



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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COMBINED SCIENCE

0653/11

Paper 1 Multiple Choice

May/June 2013

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

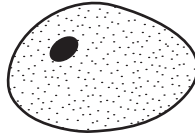
This document consists of **16** printed pages.



1 Which substance can enter a plant cell by diffusion?

- A carbon dioxide
- B cellulose
- C protein
- D starch

2 The diagram shows an animal cell. The maximum diameter of the diagram is 25 mm.



The actual cell was 0.02 mm maximum diameter.

What is the magnification of the drawing?

- A $\times 25$ B $\times 200$ C $\times 1250$ D $\times 2500$

3 A test-tube contains a solution of an enzyme.

Which colour is obtained when the biuret test is carried out on this solution?

- A blue
- B blue-black
- C orange
- D purple

4 Which two chemical substances are required for photosynthesis?

- A carbon dioxide and glucose
- B glucose and oxygen
- C oxygen and water
- D water and carbon dioxide

- 5 Mixtures were made from 5 cm^3 of a starch solution and 2 cm^3 of a solution of an enzyme that digests starch. The mixtures were all kept at the same temperature.

The table shows the different concentrations of the starch and starch-digesting enzyme solution in each mixture.

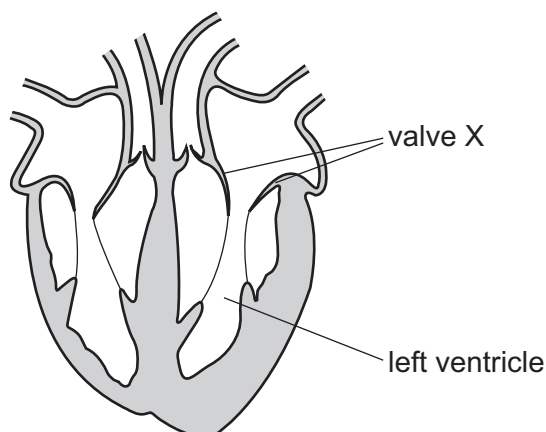
In which mixture would it take the **longest** time for all the starch to disappear?

	concentration of starch solution / %	concentration of starch-digesting enzyme / %
A	4	8
B	4	4
C	2	8
D	2	4

- 6 What is the word equation for aerobic respiration?

- A** carbon dioxide + glucose $\rightarrow$ oxygen + water
B carbon dioxide + water $\rightarrow$ glucose + oxygen
C glucose + oxygen $\rightarrow$ carbon dioxide + water
D oxygen + water $\rightarrow$ carbon dioxide + glucose

- 7 The diagram shows a section through the heart.



Which events occur as the left ventricle contracts?

- A** atrial wall contracts and valve X closes
B atrial wall contracts and valve X opens
C atrial wall relaxes and valve X closes
D atrial wall relaxes and valve X opens

8 In what form is water as it enters and is lost from a plant?

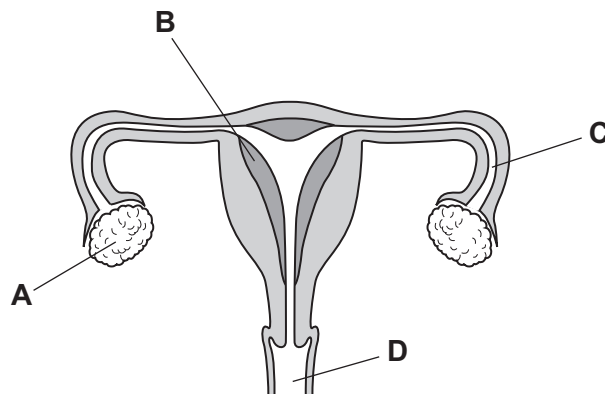
	as it enters	as it is lost
A	liquid	liquid
B	liquid	vapour
C	vapour	liquid
D	vapour	vapour

9 What is the effect of adrenaline in the control of metabolic activity?

	blood glucose concentration	rate of heart beat
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

10 The diagram shows a section through the female reproductive system.

Where is the fertilised egg implanted?



11 What describes asexual reproduction?

	number of parents	a zygote is produced	offspring identical to the parent
A	1	no	yes
B	1	yes	no
C	2	no	yes
D	2	yes	no

12 What occurs about two weeks after menstruation?

- A the release of a gamete from an ovary
- B the release of a gamete from the uterus
- C the release of a zygote from an ovary
- D the release of a zygote from the uterus

13 The diagram shows five organisms in a food chain.

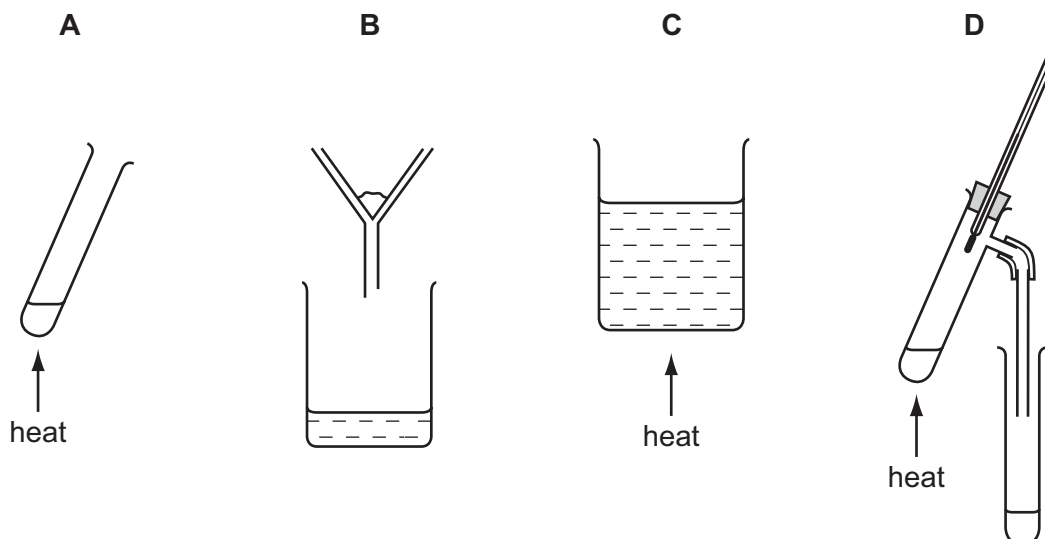
$T \rightarrow U \rightarrow V \rightarrow W \rightarrow X$

Which organisms are consumers?

- A T, U and V B T, W and X C T, V and X D U, V and W

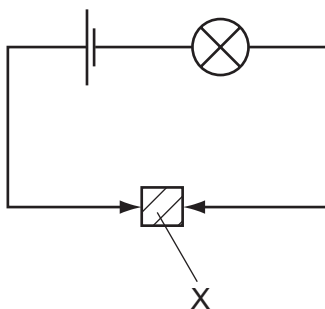
14 Aqueous copper(II) sulfate consists of copper(II) sulfate dissolved in water.

Which apparatus could **not** be used to remove water from this solution?



- 15 A solid X is placed in the circuit shown.

The lamp lights.



What is X?

- A an alloy
 - B a compound
 - C an electrolyte
 - D a salt
- 16 The reaction of zinc and sulfur to form zinc sulfide is exothermic.

Which information in the table is correct?

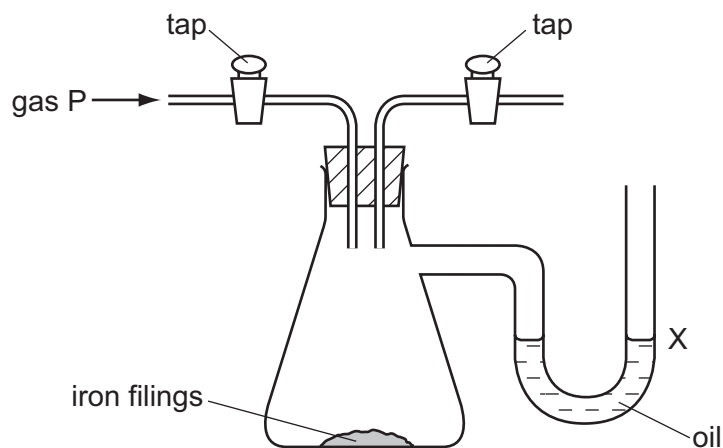
	elements in zinc sulfide	energy change during the formation of zinc sulfide
A	difficult to separate	heat given out
B	difficult to separate	heat taken in
C	easy to separate	heat given out
D	easy to separate	heat taken in

- 17 A student carries out experiments with zinc and dilute hydrochloric acid.

Which change in conditions makes the reaction slower?

- A adding a suitable catalyst
- B increasing the concentration of the acid
- C increasing the particle size of the zinc
- D increasing the temperature

18 The diagram shows an experiment on the rusting of iron.



The flask is filled with gas P. The taps are closed and the apparatus is left for a week.

The experiment is repeated with four different gases.

What happens to the oil level at X?

	gas P	oil level at X
A	damp nitrogen	rises
B	damp oxygen	falls
C	dry nitrogen	falls
D	dry oxygen	rises

19 Which mixture **cannot** be separated by distillation?

- A** air
- B** petroleum
- C** salt water
- D** sulfur and iron

20 Which statements about air are correct?

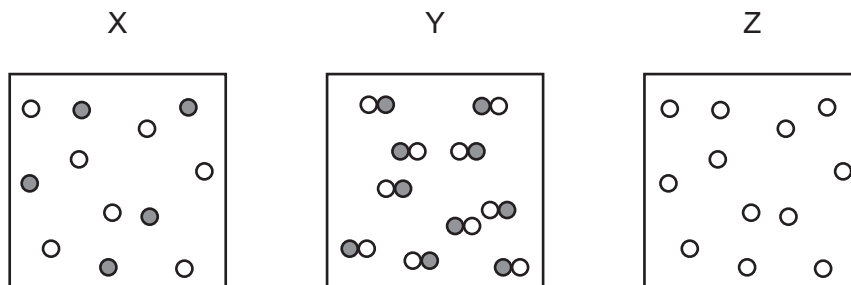
- 1 Air contains a small amount of argon which is a noble gas.
- 2 Air is made up of 78% oxygen and 21% nitrogen.
- 3 Air contains carbon dioxide which is a product of both respiration and the combustion of natural gas.

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

21 Which substance conducts electricity?

- A** $\text{CO}_2(\text{g})$ **B** $\text{NaCl}(\text{s})$ **C** $\text{NaOH}(\text{aq})$ **D** $\text{S}(\text{s})$

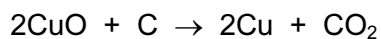
22 The diagrams represent the particles in substances X, Y and Z.



Which row correctly identifies X, Y and Z as an element, a compound or a mixture?

	element	compound	mixture
A	X	Y	Z
B	Y	Z	X
C	Z	X	Y
D	Z	Y	X

23 The equation shows the reaction of copper oxide with carbon.



In the reaction, the carbon is the 1..... agent and is 2..... during the reaction.

Which words complete gaps 1 and 2?

	1	2
A	oxidising	oxidised
B	oxidising	reduced
C	reducing	oxidised
D	reducing	reduced

24 Which pair of gases can be identified using limewater and damp litmus paper?

- A** carbon dioxide and chlorine
B carbon dioxide and hydrogen
C chlorine and oxygen
D hydrogen and chlorine

A simplified periodic table grid is shown. The grid consists of 4 rows and 18 columns. The first two columns represent the s-block, the next six columns (columns 3-8) represent the p-block, the next six columns (columns 9-14) represent the d-block, and the last two columns (columns 15-16) represent the f-block. The elements are represented by squares. The element in the 4th row, 11th column is labeled 'X'. The element in the 4th row, 12th column is labeled 'Y'. The element in the 1st row, 17th column is labeled 'Z'.

- 1 They form coloured compounds.
- 2 They can be used as catalysts.
- 3 They have low melting points.

26 Three boiling tubes are each filled with a gas from Group VII in the Periodic Table.

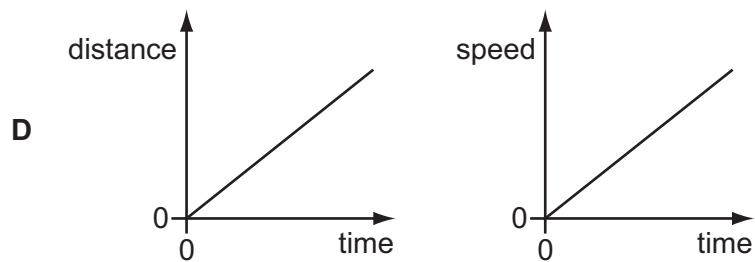
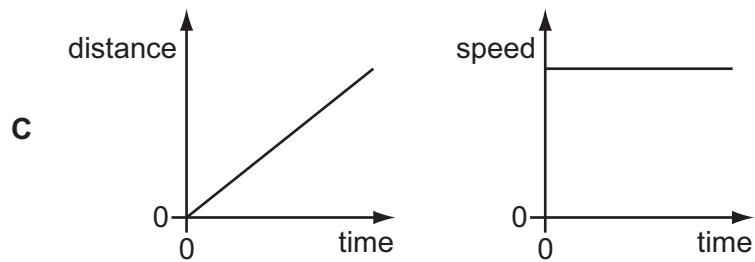
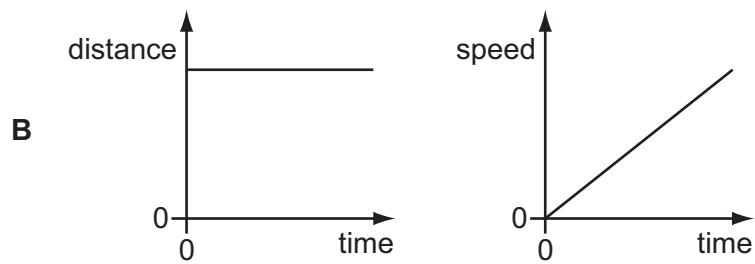
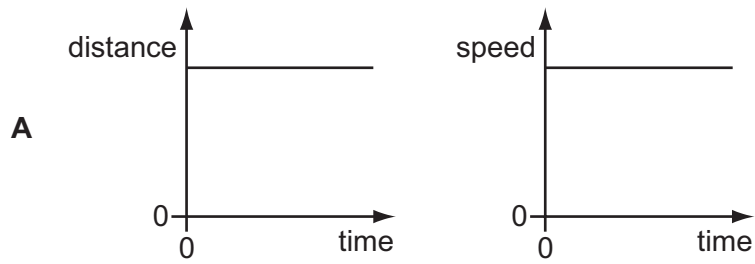
Which gases are in the tubes?

	gas 1	gas 2	gas 3
A	<i>Cl</i>	I	Br
B	Br	<i>Cl</i>	I
C	Br	I	<i>Cl</i>
D	I	Br	<i>Cl</i>

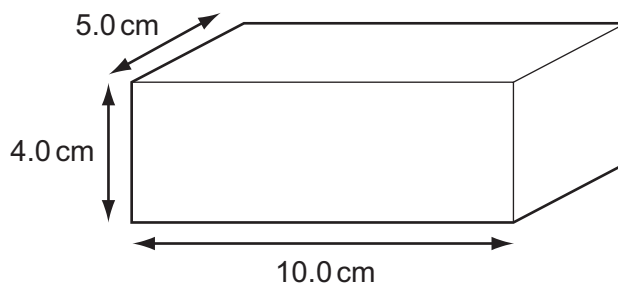
● carbon atom
○ hydrogen atom

A CH₆ **B** CH₃ **C** C₂H₄ **D** C₂H₆

- 28 Which pair of distance/time and speed/time graphs represents an object which is moving with constant speed?

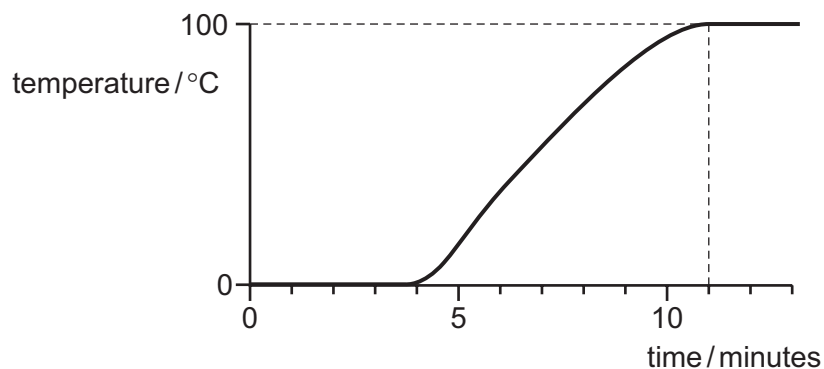


- 29 A rectangular metal block has the dimensions shown. The density of the metal is 8.0 g/cm^3 .



What is the mass of the metal block?

- A** 160 g **B** 320 g **C** 400 g **D** 1600 g
- 30 Which energy resource is non-renewable?
- A** geothermal energy
B hydroelectric energy
C nuclear energy
D wave energy
- 31 When sweat evaporates, which change of state takes place?
- A** gas to liquid
B liquid to gas
C liquid to solid
D solid to gas
- 32 A block of ice is supplied with heat at a constant rate. Eventually, the melted ice boils. The graph shows how the temperature changes with time.



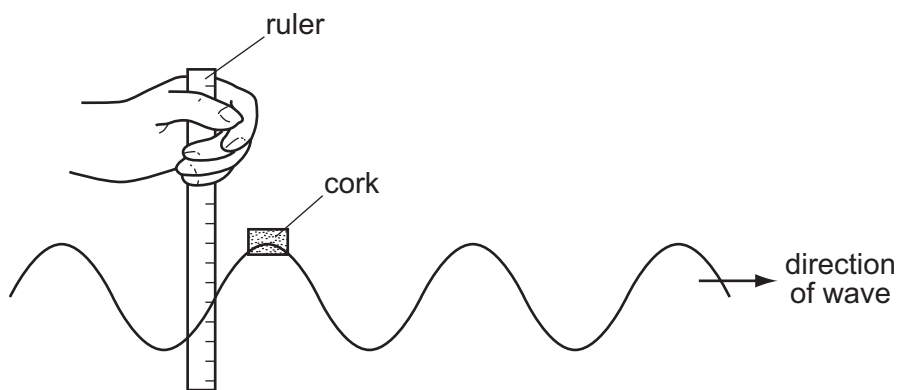
How long does it take to melt all the ice?

- A** 4 minutes **B** 7 minutes **C** 11 minutes **D** 13 minutes

- 33 The International Space Station orbits the Earth in the vacuum above the atmosphere. The electrical systems in the Space Station produce heat. How is this heat transferred from the external surfaces of the Space Station into space?

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

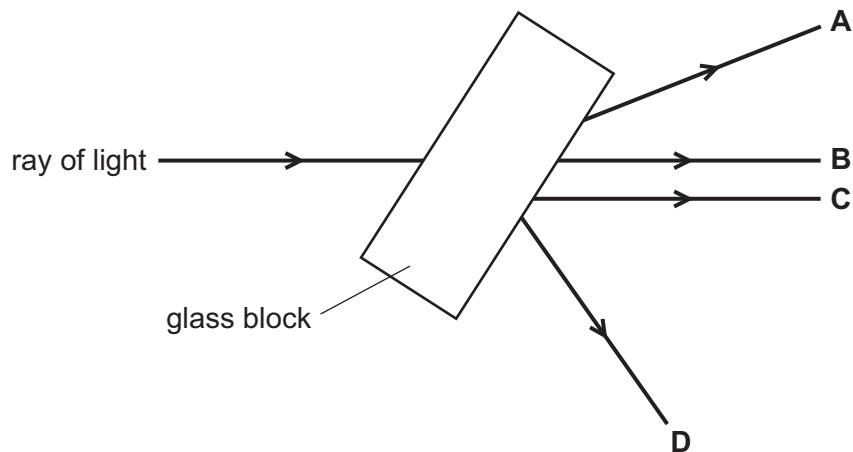
- 34 A student measures the distance a cork moves up and down on a wave in a tank of water.



Which quantity can she obtain from this measurement?

A amplitude
B frequency
C speed
D wavelength

- 35 Which labelled ray shows the path of the ray of light after it has passed through the glass block?



36 Electromagnetic waves have many different applications.

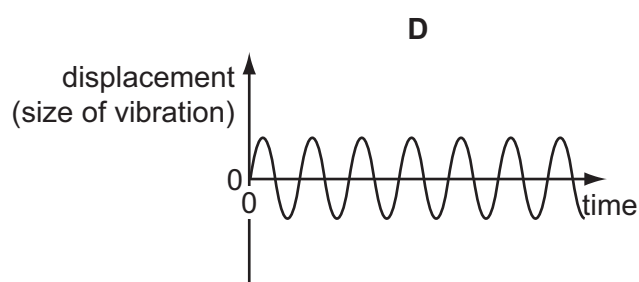
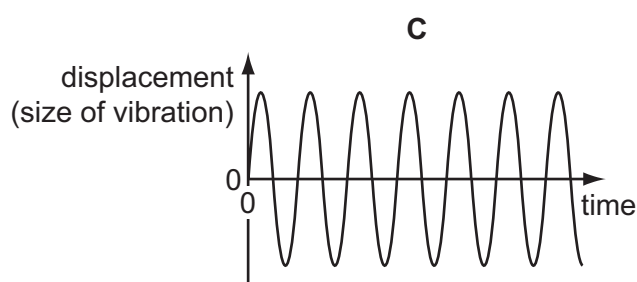
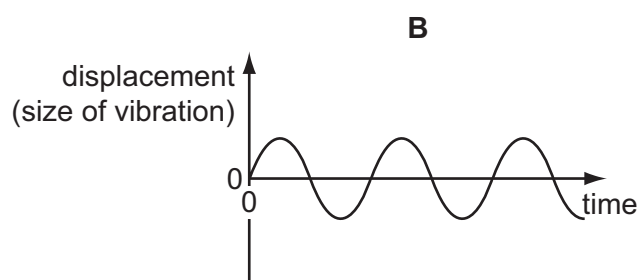
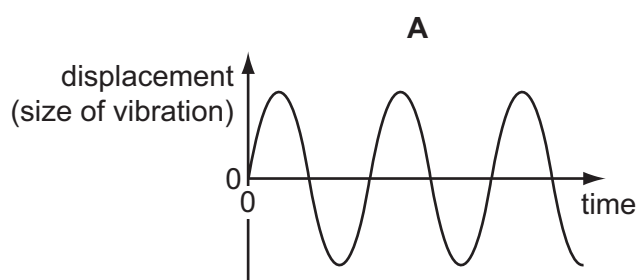
Which row identifies the type of electromagnetic wave used in each application?

	satellite television	terrestrial television (not satellite)	television remote controllers
A	microwaves	radio waves	infrared waves
B	microwaves	radio waves	microwaves
C	radio waves	infrared waves	infrared waves
D	radio waves	infrared waves	microwaves

37 A microphone is connected to an oscilloscope. The oscilloscope produces graphs of four different sounds.

The scales for the graphs are the same.

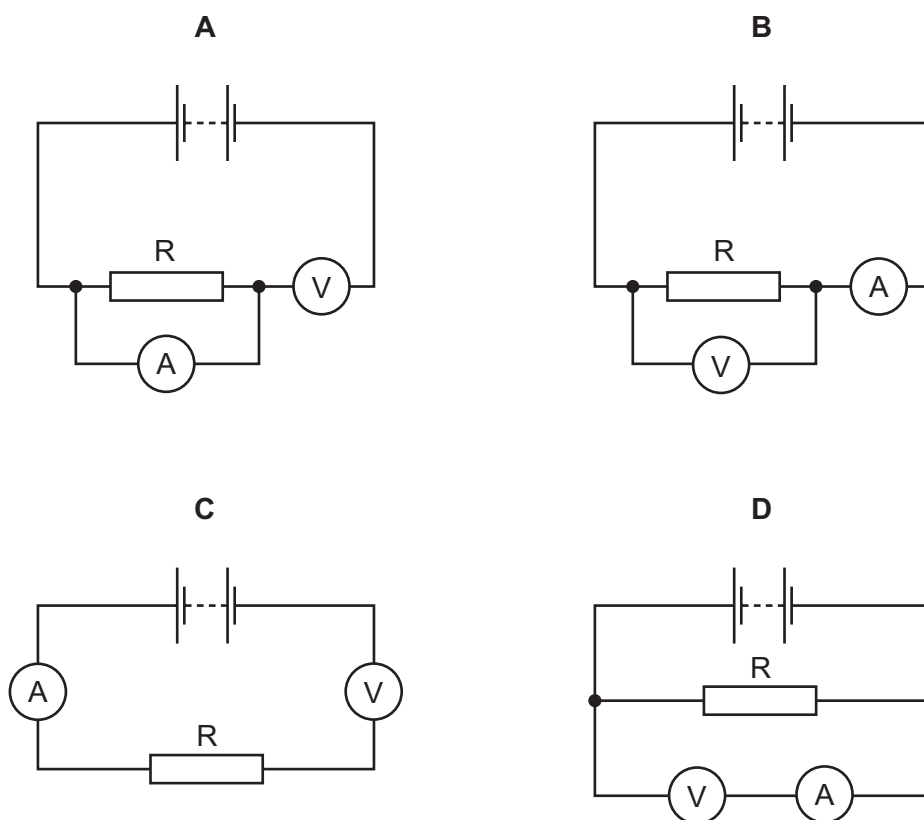
Which graph shows the quietest sound with the highest pitch?



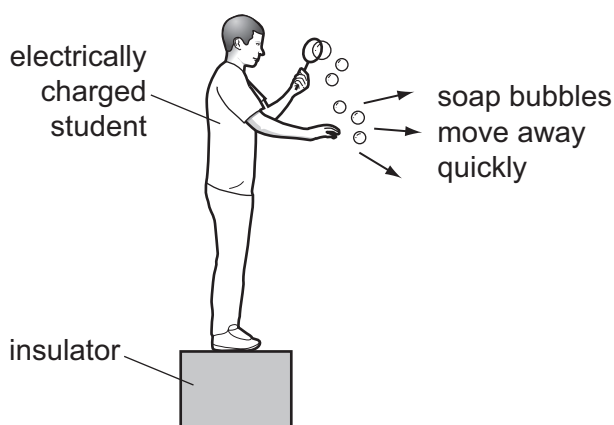
- 38 A student wishes to find the resistance of resistor R.

The diagrams show four possible circuits which the student could use.

Which circuit can be used to find the resistance of resistor R?



- 39 An electrically charged student produces soap bubbles. When he holds his hand near the bubbles, they move away quickly from his hand.

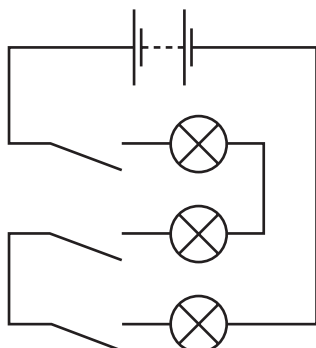
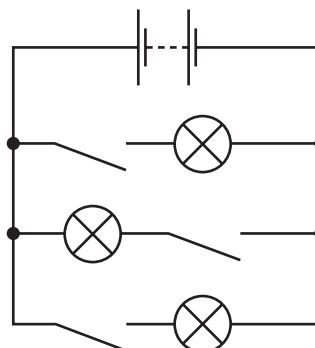
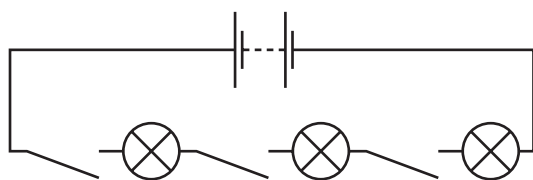
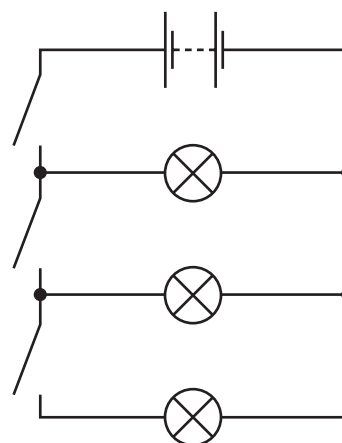


For this movement of the bubbles to happen, which statement is correct?

- A** The bubbles must be negatively charged.
- B** The bubbles must be positively charged.
- C** The bubbles must have the opposite charge to the charge on the student.
- D** The bubbles must have the same charge as the charge on the student.

- 40 An electrician wishes to connect three lamps in a circuit so that each lamp can be on and off separately.

Which circuit should be used?

A**B****C****D**

Group																	
I	II							III	IV	V	VI	VII	0				
7 Li Lithium 3	23 Na Sodium 11	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36	
39 K Potassium 19	85 Rb Rubidium 37	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54	
133 Cs Cesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
226 Fr Francium 87	226 Ra																

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

Key

a	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

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COMBINED SCIENCE

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Electronic calculators may be used.

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1 Which substance can enter a plant cell by diffusion?

- A carbon dioxide
- B cellulose
- C protein
- D starch

2 Which comparison between a typical plant cell and a typical animal cell is correct?

	feature	plant cell	animal cell
A	cell activities controlled by	nucleus and cell membrane	nucleus and cell wall
B	location of chlorophyll	chloroplasts	cytoplasm
C	location of DNA	cytoplasm	nucleus
D	starch grains	present	absent

3 A test-tube contains a solution of an enzyme.

Which colour is obtained when the biuret test is carried out on this solution?

- A blue
- B blue-black
- C orange
- D purple

4 Which two chemical substances are required for photosynthesis?

- A carbon dioxide and glucose
- B glucose and oxygen
- C oxygen and water
- D water and carbon dioxide

5 What is a function of the small intestine?

- A It allows food to be stored.
- B It cuts food into small pieces.
- C It provides a large surface area for absorption.
- D It provides space for the storage of faeces.

- 6 Which substance makes up a higher percentage of expired air compared to inspired air?
- A carbon dioxide
 - B nitrogen
 - C noble gases
 - D oxygen

- 7 What is the function of the valves in the heart?
- A to prevent blood from flowing backwards
 - B to pump blood through the heart
 - C to separate blood cells from plasma
 - D to separate oxygenated and deoxygenated blood

- 8 What are the functions of phloem?

	provides support	transports mineral ions	transports sugars
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

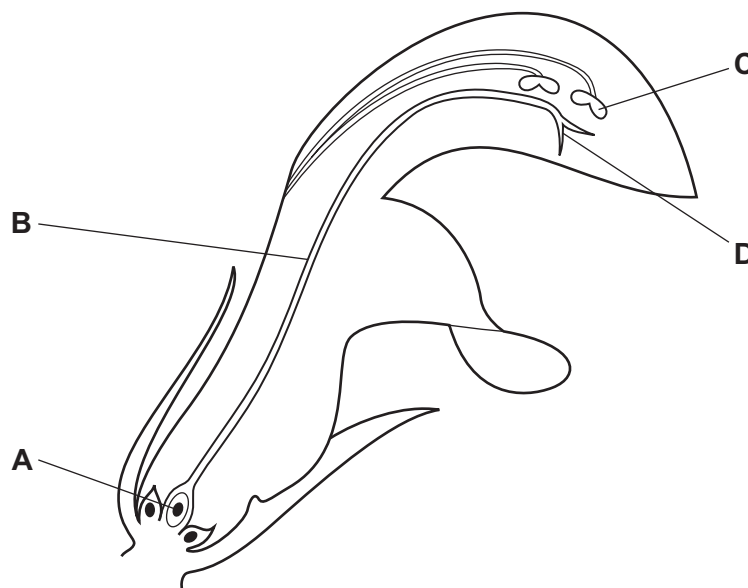
key

✓ = function of phloem

✗ = not a function of phloem

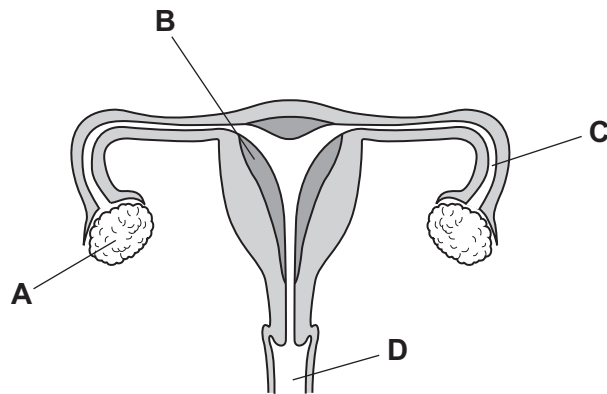
- 9 The diagram shows a section through a flower.

Which part receives pollen during pollination?



10 The diagram shows a section through the female reproductive system.

Where is the fertilised egg implanted?



11 What describes sexual reproduction?

- A** Diploid gametes form a haploid zygote, offspring genetically dissimilar to parents.
- B** Diploid gametes form a haploid zygote, offspring genetically similar to parents.
- C** Haploid gametes form a diploid zygote, offspring genetically dissimilar to parents.
- D** Haploid gametes form a diploid zygote, offspring genetically similar to parents.

12 Which chemical is a building block for making proteins?

- A** amino acid
- B** fatty acid
- C** glucose
- D** glycerol

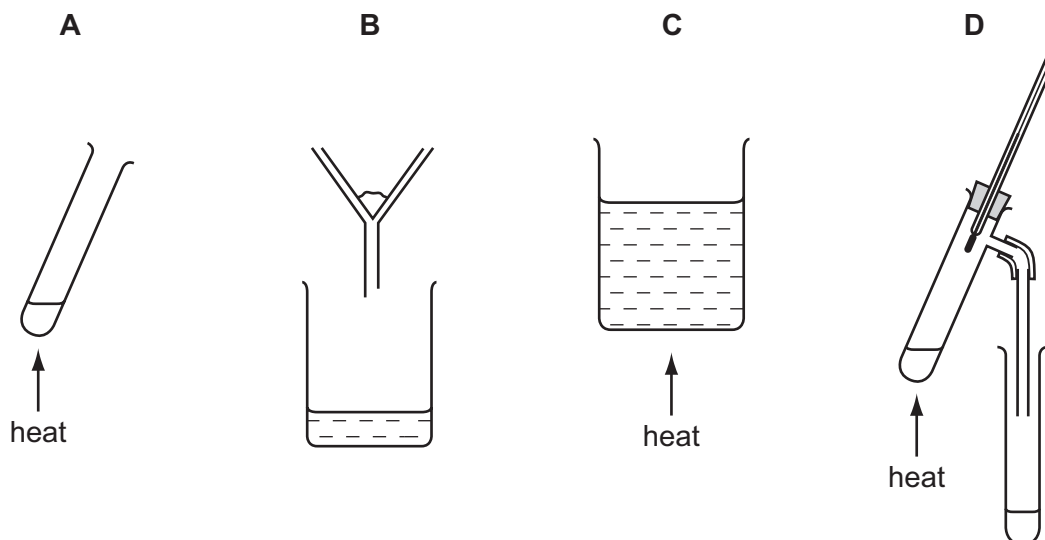
- 13 The diagram shows a calendar for February and March with four of the weeks shaded.

	February				March			
	7	14	21	28	7	14	21	28
1	8	15	22	1	8	15	22	29
2	9	16	23	2	9	16	23	30
3	10	17	24	3	10	17	24	31
4	11	18	25	4	11	18	25	
5	12	19	26	5	12	19	26	
6	13	20	27	6	13	20	27	

Menstruation for a woman starts on February 14th.

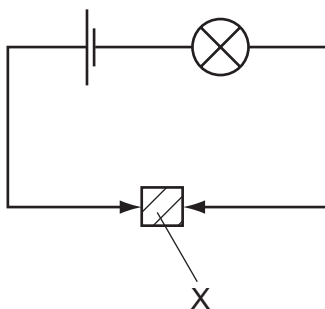
During which shaded week will the lining of the uterus be at its thickest and be rich in blood vessels?

- A** February 7th – February 13th
B February 14th – February 20th
C February 21st – February 27th
D February 28th – March 6th
- 14 Aqueous copper(II) sulfate consists of copper(II) sulfate dissolved in water.
- Which apparatus could **not** be used to remove water from this solution?



- 15 A solid X is placed in the circuit shown.

The lamp lights.



What is X?

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 - B a compound
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 - D a salt
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Which information in the table is correct?

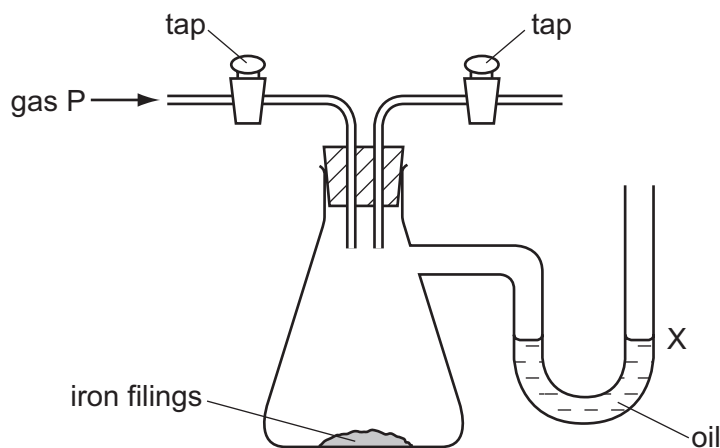
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- 17 A student carries out experiments with zinc and dilute hydrochloric acid.

Which change in conditions makes the reaction slower?

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- B increasing the concentration of the acid
- C increasing the particle size of the zinc
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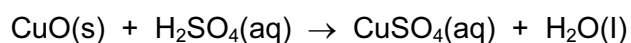
The flask is filled with gas P. The taps are closed and the apparatus is left for a week.

The experiment is repeated with four different gases.

What happens to the oil level at X?

	gas P	oil level at X
A	damp nitrogen	rises
B	damp oxygen	falls
C	dry nitrogen	falls
D	dry oxygen	rises

- 19 Copper(II) sulfate is prepared by reacting copper(II) oxide with dilute sulfuric acid.



Which statement is correct?

- A** Excess copper(II) oxide is used because it can be easily removed by filtration.
- B** Excess copper(II) oxide is used because it can be easily removed by reacting with more sulfuric acid.
- C** Excess sulfuric acid is used because it can be easily removed by evaporation.
- D** Excess sulfuric acid is used because unreacted copper(II) oxide would contaminate the product.

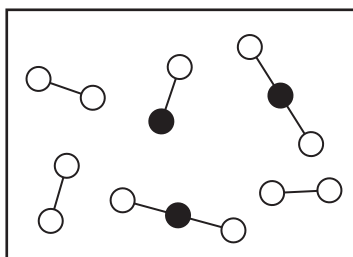
20 The diagrams show two techniques used in school chemistry laboratories for separation.



Which technique can also be used to purify a domestic water supply?

- A** 1 and 2 **B** 1 only **C** 2 only **D** neither 1 nor 2

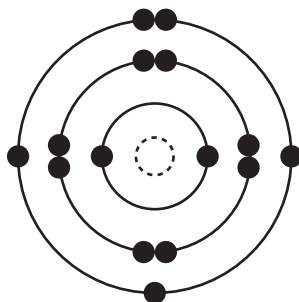
21 The diagram shows the particles in a mixture of gases.



Which statement is **not** correct?

- A** There are two different types of atom in the box.
B There are three different compounds in the box.
C There are three different types of molecule in the box.
D There are six molecules in the box.

- 22 The diagram shows the electronic structure of an atom of element X.

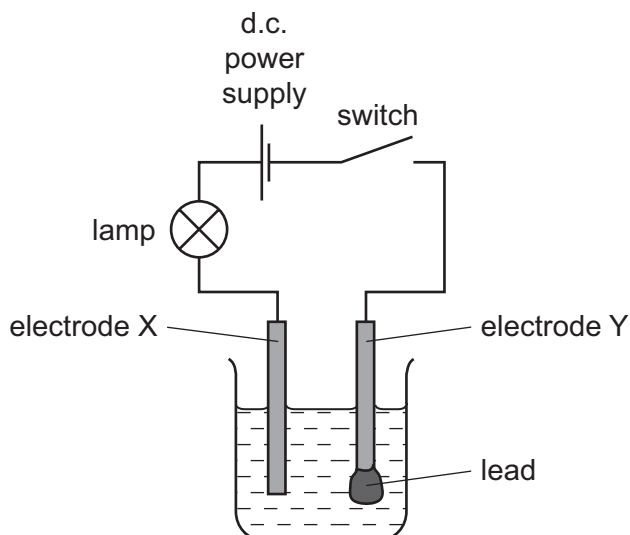


In which group of the Periodic Table is X, and how many protons does its atom contain?

	group number	number of protons
A	3	15
B	3	16
C	5	15
D	5	16

- 23 The diagram shows the apparatus used for the electrolysis of lead(II) bromide using inert electrodes X and Y.

Lead is formed at electrode Y.



Which statement about the electrolysis is correct?

- A** A green gas is given off at electrode X.
- B** Electrode Y is the anode.
- C** Only a physical change takes place when the current is switched on.
- D** The electrolyte is in the molten state.

24 P, Q, R and S are four gases found in air.

P is very unreactive.

Q makes up 21% of the air.

R makes up 78% of the air.

S is formed when fossil fuels are burned.

Which row is correct?

	P	Q	R	S
A	argon	nitrogen	oxygen	carbon dioxide
B	argon	oxygen	nitrogen	carbon dioxide
C	carbon dioxide	oxygen	nitrogen	argon
D	carbon dioxide	nitrogen	oxygen	argon

25 Which chemical test shows the presence of water?

A Water has a boiling point of 100 °C.

B Water has a freezing point of 0 °C.

C Water turns anhydrous cobalt chloride from blue to pink.

D Water turns anhydrous copper sulfate from blue to white.

26 Which statements about the complete combustion of methane are correct?

1 The reaction is endothermic.

2 Carbon dioxide is formed.

3 Water is formed.

A 1, 2 and 3

B 1 and 2 only

C 1 and 3 only

D 2 and 3 only

27 Which method is used to extract copper from copper(II) oxide?

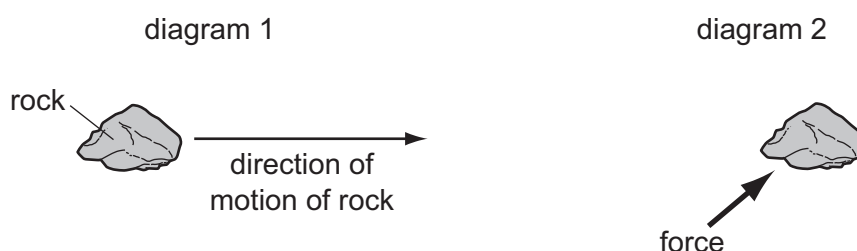
A dissolving copper(II) oxide with hydrochloric acid and then filtering

B dissolving copper(II) oxide in water and then filtering

C heating the copper(II) oxide

D heating the copper(II) oxide mixed with carbon

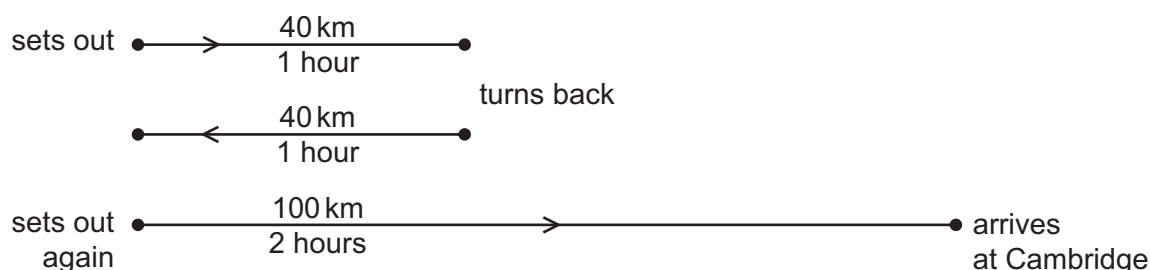
- 28 Diagram 1 shows a small rock moving through space. There are no forces acting on it. A force is now applied to the rock. Diagram 2 shows the direction of the force.



What is the effect, if any, of this force on the motion of the rock?

	speed of body	direction of motion of body
A	changes	changes
B	changes	no effect
C	no effect	changes
D	no effect	no effect

- 29 A car driver sets out from home to travel to Cambridge. After one hour he is 40 km from home. He discovers that he must return home to collect his briefcase. This journey also takes him one hour. He sets off again immediately. He reaches Cambridge, 100 km from home, 2 hours later.



What is the average speed for the whole of his journey from leaving home the first time?

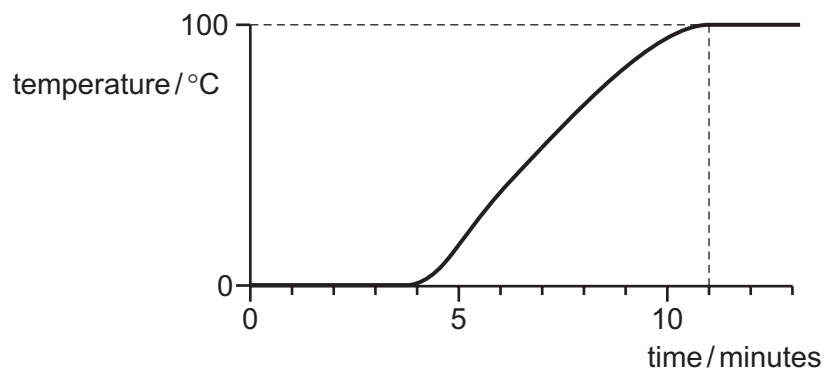
- A** 25 km/h **B** 45 km/h **C** 50 km/h **D** 90 km/h
- 30 As part of a festival, a wooden wheel is set on fire. The burning wheel rolls down a hill.
- What is one energy conversion that occurs as the wheel burns and rolls down the hill?
- A** gravitational to kinetic
B heat to chemical
C kinetic to chemical
D light to gravitational

31 When sweat evaporates, which change of state takes place?

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

32 A block of ice is supplied with heat at a constant rate. Eventually, the melted ice boils.

The graph shows how the temperature changes with time.



How long does it take to melt all the ice?

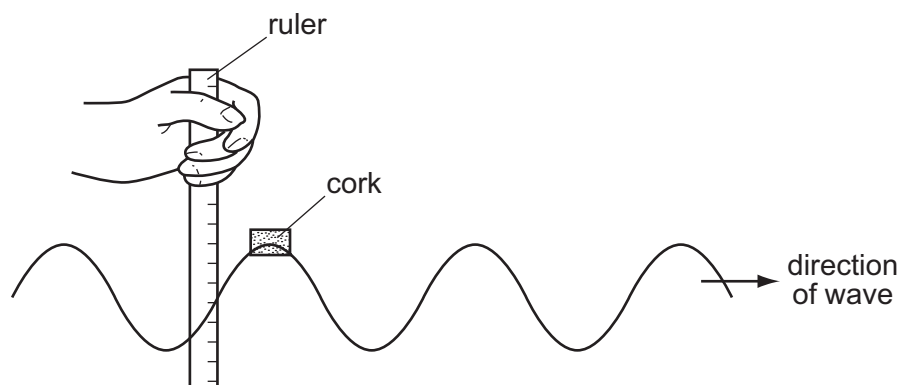
- A 4 minutes
- B 7 minutes
- C 11 minutes
- D 13 minutes

33 On a summer's day, hot air rises above hot roofs.

What is the name of this process?

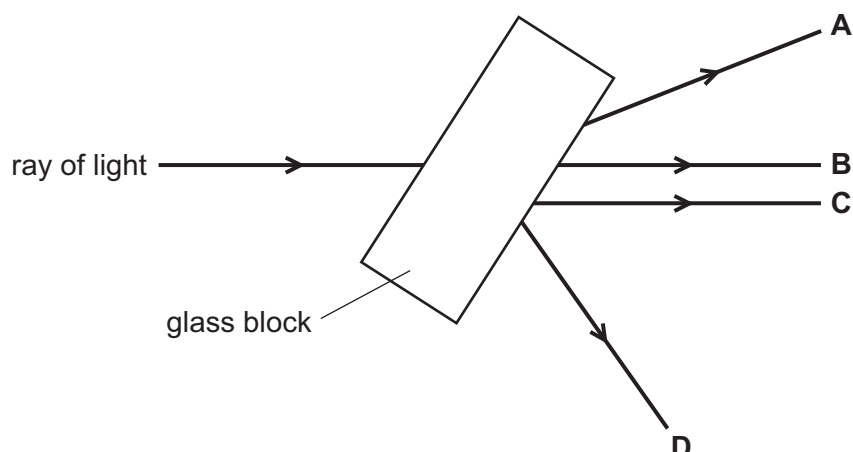
- A concentration
- B condensation
- C conduction
- D convection

- 34 A student measures the distance a cork moves up and down on a wave in a tank of water.



Which quantity can she obtain from this measurement?

- A amplitude
 - B frequency
 - C speed
 - D wavelength
- 35 Which labelled ray shows the path of the ray of light after it has passed through the glass block?



- 36 The diagram shows part of the electromagnetic spectrum.

gamma rays	P	ultra violet waves	Q	infrared waves
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Which line in the table shows the missing types of radiation at P and at Q?

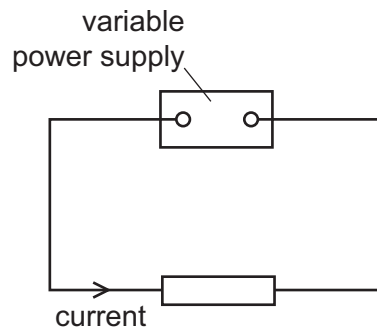
	at P	at Q
A	microwaves	radio waves
B	microwaves	visible light
C	X-rays	radio waves
D	X-rays	visible light

- 37 An electronic circuit in a fire alarm makes a loudspeaker vibrate alternately at two different frequencies.

Which pair of frequencies is suitable to use in the alarm to alert people to the danger of fire?

- A 1.5 Hz and 15 Hz
- B 15 Hz and 150 000 Hz
- C 150 Hz and 15 000 Hz
- D 150 000 Hz and 15 000 000 Hz

- 38 A variable power supply is connected to a resistor and there is a current in the resistor.



The potential difference across the resistor is increased.

The temperature of the resistor does not change.

What happens to the current in the resistor and what happens to the resistance of the resistor?

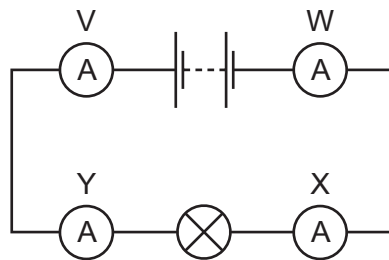
	current	resistance
A	decreases	increases
B	decreases	stays the same
C	increases	decreases
D	increases	stays the same

- 39 The circuit shows a mains supply connected to a heater.



Between which labelled points should a fuse be connected in the circuit?

- A between P and Q
 - B between Q and R
 - C between R and S
 - D between S and P
- 40 Four ammeters V, W, X and Y are connected in the circuit shown.



Which ammeters have the same reading as each other?

- A V and W only
- B V and Y only
- C X and Y only
- D V, W, X and Y

Group																		
I	II							1	0									
7 Li Lithium 3	9 Be Beryllium 4							1 H Hydrogen 1	4 He Helium 2									
23 Na Sodium 11	24 Mg Magnesium 12							11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10					
39 K Potassium 19	40 Ca Calcium 20							27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18					
85 Rb Rubidium 37	88 Sr Strontium 38							65 Zn Zinc 30	64 Cu Copper 29	59 Ni Nickel 28	58 Co Cobalt 27	101 Ru Ruthenium 44	106 Pd Palladium 46	112 Cd Cadmium 48	119 Sn Tin 50	122 Sb Antimony 51	127 I Iodine 53	131 Xe Xenon 54
133 Cs Cesium 55	137 Ba Barium 56							204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	208 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86					
226 Ra Radium 88	227 Ac Actinium 89																	

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

Key

a	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

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COMBINED SCIENCE

0653/13

Paper 1 Multiple Choice

May/June 2013

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

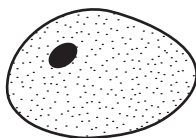
A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

This document consists of **17** printed pages and **3** blank pages.



- 1 The diagram shows an animal cell. The maximum diameter of the diagram is 25 mm.



The actual cell was 0.02 mm maximum diameter.

What is the magnification of the drawing?

- A** ×25 **B** ×200 **C** ×1250 **D** ×2500
- 2 Which substance can enter a plant cell by diffusion?
- A** carbon dioxide
B cellulose
C protein
D starch
- 3 Which two chemical substances are required for photosynthesis?
- A** carbon dioxide and glucose
B glucose and oxygen
C oxygen and water
D water and carbon dioxide
- 4 A test-tube contains a solution of an enzyme.
- Which colour is obtained when the biuret test is carried out on this solution?
- A** blue
B blue-black
C orange
D purple
- 5 What is the word equation for aerobic respiration?
- A** carbon dioxide + glucose → oxygen + water
B carbon dioxide + water → glucose + oxygen
C glucose + oxygen → carbon dioxide + water
D oxygen + water → carbon dioxide + glucose

- 6 Mixtures were made from 5 cm^3 of a starch solution and 2 cm^3 of a solution of an enzyme that digests starch. The mixtures were all kept at the same temperature.

The table shows the different concentrations of the starch and starch-digesting enzyme solution in each mixture.

In which mixture would it take the **longest** time for all the starch to disappear?

	concentration of starch solution / %	concentration of starch-digesting enzyme / %
A	4	8
B	4	4
C	2	8
D	2	4

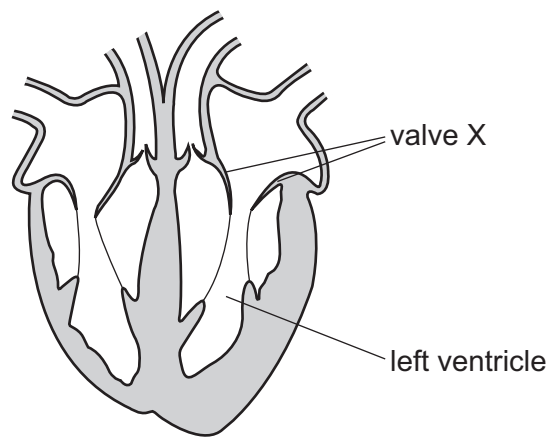
- 7 In what form is water as it enters and is lost from a plant?

	as it enters	as it is lost
A	liquid	liquid
B	liquid	vapour
C	vapour	liquid
D	vapour	vapour

- 8 What is the effect of adrenaline in the control of metabolic activity?

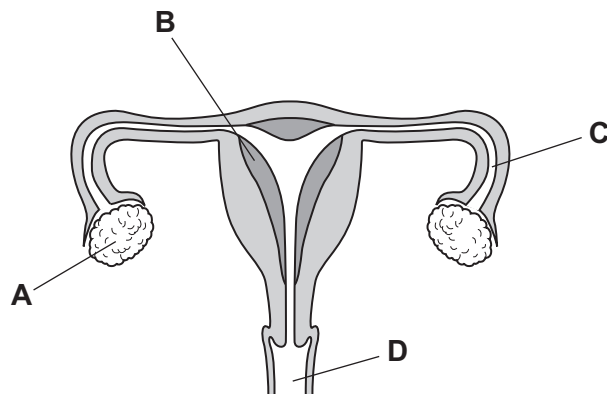
	blood glucose concentration	rate of heart beat
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 9 The diagram shows a section through the heart.



Which events occur as the left ventricle contracts?

- A atrial wall contracts and valve X closes
 - B atrial wall contracts and valve X opens
 - C atrial wall relaxes and valve X closes
 - D atrial wall relaxes and valve X opens
- 10 What occurs about two weeks after menstruation?
- A the release of a gamete from an ovary
 - B the release of a gamete from the uterus
 - C the release of a zygote from an ovary
 - D the release of a zygote from the uterus
- 11 The diagram shows a section through the female reproductive system.
- Where is the fertilised egg implanted?



12 What describes asexual reproduction?

	number of parents	a zygote is produced	offspring identical to the parent
A	1	no	yes
B	1	yes	no
C	2	no	yes
D	2	yes	no

13 The diagram shows five organisms in a food chain.

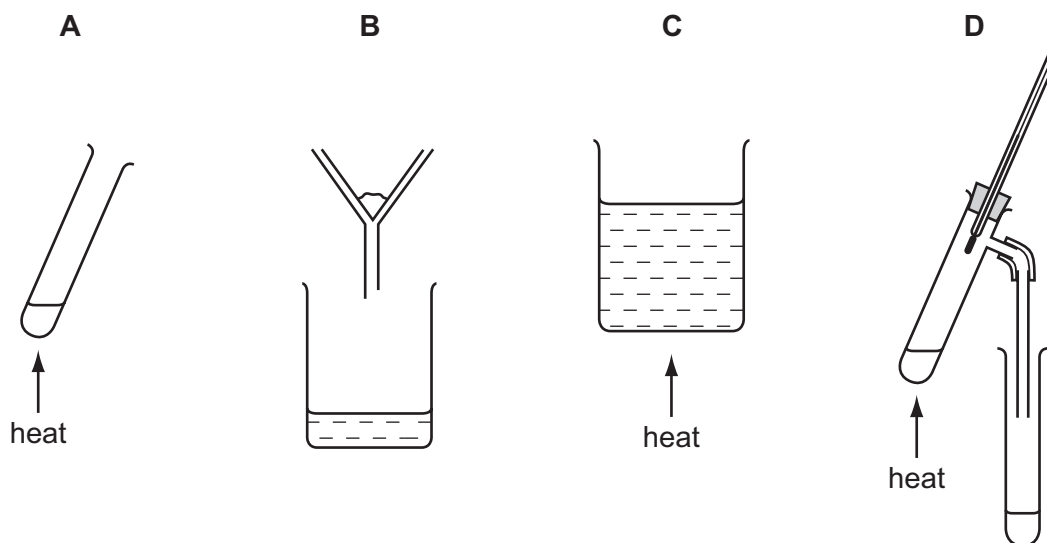
$T \rightarrow U \rightarrow V \rightarrow W \rightarrow X$

Which organisms are consumers?

A T, U and V **B** T, W and X **C** T, V and X **D** U, V and W

14 Aqueous copper(II) sulfate consists of copper(II) sulfate dissolved in water.

Which apparatus could **not** be used to remove water from this solution?



- 15 The reaction of zinc and sulfur to form zinc sulfide is exothermic.

Which information in the table is correct?

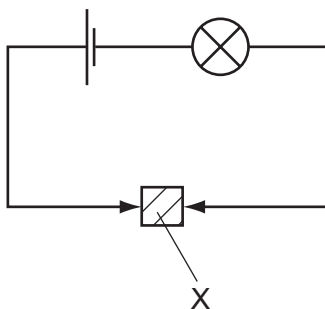
	elements in zinc sulfide	energy change during the formation of zinc sulfide
A	difficult to separate	heat given out
B	difficult to separate	heat taken in
C	easy to separate	heat given out
D	easy to separate	heat taken in

- 16 A student carries out experiments with zinc and dilute hydrochloric acid.

Which change in conditions makes the reaction slower?

- A** adding a suitable catalyst
 - B** increasing the concentration of the acid
 - C** increasing the particle size of the zinc
 - D** increasing the temperature
- 17 A solid X is placed in the circuit shown.

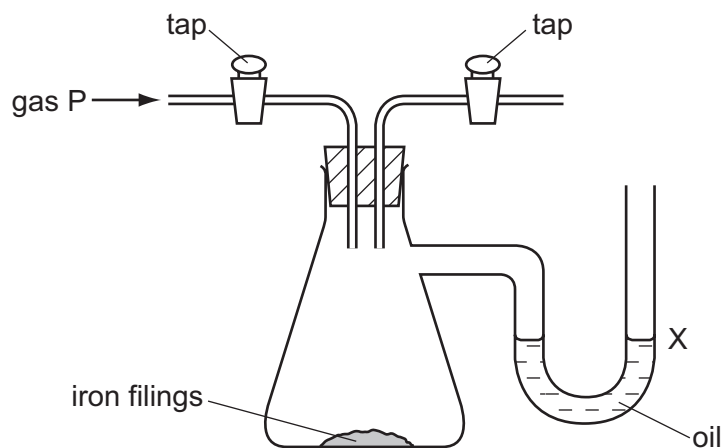
The lamp lights.



What is X?

- A** an alloy
- B** a compound
- C** an electrolyte
- D** a salt

18 The diagram shows an experiment on the rusting of iron.



The flask is filled with gas P. The taps are closed and the apparatus is left for a week.

The experiment is repeated with four different gases.

What happens to the oil level at X?

	gas P	oil level at X
A	damp nitrogen	rises
B	damp oxygen	falls
C	dry nitrogen	falls
D	dry oxygen	rises

19 Which statements about air are correct?

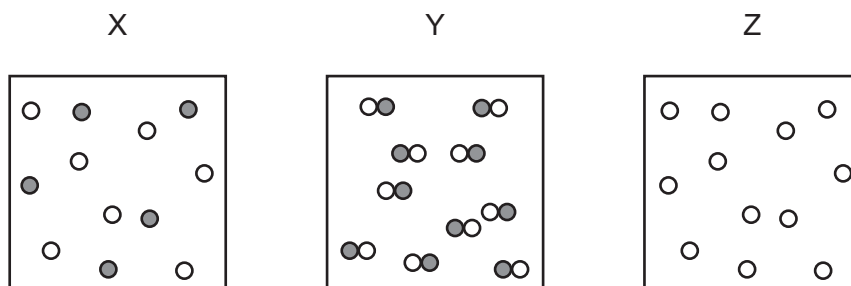
- 1 Air contains a small amount of argon which is a noble gas.
- 2 Air is made up of 78% oxygen and 21% nitrogen.
- 3 Air contains carbon dioxide which is a product of both respiration and the combustion of natural gas.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

20 Which mixture **cannot** be separated by distillation?

- A** air
- B** petroleum
- C** salt water
- D** sulfur and iron

21 The diagrams represent the particles in substances X, Y and Z.



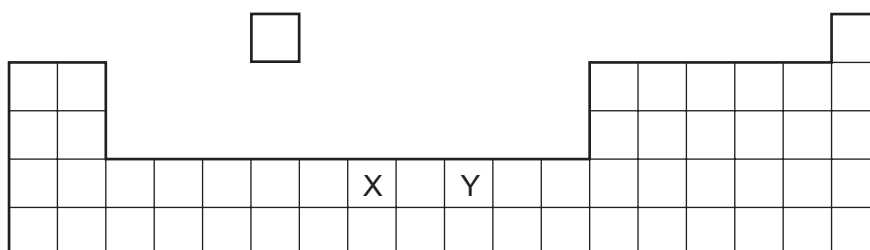
Which row correctly identifies X, Y and Z as an element, a compound or a mixture?

	element	compound	mixture
A	X	Y	Z
B	Y	Z	X
C	Z	X	Y
D	Z	Y	X

22 Which substance conducts electricity?

- A** $\text{CO}_2(\text{g})$ **B** $\text{NaCl}(\text{s})$ **C** $\text{NaOH}(\text{aq})$ **D** $\text{S}(\text{s})$

23 The diagram shows an outline of part of the Periodic Table.

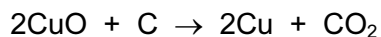


What do elements X and Y have in common?

- 1 They form coloured compounds.
- 2 They can be used as catalysts.
- 3 They have low melting points.

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

- 24 The equation shows the reaction of copper oxide with carbon.



In the reaction, the carbon is the 1..... agent and is 2..... during the reaction.

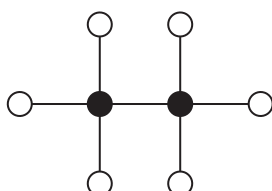
Which words complete gaps 1 and 2?

	1	2
A	oxidising	oxidised
B	oxidising	reduced
C	reducing	oxidised
D	reducing	reduced

- 25 Which pair of gases can be identified using limewater and damp litmus paper?

- A** carbon dioxide and chlorine
B carbon dioxide and hydrogen
C chlorine and oxygen
D hydrogen and chlorine

- 26 The diagram shows a molecule of ethane.



key

● carbon atom

○ hydrogen atom

What is the molecular formula of ethane?

- A** CH₆ **B** CH₃ **C** C₂H₄ **D** C₂H₆

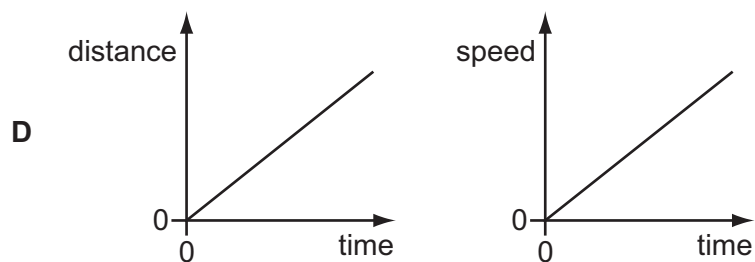
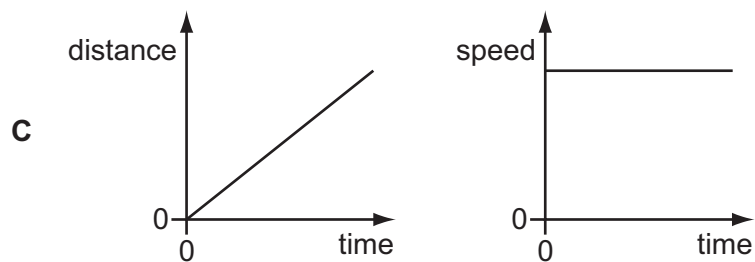
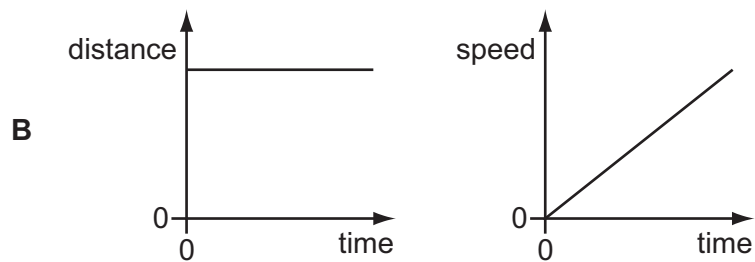
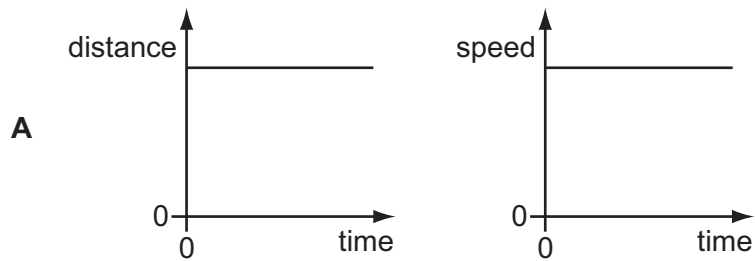
- 27 Three boiling tubes are each filled with a gas from Group VII in the Periodic Table.

Gas 1 is brown. Gas 2 is purple. Gas 3 is green.

Which gases are in the tubes?

	gas 1	gas 2	gas 3
A	Cl	I	Br
B	Br	Cl	I
C	Br	I	Cl
D	I	Br	Cl

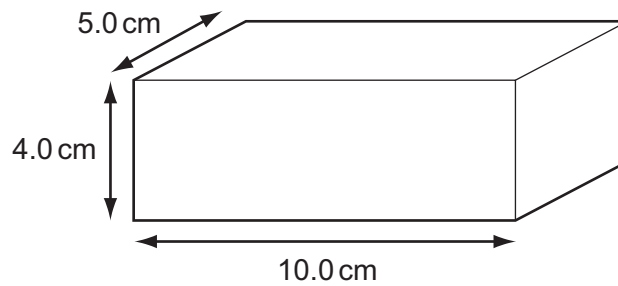
- 28 Which pair of distance/time and speed/time graphs represents an object which is moving with constant speed?



- 29 When sweat evaporates, which change of state takes place?

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

- 30 A rectangular metal block has the dimensions shown. The density of the metal is 8.0 g/cm^3 .

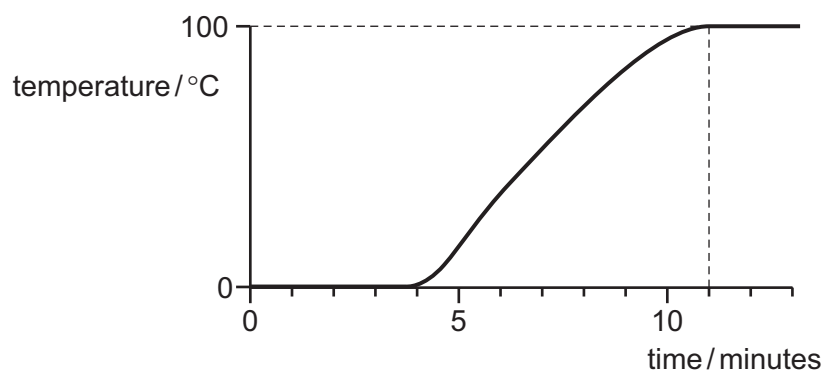


What is the mass of the metal block?

- A** 160 g **B** 320 g **C** 400 g **D** 1600 g
- 31 Which energy resource is non-renewable?
- A** geothermal energy
B hydroelectric energy
C nuclear energy
D wave energy
- 32 The International Space Station orbits the Earth in the vacuum above the atmosphere.
- The electrical systems in the Space Station produce heat.
- How is this heat transferred from the external surfaces of the Space Station into space?
- A** conduction only
B convection only
C radiation only
D conduction, convection and radiation

- 33** A block of ice is supplied with heat at a constant rate. Eventually, the melted ice boils.

The graph shows how the temperature changes with time.



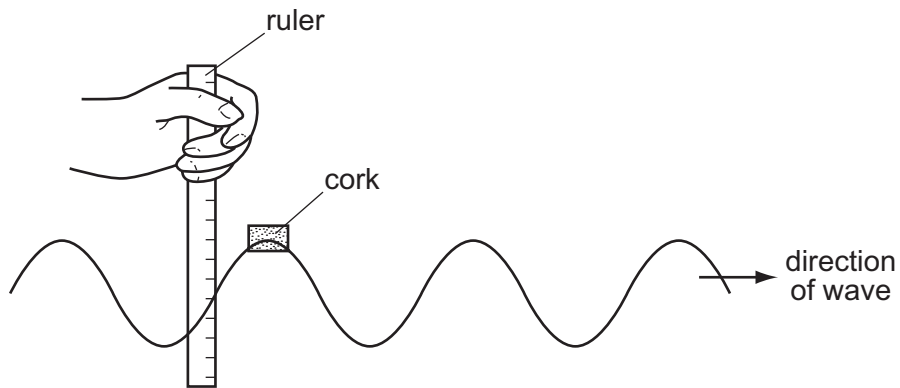
How long does it take to melt all the ice?

- A** 4 minutes **B** 7 minutes **C** 11 minutes **D** 13 minutes
- 34** Electromagnetic waves have many different applications.

Which row identifies the type of electromagnetic wave used in each application?

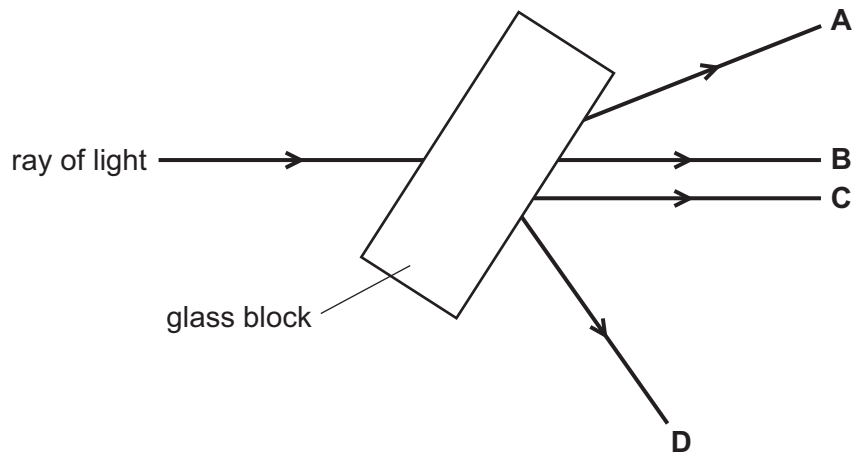
	satellite television	terrestrial television (not satellite)	television remote controllers
A	microwaves	radio waves	infrared waves
B	microwaves	radio waves	microwaves
C	radio waves	infrared waves	infrared waves
D	radio waves	infrared waves	microwaves

- 35 A student measures the distance a cork moves up and down on a wave in a tank of water.



Which quantity can she obtain from this measurement?

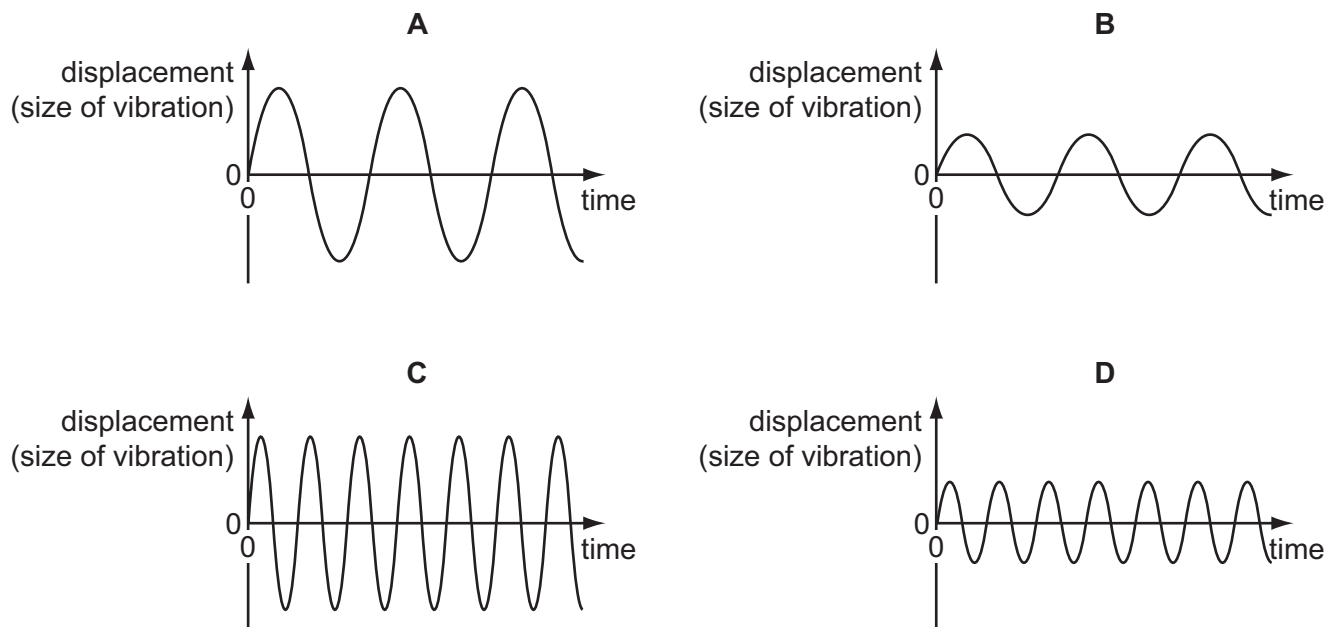
- A amplitude
 - B frequency
 - C speed
 - D wavelength
- 36 Which labelled ray shows the path of the ray of light after it has passed through the glass block?



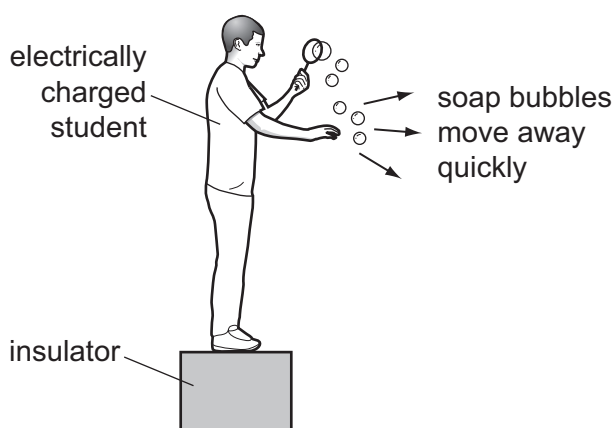
- 37 A microphone is connected to an oscilloscope. The oscilloscope produces graphs of sounds.

The scales for the graphs are the same.

Which graph shows the quietest sound with the highest pitch?



- 38 An electrically charged student produces soap bubbles. When he holds his hand near the bubbles, they move away quickly from his hand.

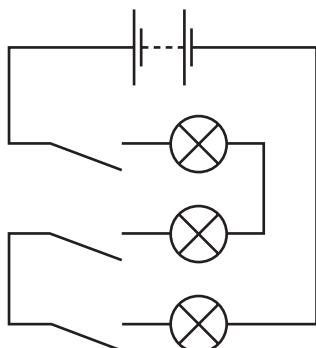
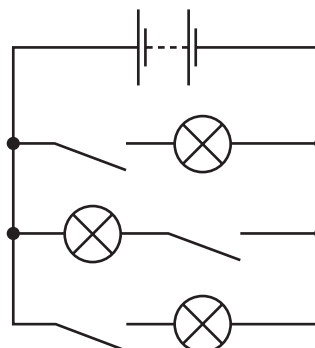
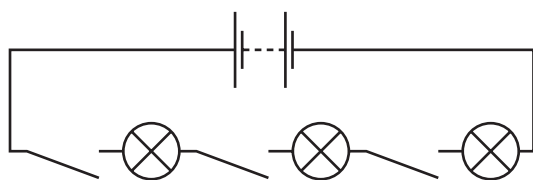
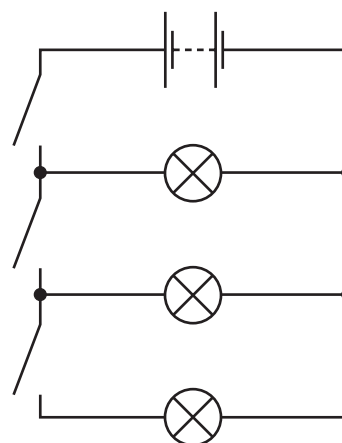


For this movement of the bubbles to happen, which statement is correct?

- A** The bubbles must be negatively charged.
- B** The bubbles must be positively charged.
- C** The bubbles must have the opposite charge to the charge on the student.
- D** The bubbles must have the same charge as the charge on the student.

- 39 An electrician wishes to connect three lamps in a circuit so that each lamp can be on and off separately.

Which circuit should be used?

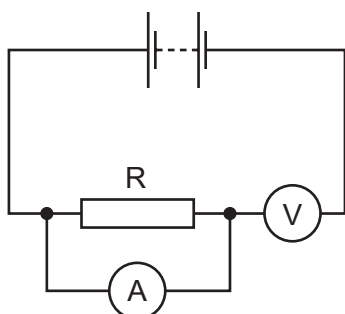
A**B****C****D**

40 A student wishes to find the resistance of resistor R.

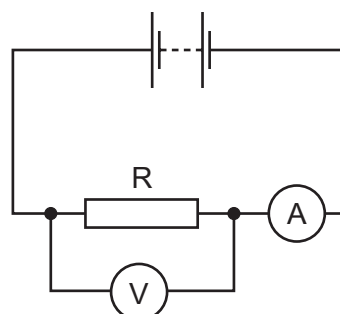
The diagrams show four possible circuits which the student could use.

Which circuit can be used to find the resistance of resistor R?

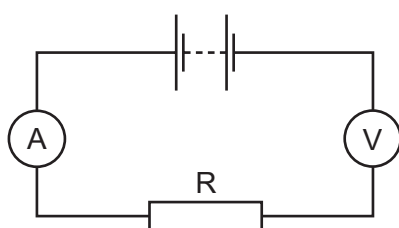
A



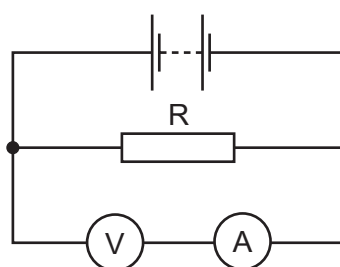
B



C



D



Group

140	Ce Cerium	141	Pr Praseodymium	144	Nd Neodymium	144	Pm Promethium	150	Sm Samarium	152	Eu Europium	157	Gd Gadolinium	159	Tb Terbium	162	Dy Dysprosium	165	Ho Holmium	167	Er Erbium	169	Tm Thulium	173	Yb Ytterbium	175	Lu Lutetium
90	Th Thorium	91	Pa Protactinium	92	U Uranium	93	Np Neptunium	94	Pu Plutonium	95	Am Americium	96	Cm Curium	97	Bk Berkelium	98	Cf Californium	99	Es Einsteinium	100	Fm Fermium	101	Md Mendelevium	102	No Nobelium	103	Lr Lawrencium

Key

a	X
---	----------

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

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