 2.
- D** The thermal capacity of liquid 1 is less than the thermal capacity of liquid 2.

- 3** A knife is being sharpened on a rotating sharpening-stone. A spark flies off and lands on the operator's hand. The spark is a very hot, very small piece of metal. The operator feels nothing.

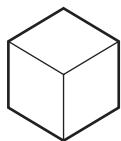
What does this show about the piece of metal?

- A** It has a high thermal capacity.
- B** It has a low thermal capacity.
- C** It is a good conductor of heat.
- D** It is a poor conductor of heat.

- 4 Four blocks, made of different materials, are each given the same quantity of internal (heat) energy.

Which block has the greatest thermal capacity?

A



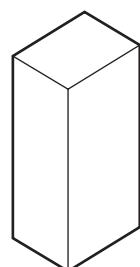
temperature
rise = 2 °C

B



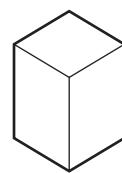
temperature
rise = 4 °C

C



temperature
rise = 6 °C

D



temperature
rise = 8 °C

- 5 1 kg of water and 1 kg of aluminium are heated to the same temperature and then allowed to cool in a room.

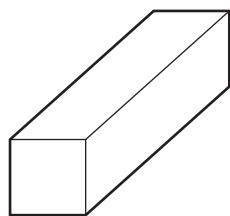
Why does the aluminium cool more quickly than the water?

- A Aluminium contracts more than water.
- B Aluminium does not evaporate but water does.
- C Aluminium has a higher thermal capacity than water.
- D Aluminium has a lower thermal capacity than water.

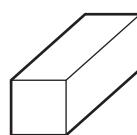
- 6 The diagram shows four blocks of steel. The same quantity of heat is given to each block.

Which block shows the greatest rise in temperature?

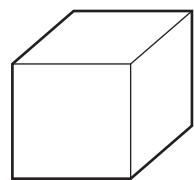
A



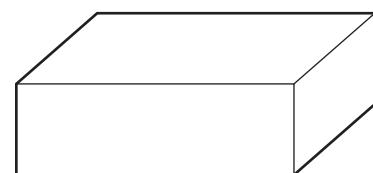
B



C

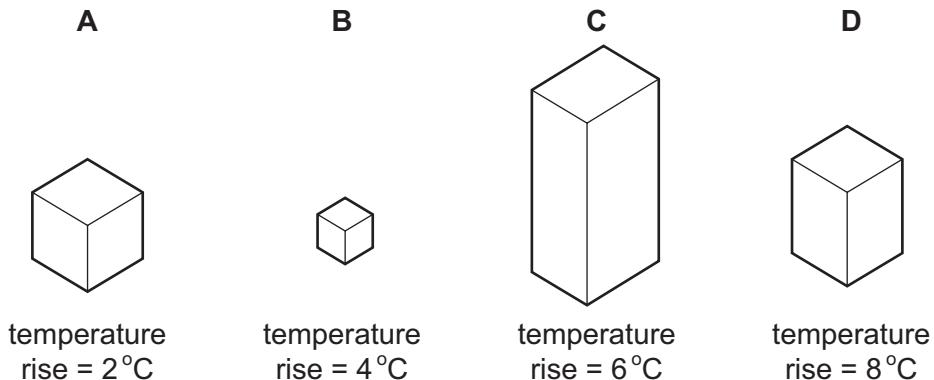


D

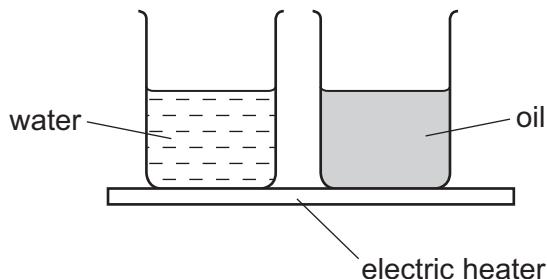


- 7 Four blocks, made of different materials, are each given the same quantity of internal energy (heat).

Which block has the greatest thermal capacity?



- 8 The diagram shows an electric heater being used to heat a beaker of water and an identical beaker of oil for several minutes.



The temperature of the water and the temperature of the oil increase constantly. The rise in temperature of the oil is much greater than that of the water.

Why is this?

- A The oil has a higher boiling point than water.
- B The oil has a higher thermal capacity than water.
- C The oil has a lower boiling point than water.
- D The oil has a lower thermal capacity than water.

°C.

- 9 A heater supplies 80 J of energy to a block of metal. The temperature of the block rises by 20

What happens to the block of metal when its temperature falls by 10 °C?

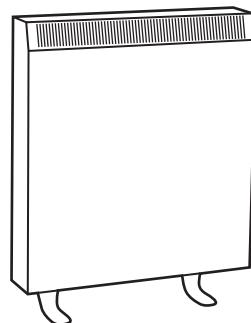
- A Its internal energy decreases by 40 J.
- B Its internal energy decreases by 160 J.
- C Its internal energy increases by 40 J.
- D Its internal energy increases by 160 J.

10 A solid object has a very large thermal capacity.

What does this mean?

- A A large amount of energy is needed to make the object become hot.
- B A large amount of energy is needed to make the object melt.
- C A small amount of energy is needed to make the object become hot.
- D A small amount of energy is needed to make the object melt.

11 A night storage heater contains a large block of material that is heated electrically during the night. During the day the block cools down, releasing thermal energy into the room.

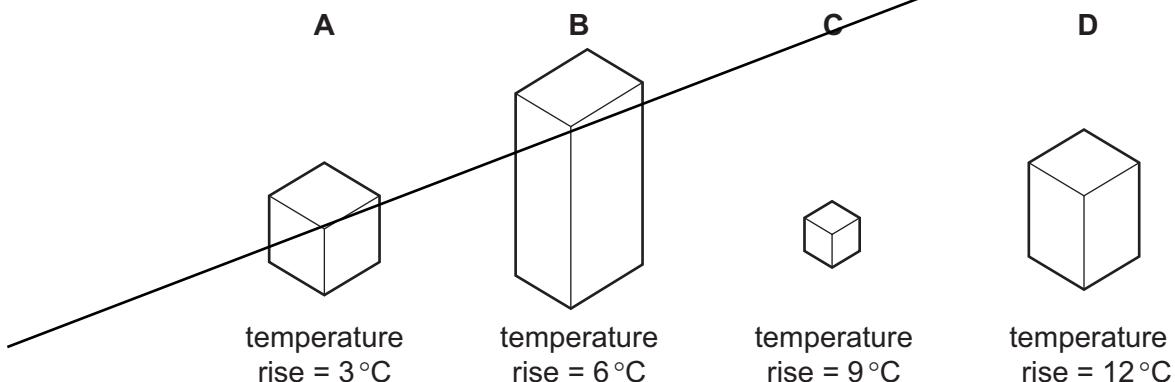


Which thermal capacity and which night-time temperature increase will cause the most energy to be stored by the block?

	thermal capacity of block	night-time temperature increase
A	large	large
B	large	small
C	small	large
D	small	small

- 12** Four blocks, made from different materials, are each heated so that they have the same increase in internal energy.

Which block has the smallest thermal capacity?



10.4 Specific heat capacity

- 1** A sample of a solid is heated for 12 minutes and its temperature noted every minute.

The results are shown in the table.

time/min	0	1	2	3	4	5	6	7	8	9	10	11	12
temperature/°C	11.5	16.1	22.1	31.0	31.1	31.1	31.1	31.3	45.0	65.2	66.2	66.3	66.3

How should the sample be described at the end of the 12 minutes?

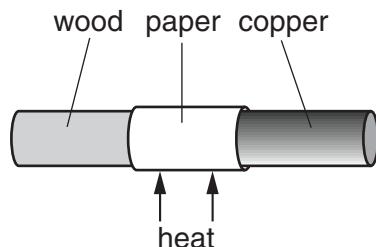
- A** all solid
- B** in the process of melting
- C** all liquid
- D** in the process of boiling

Chapter 11. Thermal energy transfer

11.1 Conduction

- 1 A bar made of half wood and half copper has a piece of paper wrapped tightly round it.

The bar is heated strongly at the centre for a short time, and the paper goes brown on one side only.



Which side goes brown, and what does this show about wood and copper?

	brown side	wood	copper
A	copper	conductor	insulator
B	copper	insulator	conductor
C	wood	conductor	insulator
D	wood	insulator	conductor

- 2 A person holds a glass beaker in one hand and fills it quickly with hot water. It takes several seconds before his hand starts to feel the heat.

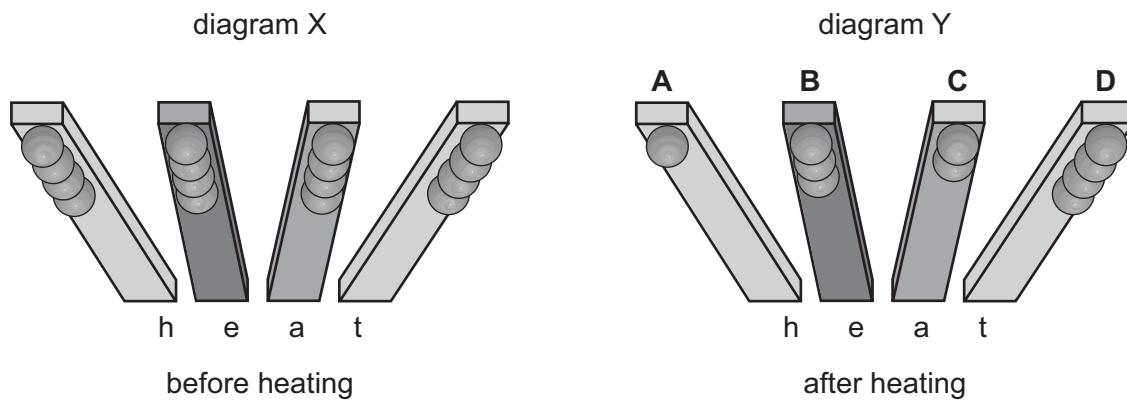
Why is there this delay?

- A Glass is a poor conductor of heat.
- B Glass is a good conductor of heat.
- C Water is a poor conductor of heat.
- D Water is a good conductor of heat.

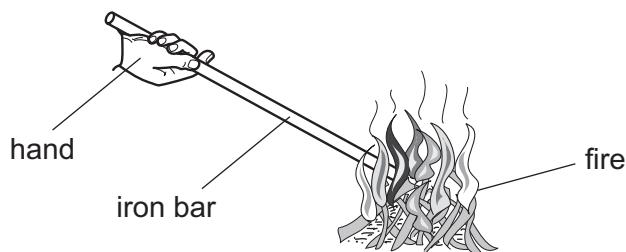
- 3 An experiment is set up to find out which metal is the best conductor of heat. Balls are stuck with wax to rods made from different metals, as shown in diagram X.

The rods are heated at one end. Some of the balls fall off, leaving some as shown in diagram Y.

Which labelled metal is the best conductor of heat?



- 4 An iron bar is held with one end in a fire. The other end soon becomes too hot to hold.

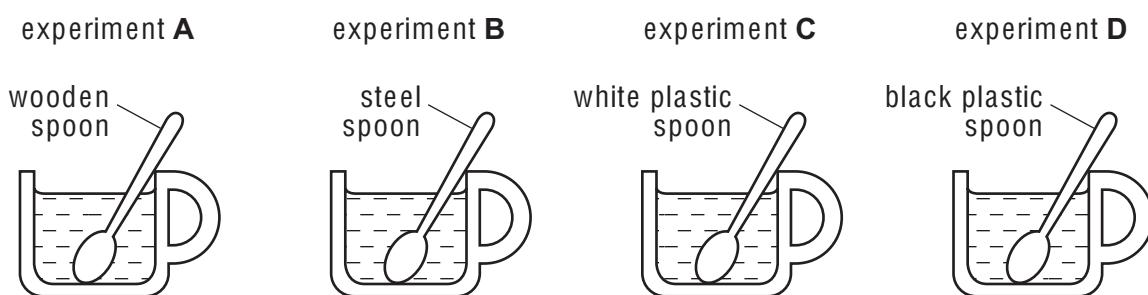


How has the heat travelled along the iron bar?

- A** by conduction
- B** by convection
- C** by expansion
- D** by radiation

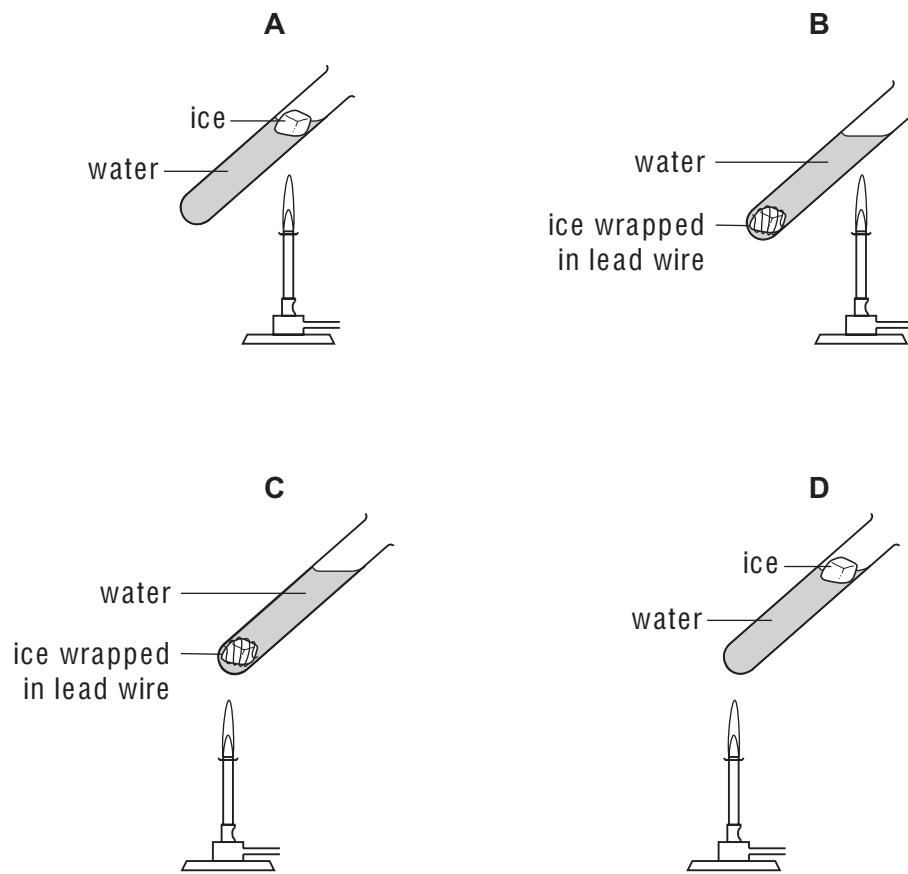
- 5 Spoons made of different materials were placed in four cups of coffee poured from the same jug.

Which spoon will be hottest to touch at end X?



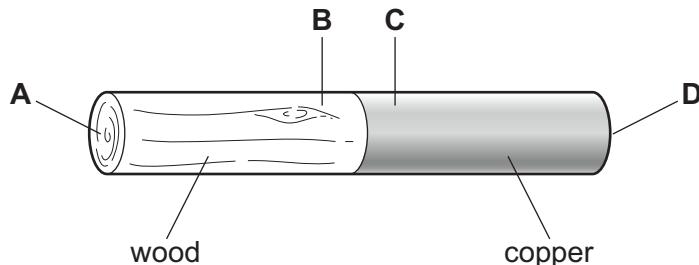
- 6 The diagrams show four identical pieces of ice that are heated in test-tubes of water.

In which test-tube will the ice take the longest time to melt?



- 7 A rod is made up of copper and wood joined together.

After the rod is heated at the join in the centre for about a minute, where would the lowest temperature be?



- 8** An experiment is set up to find out which metal is the best conductor of heat.

Balls are stuck with wax to rods made from different metals, as shown in diagram 1.

The rods are heated at one end. Some of the balls fall off, leaving some as shown in diagram 2.

Which labelled metal is the best conductor of heat?

diagram 1

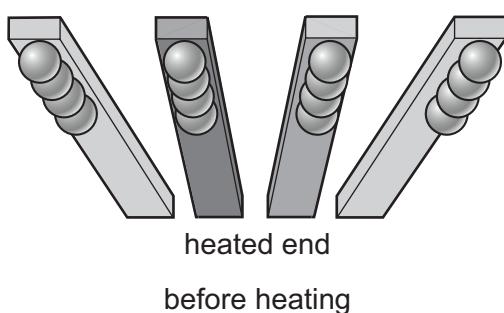
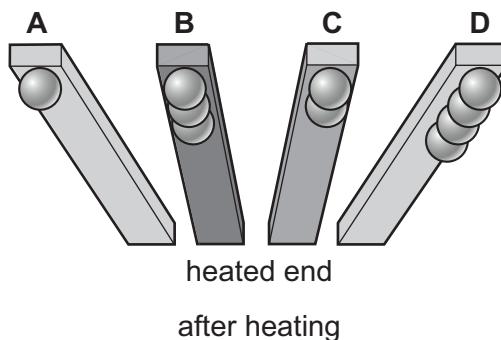
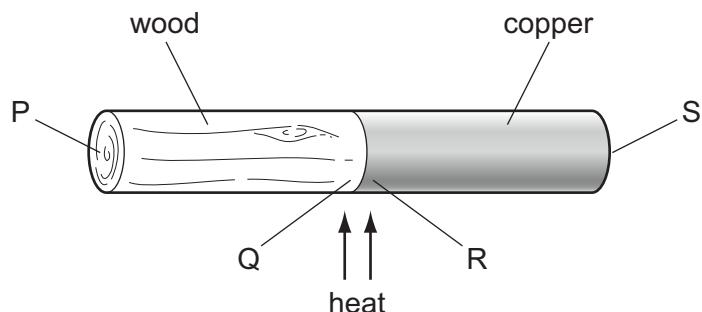


diagram 2



- 9** A rod is made of copper and wood joined together.



The rod is heated at the join in the centre for about a minute.

At which labelled point will the temperature be lowest, and at which point will it be highest?

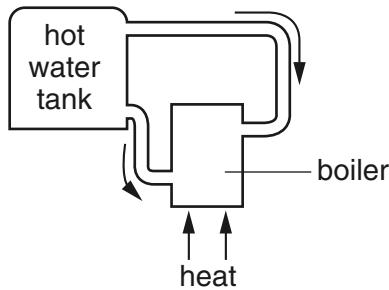
	lowest temperature	highest temperature
A	P	Q
B	P	R
C	S	P
D	S	R

11.2 Convection

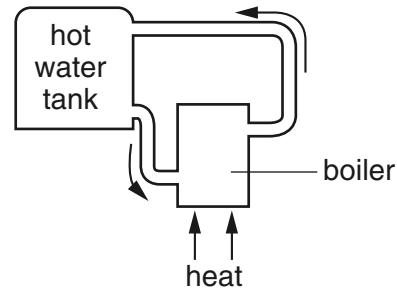
- 1 The diagrams show part of a water-heating system which is working by convection.

Which diagram shows the most likely flow of water in the system?

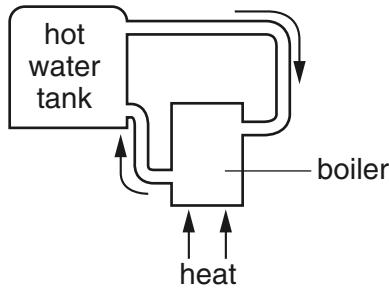
A



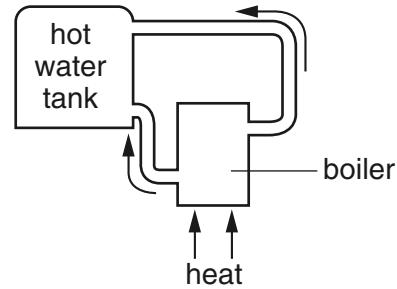
B



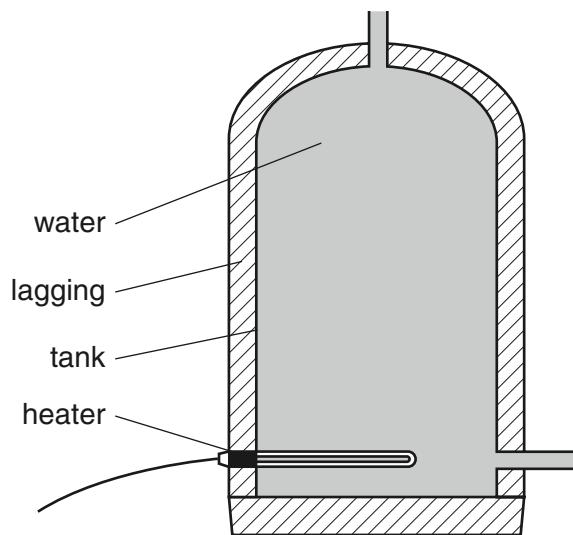
C



D



- 2 The diagram shows a heater used to heat a tank of cold water.

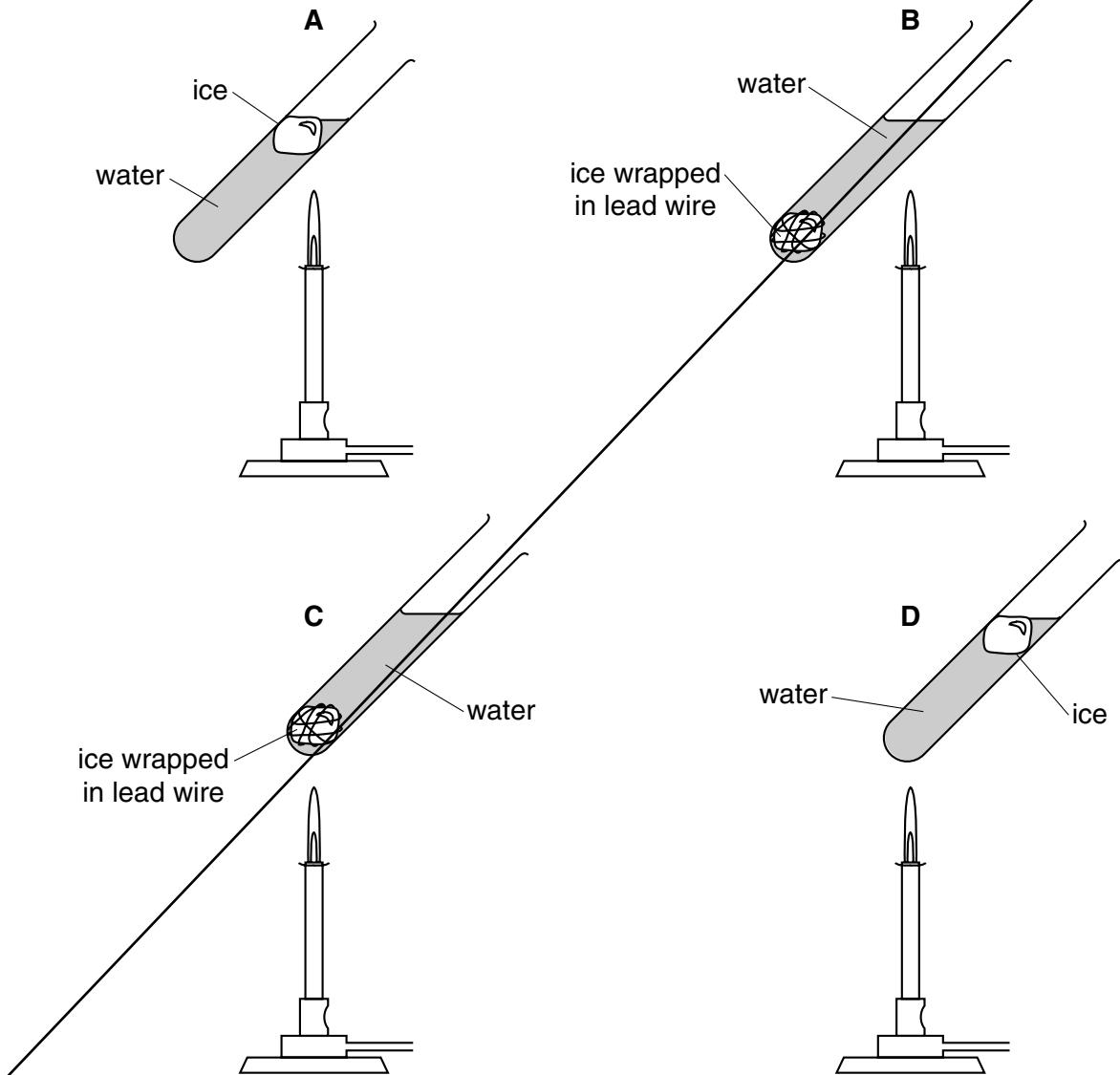


What is the main process by which heat moves through the water?

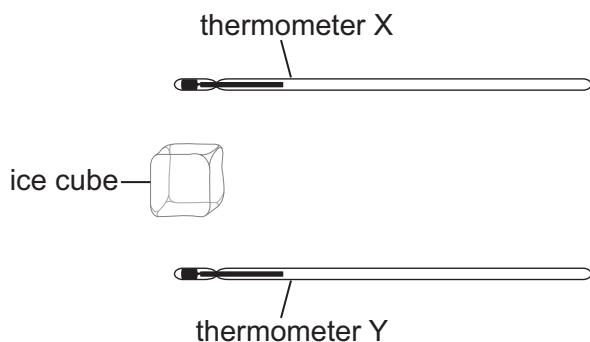
- A conduction
- B convection
- C evaporation
- D radiation

- 3 The diagrams show four identical pieces of ice that are heated in test-tubes of water.

In which test-tube will the ice take the longest time to melt?



- 4 Thermometer X is held above an ice cube and thermometer Y is held the same distance below the ice cube. After several minutes, the reading on one thermometer changes. The ice cube does not melt.



Which thermometer reading changes and why?

	thermometer	reason
A	X	cool air rises from the ice cube
B	X	warm air rises from the ice cube
C	Y	cool air falls from the ice cube
D	Y	warm air falls from the ice cube

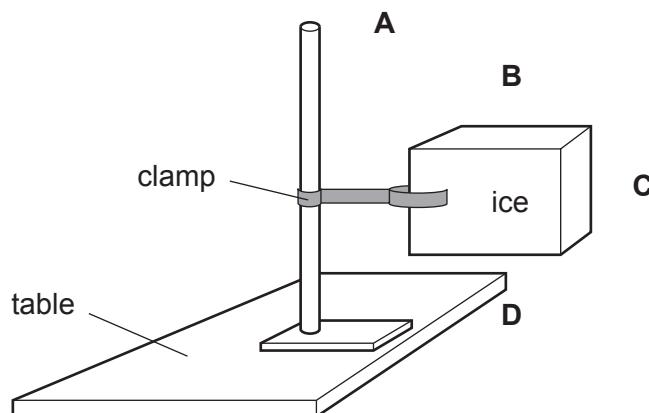
- 5 A beaker of water is heated at its base.

Why does the water at the base rise?

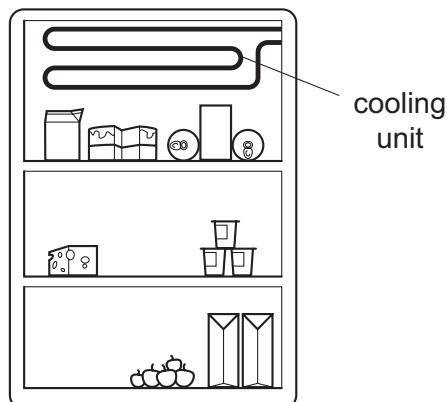
- A It contracts and becomes less dense.
- B It contracts and becomes more dense.
- C It expands and becomes less dense.
- D It expands and becomes more dense.

- 6 The diagram shows a block of ice placed in a warm room.

At which point is the temperature the **lowest**?



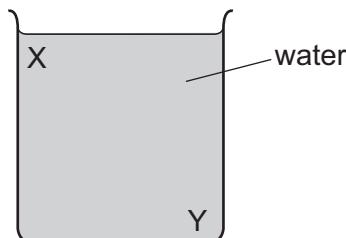
- 7 The diagram shows a cooling unit in a refrigerator.



Why is the cooling unit placed at the top?

- A Cold air falls and warm air is displaced upwards.
- B Cold air is a bad conductor so heat is not conducted into the refrigerator.
- C Cold air is a good conductor so heat is conducted out of the refrigerator.
- D Cold air stops at the top and so prevents convection.

- 8 A beaker contains water at room temperature.



How could a convection current be set up in the water?

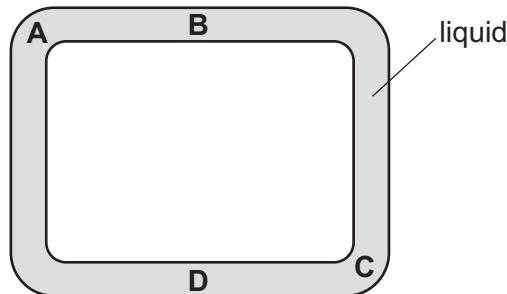
- A cool the water at X
- B cool the water at Y
- C stir the water at X
- D stir the water at Y

- 9 Which line in the table is correct about conduction and convection?

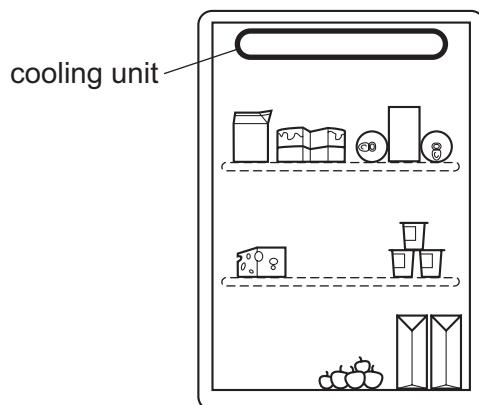
	conduction	convection
A	can happen in a solid	can happen in a solid
B	can happen in a solid	only happens in fluids
C	only happens in fluids	can happen in a solid
D	only happens in fluids	only happens in fluids

- 10 A heating element is positioned in a narrow sealed tube of liquid.

What would be the best place to position the heating element in order to obtain the best circulation of the liquid through the tube?



- 11 The diagram shows a refrigerator. The cooling unit is placed at the top. The cooling unit cools the air near it.



What happens to the density of this air as it cools and how does it move?

	density of the air	movement of the air
A	decreases	moves down
B	decreases	stays where it is
C	increases	moves down
D	increases	stays where it is

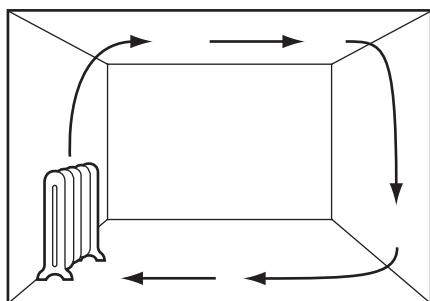
- 12 Which statement refers to convection?

- A It does not involve energy transfer.
- B It is the transfer of heat energy without the movement of particles.
- C It only occurs in liquids or gases.
- D It only occurs in solids.

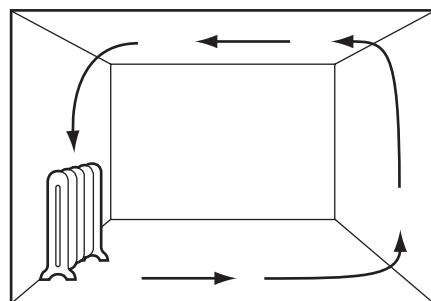
- 13 A heater is placed in a room.

Which diagram shows the movement of air as the room is heated?

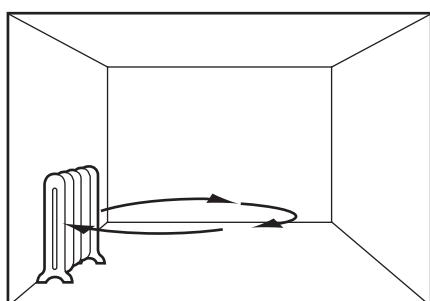
A



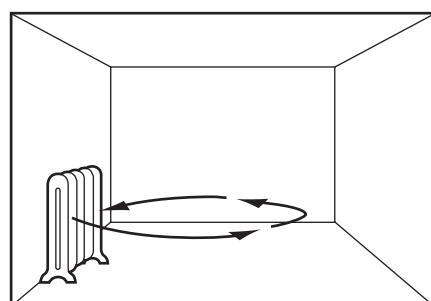
B



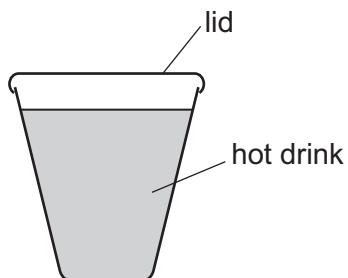
C



D



- 14 A cup with a lid contains a hot drink.

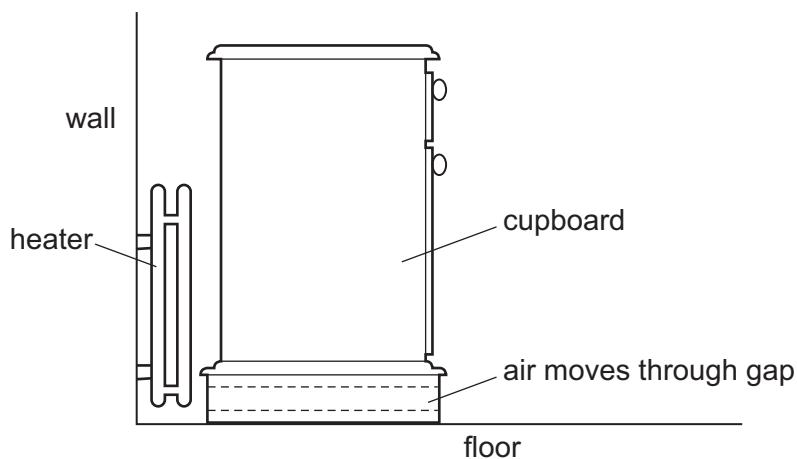


When the lid is removed, the rate of heat loss from the drink increases.

What causes this?

- A convection only
- B evaporation only
- C both convection and evaporation
- D neither convection nor evaporation

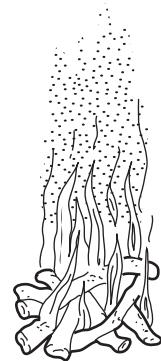
- 15 A cupboard is placed in front of a heater. Air can move through a gap under the cupboard.



Which line in the table describes the temperature and the direction of the air that moves through the gap?

	air temperature	air direction
A	cool	away from the heater
B	cool	towards the heater
C	warm	away from the heater
D	warm	towards the heater

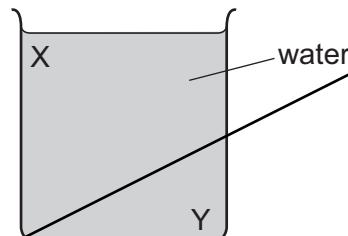
- 16 The diagram shows a fire.



Why does the smoke rise above the fire?

- A Smoke evaporates more quickly at higher temperatures.
- B Smoke molecules diffuse more quickly at higher temperatures.
- C The density of the air is lower at higher temperatures.
- D The pressure of the air is greater at higher temperatures.

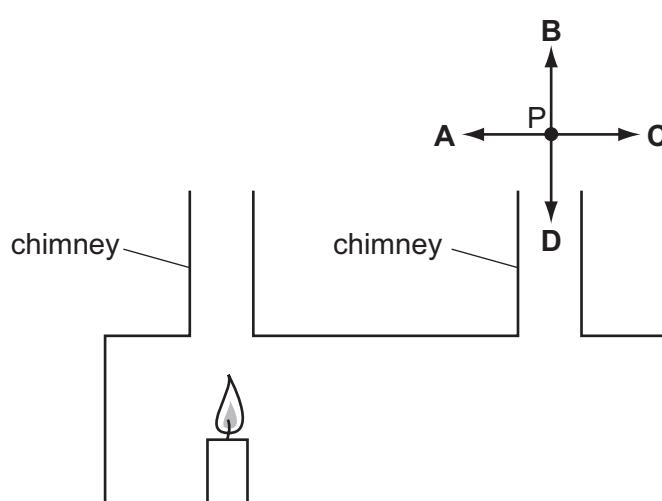
- 17 A beaker contains water at room temperature.



How could a convection current be set up in the water?

- A cool the water at X
 - B cool the water at Y
 - C stir the water at X
 - D stir the water at Y
- 18 A teacher demonstrates convection currents using a box with two chimneys and a lighted candle. She holds a smoking taper at point P.

In which direction does the convection current cause the smoke to move?

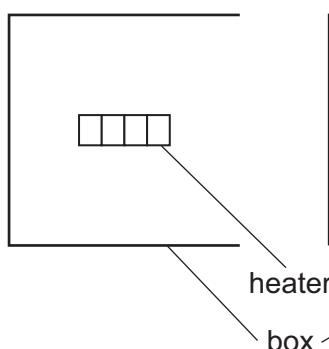


- 19 An electric heater is placed inside a metal box which has one side open. The diagram shows four possible positions for the box.

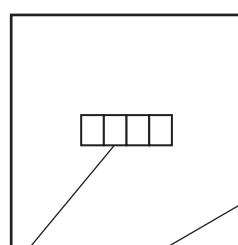
The heater is switched on for several minutes.

In which position does the box become the hottest?

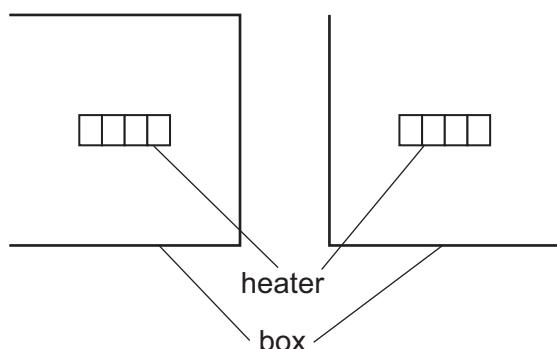
A



B



C



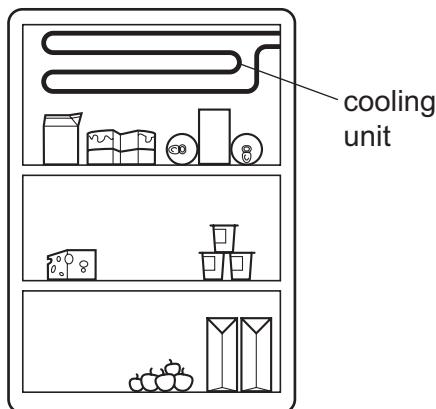
D

- 20 Food is kept in a cool-box which uses two ice packs to keep it cool.

Where should the ice packs be placed to keep all the food as cool as possible?

- A both at the bottom of the box
- B both at the top of the box
- C one at the front and one at the back of the box
- D one on the left and one on the right of the box

- 21 The diagram shows a cooling unit in a refrigerator.



Why is the cooling unit placed at the top?

- A Cold air falls and warm air is displaced upwards.
- B Cold air is a bad conductor so heat is not conducted into the refrigerator.
- C Cold air is a good conductor so heat is conducted out of the refrigerator.
- D Cold air remains at the top and so prevents convection.

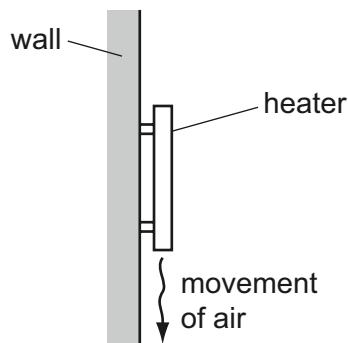
- 22 Why does convection take place in a liquid when it is heated?

- A Liquids expand when they are heated.
- B Liquids start to bubble when they get close to boiling point.
- C Molecules in the liquid expand when they are heated.
- D Molecules near to the surface of the liquid escape into the air.

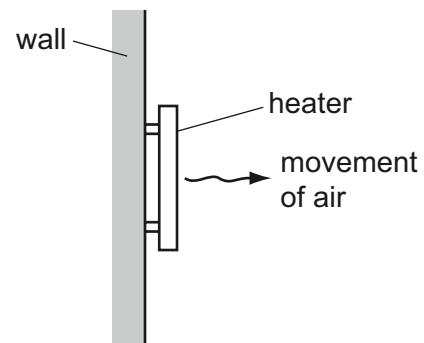
- 23 A convector heater is fixed to a wall.

Which diagram shows how warm air near the heater moves because of convection in the air?

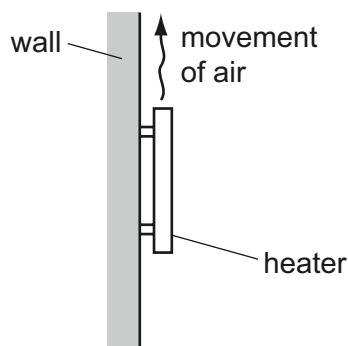
A



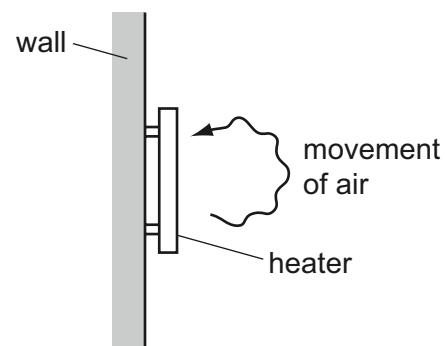
B



C



D



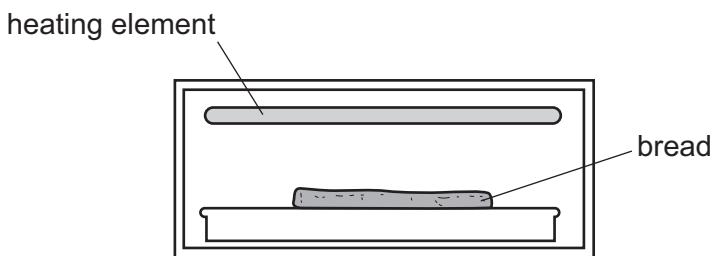
11.3 Radiation

- 1 How does thermal energy (heat energy) travel through the vacuum between the Earth and the Sun?
 - A by conduction
 - B by convection
 - C by radiation
 - D by radioactive decay

- 2 There is a vacuum between the double walls of a vacuum flask.
Which types of heat transfer are reduced by the vacuum?
 - A conduction and convection
 - B conduction and radiation
 - C convection and radiation
 - D conduction, convection and radiation

- 3 How does heat from the Sun reach the Earth?
 - A conduction only
 - B convection only
 - C radiation only
 - D conduction, convection and radiation

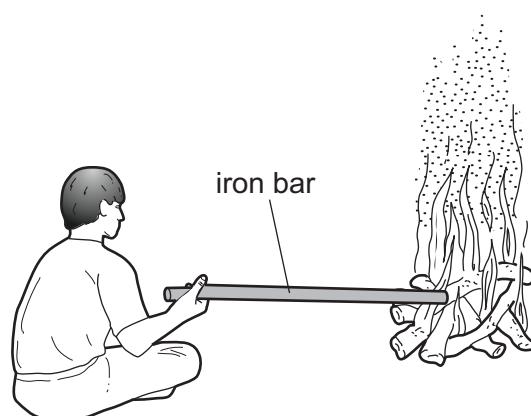
- 4 Bread can be cooked by placing it below, but not touching, a heating element.



Which process transfers thermal energy from the heating element to the bread?

- A conduction
- B convection
- C insulation
- D radiation

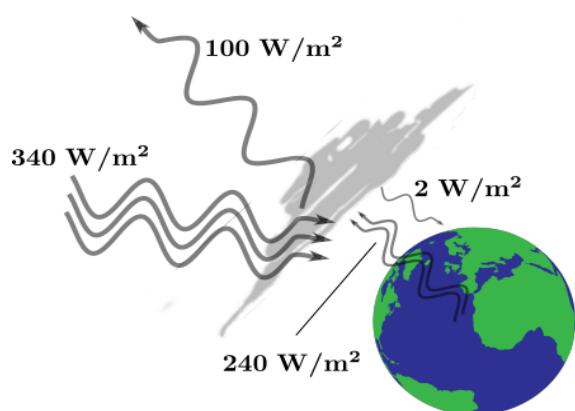
- 5 A boy sits near a campfire. He pokes the fire with an iron bar. His hand becomes hot.



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
- 6 One a winter day, suppose you must leave your house for a short time. In order to save energy, how should you change the settings of the house thermostat?
- A Leave it unchanged.
 - B Turn it down, slight, and then back on again when you return.
 - C Turn it off and then back on again when you return.
 - D As far as energy consumption is concerned, it makes no difference.
- 7 A simplified model of Earth's energy balance is shown below (not to scale). What is the net energy flow per unit area away from Earth?

- A -2 W/m^2
- B $+340 \text{ W/m}^2$
- C $+338 \text{ W/m}^2$
- D 0

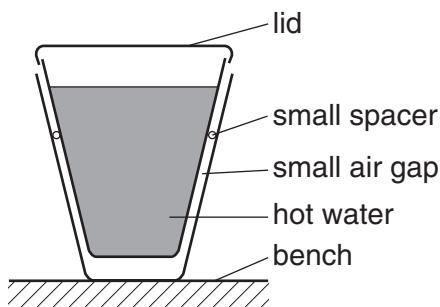


- 8 Water is held in three different containers in the same room. One contains boiling water, another contains room temperature water, and the third, ice. In terms of the emission of thermal radiation, which row below is correct?

	emits	does not emit
A	boiling	room temperature, ice
B	boiling, room temperature	ice
C	boiling, room temperature, ice	/
D	/	boiling, room temperature, ice

11.4 Insulator

- 1 Two plastic cups are placed one inside the other. Hot water is poured into the inner cup and a lid is put on top as shown.



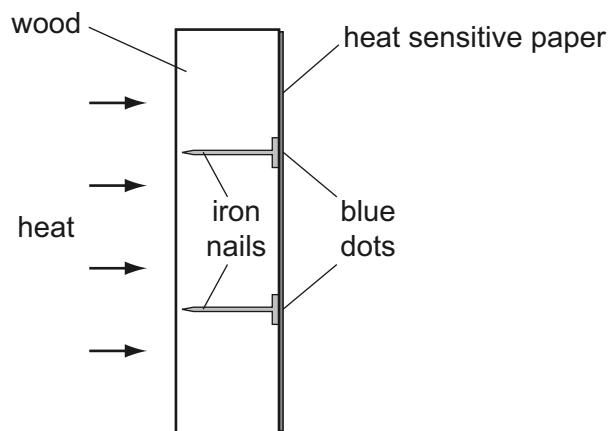
Which statement is correct?

- A Heat loss by radiation is prevented by the small air gap.
 - B No heat passes through the sides of either cup.
 - C The bench is heated by convection from the bottom of the outer cup.
 - D The lid is used to reduce heat loss by convection.
- 2 Hot liquid in a vacuum flask cools extremely slowly. This is because some methods of heat transfer cannot take place in a vacuum.

Which methods **cannot** take place in a vacuum?

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

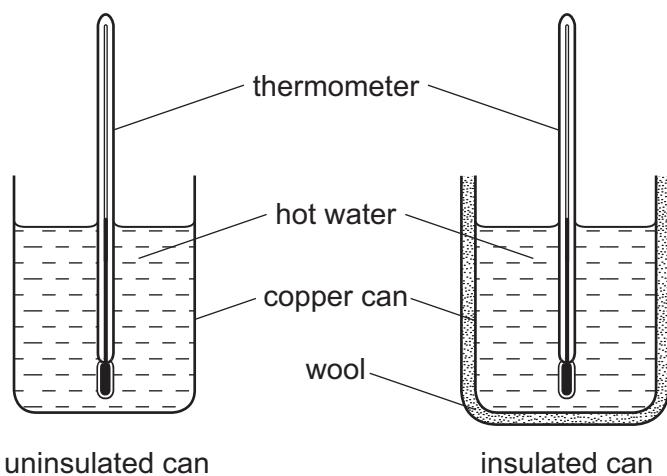
- 3 A piece of wood has some iron nails pushed through it. One side of the wood is covered with heat sensitive paper which turns from pink to blue when heated. The wood is heated as shown for a few minutes and blue dots appear on the heat sensitive paper where it touches the nails.



This experiment shows that, compared to wood, iron is a good

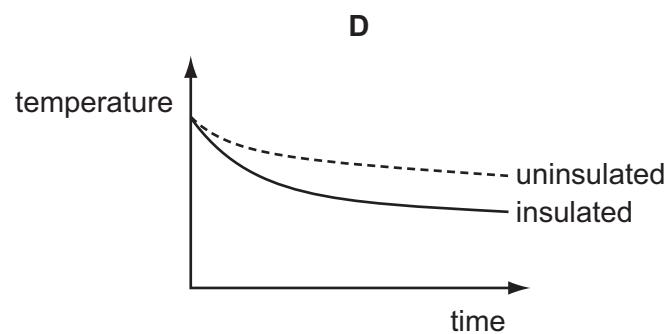
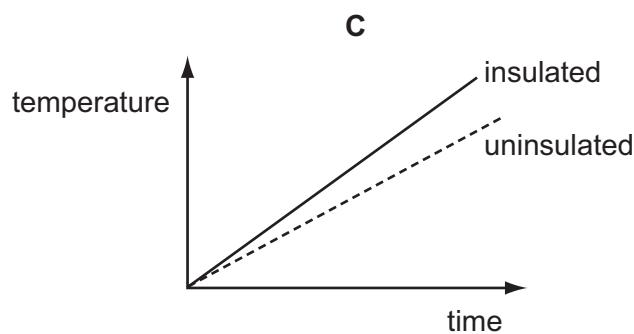
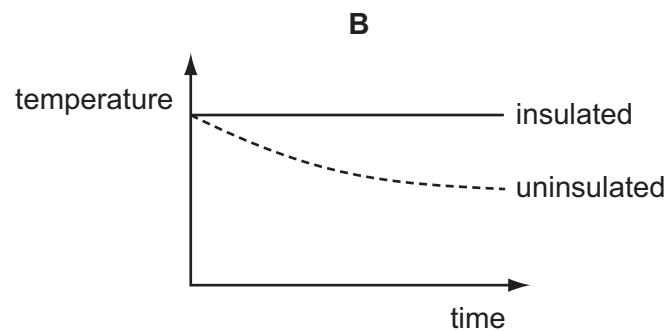
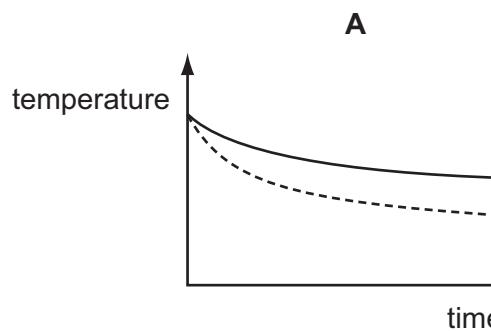
- A absorber of heat.
- B conductor of heat.
- C convector of heat.
- D emitter of heat.

- 4 Two identical copper cans are filled with boiling water.



One can is insulated with wool. The temperature of the water in each can is taken every minute for several minutes. Graphs of the results are plotted.

Which graph shows the results obtained?



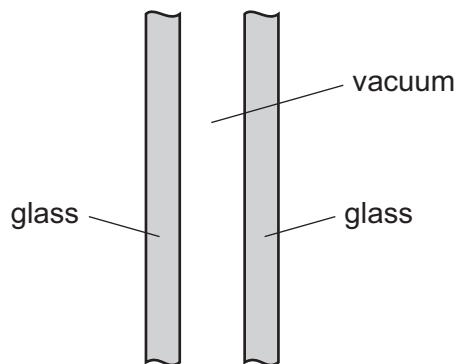
5 After a sheep has its wool cut off, it is harder for it to stay warm when the air temperature falls.

How does the wool help the sheep to stay warm?

- A Air can circulate between the wool fibres and heat up the skin by convection.
- B Air trapped by the wool fibres reduces heat losses from the skin by convection.
- C The wool fibres are curly so it takes longer for heat to be conducted away from the skin.
- D The wool fibres conduct heat to the skin from the air outside.

6 A double-glazed window consists of two panes of glass with a vacuum between them.

The vacuum reduces the amount of thermal energy transferred through the window.



Which row shows how much thermal energy is transferred through the vacuum by conduction, by convection and by radiation?

	conduction	convection	radiation
A	none	none	some
B	none	some	some
C	some	none	none
D	some	some	none

11.5 Thermal Energy Transfer Consequences

- 1 When heat is transferred from a hot to a cold body in a straight line without affecting the intervening medium, it is referred to as heat transfer via which mechanism?
 - A conduction
 - B convection
 - C radiation
 - D all of the above

- 2 What is the main mechanism by which a car's engine is ultimately cooled?
 - A air convection directly off the engine casing
 - B radiation via the car radiator
 - C convection via the car radiator
 - D conduction via the car radiator

- 3 Carbon dioxide in planetary atmospheres traps radiation. What phenomena does this directly contribute to?
 - A decrease in temperature
 - B changes in ocean temperatures
 - C greenhouse effect
 - D changes in ocean currents

- 4 If the temperature of an object is higher than its environment what can you say about heating?
 - A radiates more than it absorbs
 - B conducts more than it absorbs
 - C absorbs more than it radiates
 - D conducts less than it radiates

Part III

Physics of waves

Chapter 12. Sound

12.1 The speed of sound

- 1 Sound waves may cause an echo.

What happens to sound waves to cause an echo and what is the nature of sound waves?

	what an echo is caused by	nature of sound waves
A	reflection	longitudinal
B	reflection	transverse
C	refraction	longitudinal
D	refraction	transverse

- 2 A girl notices that when she shouts into a cave she hears an echo.

Which wave property causes the echo?

- A diffraction
- B dispersion
- C reflection
- D refraction

- 3 A girl stands at a distance from a large building. She claps her hands and a short time later hears an echo.

Why is an echo produced when the sound waves hit the building?

- A The sound waves are absorbed.
- B The sound waves are diffracted.
- C The sound waves are reflected.
- D The sound waves are refracted.

- 4 A girl stands at a distance from a large building. She claps her hands and a short time later hears an echo.

Why is an echo produced when the sound waves hit the building?

- A The sound waves are absorbed.
- B The sound waves are diffracted.
- C The sound waves are reflected.
- D The sound waves are refracted.

- 5 A student wishes to measure the speed of sound in air. She plans to measure the time between making a sound and hearing the echo from a cliff.



She will use the equation: speed = $\frac{\text{distance}}{\text{time}}$.

Which type of sound should she make and which distance should she use in her calculation?

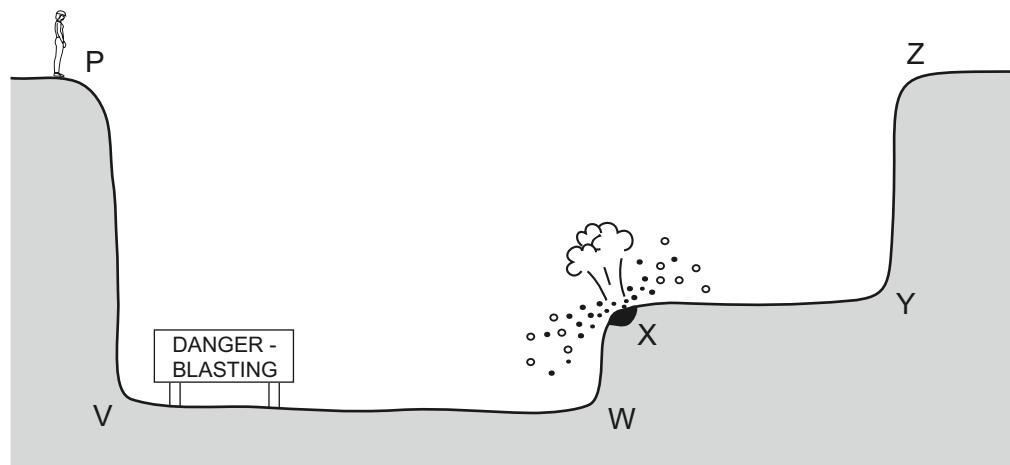
	type of sound	distance to use
A	continuous sound	$\frac{\text{distance to cliff}}{2}$
B	continuous sound	$\text{distance to cliff} \times 2$
C	short, sharp sound	$\frac{\text{distance to cliff}}{2}$
D	short, sharp sound	$\text{distance to cliff} \times 2$

- 6 Sound travels by wave motion.

Which property of waves causes echoes?

- A diffraction
- B dispersion
- C reflection
- D refraction

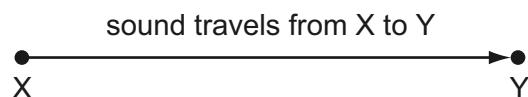
- 7 An engineer standing at P sees an explosion at X.



After the explosion, she hears two bangs. One bang is heard a fraction of a second after the other. The second bang is an echo.

From which surface has the sound reflected to cause this echo?

- A** XY **B** PV **C** ZY **D** WX
- 8 In an experiment to measure the speed of sound, a student uses a stopwatch to find how long a sound takes to travel from X to Y. She does this six times.



The table shows her results.

	time/s
first	0.5
second	0.7
third	0.6
fourth	0.4
fifth	0.9
sixth	0.5

What value for the time should be used to calculate the speed of sound?

- A** 0.4 s **B** 0.5 s **C** 0.6 s **D** 0.9 s

9 Which word correctly completes the sentence below?

An echo is a sound wave which is by a large obstacle.

- A absorbed
- B dispersed
- C reflected
- D refracted

10 Which equation can be used to calculate the speed of sound?

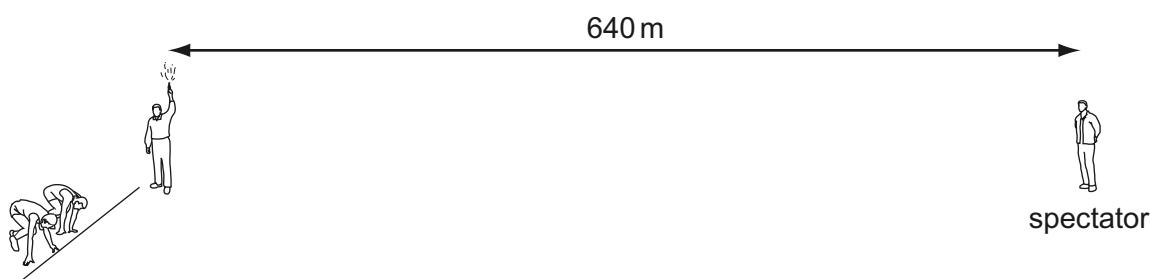
- A speed = $\frac{\text{distance}}{\text{time}}$
- B speed = distance \times time
- C speed = $\frac{\text{time}}{\text{distance}}$
- D speed = time + distance

11 A girl stands at a distance from a large building. She claps her hands and a short time later hears an echo.

Why is an echo produced when the sound waves hit the building?

- A The sound waves are absorbed.
- B The sound waves are diffracted.
- C The sound waves are reflected.
- D The sound waves are refracted.

12 A starting pistol is fired 640 m away from a spectator.

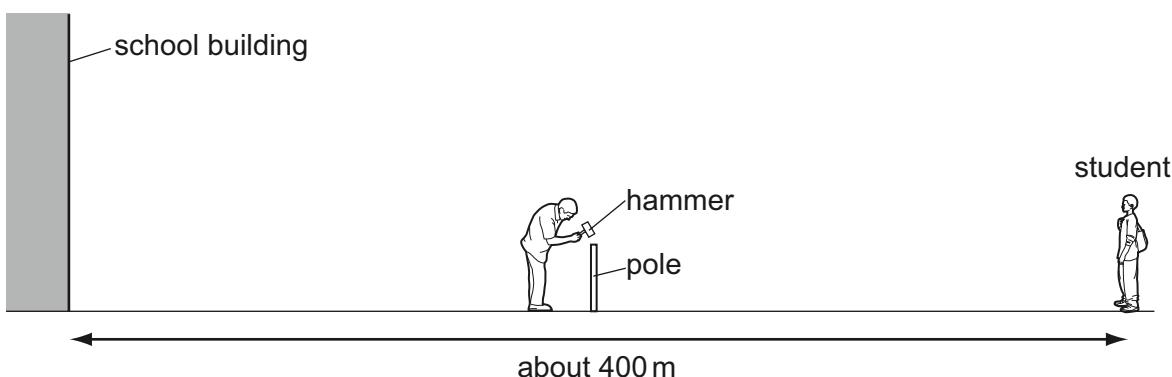


The spectator hears the sound of the starting pistol two seconds after seeing the flash from the gun.

What is the speed of sound in air?

- A 160 m/s
- B 320 m/s
- C 640 m/s
- D 1280 m/s

- 13 A sports field is next to a large school building. At the far side of the sports field, a student sees a groundsman hammer a pole into the ground.



The student hears two bangs each time the hammer hits the pole.

Why does the student hear two bangs?

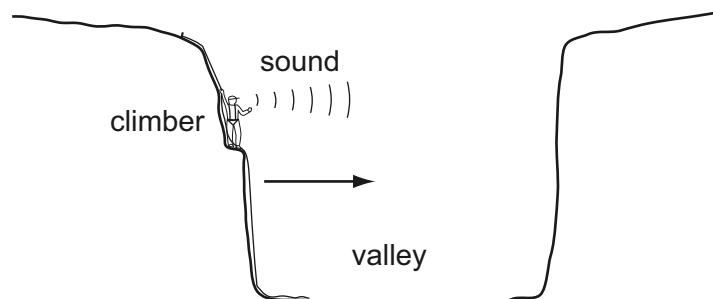
	first bang caused by	second bang caused by
A	sound of hammer hitting pole	sound of pole hitting hammer
B	sound reaching left ear	sound reaching right ear
C	sound reaching student directly	sound due to echo from school building
D	sound reflected back from school building	sound reaching student directly

- 14 When the horn on a ship is sounded, the passengers hear an echo from a cliff after 4.0 s.

If the speed of sound is 340 m/s, how far away is the cliff?

- A 170 m B 340 m C 680 m D 1360 m

- 15 To estimate the width of a valley, a climber starts a stopwatch as he shouts. He hears an echo from the opposite side of the valley after 1.0 s.

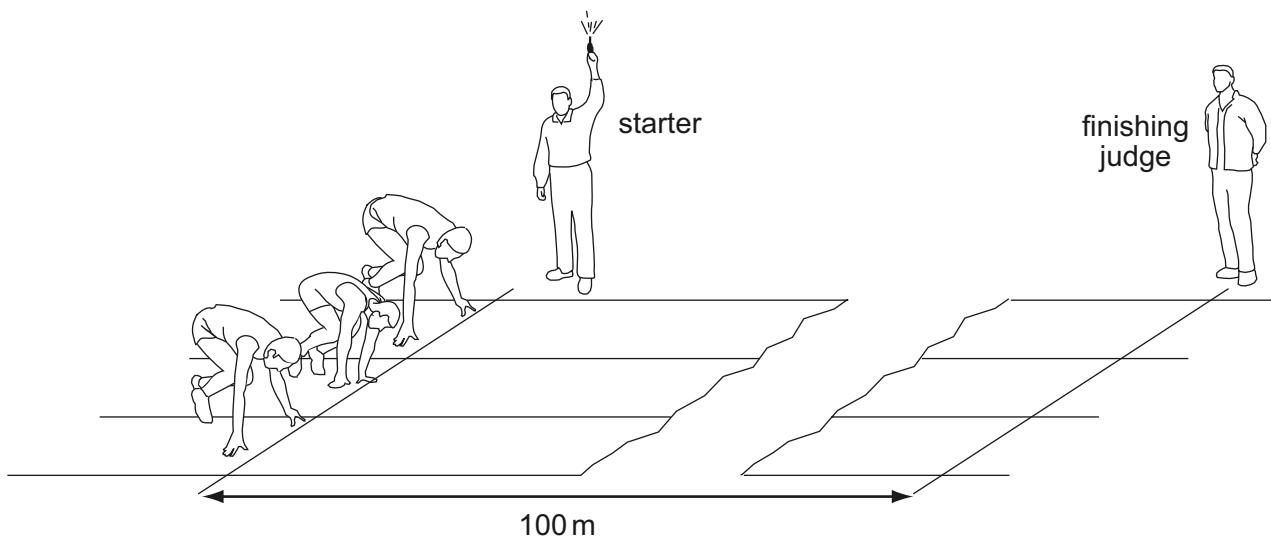


The sound travels at 340 m/s.

What is the width of the valley?

- A 85 m B 170 m C 340 m D 680 m

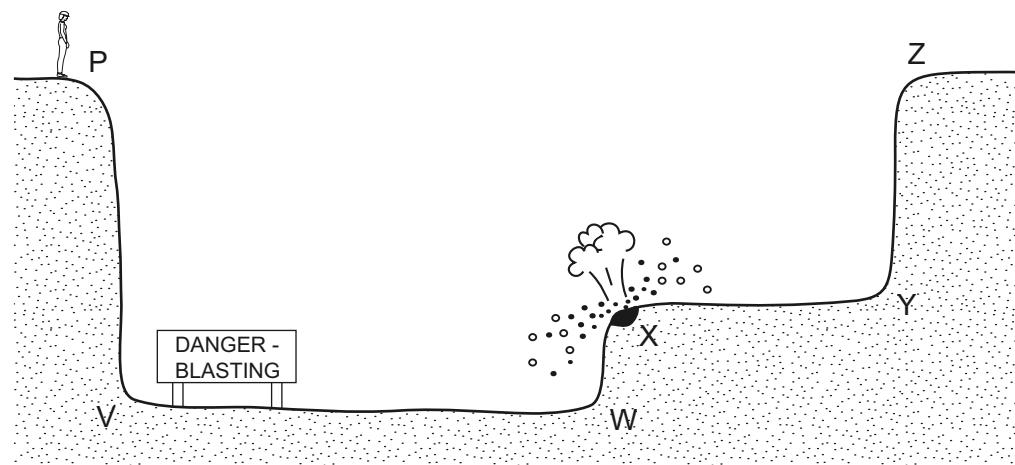
- 16 A 100 metre race is started by firing a gun. The gun makes a bang and a puff of smoke comes out of the gun as shown.



When does the finishing judge see the smoke and hear the bang?

	sees the smoke	hears the bang
A	immediately	immediately
B	immediately	after about 0.3 s
C	after about 0.3 s	immediately
D	after about 0.3 s	after about 0.3 s

- 17 An engineer standing at P hears the sound of an explosion at X.

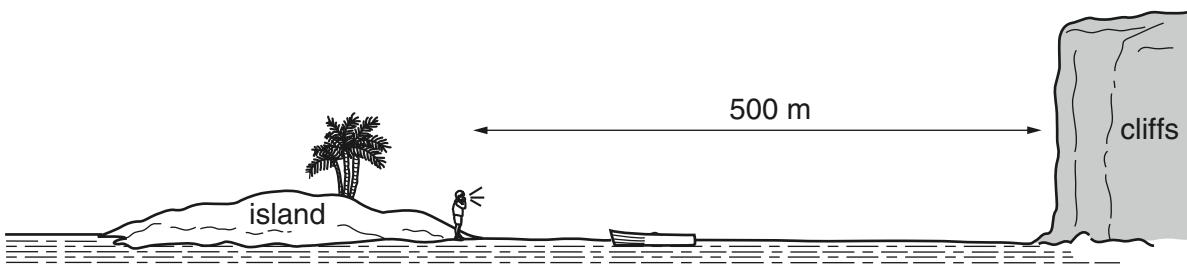


After the explosion, she hears two bangs. One bang is heard a fraction of a second after the other.

The second bang is an echo from

- A XY.
- B PV.
- C ZY.
- D WX.

- 18 A boy is stranded on an island 500 m from the shore.



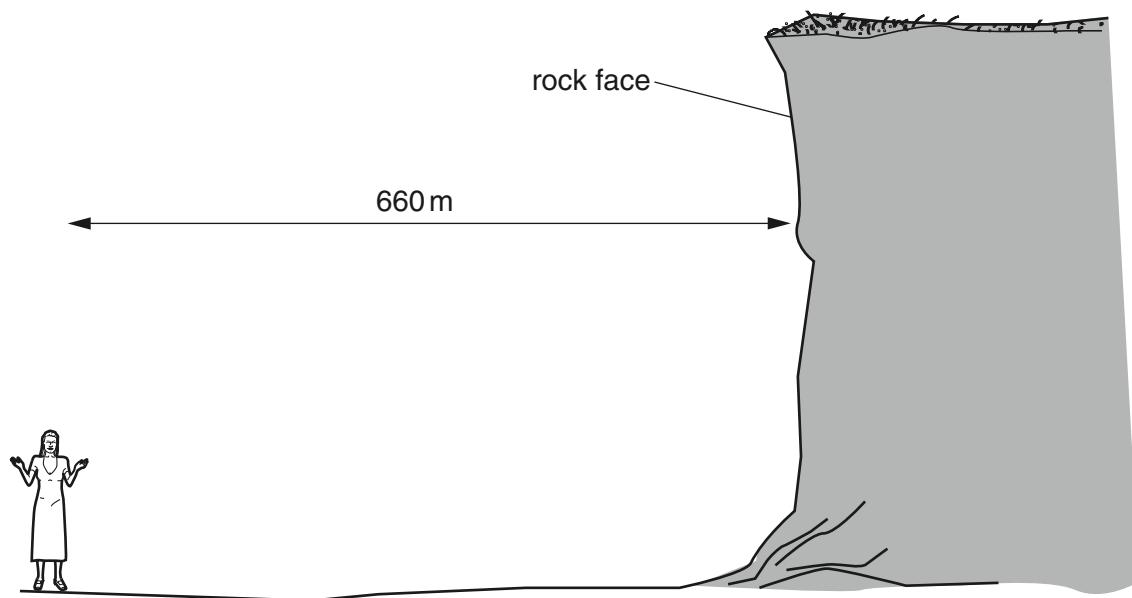
He shouts for help, but all he can hear in reply is the echo of his shout from some cliffs.

Sound travels at 340 m/s through the air.

What is the time interval between the boy shouting and hearing the echo?

- A $\frac{500}{340}$ s
- B $\frac{2 \times 500}{340}$ s
- C $\frac{340}{500}$ s
- D $\frac{2 \times 340}{500}$ s

19 A girl stands in front of a rock face.



The girl claps her hands once. The speed of sound in air is 330 m / s.

How long is it before she hears the echo?

- A $\frac{2 \times 660}{330}$ s B $\frac{660}{330}$ s C $\frac{330}{660}$ s D $\frac{330}{2 \times 660}$ s

12.2 Seeing sound

- 1 In a test, a car horn is found to be too loud and the pitch of the note is too high.

What information does this give about the amplitude and the frequency of the sound wave produced?

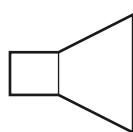
	amplitude	frequency
A	too large	too large
B	too large	too small
C	too small	too large
D	too small	too small

- 2 In a test, a car horn is found to be too loud and the pitch of the note is too high.

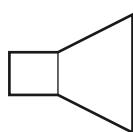
What information does this give about the amplitude and the frequency of the sound wave produced?

	amplitude	frequency
A	too large	too large
B	too large	too small
C	too small	too large
D	too small	too small

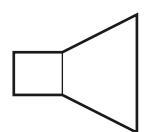
- 3 Three loudspeakers vibrate at different frequencies of 5 hertz, 25 kilohertz and 50 kilohertz.



5 hertz



25 kilohertz



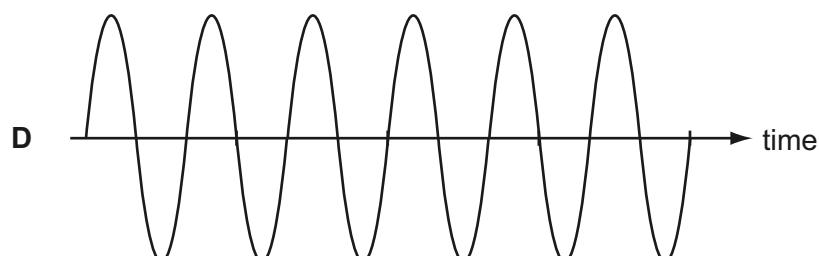
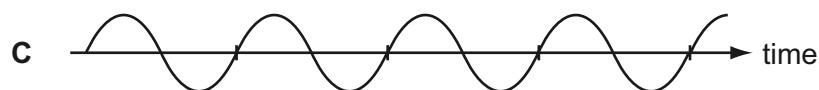
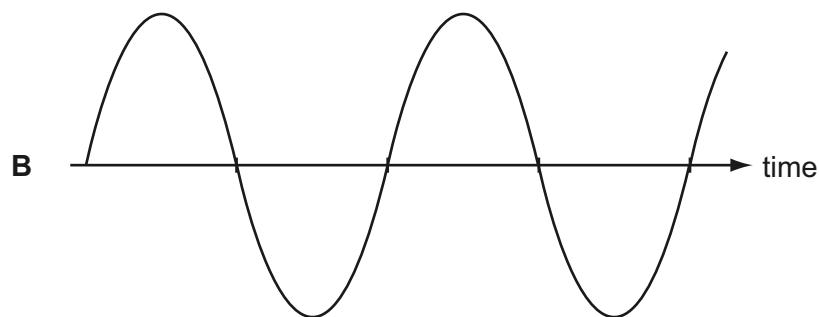
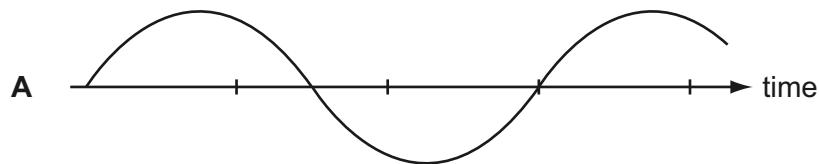
50 kilohertz

Which row shows whether the vibrations from each loudspeaker can be heard by a human?

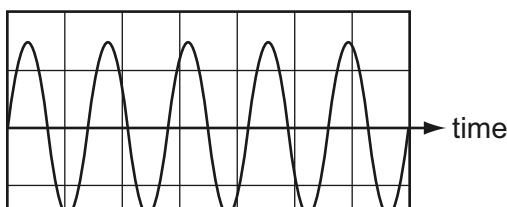
	5 hertz	25 kilohertz	50 kilohertz
A	no	no	no
B	no	yes	no
C	yes	no	yes
D	yes	yes	yes

- 4 The diagrams represent the waves produced by four sources of sound. The scales are the same for all the diagrams.

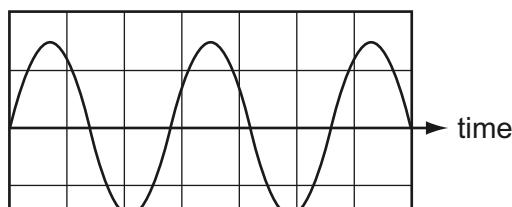
Which sound has the highest frequency?



- 5 The diagrams show the wave shapes of two different sounds. The scales are the same in each diagram.



sound 1



sound 2

How does sound 2 compare with sound 1?

- A Sound 2 is louder than sound 1.
B Sound 2 is quieter than sound 1.
C Sound 2 has a higher pitch than sound 1.
D Sound 2 has a lower pitch than sound 1.
- 6 A student listens to a machine that makes sounds of different frequencies. He can only hear one of the sounds.

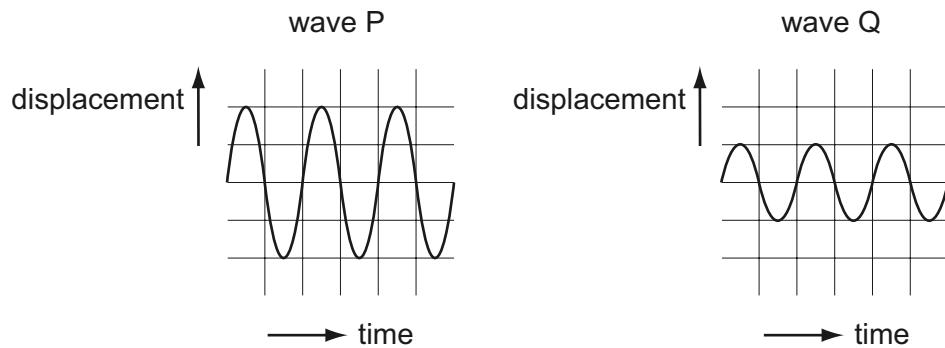
Which frequency of sound is the student able to hear?

- A 2 Hz B 10 Hz C 2 kHz D 30 kHz
- 7 A ship sends a pulse of sound vertically downwards to the sea bed. An echo is heard 0.4 seconds later.

If the speed of sound in the water is 1200 m/s, how deep is the water below the ship?

- A 240 m B 480 m C 1500 m D 3000 m

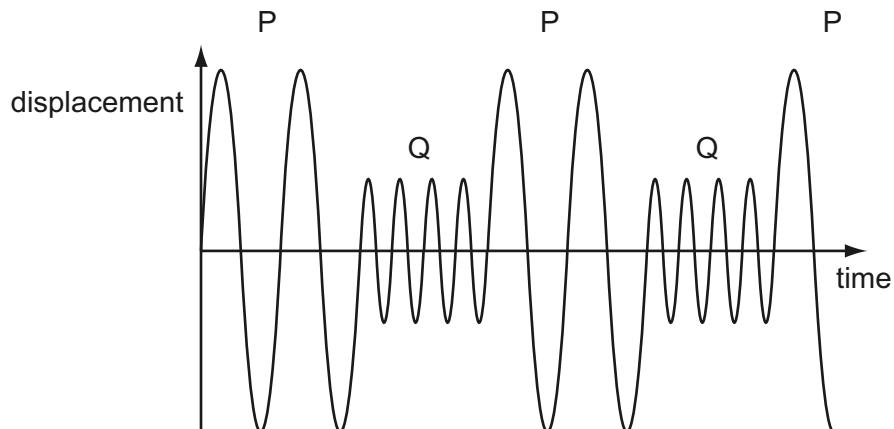
- 8 The diagrams represent two different sound waves.



How do the frequency and pitch of P compare with the frequency and pitch of Q?

	frequency of P	pitch of P
A	greater than Q	higher than Q
B	greater than Q	same as Q
C	same as Q	higher than Q
D	same as Q	same as Q

- 9 A police car siren emits two different sounds P and Q. These are produced alternately. The diagram represents the sounds emitted.

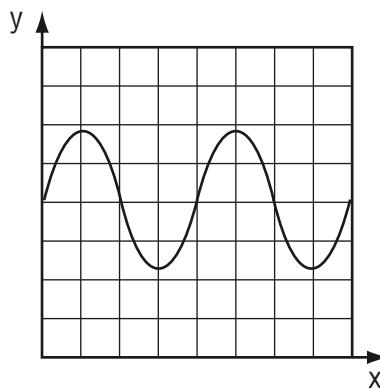


Which sound is the louder and which has the lower pitch?

	louder	lower pitch
A	P	P
B	P	Q
C	Q	P
D	Q	Q

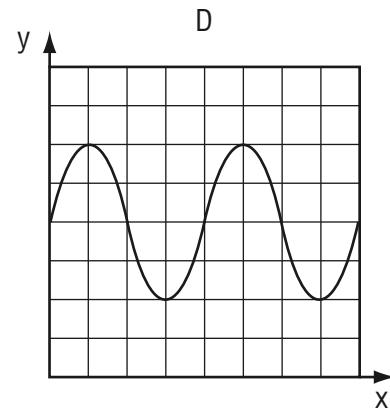
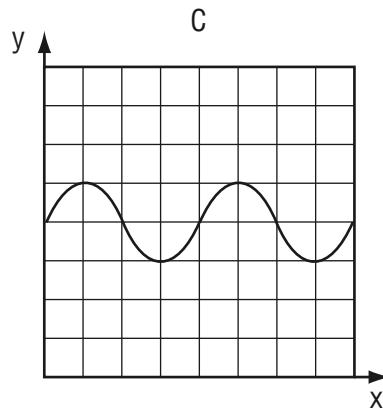
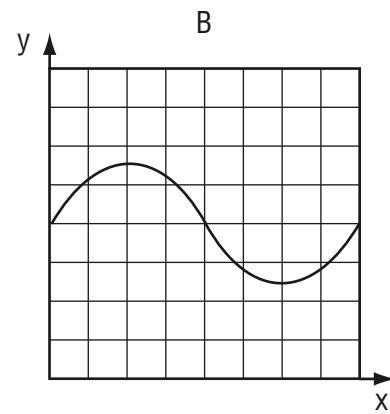
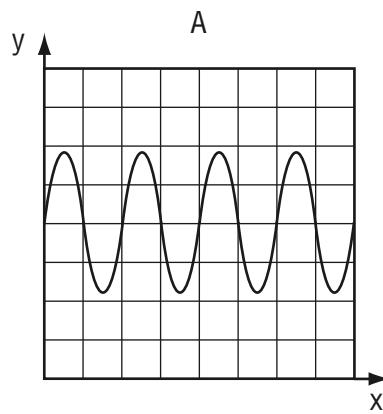
- 10 What is the approximate value of the highest frequency that can be heard by a young person?
- A 20 Hz B 200 Hz C 2000 Hz D 20 000 Hz
- 11 Which range of frequencies typically can be heard by a 10 year-old child?
- A 20 Hz – 2000 Hz
B 20 Hz – 20 000 Hz
C 200 Hz – 2000 Hz
D 200 Hz – 20 000 Hz

- 12 The graph represents a sound wave. The horizontal (x) axis represents time.



The frequency of the sound is increased.

The graphs below are shown to the same scale. Which graph represents the new sound wave?



- 13 Music is produced by the loudspeaker of a radio.

Which property of the sound wave increases when the music is made louder?

- A amplitude
- B frequency
- C speed
- D wavelength

- 14 A police car with its siren sounding is stationary in heavy traffic. A pedestrian notices that, although the loudness of the sound produced does not change, the pitch varies.

Which line in the table describes the amplitude and the frequency of the sound?

	amplitude	frequency
A	constant	varying
B	constant	constant
C	varying	constant
D	varying	varying

- 15 Sounds are made by vibrating objects. A certain object vibrates but a person nearby cannot hear any sound.

Which statement might explain why nothing is heard?

- A The amplitude of the sound waves is too large.
- B The frequency of the vibration is too high.
- C The sound waves are transverse.
- D The speed of the sound waves is too high.

- 16 A fire alarm is not loud enough. An engineer adjusts it so that it produces a note of the same pitch which is louder.

What effect does this have on the amplitude and on the frequency of the sound?

	amplitude	frequency
A	larger	larger
B	larger	same
C	same	larger
D	same	same

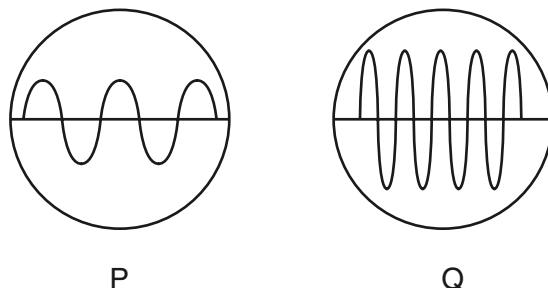
17 What is the approximate range of audible frequencies for most humans?

- A 10 Hz to 10 000 Hz
- B 20 Hz to 20 000 Hz
- C 10 kHz to 10 000 kHz
- D 20 kHz to 20 000 kHz

18 Which change will lower the pitch of a sound?

- A decreasing its amplitude
- B decreasing its frequency
- C increasing its amplitude
- D increasing its frequency

19 Two sound waves P and Q are displayed on an oscilloscope with the same time-base and Y-plate settings for each.



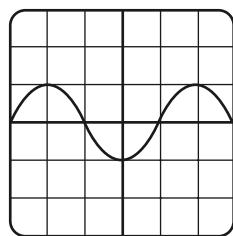
Which statement correctly describes the pitch and the loudness of the two sounds?

- A P has a higher pitch and is louder than Q.
- B P has a higher pitch and is quieter than Q.
- C P has a lower pitch and is louder than Q.
- D P has a lower pitch and is quieter than Q.

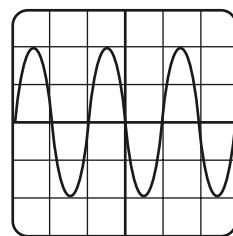
20 Which of the following can be heard by the human ear?

- A A whistle emitting a wave of frequency 50 kHz.
- B A bat emitting a wave of frequency of 30 kHz.
- C An insect emitting a wave of 300 Hz.
- D A vibrating spring emitting a wave of frequency of 5 Hz.

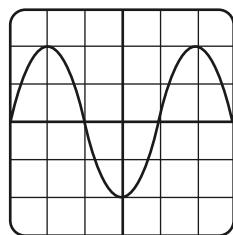
- 21 Four sound waves W, X, Y and Z are displayed by an oscilloscope screen. The oscilloscope settings are the same in each case.



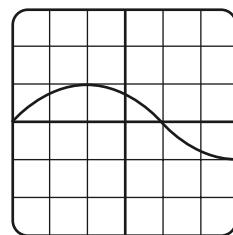
W



X



Y



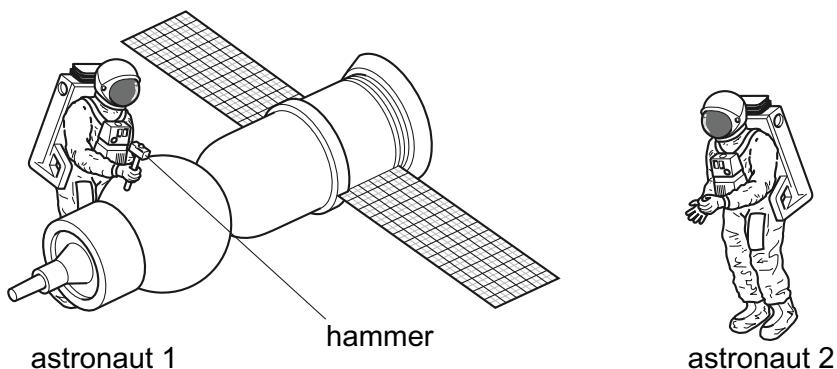
Z

Which two sounds have the same pitch?

- A W and X
- B W and Y
- C X and Y
- D X and Z

12.3 How sound travel

- 1 Astronaut 1 uses a hammer to mend a satellite in space. Astronaut 2 is nearby. There is no air in space.



Compared with the sound heard if they were working on Earth, what does astronaut 2 hear?

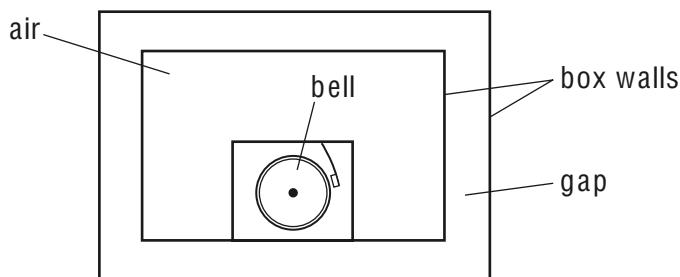
- A a louder sound
 - B a quieter sound
 - C a sound of the same loudness
 - D no sound at all
- 2 Sound waves travel from a point X to another point Y.



Which diagram represents the movement of the air molecules, caused by the sound waves, in the region between X and Y.



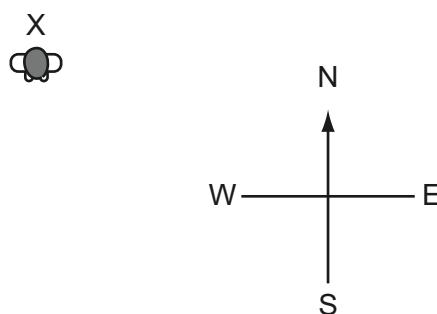
- 3 A battery-operated bell is surrounded by a box with double walls.



The bell is ringing but no sound at all is heard outside the box.

What is in the gap?

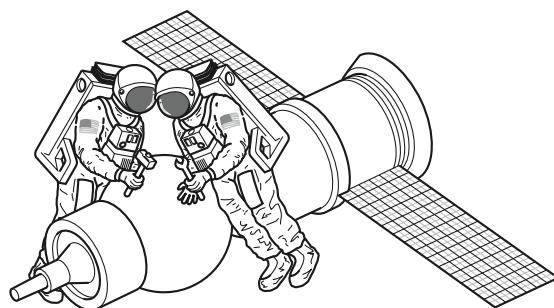
- A a solid
 - B a liquid
 - C a gas
 - D a vacuum
- 4 The diagram shows a man standing at X who shouts to a man standing at Y.



The man's voice will be heard sooner and more clearly if the wind is blowing towards the

- A north.
- B south.
- C east.
- D west.

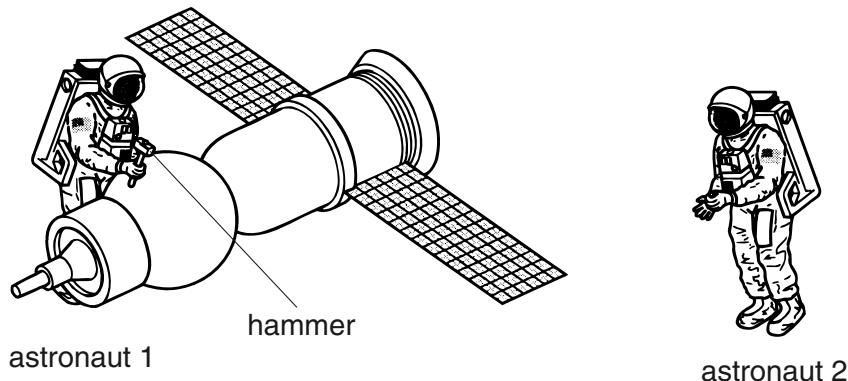
- 5 Two astronauts without radios can only communicate in space if their helmets are touching. There is no air in space.



What does this show about sound?

	through a solid	through a vacuum
A	can travel	can travel
B	can travel	cannot travel
C	cannot travel	can travel
D	cannot travel	cannot travel

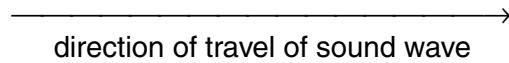
- 6 Astronaut 1 uses a hammer to mend a satellite in space. Astronaut 2 is nearby. There is no atmosphere in space.



Compared with the sound heard if they were working on Earth, what does astronaut 2 hear?

- A no sound at all
- B a quieter sound
- C a sound of the same loudness
- D a louder sound

- 7 A sound wave passes through the air, in the direction shown.



How does a particle of air move as the sound wave passes?

A moves to the right and stays there • →

B moves left and right ← • →

C moves up and stays there ↑
•

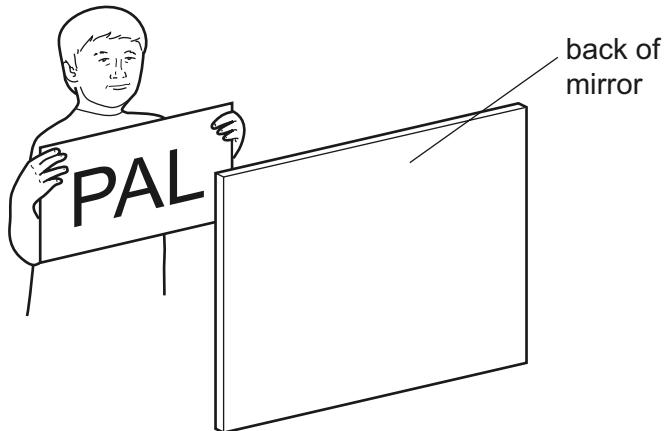
D moves up and down ↑
•
↓

Chapter 13. Light

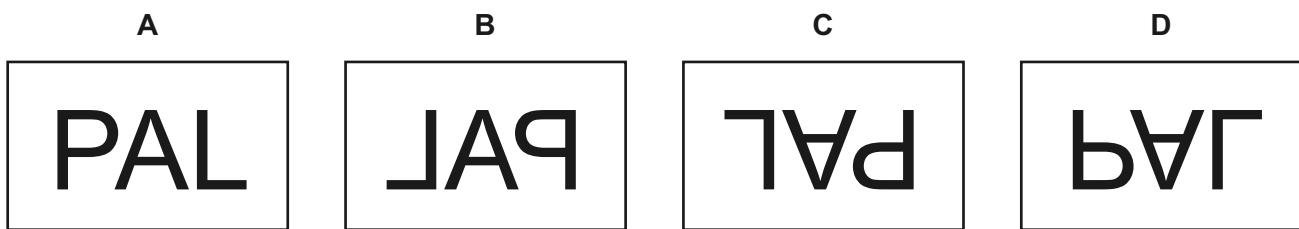
13.1 Reflecting light

- 1 A piece of paper has 'PAL' written on it.

A student holds the paper in front of a plane mirror.

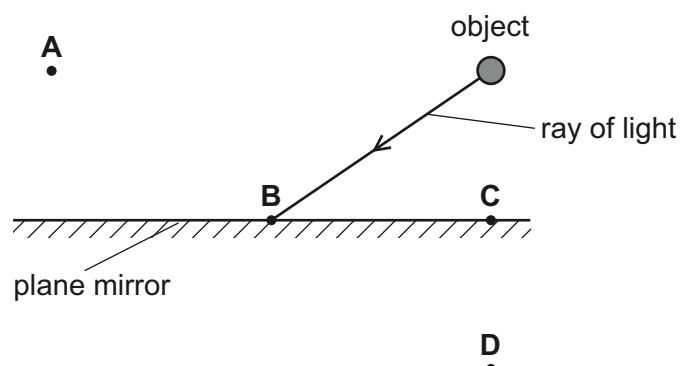


What does the student see?

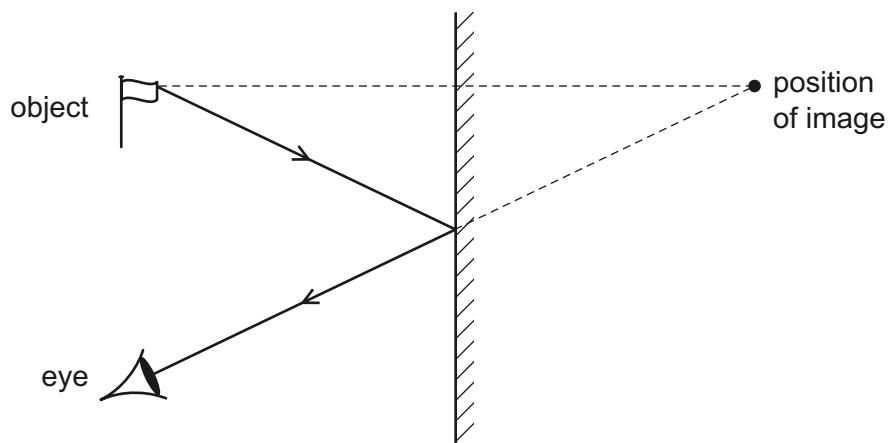


- 2 A plane mirror is used to form an image of an object.

At which labelled point is the image formed?



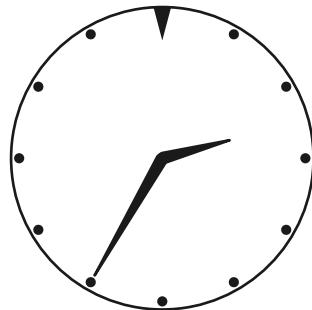
- 3 The image formed by a plane mirror is upright.



What are the other characteristics of the image?

	laterally inverted (left to right)	magnified (larger than the object)	virtual
A	no	yes	yes
B	yes	no	no
C	yes	no	yes
D	yes	yes	no

- 4 The diagram shows the image of a clock in a plane mirror.



What time is shown?

- A 02:25 B 02:35 C 09:25 D 09:35

- 5 A girl writes the word **LEFT** on a piece of card.



She looks at the image of this card, made by reflection by a plane mirror.

What does she see?

A



B



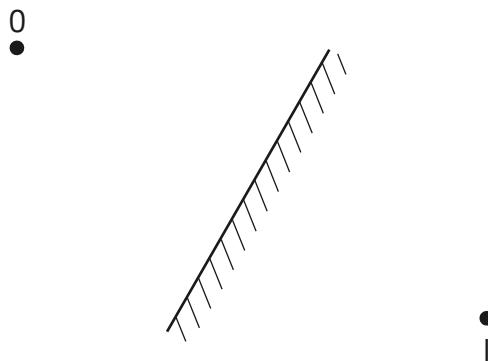
C



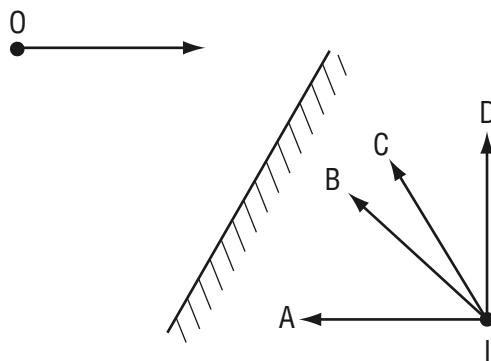
D



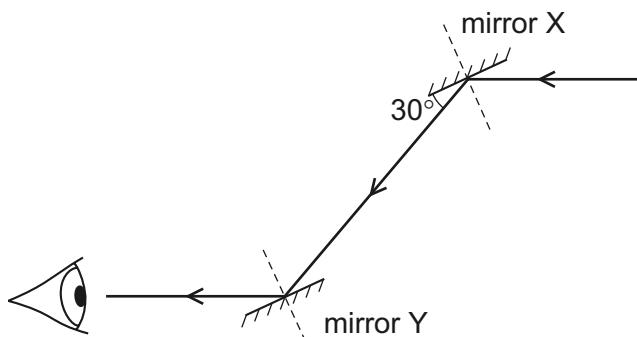
- 6 An object placed in front of a plane mirror at O produces an image at I.



If the object moves towards the mirror in the direction shown by the arrow, in which direction does the image move?

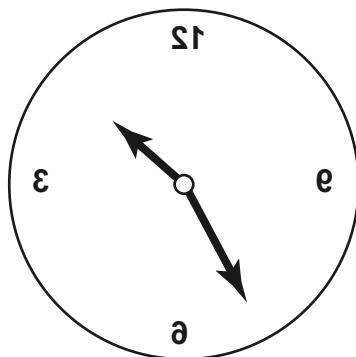


- 7 A ray of light is reflected by two parallel plane mirrors X and Y.



Which statement is correct?

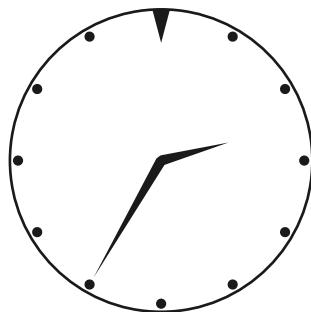
- A The angle of incidence at mirror X is 30° .
 - B The angle of incidence at mirror Y is 60° .
 - C The angle of reflection at mirror X is 120° .
 - D The angle of reflection at mirror Y is 0° .
- 8 The image of a clock face as seen in a plane mirror is shown.



What is the time on the clock?

- A 1.25
- B 1.35
- C 10.25
- D 10.35

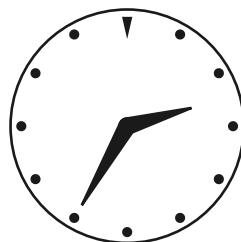
- 9 The diagram shows the image of a clock in a plane mirror.



What time is shown?

- A 02:25 B 02:35 C 09:25 D 09:35

- 10 The diagram shows the image of a clockface in a plane mirror.



Which of these times is shown?

- A 02.25 B 02.35 C 09.25 D 09.35

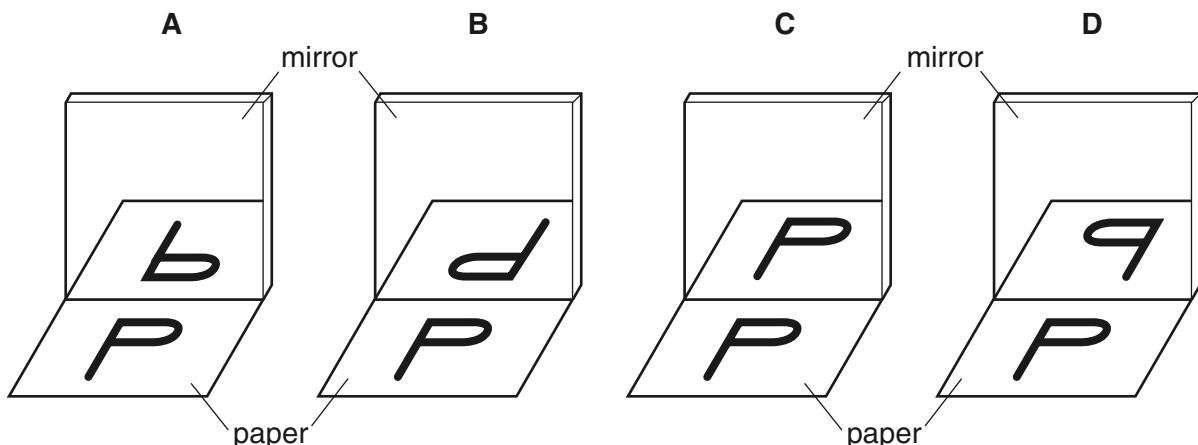
- 11 A plane mirror is on a wall.

Which is a correct description of the image formed by the mirror?

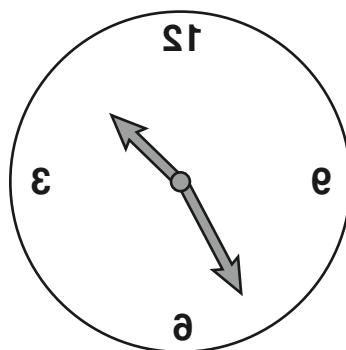
- A the right way up and smaller than the object
- B the right way up and the same size as the object
- C upside down and smaller than the object
- D upside down and the same size as the object

- 12 A student looks at the letter P on a piece of paper, and at its reflection in a mirror.

What does he see?



- 13 The image of a clock face as seen in a plane mirror is shown.

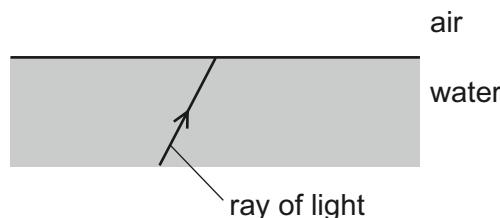


What is the actual time on the clock?

- A** 1.25 **B** 1.35 **C** 10.25 **D** 10.35

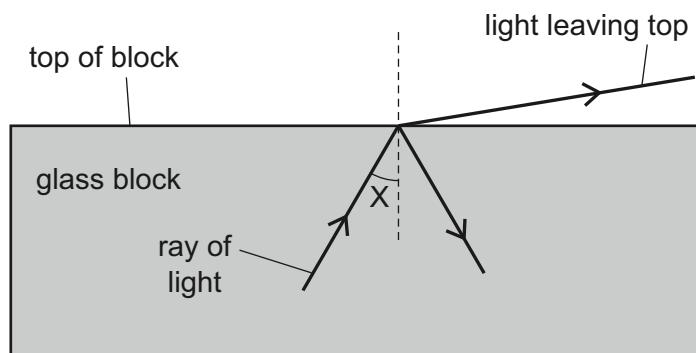
13.2 Refraction of light

- 1 A ray of light in water is incident on the surface. The angle of incidence is much smaller than the critical angle.



What happens to this ray?

- A It is completely reflected.
 - B It is completely refracted.
 - C It is partially reflected and partially refracted.
 - D It is refracted at an angle of refraction of 90° .
- 2 A scientist is trying to direct a ray of light through a glass block without any light leaving the top of the block. However, some light does leave the top.



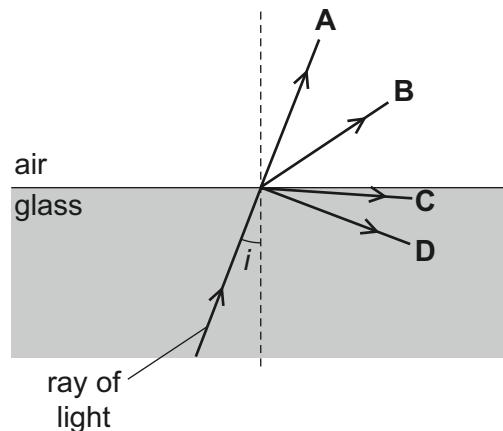
The scientist changes angle X and stops the ray of light leaving the top.

Which row in the table describes the change to angle X and the name of the effect produced?

	change to angle X	name of effect produced
A	decrease	total internal reflection
B	decrease	total internal refraction
C	increase	total internal reflection
D	increase	total internal refraction

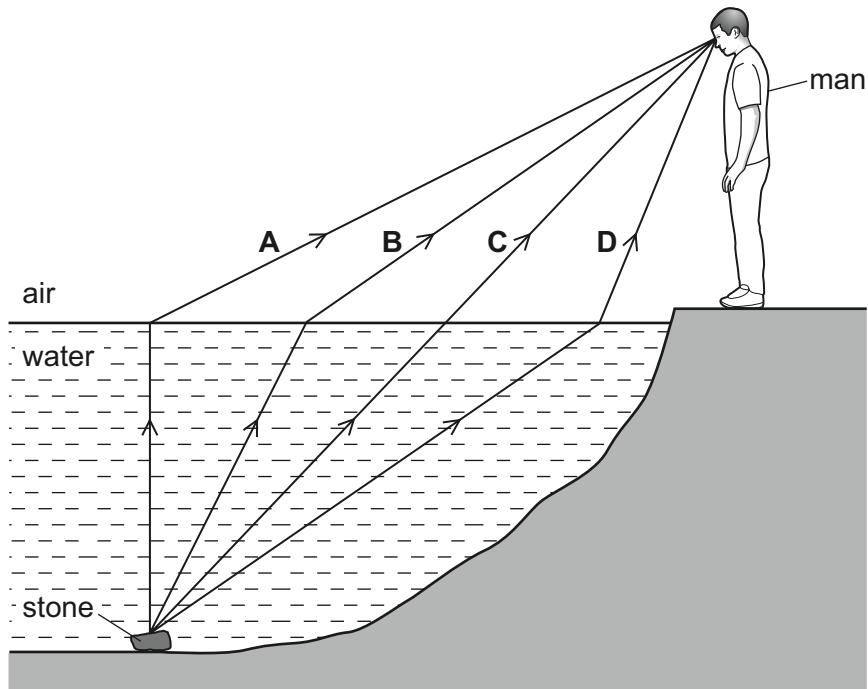
- 3 A ray of light in glass is incident on a boundary with air.

Which path does the ray of light take when the angle of incidence i is less than the critical angle?

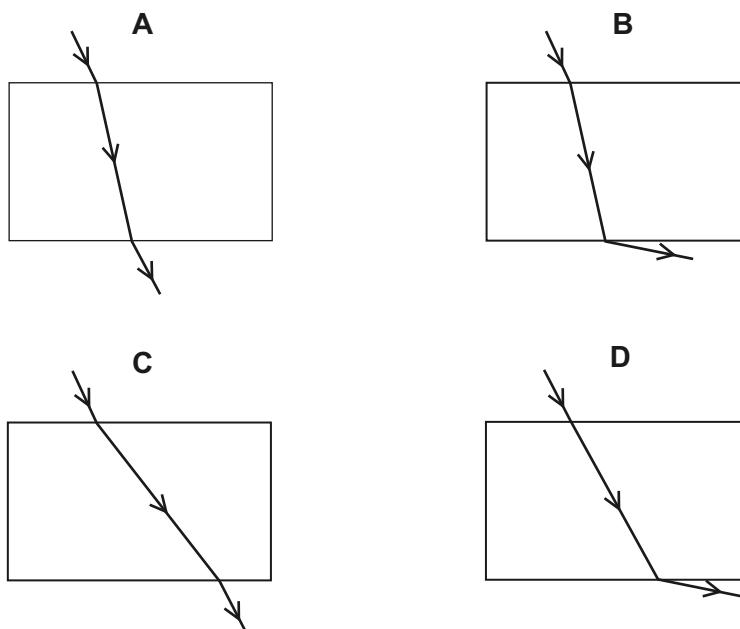


- 4 A man sees a stone at the bottom of a pool of water.

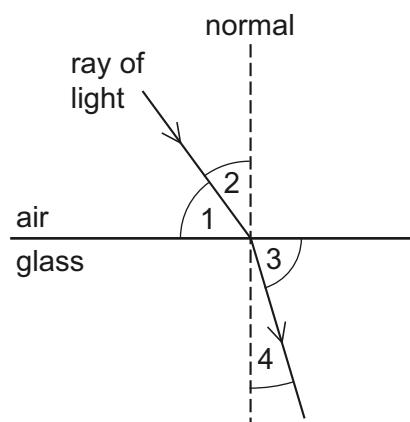
Which path could be taken by light from the stone to the man?



5 Which diagram correctly shows a ray of light passing through a rectangular glass block?



6 The diagram shows a ray of light entering a block of glass.



Which numbered angles are the angles of incidence and of refraction?

	angle of incidence	angle of refraction
A	1	3
B	1	4
C	2	3
D	2	4

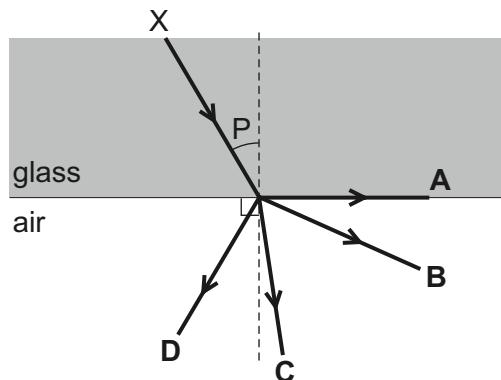
7 What causes refraction when light travels from air into glass?

- A The amplitude of the light waves changes.
- B The colour of the light changes.
- C The frequency of the light waves changes.
- D The speed of the light changes.

13.3 Total internal reflection

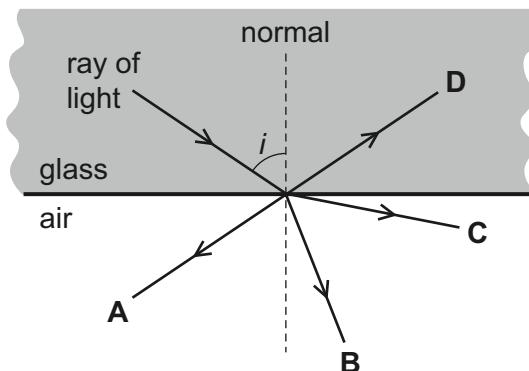
- 1 The diagram shows a ray of light travelling from X. Angle P is less than the critical angle.

In which direction does the ray continue?

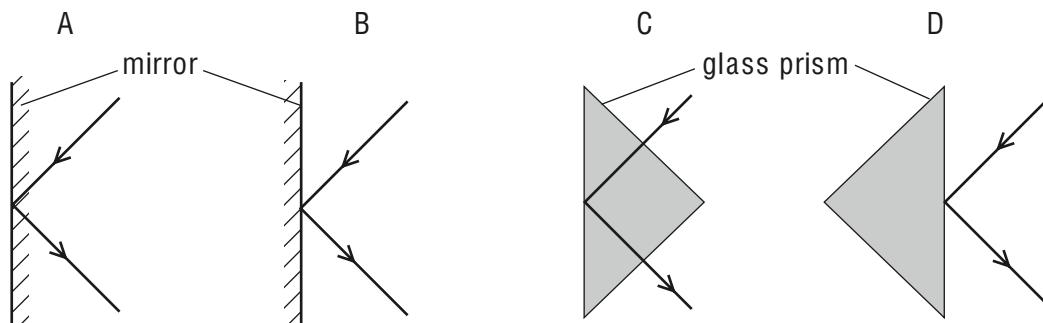


- 2 The diagram shows a ray of light incident on the edge of a piece of glass. The angle i is bigger than the critical angle.

Which arrow correctly shows the direction of the ray after it leaves the edge of the glass?

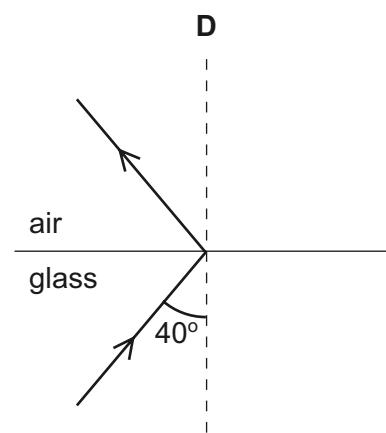
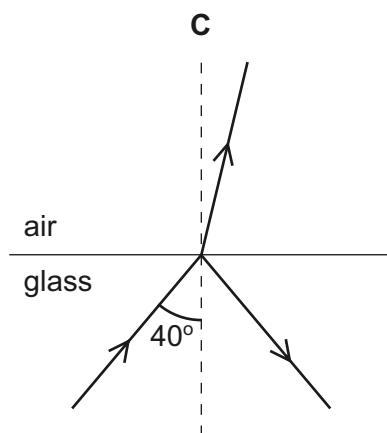
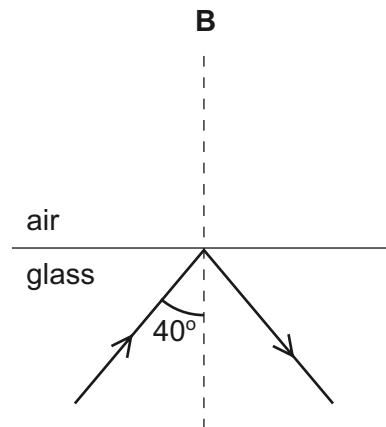
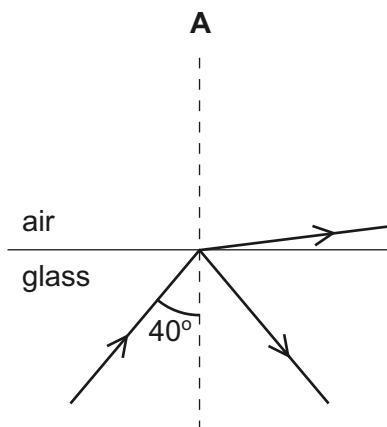


- 3 Which diagram shows total internal reflection of light?



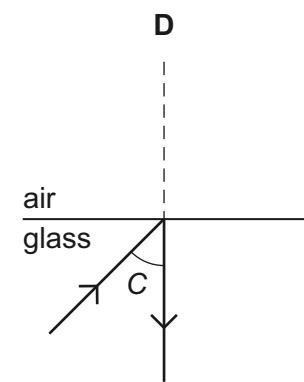
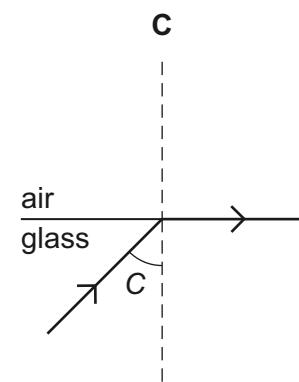
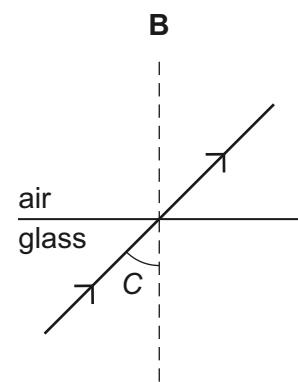
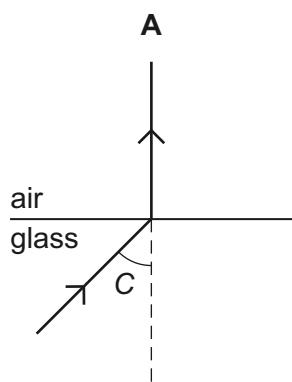
- 4 A ray of light passes from glass into air at an angle of incidence of 40° . The glass has a critical angle of 42° .

Which diagram shows what happens to the ray?



- 5 The critical angle for a glass/air boundary is C .

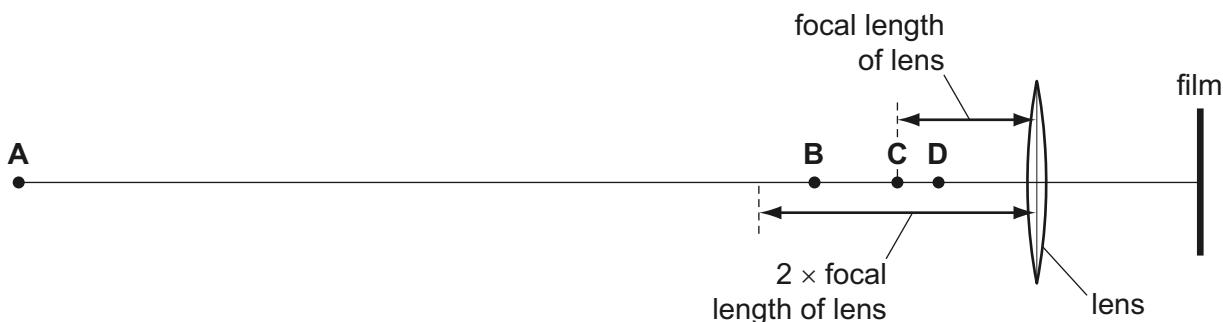
Which diagram shows the correct path of the light ray?



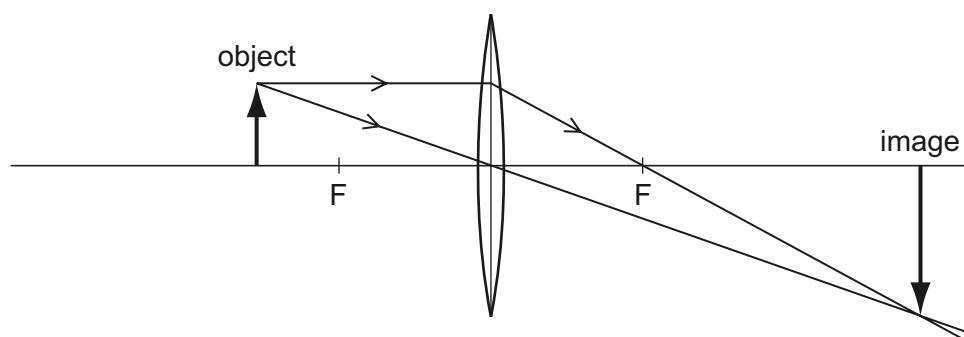
13.4 Lenses

- 1 The converging lens in a camera is used to make an image on a film.

At which labelled point could a large object be placed so that it makes a smaller image?



- 2 A thin converging lens forms an image.

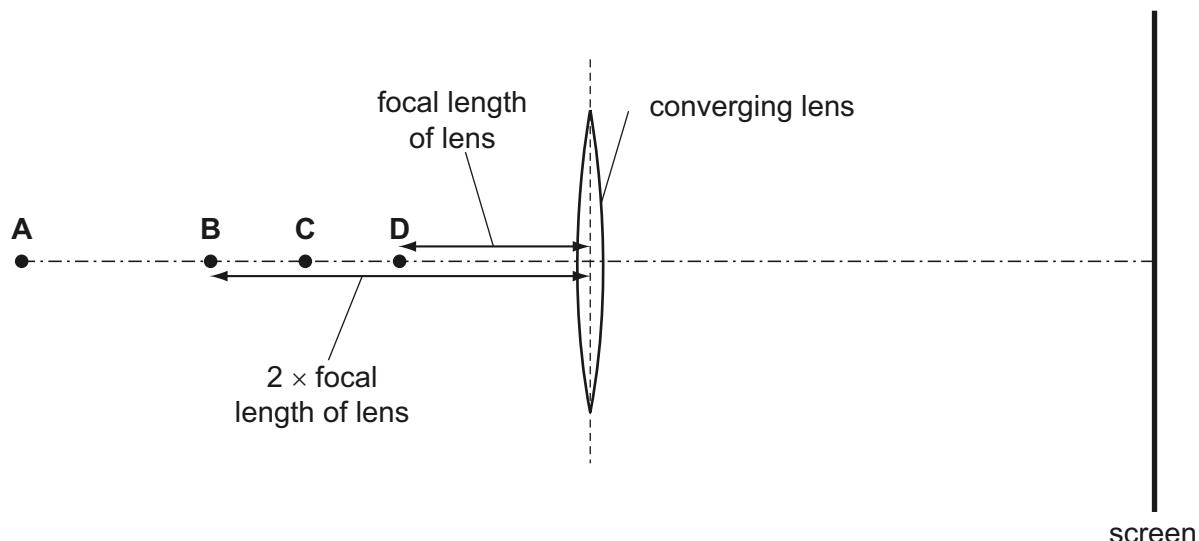


What is the nature of this image and can it be formed on a screen?

	nature of image	can be formed on a screen?
A	not real	no
B	not real	yes
C	real	no
D	real	yes

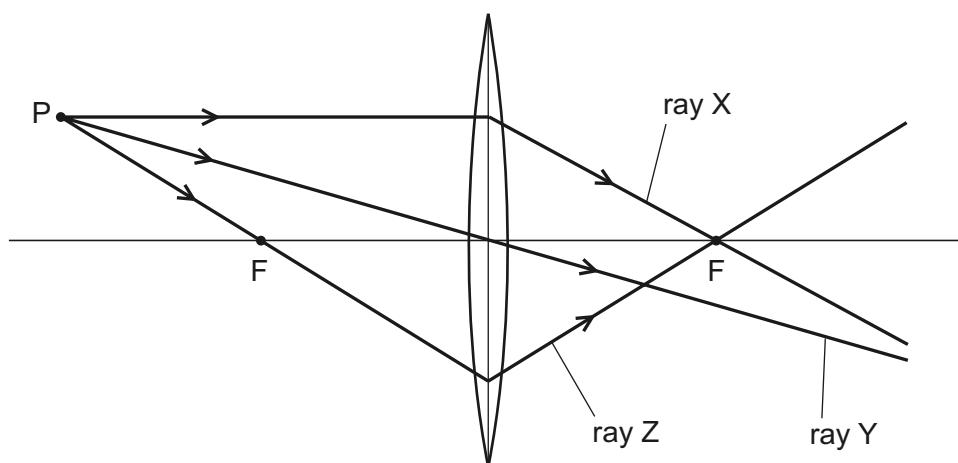
- 3 A converging lens in a projector is used to make an **enlarged** image of a small piece of film on a screen.

At which labelled point could the piece of film be placed so that the lens produces this image?



- 4 A student draws three rays of light from point P through a converging lens.

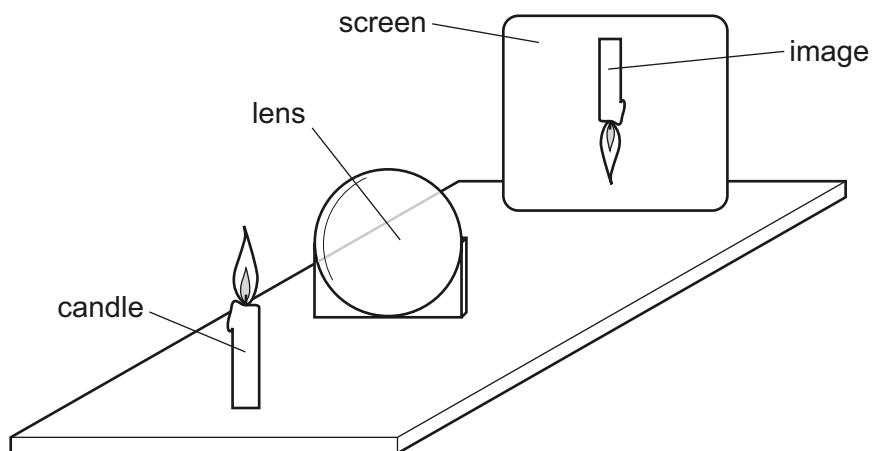
Each point labelled F is a principal focus of the lens.



Which of the rays are drawn correctly?

- A ray Y only
- B ray Z only
- C ray X and ray Y
- D ray X and ray Z

- 5 A thin converging lens is used to produce, on a screen, a focused image of a candle.

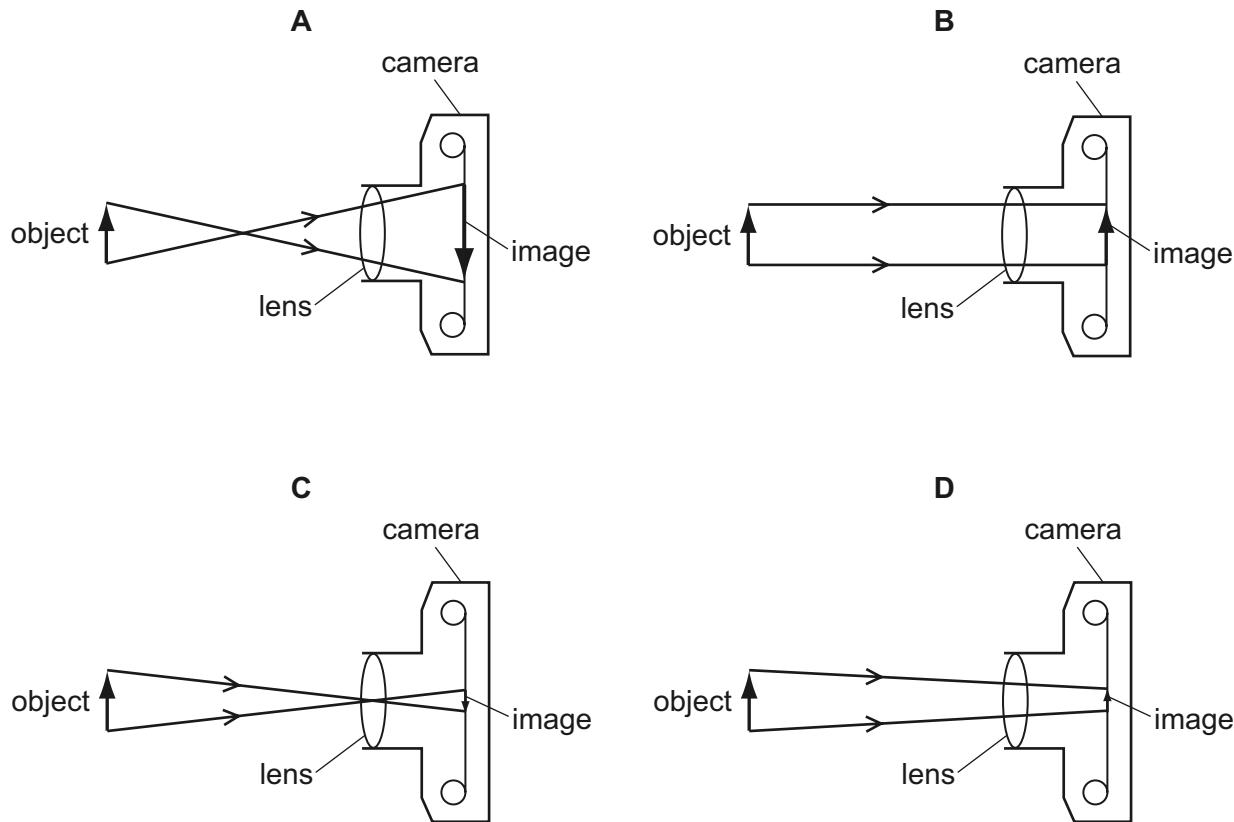


Various focused images are produced on the screen by moving the lens and the screen backwards and forwards.

Which statement is **always** correct?

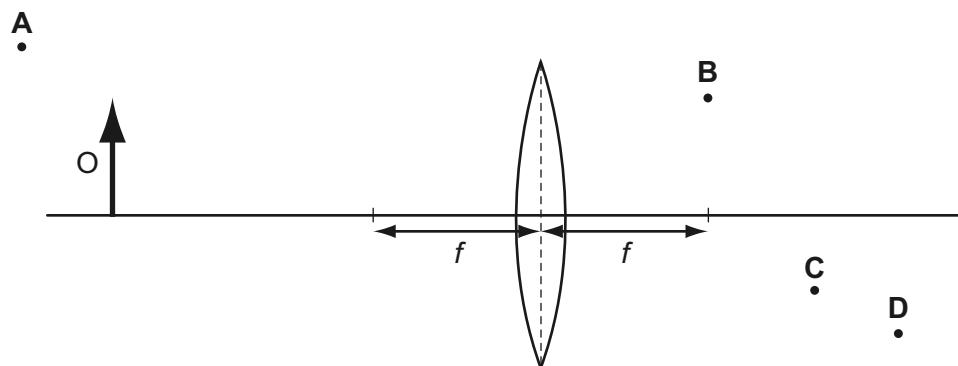
- A The image is at the principal focus (focal point) of the lens.
- B The image is bigger than the object.
- C The image is closer to the lens than the object is.
- D The image is inverted.

6 Which diagram correctly shows rays of light passing through a converging lens in a camera?



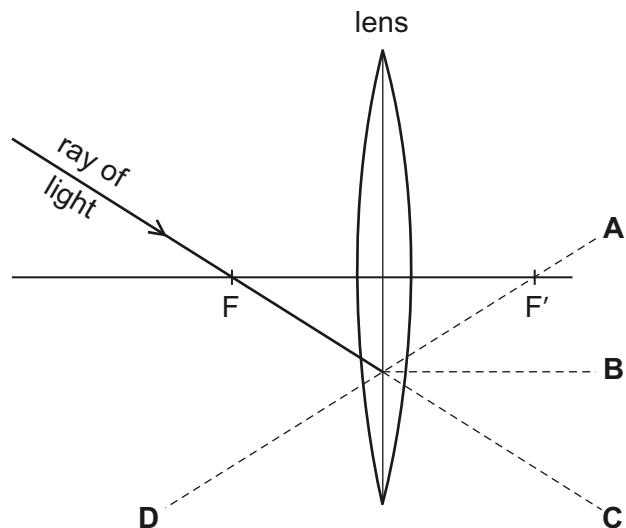
7 An object O is placed in front of a converging lens of focal length f .

At which point will the top of the image be seen?



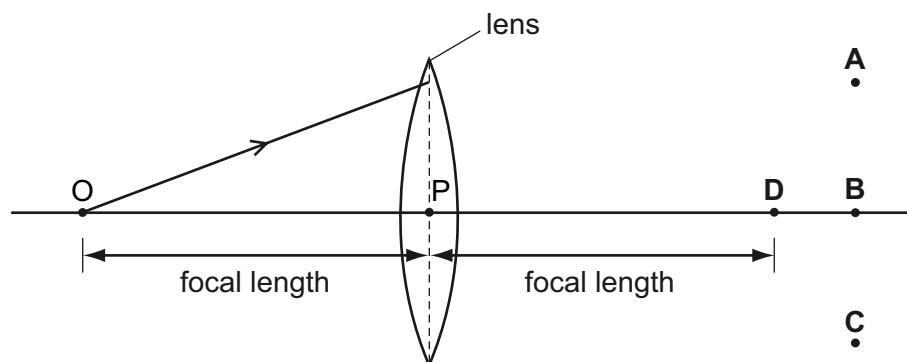
- 8 The diagram shows the path of a ray of light passing through a principal focus F of a lens.

Which broken line shows the direction of the ray after it leaves the lens?

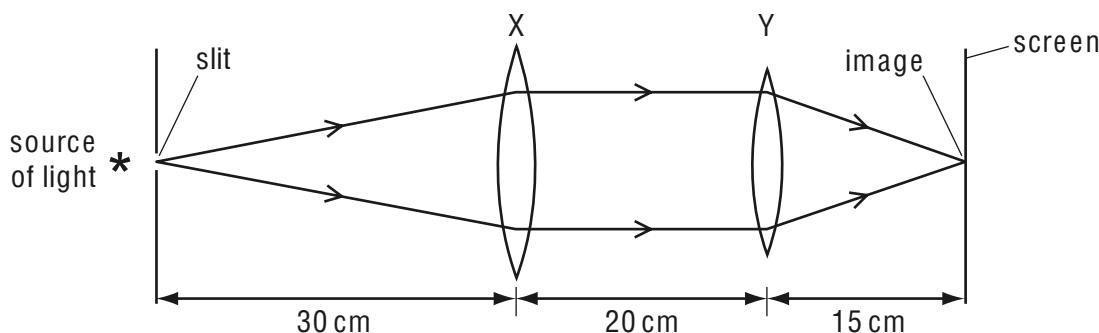


- 9 In the diagram, the distance OP is the focal length of the lens.

Through which point will the ray shown pass, after refraction by the lens?



- 10 Two thin converging lenses X and Y are used as shown to give a focused image of an illuminated slit. The rays shown are parallel between X and Y.

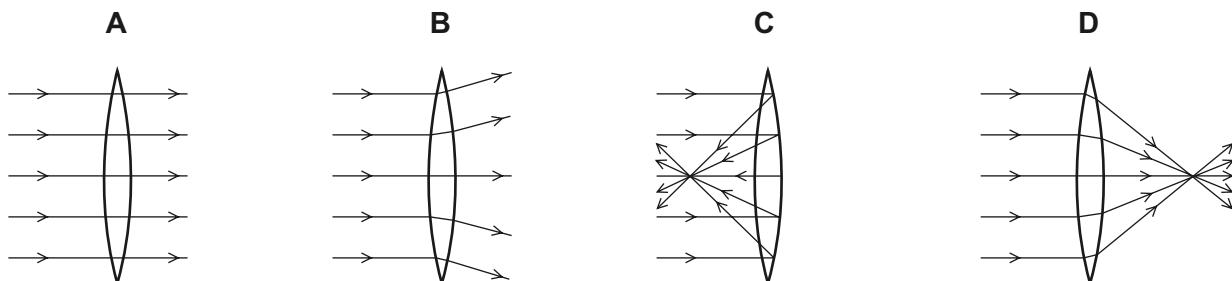


What are the correct values for the focal lengths of X and of Y?

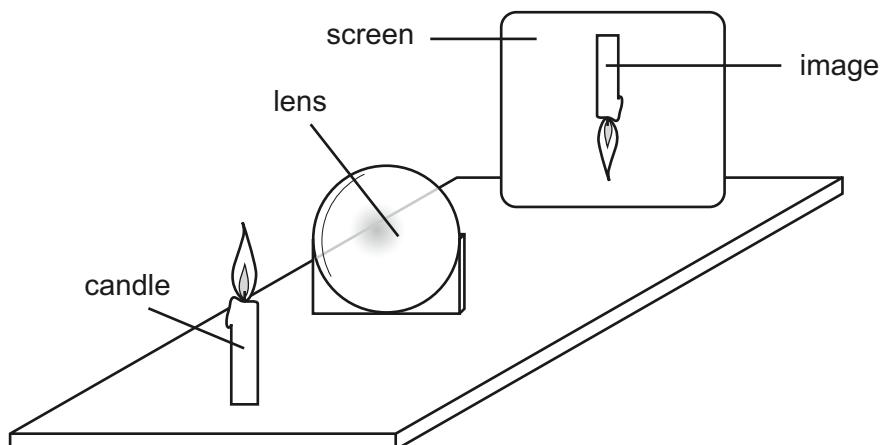
	focal length of X/cm	focal length of Y/cm
A	50	35
B	30	20
C	30	15
D	20	20

- 11 A parallel beam of light falls on a converging lens.

Which diagram shows what happens to the beam of light?



- 12 A thin converging lens is used to produce, on a screen, a focused image of a candle.

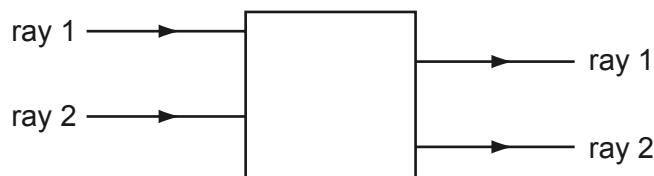


The screen and the lens are moved back and forth and various focused images are produced on the screen.

Which statement is **always** true?

- A The image is at the principal focus (focal point) of the lens.
- B The image is bigger than the object.
- C The image is closer to the lens than the object is.
- D The image is inverted.

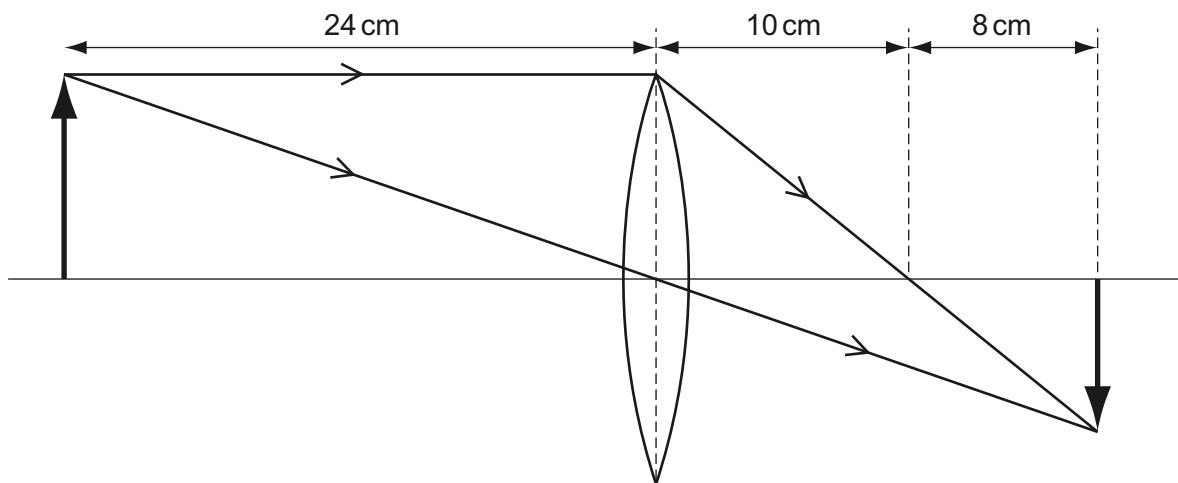
- 13 Rays of light enter and leave a box.



What could be inside the box to make the rays behave as shown?

- A a converging lens
- B a parallel-sided glass block
- C a plane mirror
- D a triangular prism

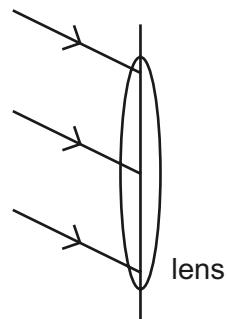
- 14 The ray diagram shows how an image is formed by a converging lens.



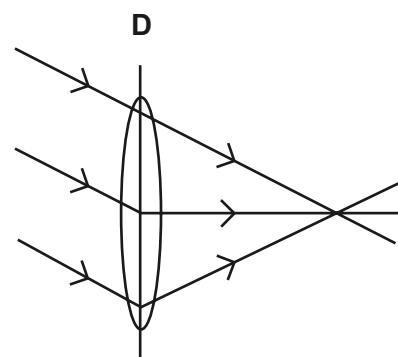
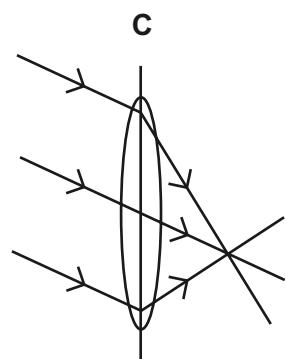
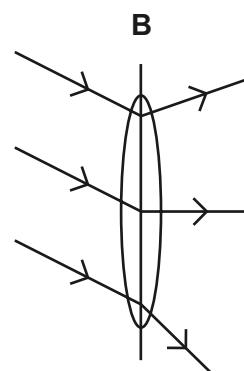
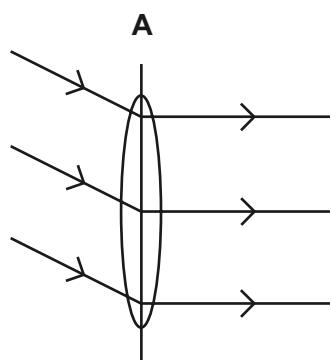
What is the focal length of this lens?

- A 8 cm B 10 cm C 18 cm D 24 cm

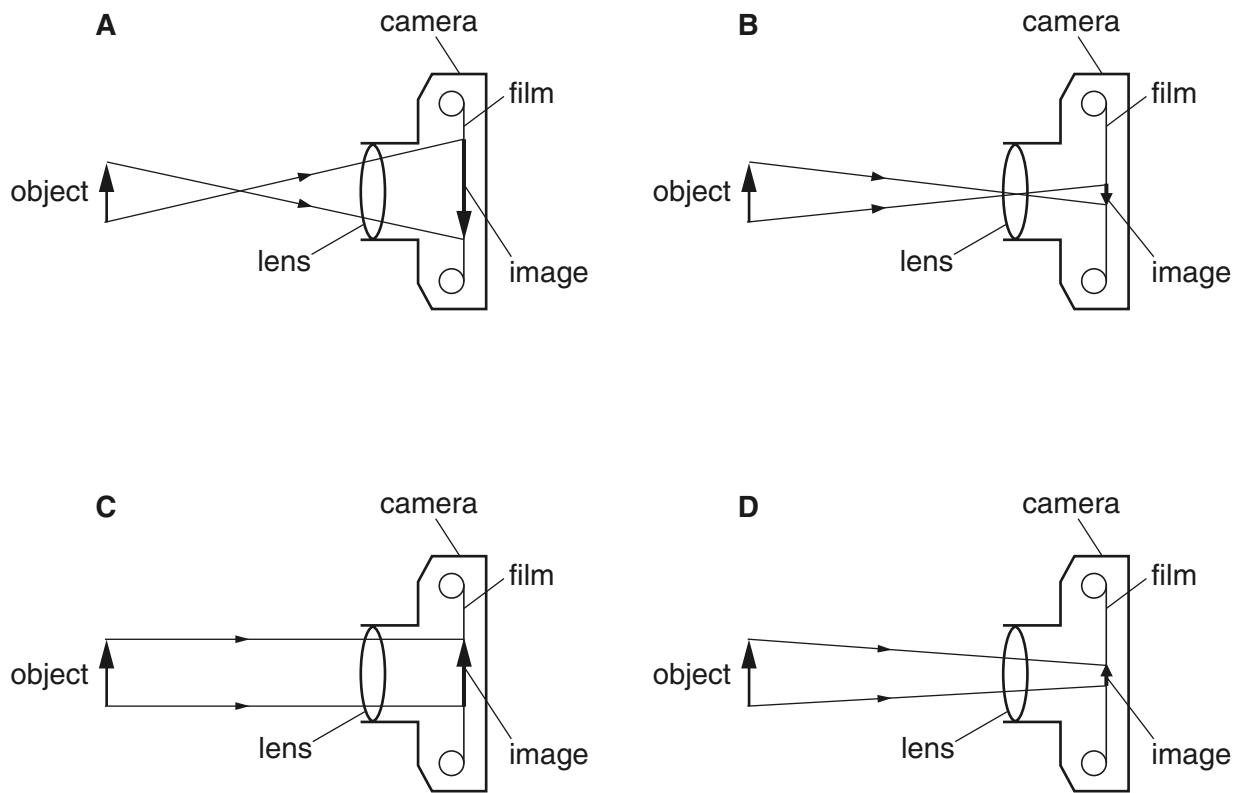
- 15 Three rays of light fall on a converging lens as shown.



Which diagram shows the path of the rays after passing through the lens?



16 Which diagram correctly shows rays passing through a camera lens?

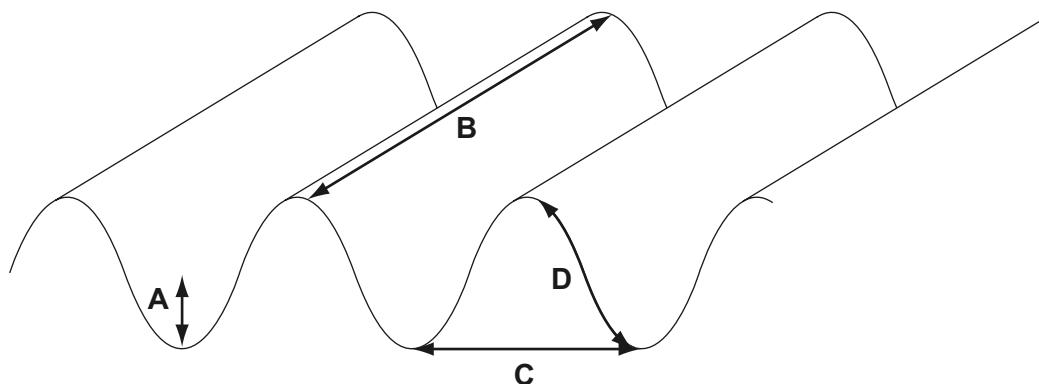


Chapter 14. Wave

14.1 Describing Waves

- 1 The diagram shows a water wave in a ripple tank.

Which line represents a wavefront?



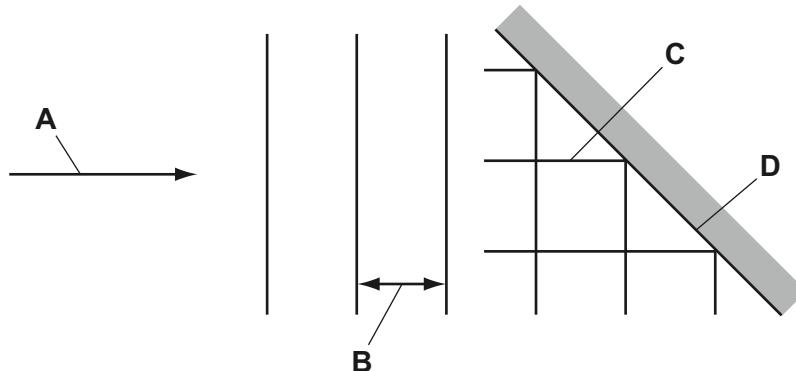
- 2 A swimmer is sitting on a rock at the sea shore looking at passing waves. He notices that five complete wavelengths pass him in 20 s.

What is the frequency of this wave?

- A 0.25 Hz B 4.0 Hz C 15 Hz D 100 Hz

- 3 The diagram shows plane waves reflected by a plane surface.

Which line represents a wavefront?



- 4 Which row correctly describes light waves and radio waves?

	light waves	radio waves
A	longitudinal	longitudinal
B	longitudinal	transverse
C	transverse	longitudinal
D	transverse	transverse

5 What is the unit of wavelength?

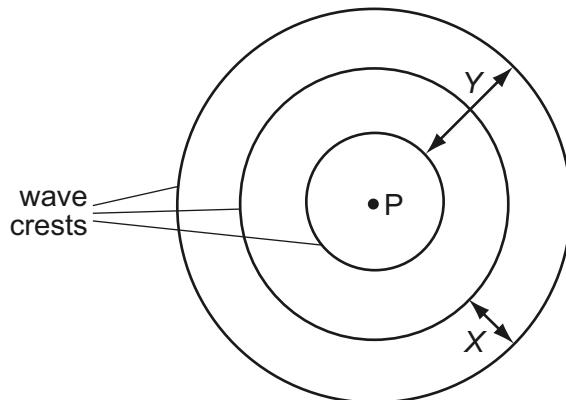
- A hertz
- B metre
- C metre per second
- D second

6 Which of these waves is longitudinal?

- A infra-red
- B radio
- C sound
- D water

7 A vertical stick is dipped up and down in water at P.

In two seconds, three wave crests are produced on the surface of the water.



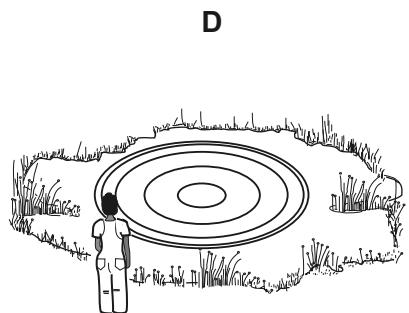
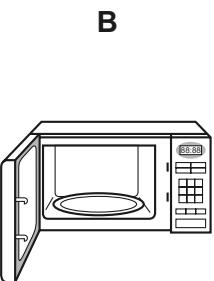
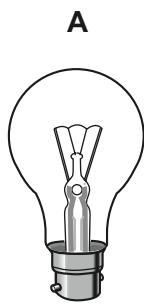
Which statement is correct?

- A Distance X is the amplitude of the waves.
- B Distance Y is the wavelength of the waves.
- C Each circle represents a wavefront.
- D The frequency of the waves is 3 Hz.

8 Which group contains only transverse waves?

- A infra-red waves, light waves, sound waves
- B infra-red waves, light waves, ultra-violet waves
- C infra-red waves, ultra-violet waves, sound waves
- D light waves, sound waves, ultra-violet waves

9 Which waves are longitudinal?



light waves
from a lamp

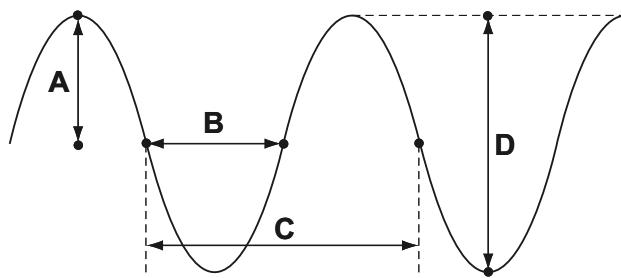
microwaves
in an oven

sound waves
from a trumpet

water waves
on a pond

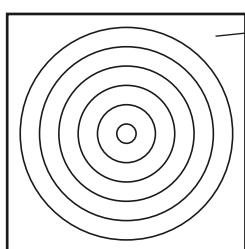
10 The drawing shows a wave.

Which labelled distance is the wavelength?



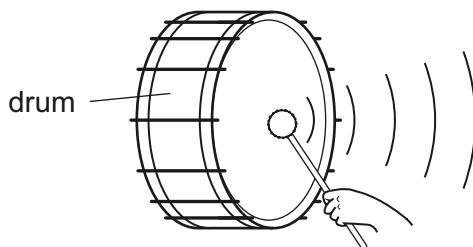
11 The diagrams show examples of wave motion.

1



waves on water

2



waves in air

3



waves on a rope

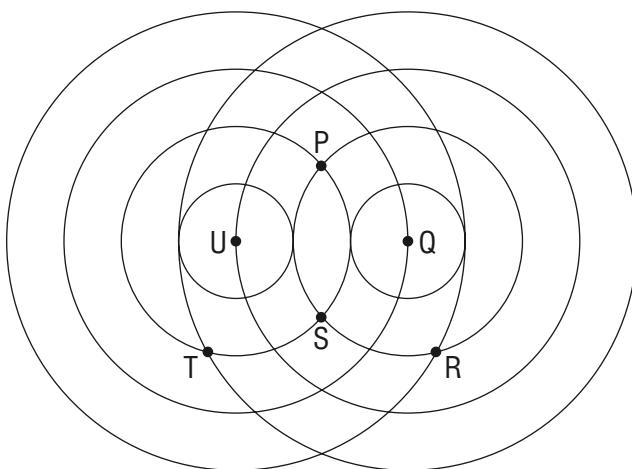
4

waves in a spring
(as shown)

Which are longitudinal waves?

- A 1 only
- B 1, 2 and 4
- C 2 and 3 only
- D 2 and 4 only

12 Two sets of water waves overlap as shown in the diagram.

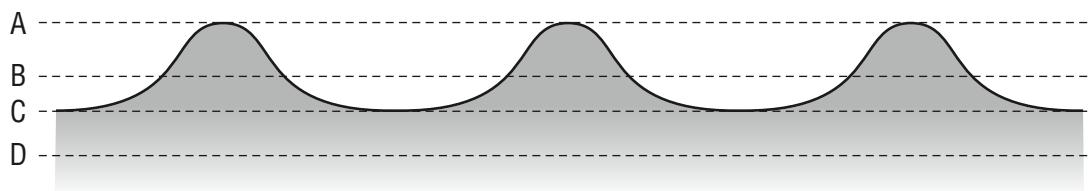


From which two points are the sets of waves coming?

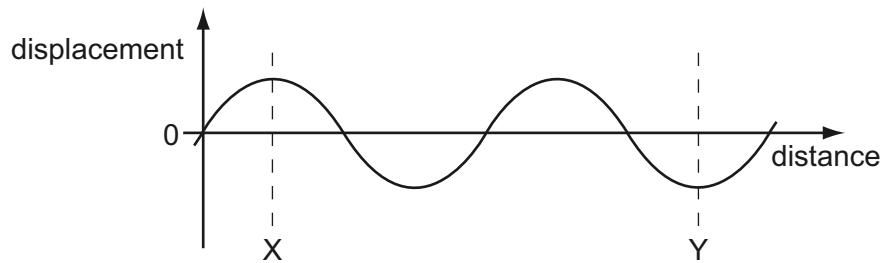
- A P and S
- B T and R
- C Q and T
- D U and Q

- 13 The diagram shows a section through a series of waves on water.

Which dotted line shows the position of the still water surface after the waves have passed?



- 14 The diagram shows a wave.

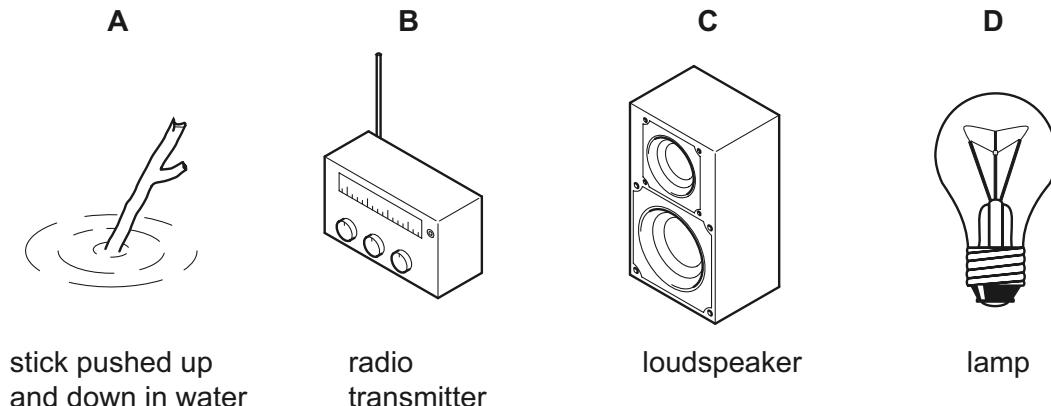


How many wavelengths are there between X and Y?

- A $\frac{2}{3}$ B 1 C $1\frac{1}{2}$ D 3

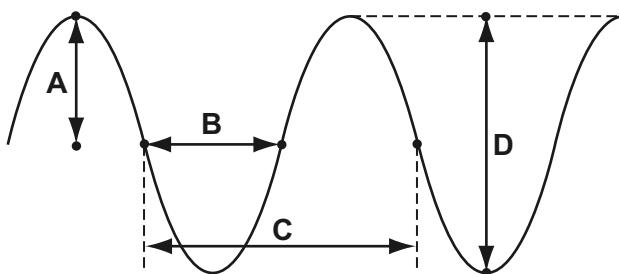
- 15 The diagrams show four sources of waves.

Which source generates longitudinal waves?



- 16 The drawing shows a wave.

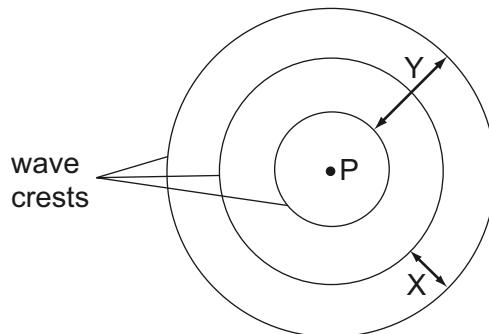
Which labelled distance is the wavelength?



- 17 Which of these waves is longitudinal?

- A light waves
- B sound waves
- C water waves
- D X-ray waves

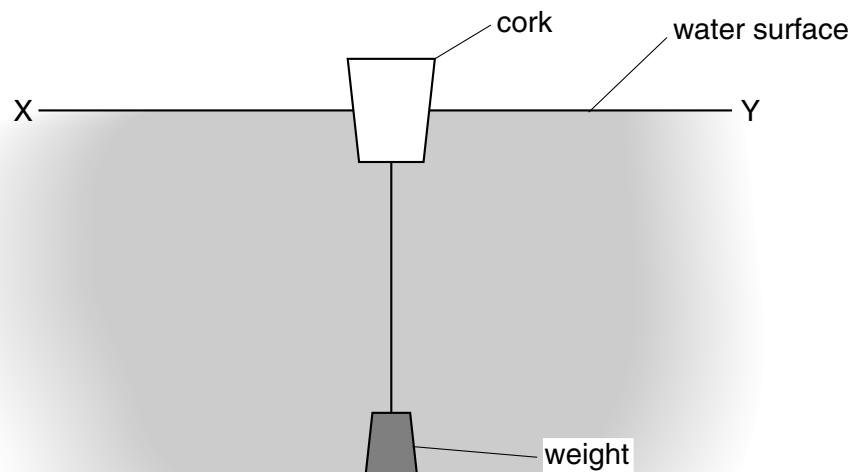
- 18 A vertical stick is dipped up and down in water at P. In two seconds, three wave crests are produced on the surface of the water.



Which statement is true?

- A Distance X is the amplitude of the waves.
- B Distance Y is the wavelength of the waves.
- C Each circle represents a wavefront.
- D The frequency of the waves is 3 Hz.

- 19 The diagram shows a cork with a weight attached so that the cork floats upright.

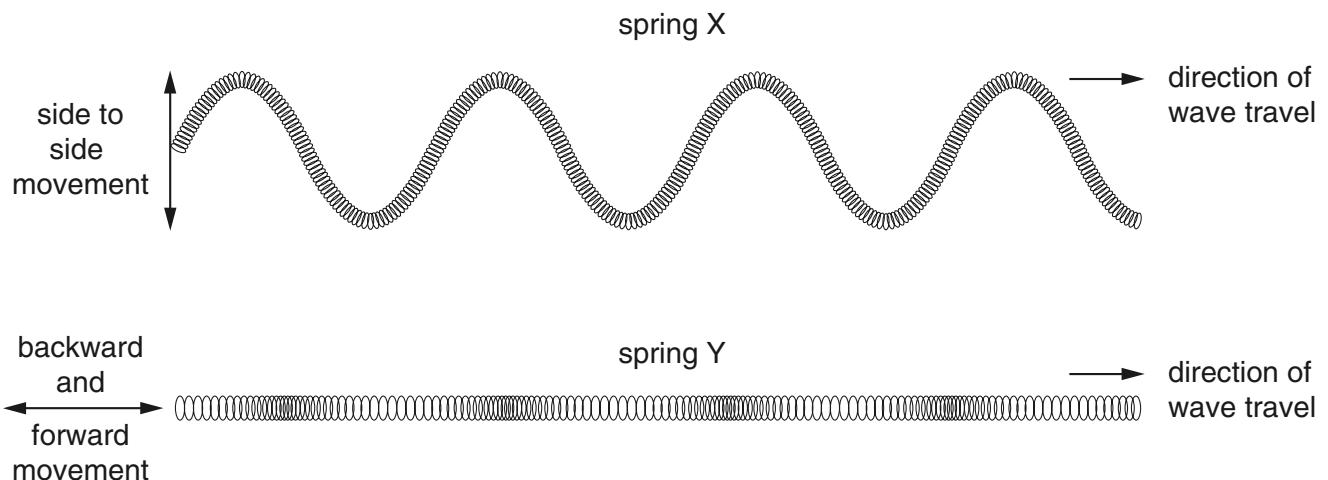


Transverse waves travel across the water from X to Y.

Which way do the waves make the cork move?

- A $\rightarrow \leftarrow$ right and left
- B $\uparrow \downarrow$ up and down
- C \rightarrow only to the right
- D \leftarrow only to the left

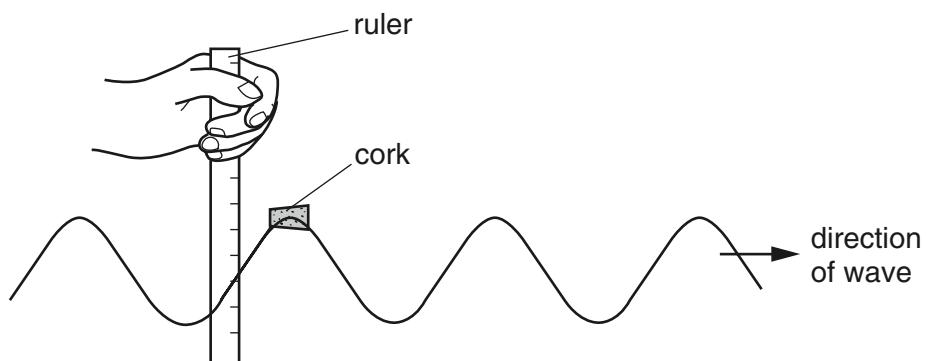
- 20 Waves are sent along two long springs X and Y as shown.



How should the wave motions in X and Y be described?

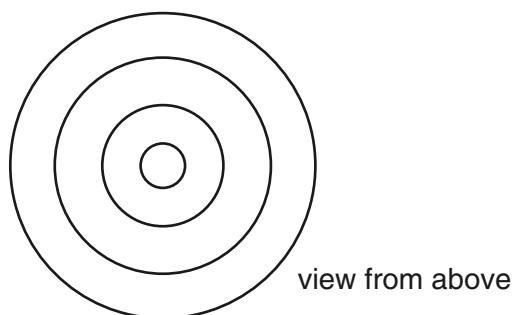
	spring X	spring Y
A	longitudinal	longitudinal
B	longitudinal	transverse
C	transverse	longitudinal
D	transverse	transverse

- 21 A student measures how far a cork moves up and down on a wave in a tank of water.



Which quantity can he obtain from his measurement?

- A amplitude
 - B frequency
 - C speed
 - D wavelength
- 22 A drop of water from a tap falls onto the surface of some water of constant depth.



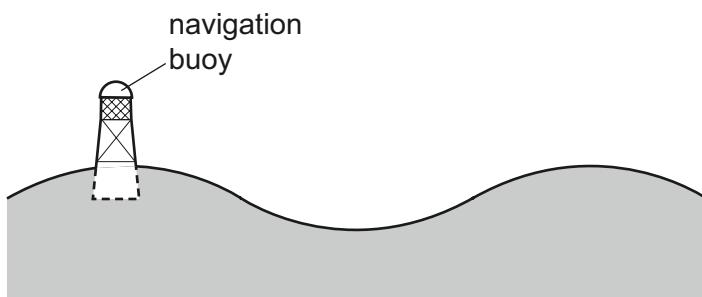
Water waves spread out on the surface of the water.

Which statement is true?

- A The waves are longitudinal and travel at the same speed in all directions.
- B The waves are longitudinal and travel more quickly in one direction than in others.
- C The waves are transverse and travel at the same speed in all directions.
- D The waves are transverse and travel more quickly in one direction than in others.

14.2 Wave speed

- 1 A navigation buoy floating on the sea oscillates up and down as a wave passes.



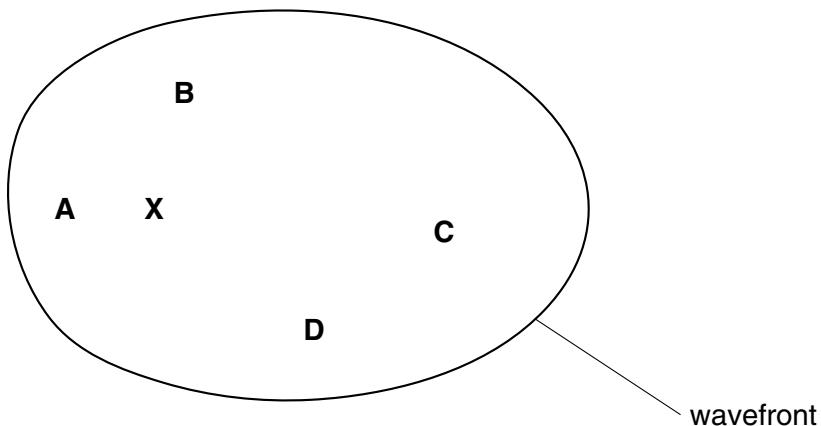
In exactly two minutes, six complete wavelengths pass the buoy.

What is the frequency of the waves?

- A 0.050 Hz B 0.33 Hz C 3.0 Hz D 20 Hz
- 2 Which is the best description of the speed of a water wave?
- A the distance between one wave crest and the next
B the distance between the crest of a wave and a trough
C the distance that a particle of water moves up and down in one second
D the distance that a wavefront moves along the surface in one second
- 3 Waves travel more slowly on the surface of water when the water is shallow.

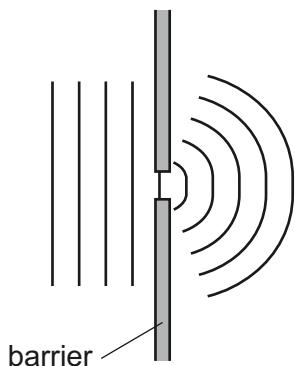
A person drops a stone into a pool at X. The diagram shows the first wavefront on the surface of the pool.

Which region of the pool is likely to be most shallow?



14.3 Wave phenomena

- 1 The diagram shows plane water waves passing through a narrow gap in a barrier.

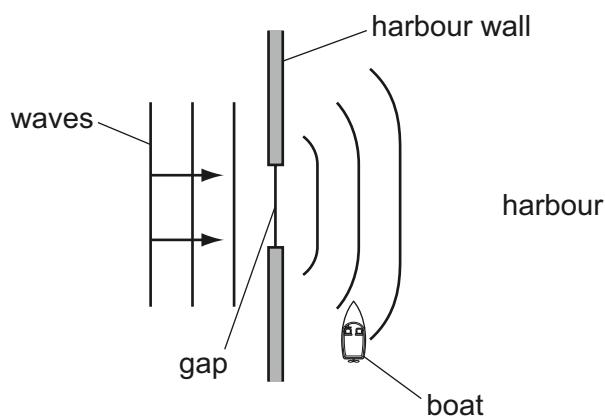


The waves spread out on the far side of the barrier.

Which property of waves does this illustrate?

- A diffraction
- B reflection
- C refraction
- D vibration

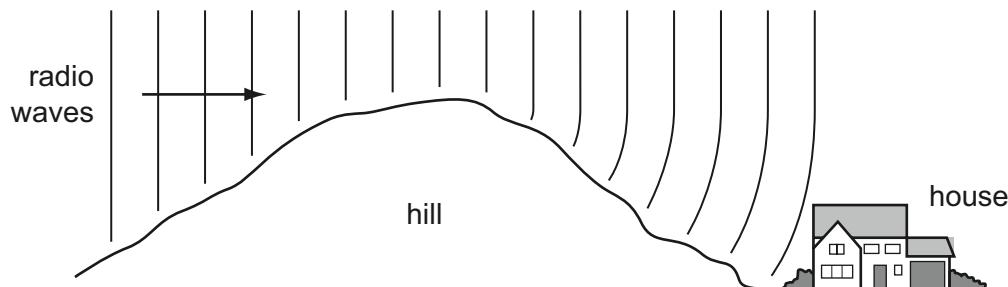
- 2 The diagram shows water waves passing through a gap in a harbour wall. The waves curve round the wall and reach a small boat in the harbour.



What is the name of this curving effect, and how can the gap be changed so that the waves are less likely to reach the boat?

	name of effect	change to the gap
A	diffraction	make the gap slightly bigger
B	diffraction	make the gap slightly smaller
C	refraction	make the gap slightly bigger
D	refraction	make the gap slightly smaller

- 3 Radio waves are received at a house at the bottom of a hill.



The waves reach the house because the hill has caused them to be

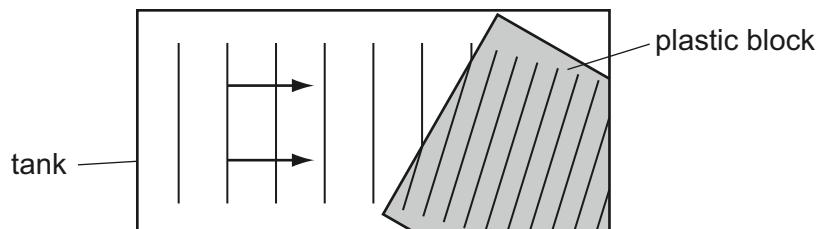
- A diffracted.
- B radiated.
- C reflected.
- D refracted.

- 4 Water waves can be used to show reflection, refraction and diffraction.

For each of these, which row shows whether or not the speed of the water waves changes?

	reflection	refraction	diffraction
A	no	no	yes
B	no	yes	no
C	yes	no	no
D	yes	yes	yes

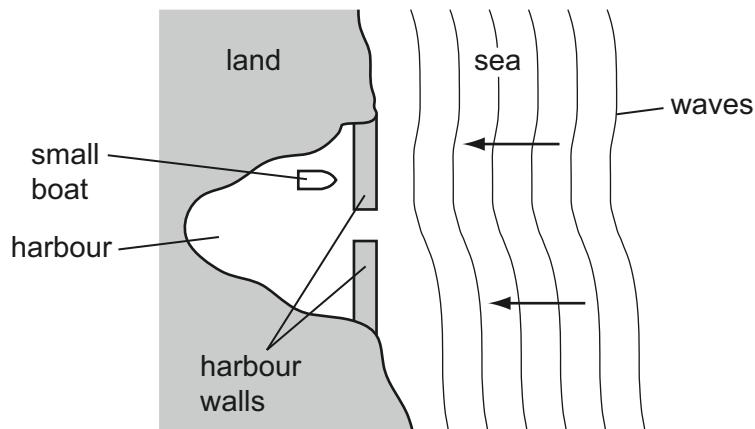
- 5 Water waves in a tank pass over a thin plastic block as shown.



What happens to the waves as they reach the plastic block?

- A They are diffracted because they slow down.
- B They are diffracted because they speed up.
- C They are refracted because they slow down.
- D They are refracted because they speed up.

- 6 A small boat in a harbour is protected from waves on the sea by harbour walls.



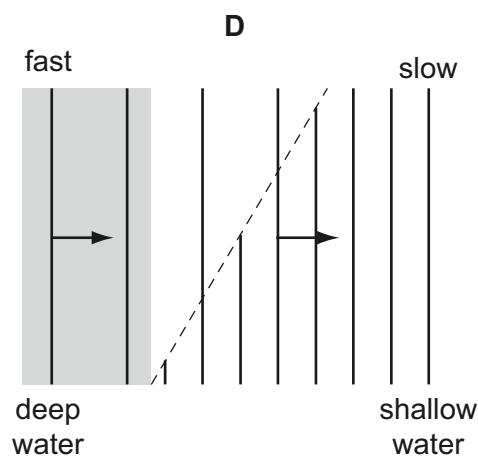
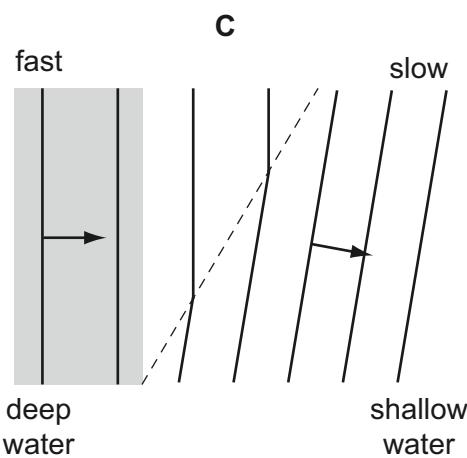
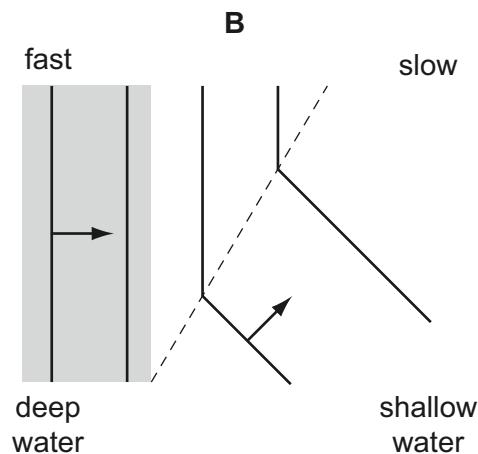
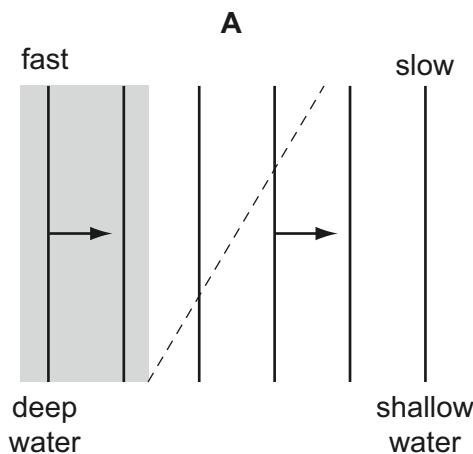
Some waves can curve round the harbour walls and reach the boat.

What is the name for this effect?

- A diffraction
- B dispersion
- C reflection
- D refraction

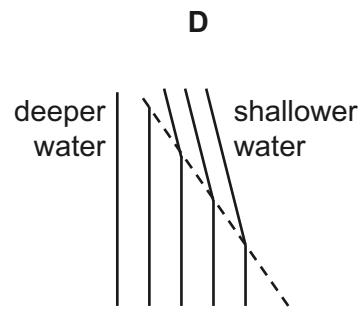
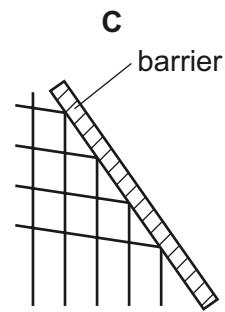
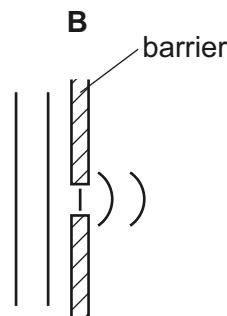
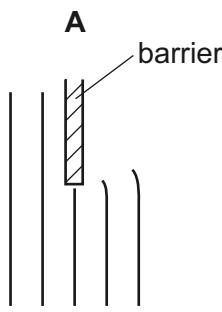
- 7 The diagrams show water waves that move more slowly after passing into shallow water at the broken line.

Which diagram shows what happens to the waves?



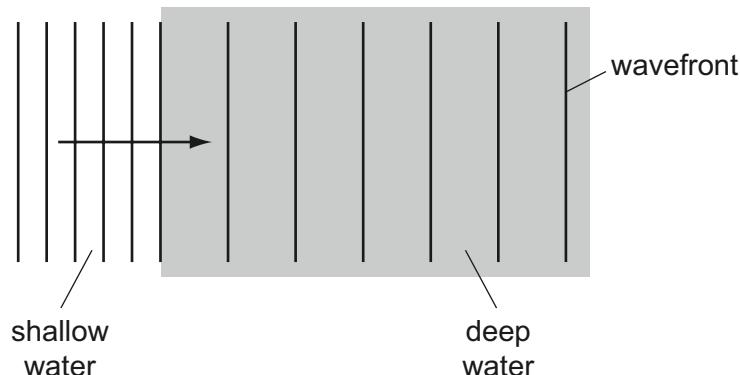
- 8 The diagrams represent water waves in a tank.

Which diagram represents waves that change speed?



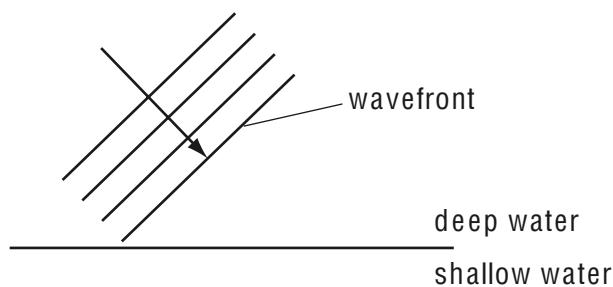
- 9 Waves in a tank pass from shallow to deep water.

The wavefront diagram is shown.



Which quantity increases as the waves enter the deep water?

- A amplitude
B frequency
C wave energy
D wavelength
- 10 The diagram represents water waves about to move into shallow water from deep water.



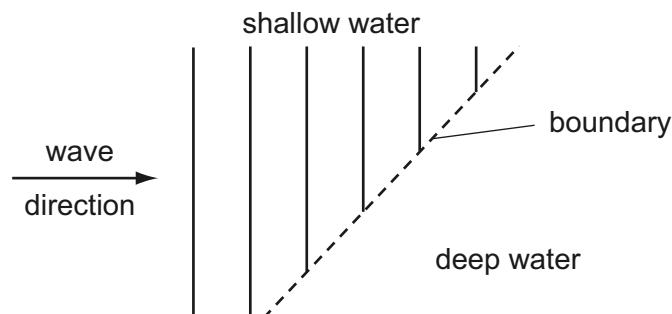
Which property of the waves remains the same after the waves move into shallow water?

- A frequency
B speed
C wavefront direction
D wavelength

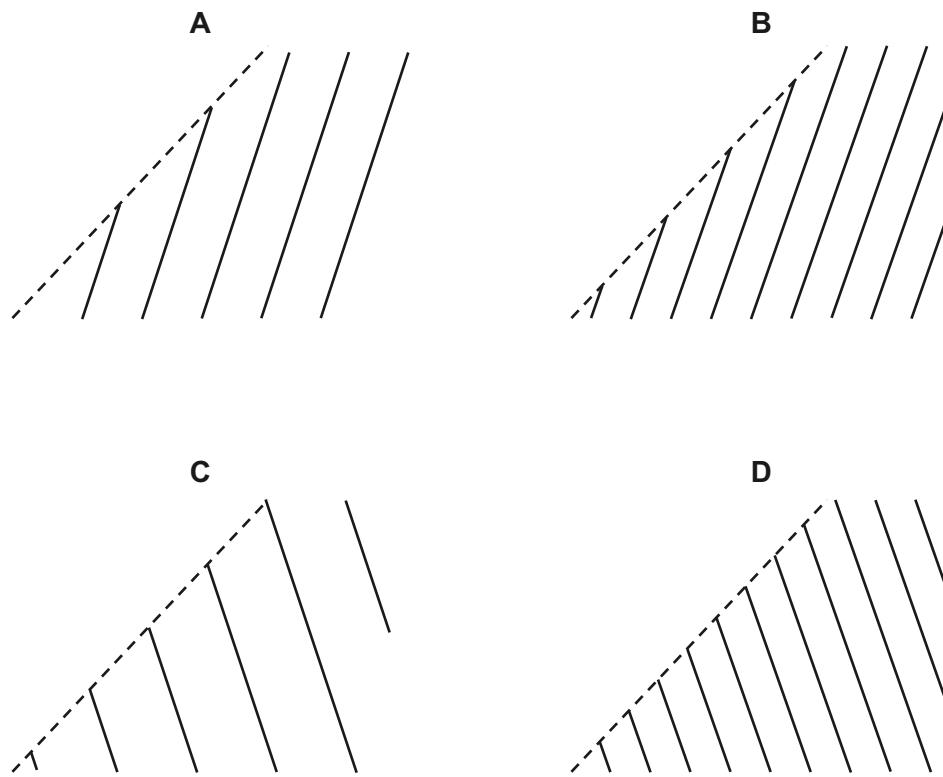
11 Which line gives an example of a longitudinal wave and describes its vibrations?

	example of a longitudinal wave	vibrations
A	light wave	at right angles to the direction the wave travels
B	light wave	in the same direction as the wave travels
C	sound wave	at right angles to the direction the wave travels
D	sound wave	in the same direction as the wave travels

12 Plane water waves travel from a shallow region into a deeper region. They travel more quickly in the deeper water.



Which diagram shows the wave pattern in the deeper water?

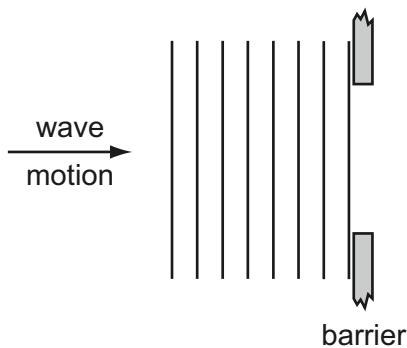


13 Water waves are reflected at a plane surface.

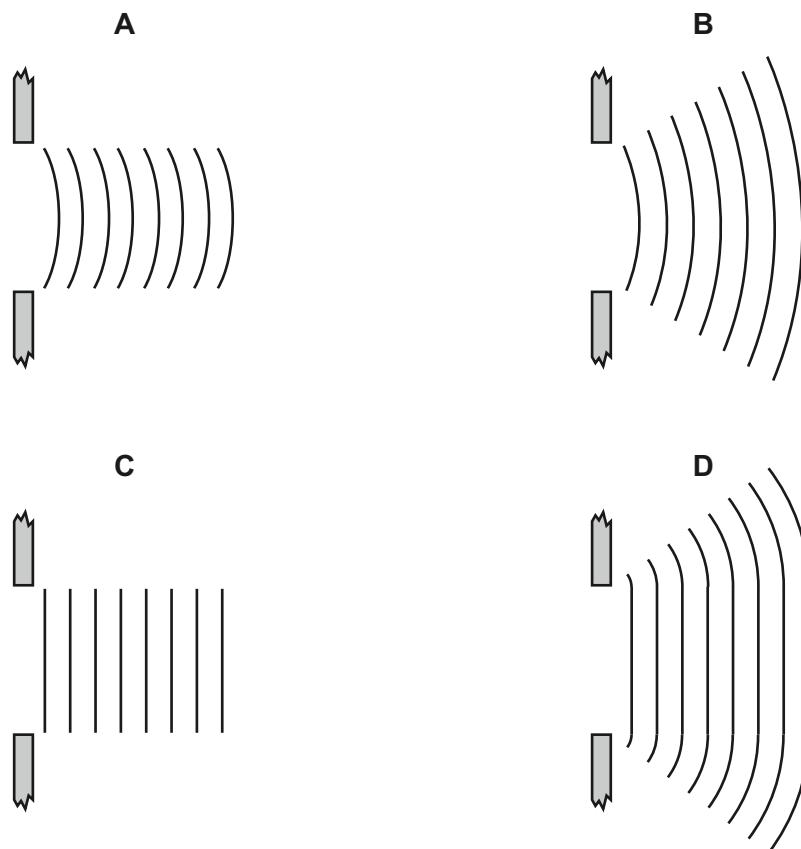
Which property of the waves is changed by the reflection?

- A direction
- B frequency
- C speed
- D wavelength

14 In a ripple tank experiment, plane water-waves meet a straight barrier with a wide gap in it.

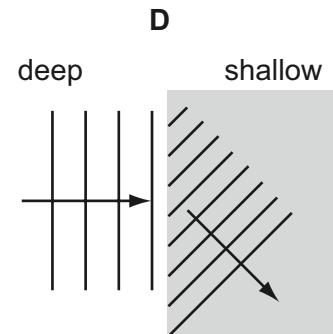
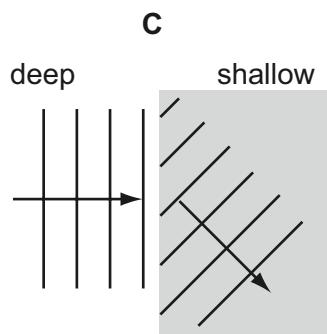
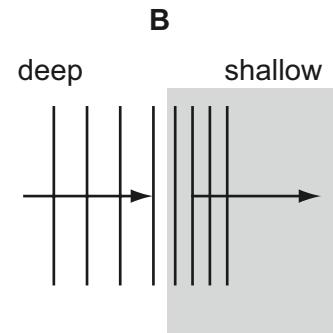
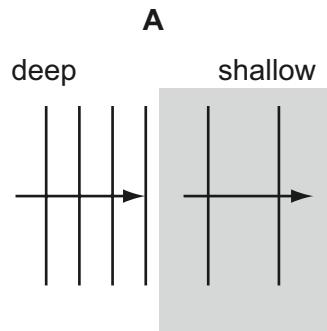


Which diagram shows the wave pattern beyond the barrier?

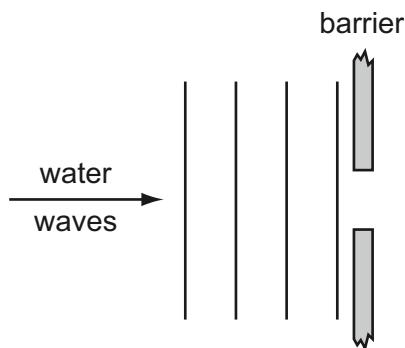


- 15 Water waves travel more slowly in shallow water than in deep water.

Which diagram shows what will happen to plane waves in deep water when they enter shallow water?

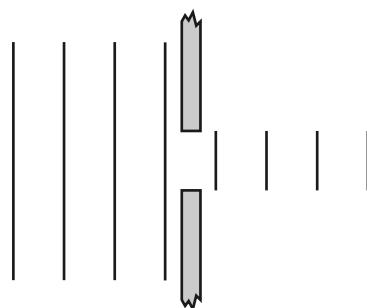


- 16 In a ripple tank, water waves move towards a barrier with a narrow gap.

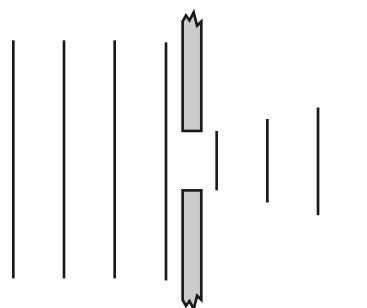


Which diagram best shows the waves beyond the barrier?

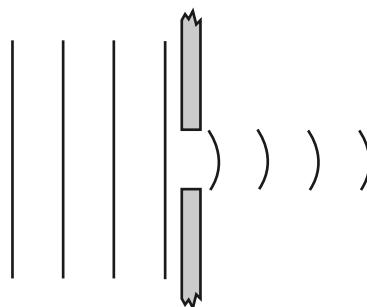
A



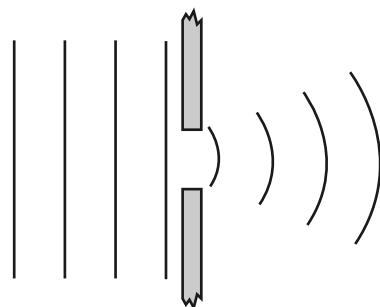
B



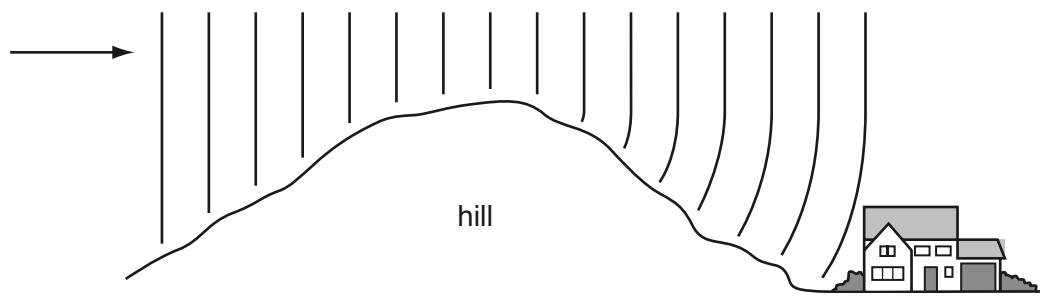
C



D



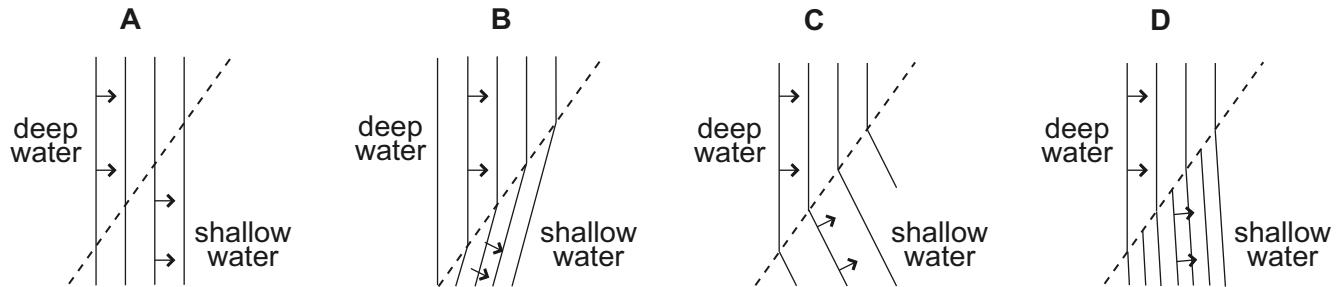
- 17 Radio waves are received at a house at the bottom of a hill.



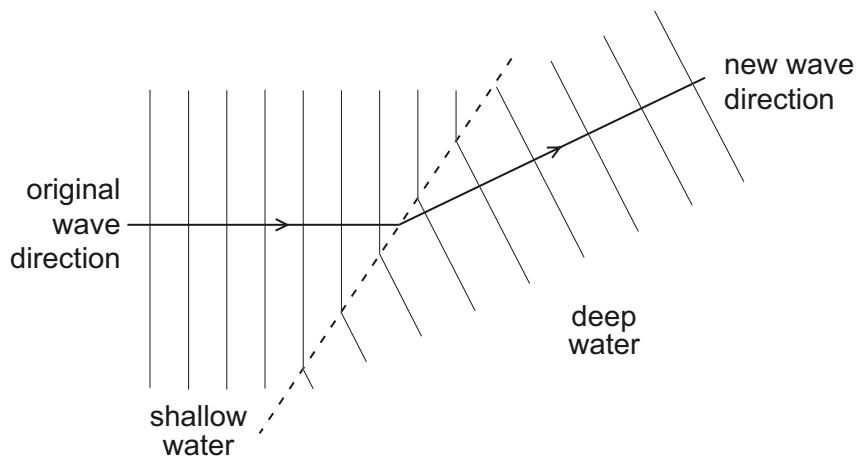
The waves reach the house because the hill has caused them to be

- A diffracted.
 - B radiated.
 - C reflected.
 - D refracted.
- 18 Waves move from deep water to shallow water where they are slower.

Which diagram shows what happens to the waves?

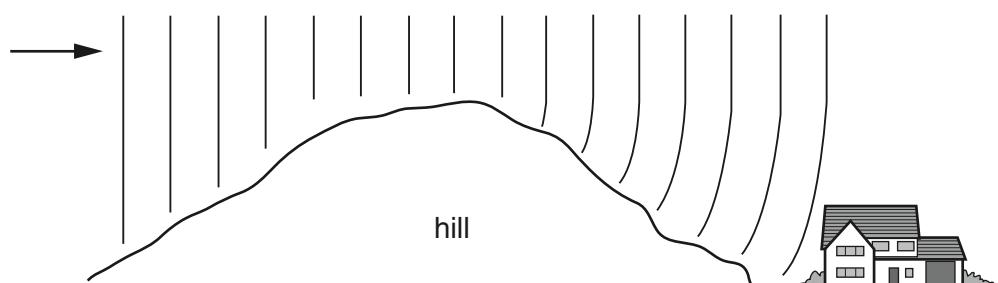


- 19 Water waves change direction when they move from shallow water to deep water.



What is the name of this effect?

- A diffraction
 - B dispersion
 - C reflection
 - D refraction
- 20 Radio waves are received at a house at the bottom of a hill.



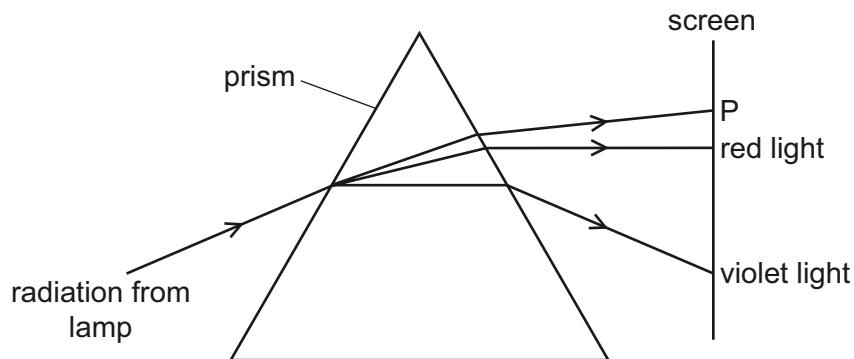
The waves reach the house because the hill has caused them to be

- A diffracted.
- B radiated.
- C reflected.
- D refracted.

Chapter 15. Electromagnetic wave spectra

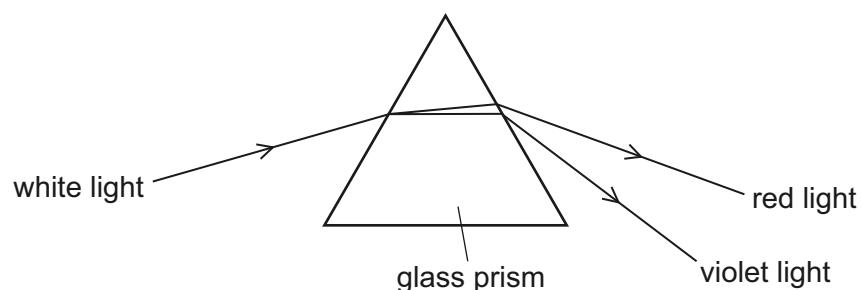
15.1 Light dispersion

- 1 The diagram shows radiation from a lamp passing through a prism.



Which type of radiation is found at P?

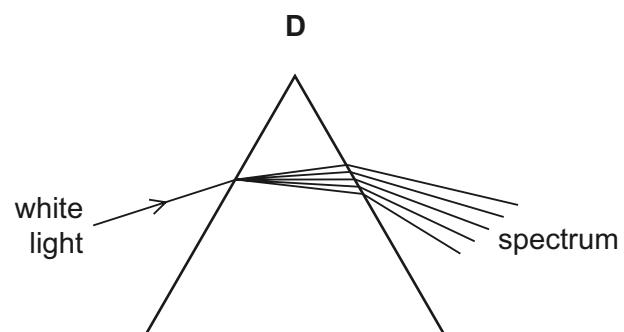
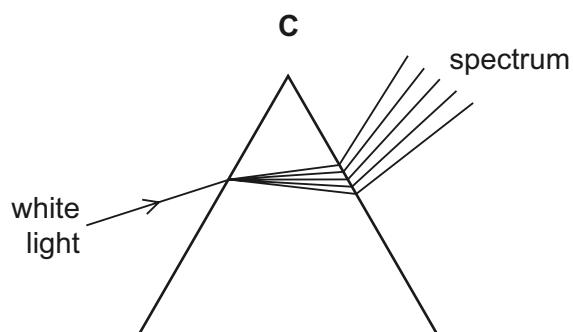
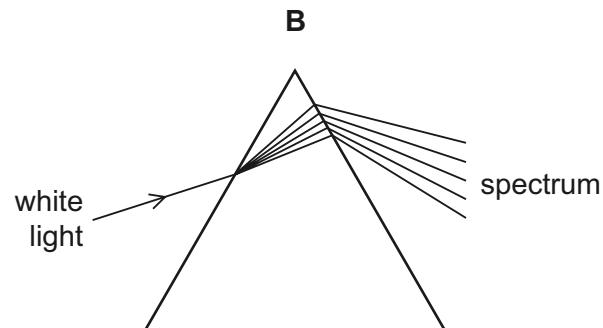
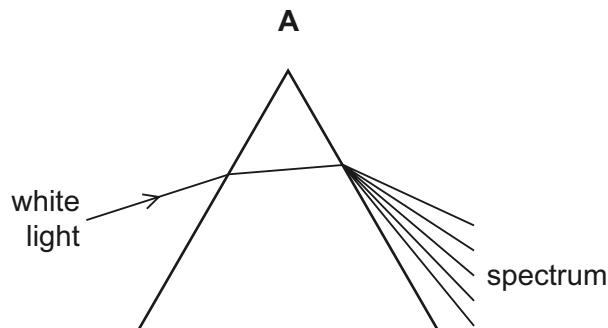
- A γ -rays
 - B infra-red
 - C ultraviolet
 - D X-rays
- 2 The diagram shows the dispersion of white light by a glass prism.



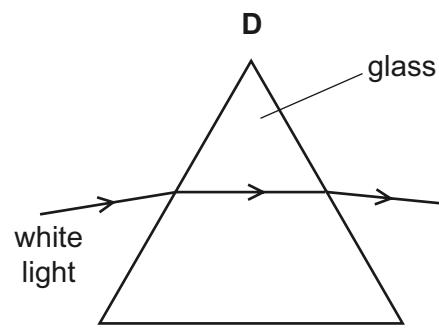
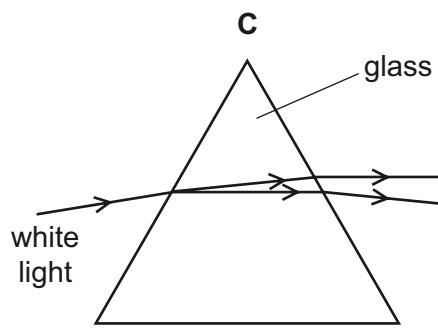
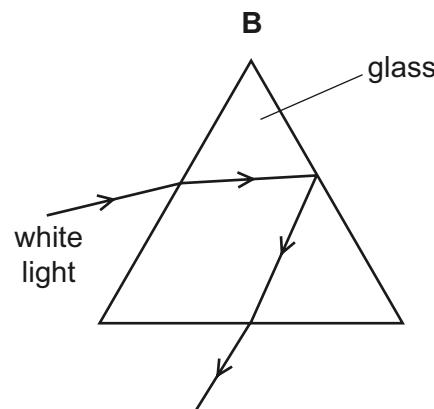
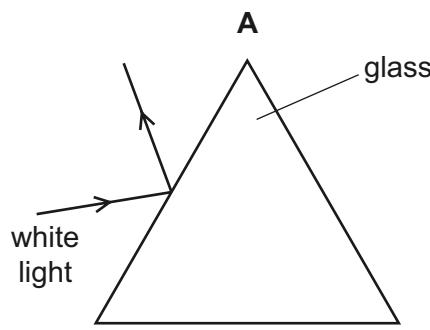
Why does dispersion occur when white light enters the glass?

- A The frequency of red light decreases more than that of violet light.
- B The frequency of violet light decreases more than that of red light.
- C The speed of red light decreases more than that of violet light.
- D The speed of violet light decreases more than that of red light.

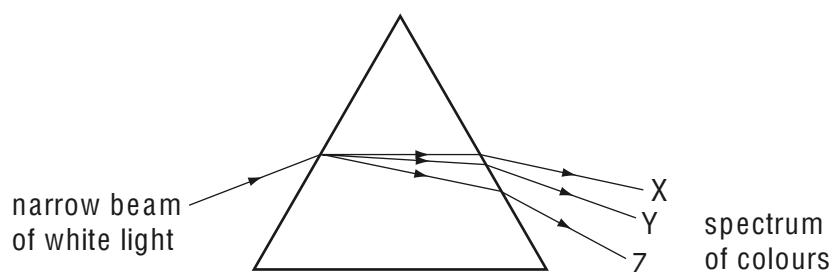
3 Which diagram shows what happens when a ray of white light passes through a prism?



4 Which diagram shows the dispersion of white light?



- 5 A student shines a narrow beam of white light into a prism as shown in the diagram. He sees a spectrum of colours emerging from the prism.

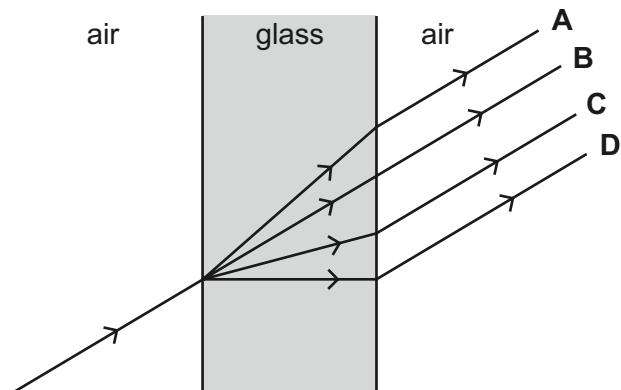


Which three colours does he see at **X**, at **Y** and at **Z**?

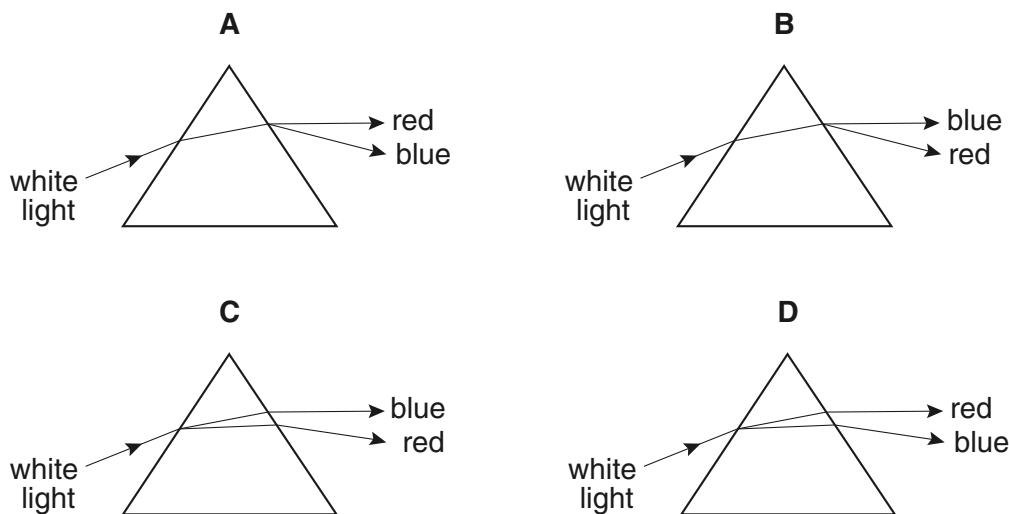
	X	Y	Z
A	blue	yellow	red
B	red	blue	yellow
C	red	yellow	blue
D	yellow	red	blue

- 6 A ray of light passes through a window.

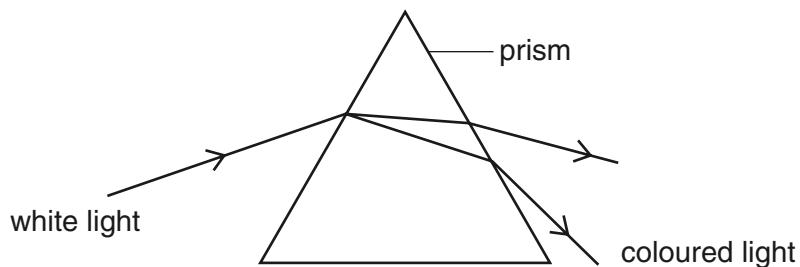
Which path does it take?



- 7 Which diagram correctly shows the paths taken by red and blue light when a beam of white light enters a glass prism?



- 8 One of the effects of passing a ray of white light through a prism is to split the light into colours.



What is the name given to this effect?

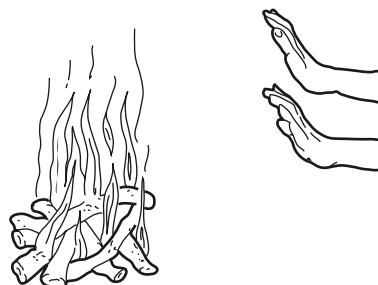
- A** deviation
- B** dispersion
- C** reflection
- D** refraction

15.2 Electromagnetic wave spectra

- 1 Which statement about radio waves is correct?
- A They travel as longitudinal waves.
 - B They travel at the same speed as sound waves.
 - C They travel by means of molecular vibration.
 - D They can travel through a vacuum.
- 2 Which row shows the nature of light waves, sound waves and X-rays?

	light waves	sound waves	X-rays
A	longitudinal	longitudinal	transverse
B	longitudinal	transverse	longitudinal
C	transverse	longitudinal	transverse
D	transverse	transverse	longitudinal

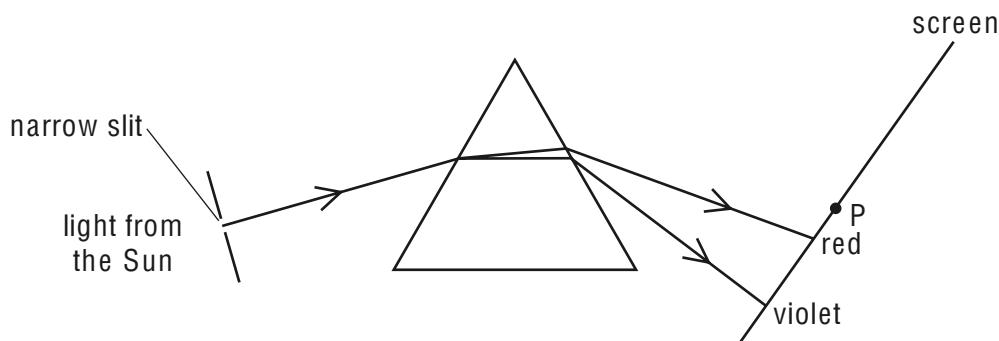
- 3 A student warms her hands near a fire.



Which waves carry most heat to her hands and are these waves electromagnetic?

	waves	electromagnetic
A	infra-red	no
B	infra-red	yes
C	visible light	no
D	visible light	yes

- 4 Light from the Sun passes through a prism and a spectrum is produced on a screen.

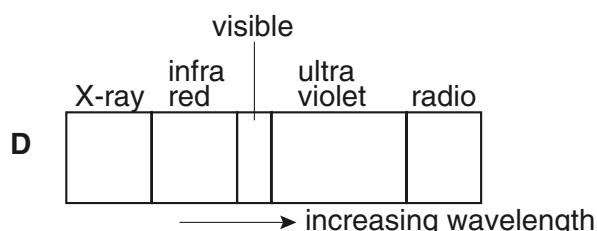
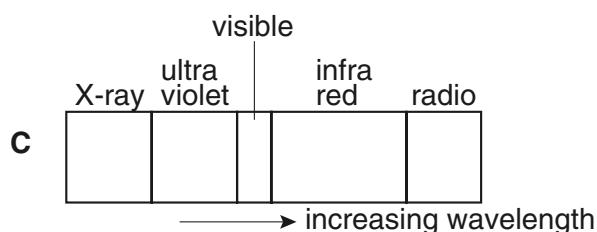
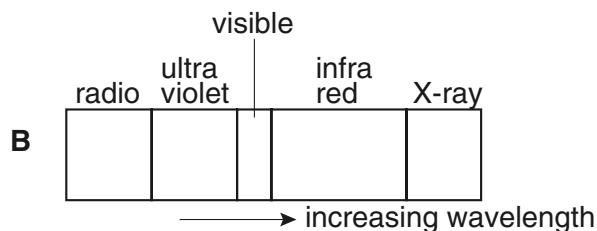
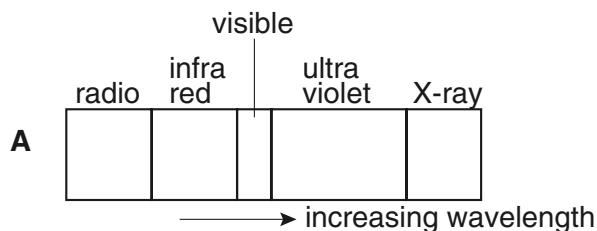


A thermometer placed at P shows a large temperature rise.

Which type of radiation causes this?

- A infra-red
 - B microwave
 - C ultra-violet
 - D visible light
- 5 Which type of radiation lies between visible light and microwaves in the electromagnetic spectrum?
- A infra-red
 - B radio waves
 - C ultra-violet
 - D X-rays
- 6 Which type of wave **cannot** travel through a vacuum?
- A infra-red radiation
 - B microwaves
 - C sound waves
 - D X-rays

7 Which diagram shows the correct order of the waves in the electromagnetic spectrum?



8 Which statement is correct about the speed of electromagnetic waves in a vacuum?

- A Ultra-violet waves have the greatest speed.
- B Visible light waves have the greatest speed.
- C Infra-red waves have the greatest speed.
- D All electromagnetic waves have the same speed.

9 A woman tunes her radio to a station broadcasting on 200 m.

What does the 200 m tell her about the radio wave?

- A its amplitude
- B its frequency
- C its speed
- D its wavelength