



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

Paper 2 Multiple Choice (Extended)

0653/21

October/November 2018

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, 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.

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

Electronic calculators may be used.

This document consists of **14** printed pages and **2** blank pages.



1 Which structure found in plant cells is matched to its function?

	structure	function
A	cell membrane	provides strength and support
B	chloroplast	absorbs light energy
C	cytoplasm	filled with cell sap for strengthening
D	permanent vacuole	site of chemical reactions

2 Which process depends on diffusion?

- A** circulation
- B** digestion
- C** gaseous exchange
- D** phagocytosis

3 Biological catalysts speed up reactions in the body.

What is another name for biological catalysts?

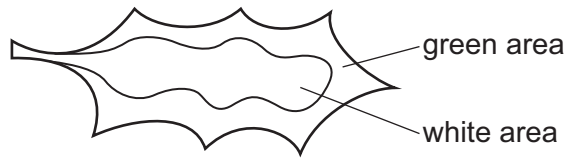
- A** antibodies
- B** enzymes
- C** fatty acids
- D** hormones

4 Microorganisms are used to make yoghurt.

Which acid is produced when microorganisms break down lactose in the milk?

- A** amino acid
- B** fatty acid
- C** hydrochloric acid
- D** lactic acid

- 5 The diagram shows a leaf that was tested for starch using iodine solution.

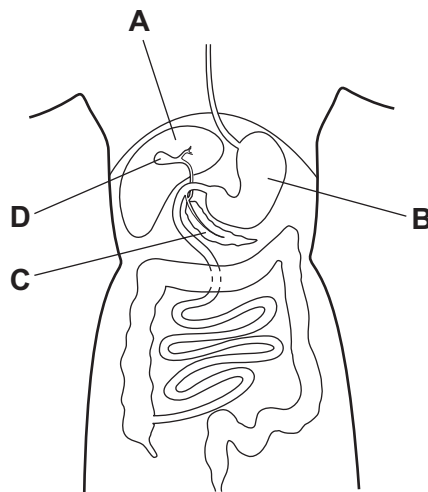


Which row shows the results for this leaf and explains the results?

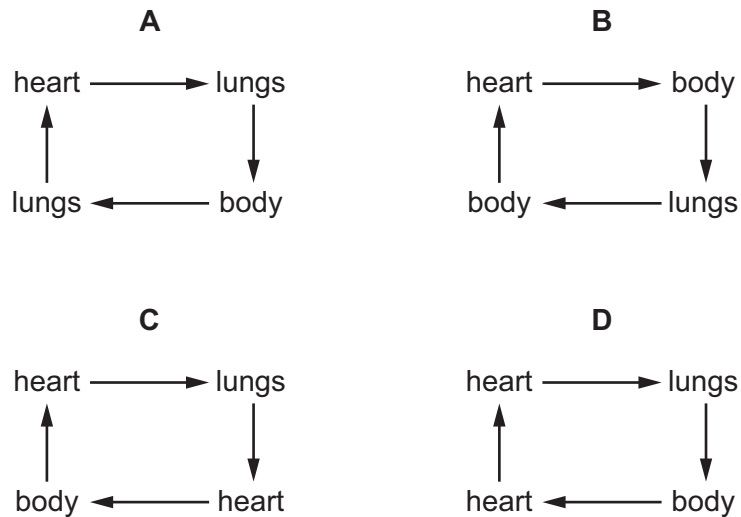
	green area of leaf after test	white area of leaf after test	explanation
A	blue-black	blue-black	chlorophyll is found in all parts of the leaf
B	blue-black	brown	chlorophyll is found in only part of the leaf
C	brown	brown	chlorophyll is found in all parts of the leaf
D	brown	blue-black	chlorophyll is found in only part of the leaf

- 6 The diagram shows part of the human alimentary canal.

Where is bile made?



7 Which diagram shows the double circulatory system of a human?

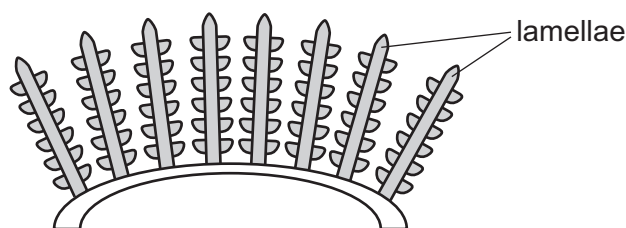


8 Aerobic respiration is the release of a relatively X..... amount of energy by the breakdown of food substances in the presence of Y..... .

Which words complete the gaps X and Y?

	X	Y
A	large	carbon dioxide
B	large	oxygen
C	small	carbon dioxide
D	small	oxygen

9 The diagram shows structures called lamellae. They are found in the gills of fish.



Lamellae increase the surface area of the gills. The gills are the site of gaseous exchange in fish.

What is the effect of this increased surface area?

- A** decreased rate of carbon dioxide diffusion into the blood
- B** decreased rate of oxygen diffusion into the blood
- C** increased rate of carbon dioxide diffusion into the blood
- D** increased rate of oxygen diffusion into the blood

10 Which statement about adrenaline is **not** correct?

- A Adrenaline is transported in the blood plasma.
- B Adrenaline lowers the blood glucose concentration.
- C The heart is one of the target organs for adrenaline.
- D The liver destroys adrenaline.

11 What is the function of the amniotic sac?

- A It surrounds the fetus in the uterus and contains amniotic fluid.
- B It surrounds the fetus in the uterus and provides essential nutrients for the fetus.
- C It surrounds the fetus in the vagina and contains amniotic fluid.
- D It surrounds the fetus in the vagina and provides essential nutrients for the fetus.

12 What is the definition of a trophic level?

- A It shows how an organism loses energy.
- B It shows the position of an organism in a food chain.
- C It shows the consumers of an organism.
- D It shows the food eaten by an organism.

13 Which are possible harmful effects of deforestation?

	global warming	species extinction
A	✓	✓
B	✓	x
C	x	✓
D	x	x

14 Sucrose is a covalent compound.

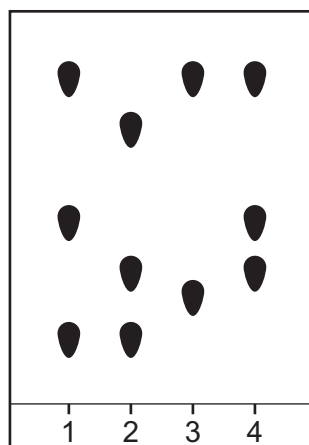
It is a solid at room temperature.

Which statement about sucrose is correct?

- A It is made of atoms that are close together and in continuous random motion.
- B It is made of atoms that are far apart and vibrating about a fixed point.
- C It is made of molecules that are close together and vibrating about a fixed point.
- D It is made of molecules that are far apart and in continuous random motion.

15 Four dyes are separated using chromatography.

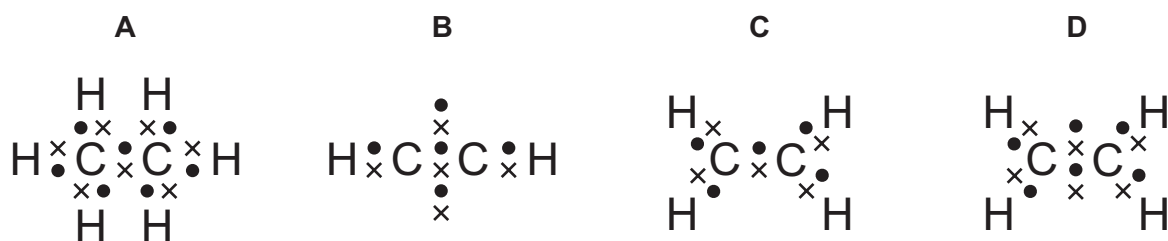
The results are shown.



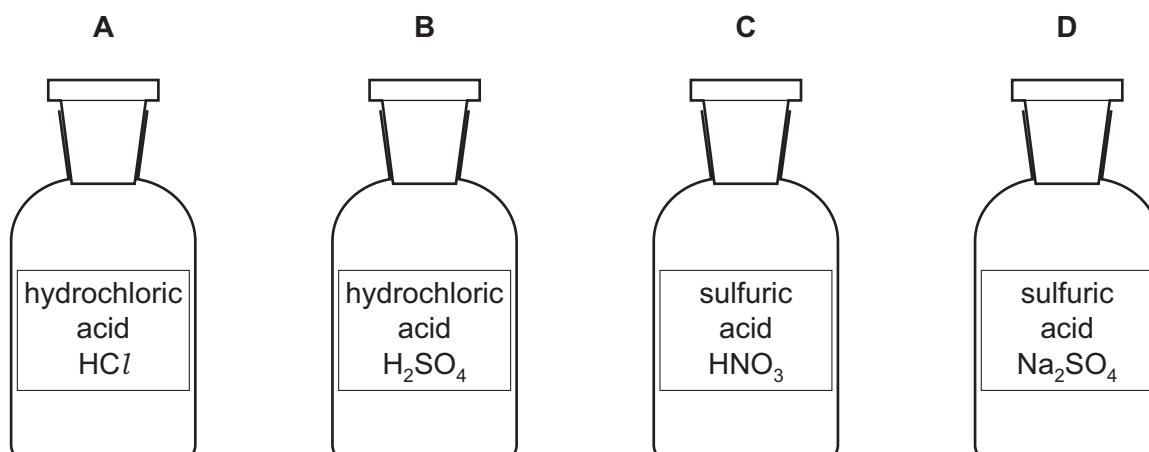
Which dyes contain two colours that are present in both dyes?

- A** 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

16 Which diagram represents the bonding in a molecule of ethene?



17 On which label does the formula match the name of the acid?



- 18 Some chemical compounds are broken down by electrolysis using inert electrodes.

Which row identifies the electrode products for the stated electrolyte?

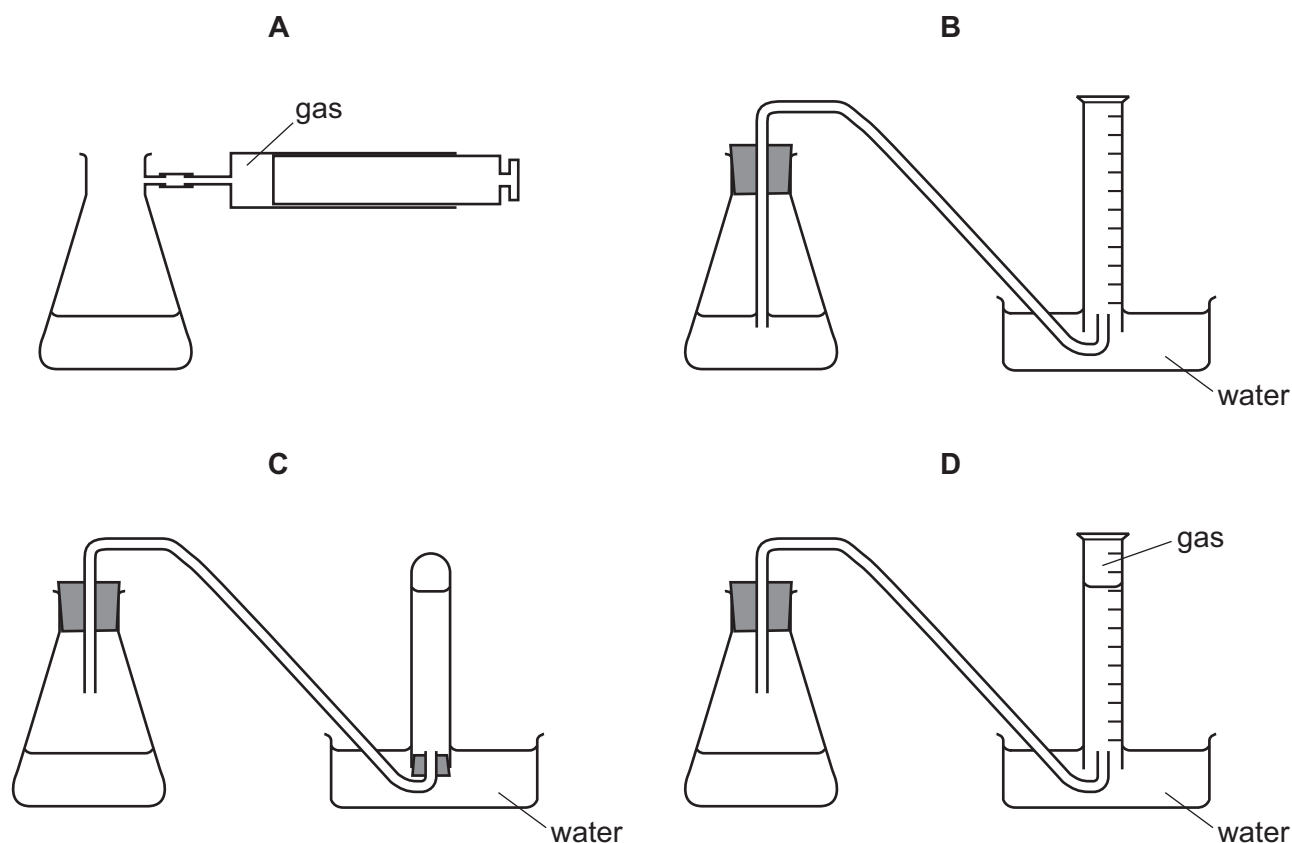
	electrolyte	product at anode	product at cathode
A	aqueous copper chloride	hydrogen	copper
B	molten aluminium oxide	aluminium	oxygen
C	molten copper chloride	chlorine	copper
D	molten potassium bromide	potassium	bromine

- 19 When concentrated sulfuric acid is added to water, the temperature of the mixture increases.

Which row describes the type of reaction and the energy change for this process?

	type of reaction	energy change
A	endothermic	chemical to thermal
B	endothermic	thermal to chemical
C	exothermic	chemical to thermal
D	exothermic	thermal to chemical

- 20 Which diagram shows apparatus used to investigate the rate of a reaction in which a gas is given off?



21 Iron oxide reacts with carbon monoxide.

The word equation for the reaction is:



Which statement is **not** correct?

- A** Carbon is neither oxidised nor reduced.
- B** Carbon is oxidised.
- C** Iron is reduced.
- D** This is a redox reaction.

22 Which element in a period of the Periodic Table has the greatest metallic character?

- A** the element which most readily forms an anion
- B** the element with the fewest outer-shell electrons
- C** the element with the highest atomic number
- D** the element with the largest group number

23 The positions of four elements are shown in the outline of the Periodic Table.

Which element has a high melting point and forms coloured compounds?

[illegible]

24 Which gas is used to provide an inert atmosphere in lamps?

- A** argon
B helium
C neon
D nitrogen

25 Which statement about metals is **not** correct?

- A Copper is below hydrogen in the reactivity series.
- B Lithium produces a flame when a small piece is added to cold water.
- C Magnesium reacts with steam to produce hydrogen.
- D Zinc reacts with copper ions to form zinc ions and copper.

26 Gasoline is a hydrocarbon fuel obtained from petroleum.

Which statement is correct?

- A Gasoline burns to form carbon dioxide and water.
- B Gasoline contains the elements carbon, hydrogen and oxygen.
- C Gasoline is used as a fuel in diesel engines.
- D The combustion of gasoline is an endothermic reaction.

27 P, Q and R are three fractions obtained from petroleum by fractional distillation.

Molecules of R are larger than molecules of P.

The intermolecular forces in Q are weaker than those in P.

What is the order of boiling points?

	lowest	→	highest
A	P	Q	R
B	Q	P	R
C	R	P	Q
D	R	Q	P

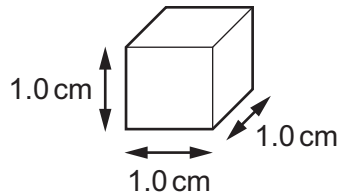
28 A gold block is taken from the surface of the Earth to the surface of the Moon.

The gravitational field is weaker on the Moon than it is on the Earth.

Which property of the gold block changes?

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

- 29 A cube of aluminium has sides of length 1.0 cm.



Compared with this cube, which statement about a cube of aluminium with sides of 2.0 cm is correct?

- A It has the same density.
 - B It has the same mass.
 - C It has twice the density.
 - D It has twice the mass.
- 30 A spring that obeys Hooke's law is 20 cm long when unstretched.

A load of 10 N is hung from the spring and its length increases to 25 cm.

The 10 N load is removed and replaced with a 30 N load.

What is the new length of the spring?

- A 15 cm B 35 cm C 40 cm D 60 cm
- 31 A brick of mass 4.0 kg rests on a window ledge. It falls off the window ledge and drops through a height of 5.0 m to the ground. The acceleration of free fall g is 10 m/s^2 .

Air resistance can be ignored.

Which row states the kinetic energy and the speed of the brick just before it hits the ground?

	kinetic energy of brick / J	<u>speed of brick</u> m/s
A	20	2.2
B	20	3.2
C	200	7.1
D	200	10

- 32** A scientist investigates two different substances, P and Q.

Substance P completely fills its container but can be compressed.

Substance Q is not in a container but has a definite shape.

In which state is each substance?

	substance P	substance Q
A	gas	liquid
B	gas	solid
C	liquid	gas
D	liquid	solid

- 33** A liquid evaporates when molecules leave its surface.

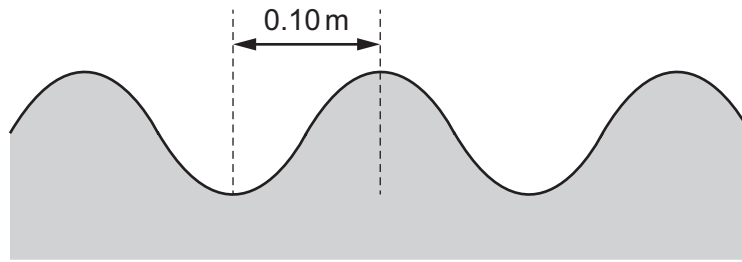
Which molecules leave the surface, and what happens to the temperature of the remaining liquid?

- A** The more energetic molecules leave and the temperature falls.
- B** The more energetic molecules leave and the temperature rises.
- C** The less energetic molecules leave and the temperature falls.
- D** The less energetic molecules leave and the temperature rises.

- 34** How is heat transferred in solids?

- A** Heated molecules become less dense and travel to colder areas.
- B** Heated molecules become more dense and travel to colder areas.
- C** Heated molecules vibrate more quickly and cause neighbouring molecules to vibrate more quickly.
- D** Heated molecules vibrate more slowly and cause neighbouring molecules to vibrate more quickly.

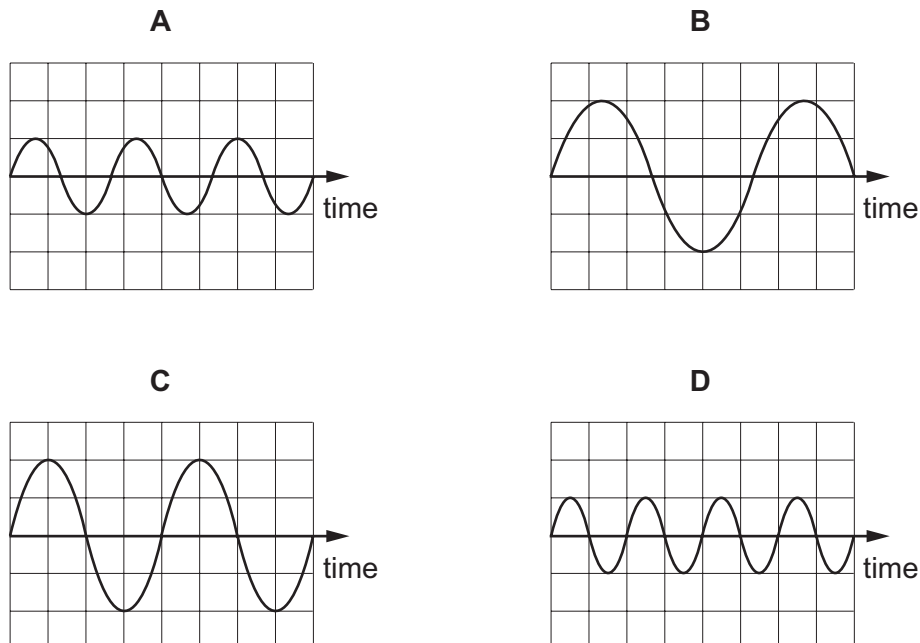
- 35 The diagram shows a water wave travelling at 0.56 m/s .



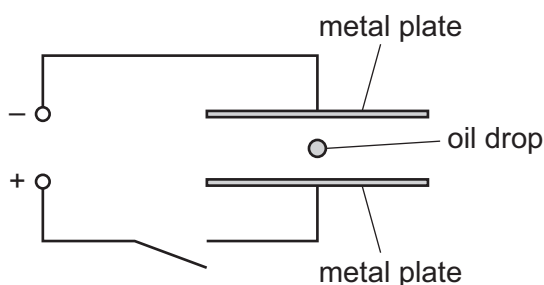
What is the frequency of the wave?

- A** 0.11 Hz **B** 0.36 Hz **C** 2.8 Hz **D** 5.6 Hz
- 36 Which list shows electromagnetic waves in order of decreasing wavelength (largest to smallest)?
- A** gamma rays $\rightarrow$ radio waves $\rightarrow$ infra-red $\rightarrow$ microwaves
B microwaves $\rightarrow$ visible light $\rightarrow$ X-rays $\rightarrow$ infra-red
C radio waves $\rightarrow$ visible light $\rightarrow$ ultraviolet $\rightarrow$ X-rays
D X-rays $\rightarrow$ infra-red $\rightarrow$ microwaves $\rightarrow$ visible light
- 37 The diagrams represent four different sound waves. The scales are the same in all the diagrams.

Which sound has the lowest pitch?



- 38 The diagram shows a negatively charged oil drop between two metal plates. The plates are connected by an open switch to a power supply. The oil drop is falling at a steady speed.

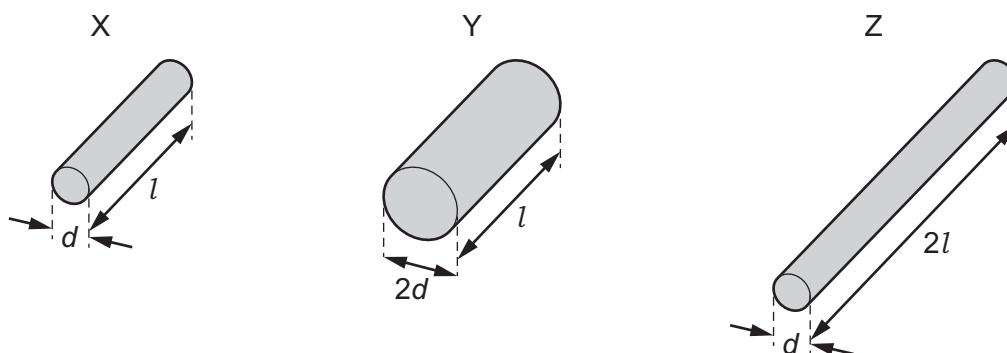


The switch is now closed.

What happens to the oil drop?

- A It moves downwards at an increasing speed.
 - B It moves upwards at an increasing speed.
 - C It moves to the left at a constant speed.
 - D It moves to the right at a constant speed.
- 39 Three pieces of resistance wire X, Y and Z are made of the same metal.

The diagram shows the lengths and the diameters of the wires.



What is the order of the wires when they are placed in order of increasing resistance, least resistance first?

- A $Y \rightarrow X \rightarrow Z$
 - B $Y \rightarrow Z \rightarrow X$
 - C $Z \rightarrow X \rightarrow Y$
 - D $Z \rightarrow Y \rightarrow X$
- 40 An electric motor is connected to a 120 V mains supply.

The motor transfers 72 000 J of energy in 2.0 minutes.

What is the current in the motor?

- A 0.20 A
- B 5.0 A
- C 10 A
- D 300 A

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The Periodic Table of Elements

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3 Li lithium 7	4 Be beryllium 9	atomic number atomic symbol name relative atomic mass										5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	11 Na sodium 23	12 Mg magnesium 24	13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40	19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131	55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
87 Fr francium —	88 Ra radium —	89–103 actinoids	104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —		114 Fl flerovium —		116 Lv livermorium —																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								

lanthanoids

actinoids

57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium —	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	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 —

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



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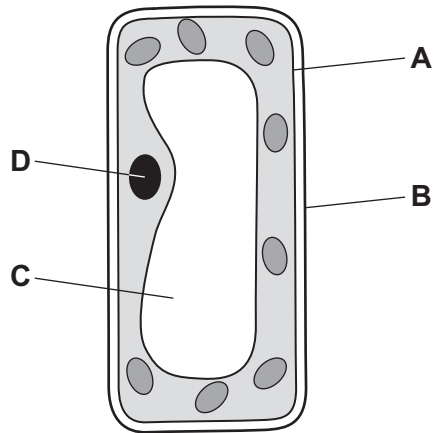
Electronic calculators may be used.

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- 1 The diagram shows a typical plant cell.

Which part of the cell controls the movement of materials into and out of the cell?



- 2 Which process depends on diffusion?

- A circulation
- B digestion
- C gaseous exchange
- D phagocytosis

- 3 Enzymes are used in digestion to break down larger molecules into smaller molecules.

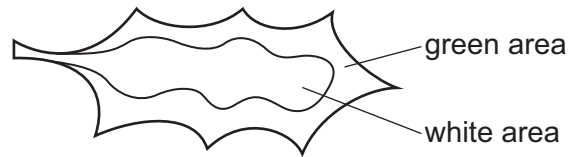
Which row matches the large molecules with the small molecules they are broken down into?

	large molecules	small molecules
A	fat	glycerol and fatty acids
B	glycogen	glycerol and amino acids
C	protein	simple sugars
D	starch	amino acids

- 4 Which two nutrients are needed for healthy bone and tooth development?

- A calcium and iron
- B iron and vitamin C
- C vitamin C and vitamin D
- D vitamin D and calcium

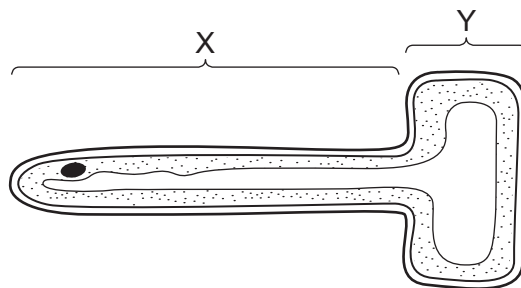
- 5 The diagram shows a leaf that was tested for starch using iodine solution.



Which row shows the results for this leaf and explains the results?

	green area of leaf after test	white area of leaf after test	explanation
A	blue-black	blue-black	chlorophyll is found in all parts of the leaf
B	blue-black	brown	chlorophyll is found in only part of the leaf
C	brown	brown	chlorophyll is found in all parts of the leaf
D	brown	blue-black	chlorophyll is found in only part of the leaf

- 6 The diagram shows a cross-section of a root hair cell.

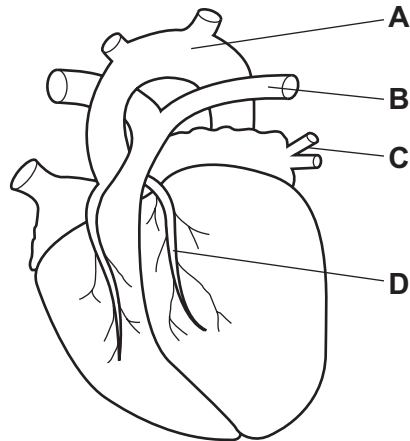


Which row identifies the part of the cell with the larger surface area and its function?

	part of cell	function
A	X	water and glucose uptake
B	X	water and ion uptake
C	Y	water and glucose uptake
D	Y	water and ion uptake

- 7 The diagram shows the external surface of the heart.

Which letter identifies a coronary artery?



- 8 Six molecules of glucose are aerobically respired in an animal cell.

How many molecules of carbon dioxide are released in this process?

- A 1 B 6 C 12 D 36

- 9 Which features will maximise the rate of gas exchange across the alveoli?

	large surface area	small blood supply	thin membrane
A	✓	✓	x
B	✓	✓	✓
C	✓	x	✓
D	x	✓	✓

- 10 What happens to the blood glucose concentration and pulse rate when adrenaline is released into a person's bloodstream?

	blood glucose concentration	pulse rate
A	decreases	increases
B	decreases	decreases
C	increases	increases
D	increases	decreases

- 11 Which row describes the net diffusion of substances between the fetus and the mother across the placenta?

	from fetus to mother	from mother to fetus
A	carbon dioxide and glucose	oxygen and amino acids
B	carbon dioxide and waste products	oxygen and glucose
C	oxygen and glucose	carbon dioxide and amino acid
D	oxygen and waste products	carbon dioxide and glucose

- 12 What is the definition of a trophic level?

- A** It shows how an organism loses energy.
- B** It shows the position of an organism in a food chain.
- C** It shows the consumers of an organism.
- D** It shows the food eaten by an organism.

- 13 Which are possible harmful effects of deforestation?

	global warming	species extinction
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

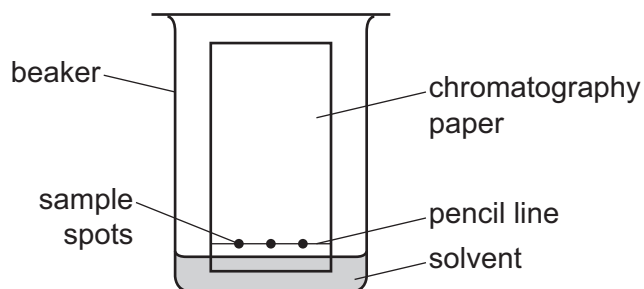
- 14 Sucrose is a covalent compound.

It is a solid at room temperature.

Which statement about sucrose is correct?

- A** It is made of atoms that are close together and in continuous random motion.
- B** It is made of atoms that are far apart and vibrating about a fixed point.
- C** It is made of molecules that are close together and vibrating about a fixed point.
- D** It is made of molecules that are far apart and in continuous random motion.

15 The apparatus used for chromatography is shown.



Which statement about the method used for chromatography is **not** correct?

- A The beaker is swirled to help the solvent to rise.
- B The chromatography paper is placed in the beaker after the solvent has been added.
- C The chromatography paper is removed before the solvent reaches the top of the paper.
- D The sample spots are placed on the pencil line above the level of the solvent.

16 Which molecule contains a double covalent bond?

- A ethene
- B methane
- C nitrogen
- D water

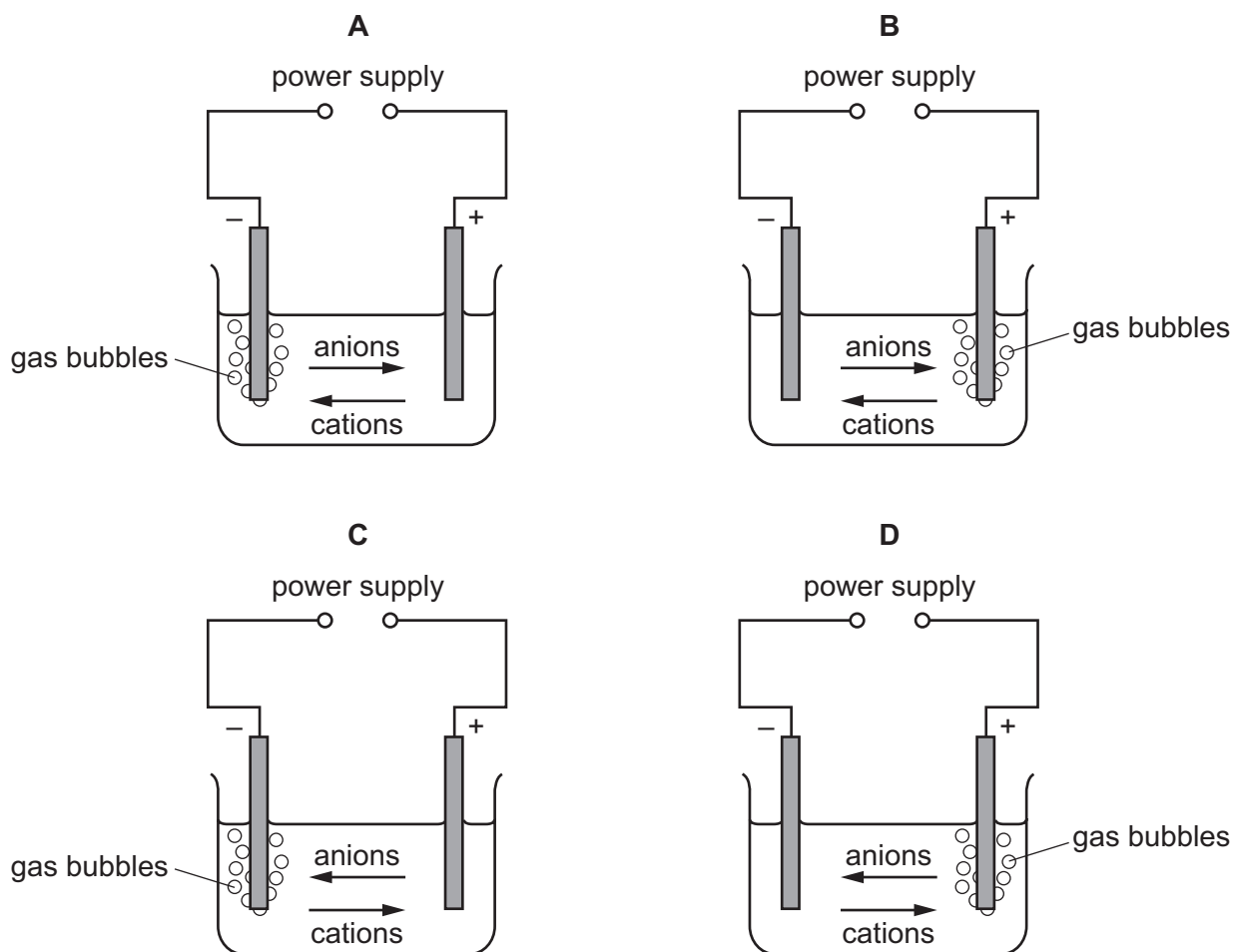
17 Which formula does **not** represent an acid?

- A H_2SO_4 B HCl C HNO_3 D NH_3

18 During the electrolysis of aqueous copper chloride, ions move.

A gas is produced at one of the electrodes.

Which diagram shows the movement of ions and the electrode at which the gas is produced?



19 Which statement describes an endothermic reaction?

- A** Chemical energy is transformed into thermal energy and the temperature falls.
- B** Chemical energy is transformed into thermal energy and the temperature rises.
- C** Thermal energy is transformed into chemical energy and the temperature falls.
- D** Thermal energy is transformed into chemical energy and the temperature rises.

20 Hydrogen peroxide decomposes to form oxygen and water.

A catalyst is added to the hydrogen peroxide.

Which row describes the change in the rate of reaction and the mass of catalyst left at the end of the reaction?

	rate of reaction	mass of catalyst left at end of reaction
A	decrease	less
B	decrease	no change
C	increase	less
D	increase	no change

21 Iron oxide reacts with carbon monoxide.

The word equation for the reaction is:



Which statement is **not** correct?

- A** Carbon is neither oxidised nor reduced.
- B** Carbon is oxidised.
- C** Iron is reduced.
- D** This is a redox reaction.

22 Francium is the element at the bottom of Group I.

What would happen if a sample of francium is added to water?

- A** Francium reacts rapidly to produce bubbles of carbon dioxide.
- B** Francium reacts to form a precipitate of francium oxide.
- C** Francium reacts violently and produces a flammable gas.
- D** Francium sinks and no reaction occurs.

23 The positions of four elements are shown in the outline of the Periodic Table.

Which element has a high melting point and forms coloured compounds?

[illegible]

24 Which statement about noble gases is **not** correct?

- A** A neon atom has a full outer shell of electrons.
- B** Helium is used to fill balloons.
- C** Noble gases are very unreactive.
- D** Noble gases exist as molecules containing two atoms.

25 Which metal most readily forms positive ions?

- A** calcium
- B** copper
- C** iron
- D** zinc

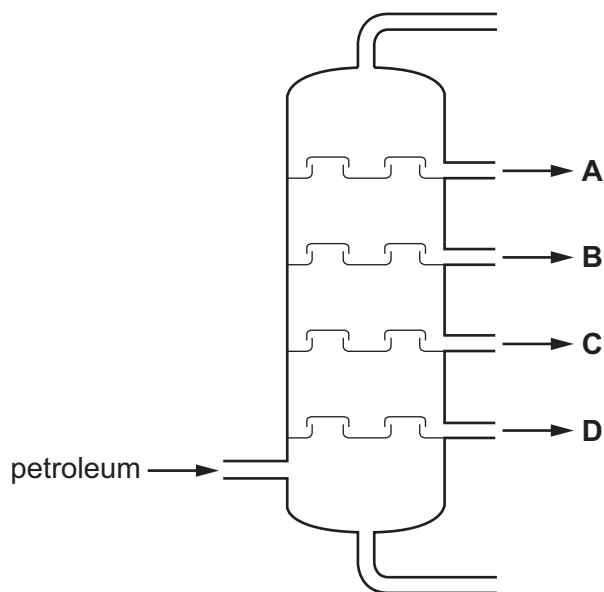
26 Gasoline is a hydrocarbon fuel obtained from petroleum.

Which statement is correct?

- A** Gasoline burns to form carbon dioxide and water.
- B** Gasoline contains the elements carbon, hydrogen and oxygen.
- C** Gasoline is used as a fuel in diesel engines.
- D** The combustion of gasoline is an endothermic reaction.

27 Petroleum is separated into fractions by fractional distillation.

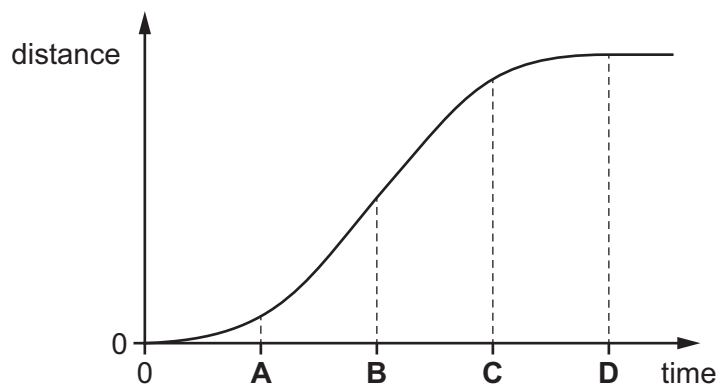
Which labelled fraction contains molecules with the largest intermolecular attractive forces?



28 A train travels between two stations.

The distance-time graph for the train is shown.

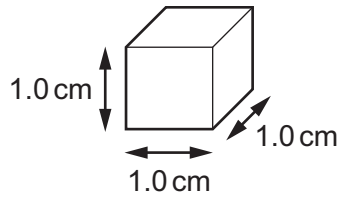
At which time is the train travelling the fastest?



29 What name is given to the gravitational force acting on a mass?

- A** density
- B** power
- C** weight
- D** work

- 30 A cube of aluminium has sides of length 1.0 cm.



Compared with this cube, which statement about a cube of aluminium with sides of 2.0 cm is correct?

- A It has the same density.
 - B It has the same mass.
 - C It has twice the density.
 - D It has twice the mass.
- 31 A brick of mass 4.0 kg rests on a window ledge. It falls off the window ledge and drops through a height of 5.0 m to the ground. The acceleration of free fall g is 10 m/s^2 .

Air resistance can be ignored.

Which row states the kinetic energy and the speed of the brick just before it hits the ground?

	kinetic energy of brick / J	<u>speed of brick</u> m/s
A	20	2.2
B	20	3.2
C	200	7.1
D	200	10

- 32 Gases are easier to compress than either solids or liquids.

Which statement about gas molecules is correct?

- A They are closer together and the forces between them are stronger.
- B They are closer together and the forces between them are weaker.
- C They are further apart and the forces between them are stronger.
- D They are further apart and the forces between them are weaker.

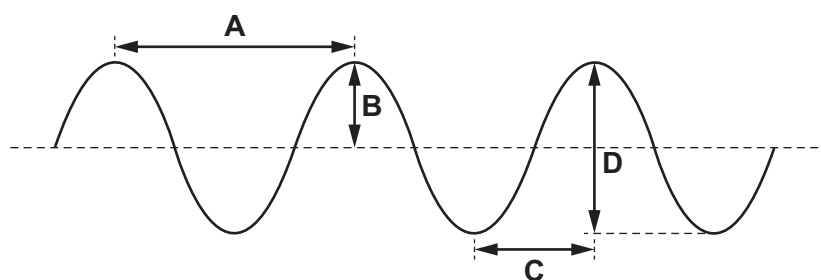
- 33** A liquid evaporates when molecules leave its surface.

Which molecules leave the surface, and what happens to the temperature of the remaining liquid?

- A** The more energetic molecules leave and the temperature falls.
- B** The more energetic molecules leave and the temperature rises.
- C** The less energetic molecules leave and the temperature falls.
- D** The less energetic molecules leave and the temperature rises.

- 34** The diagram represents a wave.

Which labelled distance gives the amplitude of the wave?



- 35** A student is watching television. He uses a remote controller to change the programme.

The remote controller uses electromagnetic waves. Electromagnetic waves are also used to transmit the television signals from a satellite.

Which row shows the type of wave used for each purpose?

	remote controller	satellite
A	infra-red	microwaves
B	infra-red	radio waves
C	ultraviolet	microwaves
D	ultraviolet	radio waves

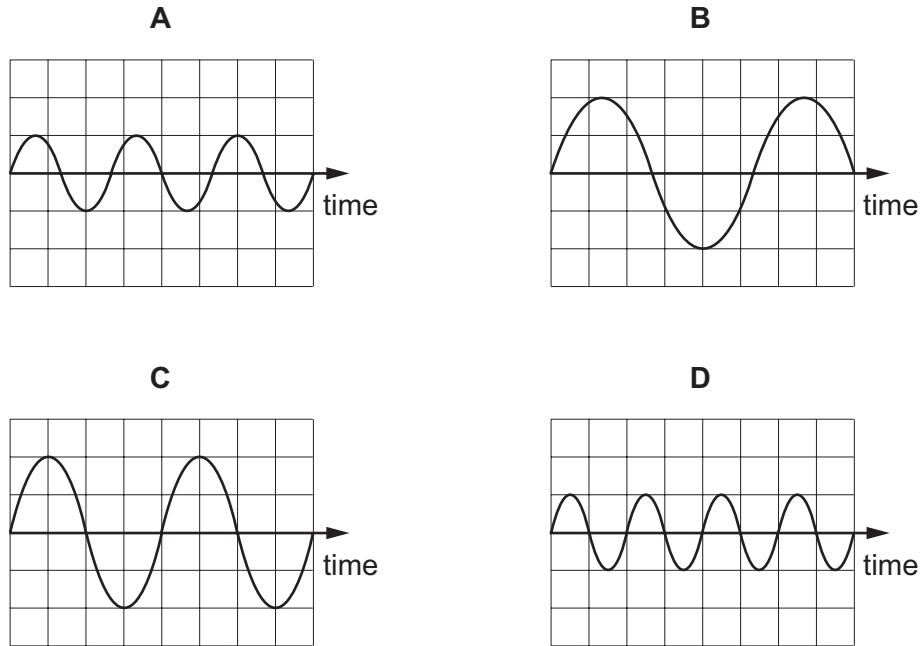
- 36** A girl stands in front of a plane mirror. She then walks towards the mirror at a speed of 1.0 m/s.

At what combined speed do the girl and her image appear to approach each other?

- A** 0 m/s
- B** 0.50 m/s
- C** 1.0 m/s
- D** 2.0 m/s

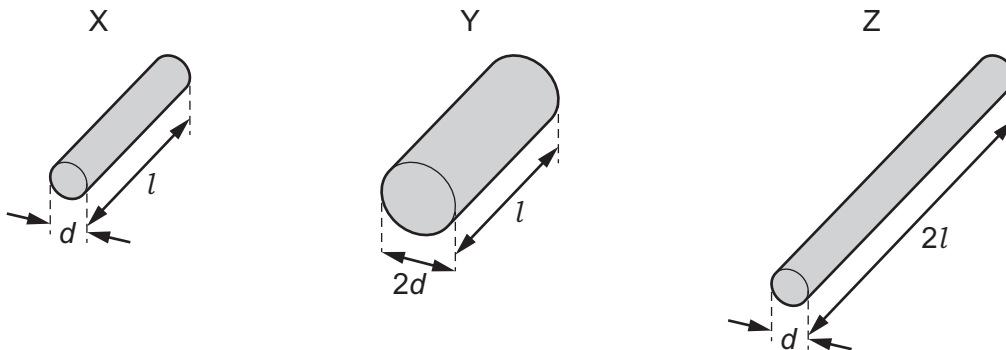
37 The diagrams represent four different sound waves. The scales are the same in all the diagrams.

Which sound has the lowest pitch?



38 Three pieces of resistance wire X, Y and Z are made of the same metal.

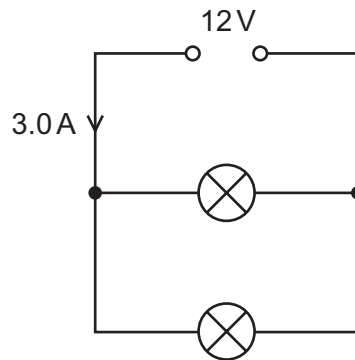
The diagram shows the lengths and the diameters of the wires.



What is the order of the wires when they are placed in order of increasing resistance, least resistance first?

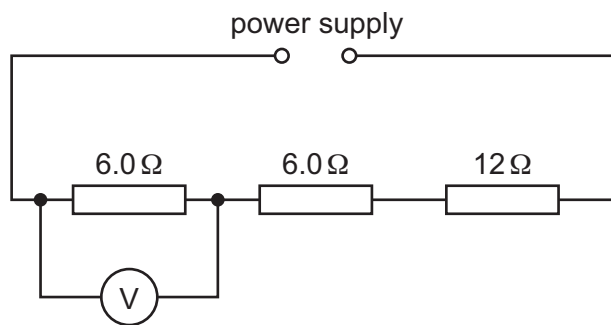
- A** $Y \rightarrow X \rightarrow Z$ **B** $Y \rightarrow Z \rightarrow X$ **C** $Z \rightarrow X \rightarrow Y$ **D** $Z \rightarrow Y \rightarrow X$

- 39 The diagram shows two identical lamps connected in parallel to a 12 V power supply. A current of 3.0 A is delivered by the power supply.



What is the power produced by **each** lamp?

- A** 4.0 W **B** 8.0 W **C** 18 W **D** 36 W
- 40 The diagram shows two $6.0\ \Omega$ resistors and one $12\ \Omega$ resistor connected in series to a power supply. The voltmeter connected across one $6.0\ \Omega$ resistor reads 2.0 V.



What is the potential difference across the power supply?

- A** 6.0 V **B** 8.0 V **C** 12 V **D** 48 V

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The Periodic Table of Elements

Group																	
I	II	1 H hydrogen 1										III	IV	V	VI	VII	VIII
3 Li lithium 7	4 Be beryllium 9	Key atomic number atomic symbol name relative atomic mass										5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
	11 Na sodium 23																
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65						
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —
87 Fr francium —	88 Ra radium —	89–103 actinoids	104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —		114 Fl flerovium —		116 Lv livermorium —		

lanthanoids

actinoids

57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium —	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	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 —

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



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

Paper 2 Multiple Choice (Extended)

0653/23

October/November 2018

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, 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.

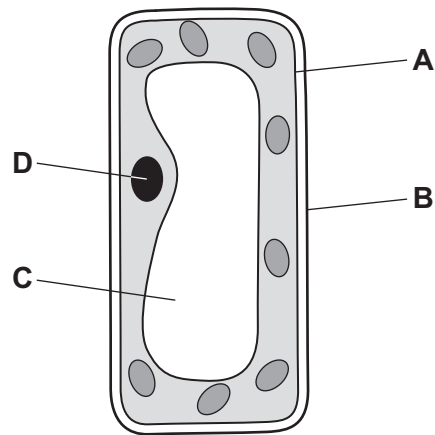
Electronic calculators may be used.

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



- 1 The diagram shows a typical plant cell.

Which part of the cell contains the genetic information of the cell?



- 2 Which process depends on diffusion?

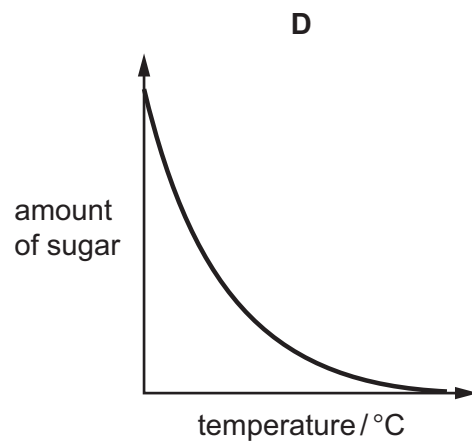
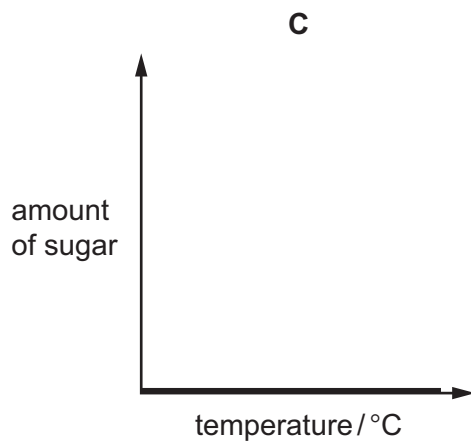
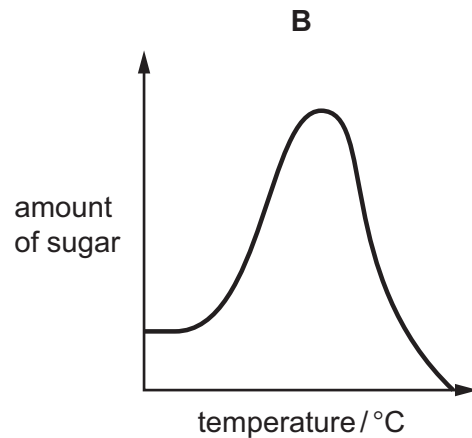
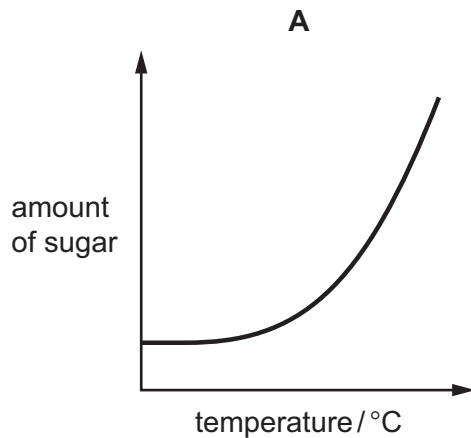
- A circulation
- B digestion
- C gaseous exchange
- D phagocytosis

- 3 A human enzyme breaks down starch into simple sugars.

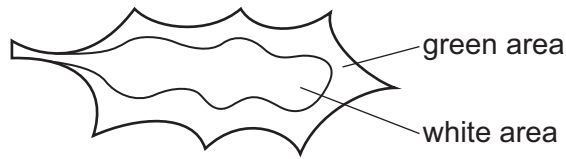
A solution of this human enzyme was heated to 90 °C for 30 minutes.

2 cm³ of this human enzyme solution was added to starch solution in several different test-tubes. The test-tubes were kept at different temperatures for 15 minutes.

Which graph shows the amount of sugar produced in the test-tubes?



- 4 The diagram shows a leaf that was tested for starch using iodine solution.



Which row shows the results for this leaf and explains the results?

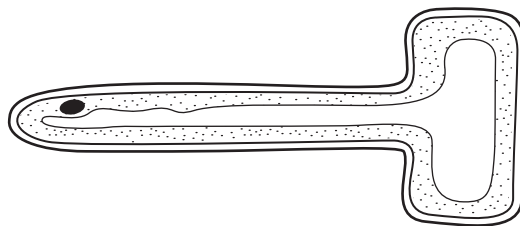
	green area of leaf after test	white area of leaf after test	explanation
A	blue-black	blue-black	chlorophyll is found in all parts of the leaf
B	blue-black	brown	chlorophyll is found in only part of the leaf
C	brown	brown	chlorophyll is found in all parts of the leaf
D	brown	blue-black	chlorophyll is found in only part of the leaf

- 5 A doctor advises a man to change his diet and reduce his intake of saturated fat and salt.

Which condition is the man most likely to be suffering from?

- A** constipation
- B** coronary heart disease
- C** dental decay
- D** starvation

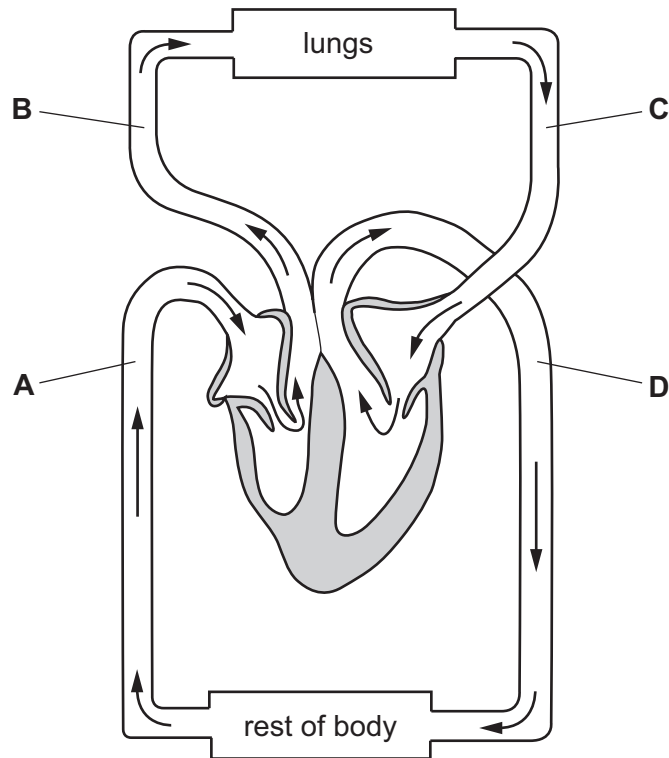
- 6 The diagram shows a cross-section of a root hair cell.



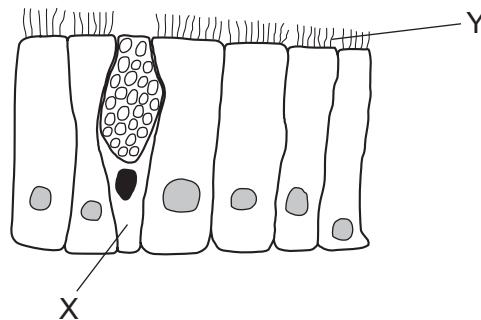
Which row describes the root hair cell and its function?

	animal cell or plant cell	function
A	animal cell	water and glucose uptake
B	animal cell	water and ion uptake
C	plant cell	water and glucose uptake
D	plant cell	water and ion uptake

7 Which blood vessel contains blood at the highest pressure?



8 The diagram shows two different types of cell which line the trachea in the gas exchange system.



What is the role of X and Y?

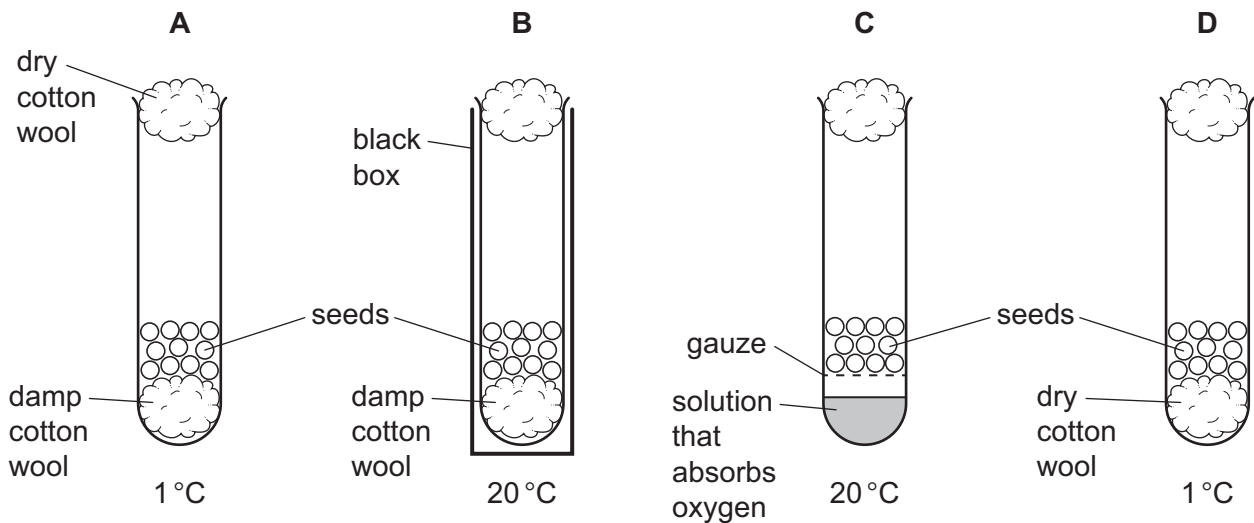
	X	Y
A	produces mucus	traps pathogens
B	produces mucus	moves pathogens towards the mouth
C	moves pathogens towards the mouth	traps pathogens
D	moves pathogens towards the mouth	moves pathogens towards the mouth

9 Which statement about adrenaline is **not** correct?

- A It decreases blood glucose concentration.
- B It is carried by the blood.
- C It is produced by a gland.
- D The heart is one of its target organs.

10 In an investigation, four test-tubes containing seeds were set up as shown in the diagram.

After several days, which test-tube will contain the most germinated seeds?



11 During pregnancy in humans, gas exchange occurs between a mother and her fetus.

Where does this gas exchange occur?

- A amniotic fluid
- B amniotic sac
- C placenta
- D umbilical cord

12 What is the definition of a trophic level?

- A It shows how an organism loses energy.
- B It shows the position of an organism in a food chain.
- C It shows the consumers of an organism.
- D It shows the food eaten by an organism.

13 Which are possible harmful effects of deforestation?

	global warming	species extinction
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

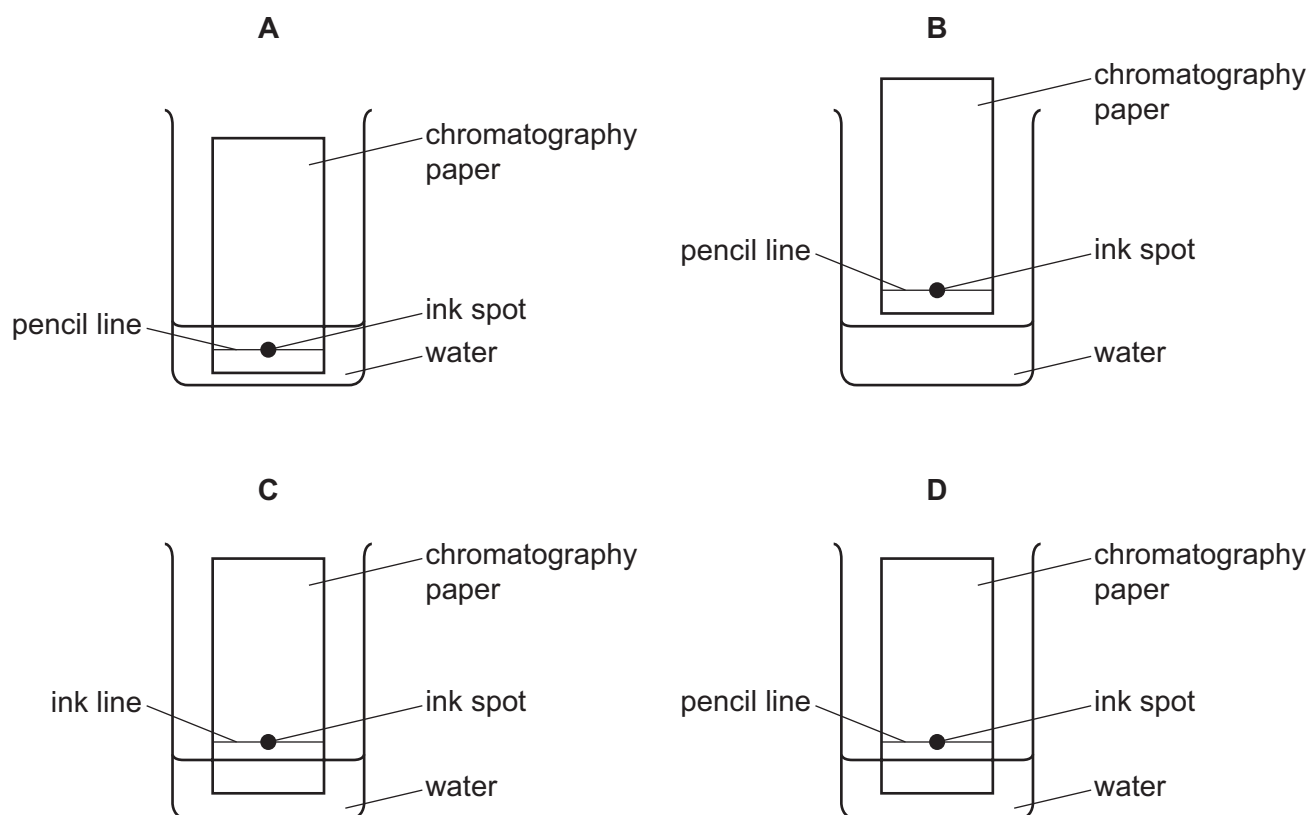
14 Sucrose is a covalent compound.

It is a solid at room temperature.

Which statement about sucrose is correct?

- A** It is made of atoms that are close together and in continuous random motion.
- B** It is made of atoms that are far apart and vibrating about a fixed point.
- C** It is made of molecules that are close together and vibrating about a fixed point.
- D** It is made of molecules that are far apart and in continuous random motion.

15 Which diagram shows how apparatus is used to separate the different colours in an ink?



16 Which is the electronic structure of a noble gas?

- A 2,6 B 2,8 C 2,8,1 D 2,8,7

17 What is the formula of nitric acid?

- A HCl B HNO_3 C NaOH D NH_3

18 During the electrolysis of molten potassium chloride, which particles in the electrolyte move towards the cathode?

- A electrons
B chloride ions
C chlorine molecules
D potassium ions

19 The temperature of some water is recorded.

Sodium chloride is dissolved in the water and the temperature of the solution is recorded.

temperature of water = 20°C

temperature of solution = 18°C

Which statement about the process is correct?

- A It is endothermic because chemical energy is changed into heat energy.
B It is endothermic because heat energy is changed into chemical energy.
C It is exothermic because chemical energy is changed into heat energy.
D It is exothermic because heat energy is changed into chemical energy.

20 Substance X increases the rate of a chemical reaction, but it remains unchanged at the end of the reaction.

Which word describes substance X?

- A catalyst
B electrolyte
C product
D unreactive

21 Iron oxide reacts with carbon monoxide.

The word equation for the reaction is:



Which statement is **not** correct?

- A** Carbon is neither oxidised nor reduced.
- B** Carbon is oxidised.
- C** Iron is reduced.
- D** This is a redox reaction.

22 Rubidium is an element below potassium in Group I of the Periodic Table.

Which property of rubidium is **not** correct?

- A** Rubidium is a soft metal.
- B** Rubidium is less reactive than potassium.
- C** Rubidium melts at a lower temperature than potassium.
- D** Rubidium reacts with water forming hydrogen.

23 The positions of four elements are shown in the outline of the Periodic Table.

Which element has a high melting point and forms coloured compounds?

[illegible]

24 Which gas is used to fill weather balloons?

- A** argon
B carbon dioxide
C helium
D nitrogen

25 What is observed when magnesium ribbon is placed into aqueous copper sulfate?

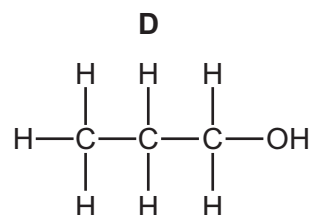
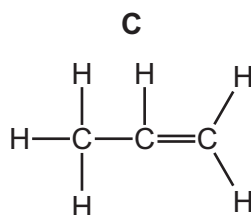
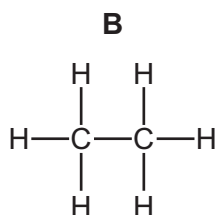
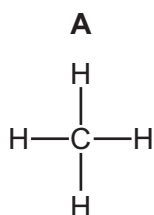
- A** The blue solution gets darker and a brown solid appears.
- B** The blue solution gets darker and no solid is visible.
- C** The blue solution gets paler and a brown solid appears.
- D** The blue solution gets paler and no solid is visible.

26 Gasoline is a hydrocarbon fuel obtained from petroleum.

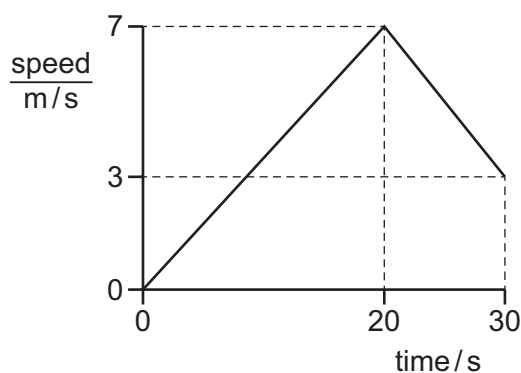
Which statement is correct?

- A** Gasoline burns to form carbon dioxide and water.
- B** Gasoline contains the elements carbon, hydrogen and oxygen.
- C** Gasoline is used as a fuel in diesel engines.
- D** The combustion of gasoline is an endothermic reaction.

27 Which substance rapidly decolourises bromine?



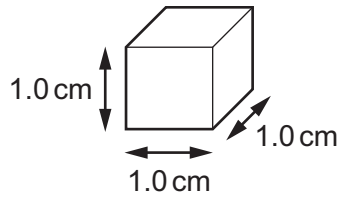
28 The graph shows the motion of a cyclist over a period of 30 s.



Which distance does she travel?

- A** 90 m
- B** 105 m
- C** 115 m
- D** 120 m

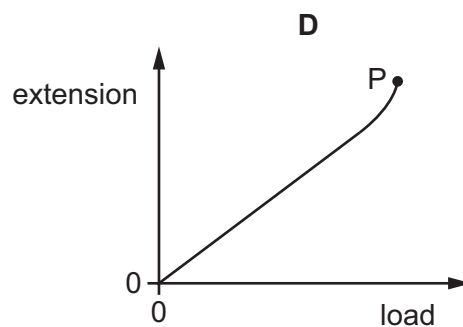
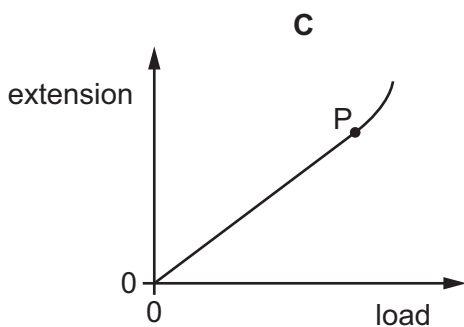
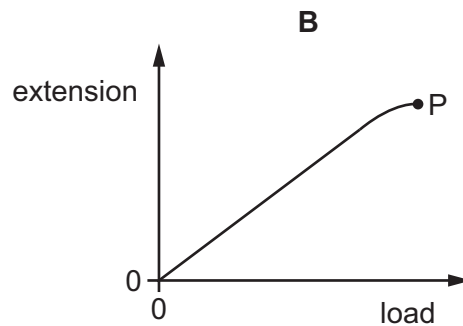
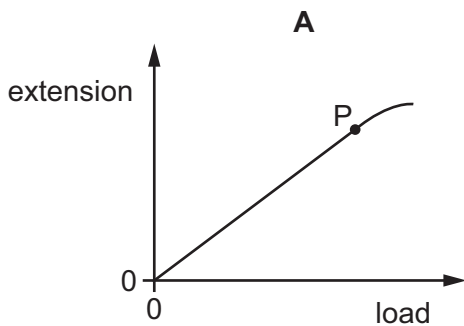
- 29 A cube of aluminium has sides of length 1.0 cm.



Compared with this cube, which statement about a cube of aluminium with sides of 2.0 cm is correct?

- A It has the same density.
 - B It has the same mass.
 - C It has twice the density.
 - D It has twice the mass.
- 30 A stretching force is applied to a copper wire. The wire obeys Hooke's Law until it reaches the limit of proportionality.

Which is the extension-load graph for the wire and shows the limit of proportionality labelled P?



- 31** A brick of mass 4.0 kg rests on a window ledge. It falls off the window ledge and drops through a height of 5.0 m to the ground. The acceleration of free fall g is 10 m/s^2 .

Air resistance can be ignored.

Which row states the kinetic energy and the speed of the brick just before it hits the ground?

	kinetic energy of brick / J	<u>speed of brick</u> m/s
A	20	2.2
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C	200	7.1
D	200	10

- 32** A liquid evaporates when molecules leave its surface.

Which molecules leave the surface, and what happens to the temperature of the remaining liquid?

- A** The more energetic molecules leave and the temperature falls.
 - B** The more energetic molecules leave and the temperature rises.
 - C** The less energetic molecules leave and the temperature falls.
 - D** The less energetic molecules leave and the temperature rises.
- 33** Convection is a process by which thermal energy is transferred from one place to another.

Where can convection take place?

- A** in a gas and in a vacuum
- B** in a liquid and in a gas
- C** in a liquid and in a solid
- D** in a solid and in a vacuum

- 34** A musical instrument produces a note of frequency 170 Hz. The sound wave produced travels through the air at a speed of 340 m/s.

Which row describes the sound wave?

	nature of wave	wavelength / m
A	longitudinal	0.50
B	longitudinal	2.0
C	transverse	0.50
D	transverse	2.0

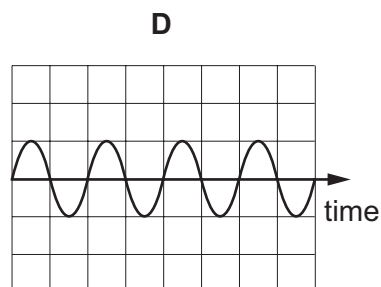
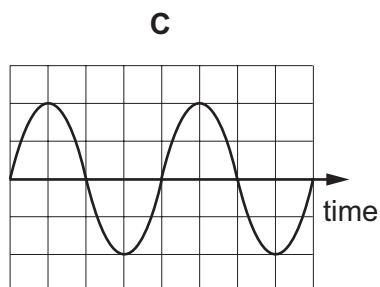
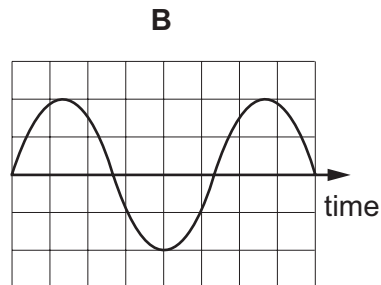
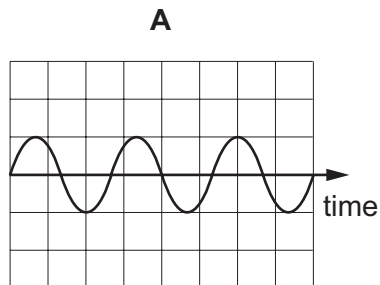
- 35** A girl stands in front of a plane mirror and observes her image. She walks 2.0 m towards the mirror.

What is the change in the distance between the girl and her image?

- A** 0 m **B** 1.0 m **C** 2.0 m **D** 4.0 m

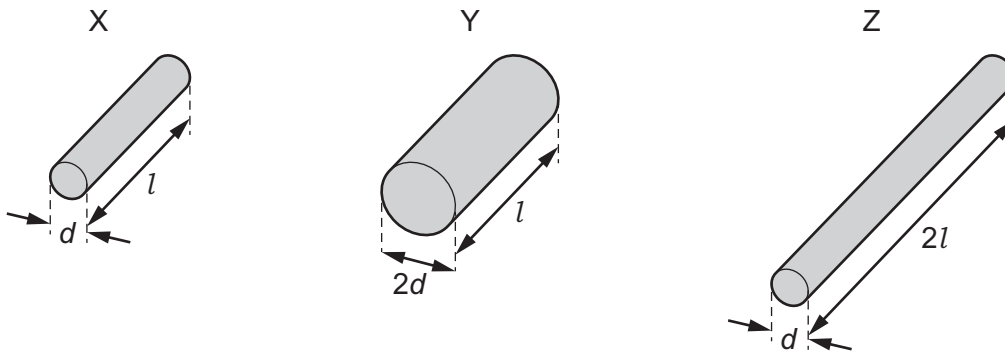
- 36** The diagrams represent four different sound waves. The scales are the same in all the diagrams.

Which sound has the lowest pitch?



- 37 Three pieces of resistance wire X, Y and Z are made of the same metal.

The diagram shows the lengths and the diameters of the wires.



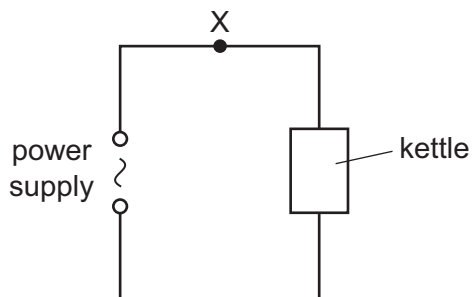
What is the order of the wires when they are placed in order of increasing resistance, least resistance first?

- A $Y \rightarrow X \rightarrow Z$ B $Y \rightarrow Z \rightarrow X$ C $Z \rightarrow X \rightarrow Y$ D $Z \rightarrow Y \rightarrow X$
- 38 A lamp has a potential difference V across it that causes a current I in it.

Which equation gives the power P produced by the lamp?

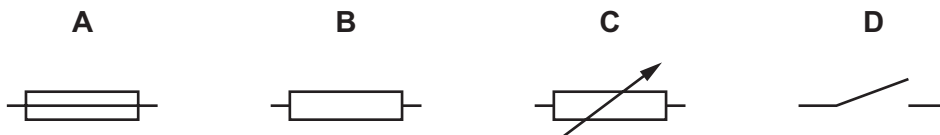
- A $P = \frac{I}{V}$ B $P = \frac{V}{I}$ C $P = IV$ D $P = I + V$

- 39 A kettle is connected to a power supply as shown.

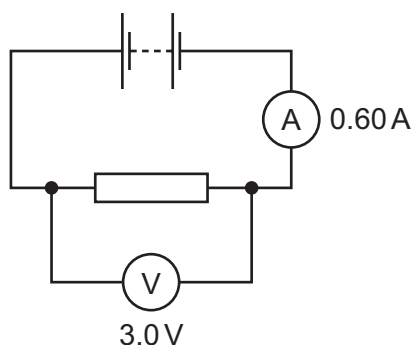


If too much current flows, a component connected at X automatically disconnects the power supply.

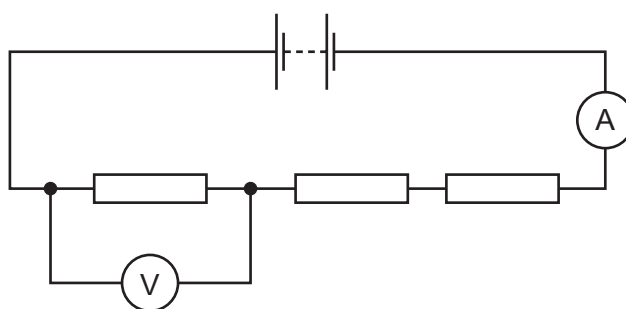
Which symbol represents the component at X?



- 40 A student sets up the circuit shown in the diagram. The ammeter reads 0.60 A and the voltmeter reads 3.0 V .



The student now takes two resistors that are identical to the original resistor. She connects them in series with the original resistor.



What are the new readings on the ammeter and the voltmeter?

	ammeter / A	voltmeter / V
A	0.20	1.0
B	0.20	3.0
C	0.60	1.0
D	0.60	3.0

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The Periodic Table of Elements

Group																		
I	II	Key										III	IV	V	VI	VII	VIII	
		atomic number atomic symbol name relative atomic mass										1 H hydrogen 1						
3 Li lithium 7	4 Be beryllium 9																	
11 Na sodium 23	12 Mg magnesium 24											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20	
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84	
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131	
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids		72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —
87 Fr francium —	88 Ra radium —	89–103 actinoids		104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —	114 Fl flerovium —	116 Lv livermorium —	118 Og oganesson —	119 Ts tennessine —	120 Nh nihonium —	121 Ds darmstadtium —

lanthanoids

57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium —	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	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 —

actinoids

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