



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

Paper 2 Multiple Choice (Extended)

0653/21

May/June 2019

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 20.

Electronic calculators may be used.

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

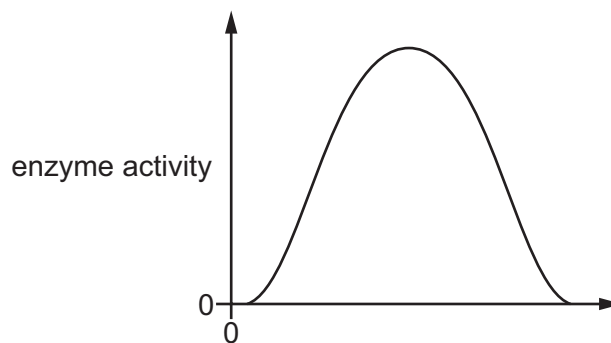
- 1 A student is reading a text book. He finds the following definition about how substances move in and out of cells.

The net movement of water molecules from a region of higher water potential to a region of lower water potential through a partially permeable membrane is called

The corner of the page has been torn.

What is the missing word at the end of the sentence?

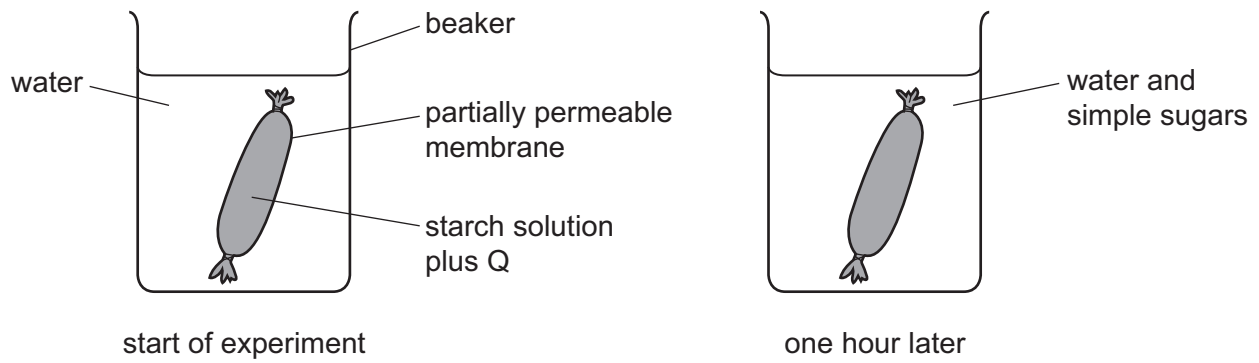
- A diffusion
 - B dissolving
 - C evaporation
 - D osmosis
- 2 The graph shows how the activity of an enzyme varies.



Which label for the x-axis of this graph is correct?

- A enzyme activity
 - B pH
 - C temperature
 - D time
- 3 What is defined as the breakdown of food into smaller pieces, without chemically changing the molecules?
- A absorption
 - B chemical digestion
 - C egestion
 - D mechanical digestion

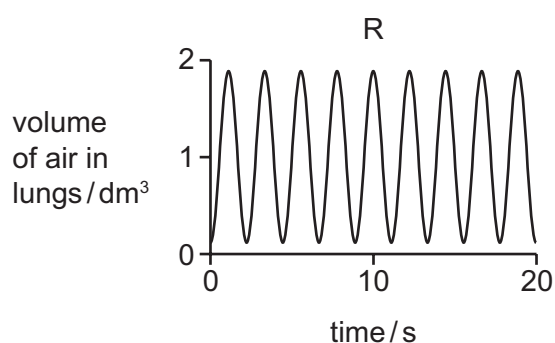
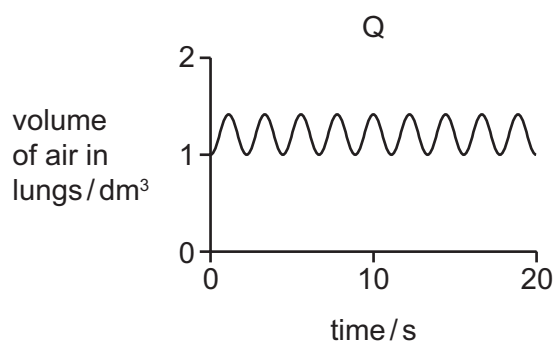
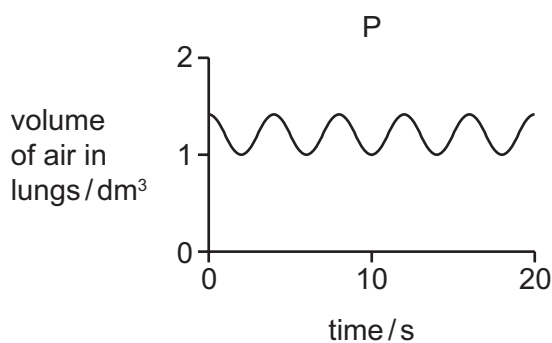
- 4 The diagram shows an experiment at the start and one hour later.



What is Q?

- A amylase
 - B lipase
 - C protease
 - D water
- 5 The rate of water absorption into a plant is increased by the large surface area of which type of cell?
- A mesophyll
 - B root cortex
 - C root hair
 - D xylem

- 6 The graphs P, Q and R show the changes in the volume of air in the lungs of the same person, measured after different levels of activities.



Which row shows the correct graph for each level of activity?

	at rest	immediately after 10 minutes of running	immediately after 10 minutes of walking
A	P	Q	R
B	P	R	Q
C	R	Q	P
D	R	P	Q

- 7 Which word equation represents aerobic respiration?

- A** carbon dioxide + glucose → oxygen + water
- B** glucose + oxygen → carbon dioxide + water
- C** oxygen + water → carbon dioxide + glucose
- D** water + carbon dioxide → glucose + oxygen

8 How does adrenaline affect blood glucose concentration and pulse rate?

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

9 Diagram 1 shows a germinating bean seed placed horizontally.

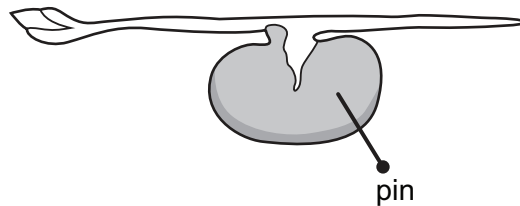


diagram 1

Diagram 2 shows the same seed after three days. The shoot has grown upwards because of the action of an auxin.

Where is the auxin produced?

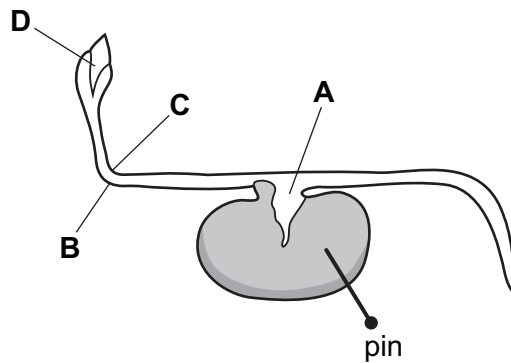
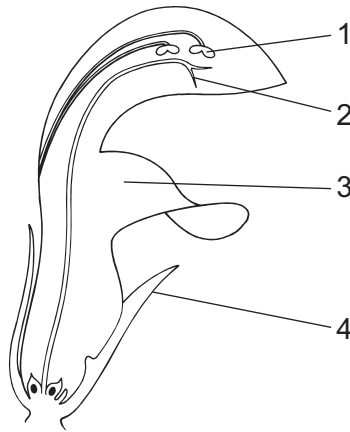


diagram 2

10 What are the features of sexual reproduction?

	fusion of nuclei	nature of offspring
A	no	genetically dissimilar
B	yes	genetically identical
C	no	genetically identical
D	yes	genetically dissimilar

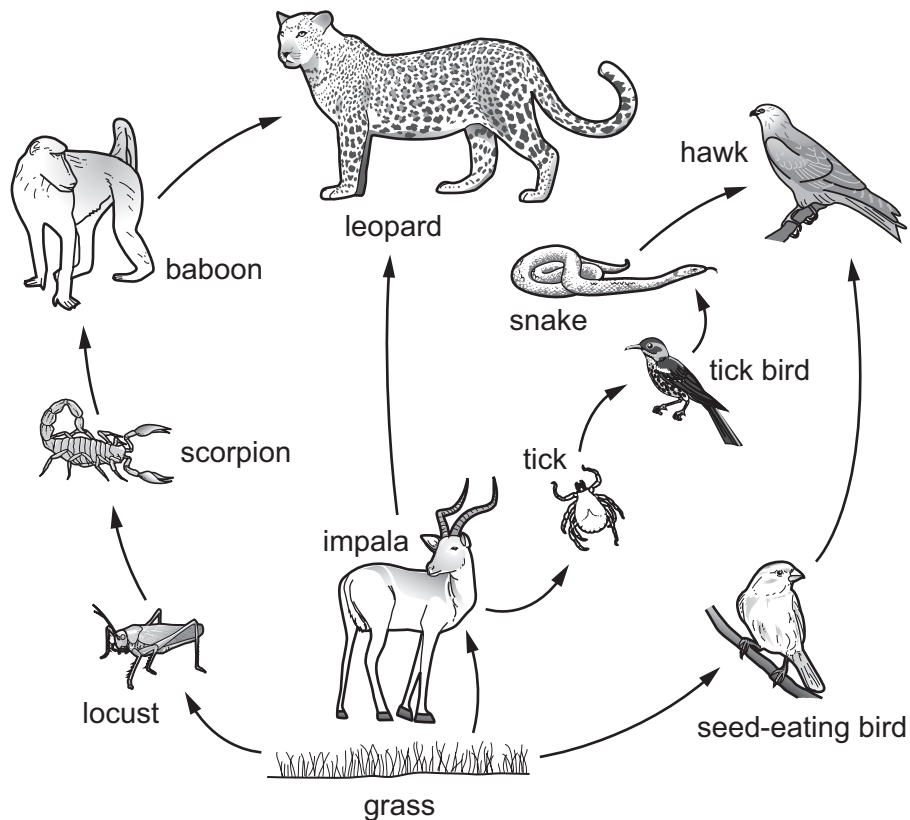
11 The diagram shows a section through an insect-pollinated flower.



Which labels are correct?

	anther	petal	sepal	stigma
A	1	3	4	2
B	1	4	3	2
C	2	3	4	1
D	2	4	3	1

12 The diagram shows a food web from the African grasslands.



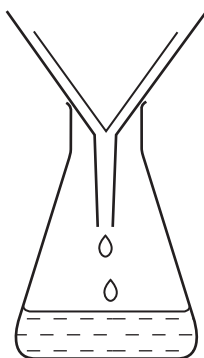
Which row correctly identifies the positions of the organisms in the food web?

	primary consumer	secondary consumer	tertiary consumer
A	grass	seed-eating bird	locust
B	impala	tick	leopard
C	locust	scorpion	tick bird
D	seed-eating bird	tick bird	baboon

13 Which changes to the composition of the atmosphere are caused by cutting down forests?

	carbon dioxide gas	oxygen gas
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

14 The diagram shows apparatus used for filtration.



Why can sugar and salt **not** be separated by using this apparatus?

- A They are both compounds.
- B They are both white.
- C They both dissolve in water.
- D They both have the same size particles.

15 Copper sulfate crystals dissolve in water.

Which word describes the role of the water?

- A filtrate
- B solute
- C solution
- D solvent

16 Magnesium chloride is an ionic compound.

Which row describes the formation of magnesium chloride and the strength of the attraction between its ions?

	formation of magnesium chloride	strength of the attraction between ions
A	electrons are shared between magnesium and chlorine	strong
B	electrons are shared between magnesium and chlorine	weak
C	electrons are transferred from magnesium to chlorine	strong
D	electrons are transferred from magnesium to chlorine	weak

17 Which process occurs at the anode during the electrolysis of concentrated aqueous sodium chloride?

- A** Chloride ions lose electrons to form chlorine.
- B** Hydrogen ions gain electrons to form hydrogen.
- C** Oxide ions lose electrons to form oxygen.
- D** Sodium ions gain electrons to form sodium.

18 When an excess of zinc is added to dilute hydrochloric acid, a gas is released.

Which pieces of apparatus are needed to investigate the rate of this reaction?

- 1 balance
- 2 gas syringe
- 3 stop watch
- 4 thermometer

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

19 Calcium chloride is a soluble salt.

It is made by adding calcium carbonate to substance X.

Solid calcium chloride is obtained from the reaction mixture by process Y.

What are substance X and process Y?

	substance X	process Y
A	hydrochloric acid	crystallisation
B	hydrochloric acid	filtration
C	sodium chloride	crystallisation
D	sodium chloride	filtration

20 Which aqueous ion gives a white precipitate with aqueous sodium hydroxide and with aqueous ammonia?

- A** Cu^{2+} **B** Fe^{2+} **C** Fe^{3+} **D** Zn^{2+}

21 Which pair of substances react together?

- A bromine and potassium chloride
- B bromine and potassium iodide
- C iodine and potassium bromide
- D iodine and potassium chloride

22 Iron obtained from the blast furnace contains small amounts of carbon and silicon.

Which statement describes this iron?

- A It is a covalent compound.
- B It is an alloy.
- C It is an ionic compound.
- D It is slag.

23 P, Q, R and S are four metallic elements.

An atom of S forms an ion by losing only one electron.

When Q is added to a solution of R^{2+} ions, metal R is produced.

P reacts with cold water to form hydrogen.

What are P, Q, R and S?

	P	Q	R	S
A	calcium	magnesium	copper	sodium
B	copper	magnesium	iron	potassium
C	potassium	copper	zinc	sodium
D	sodium	zinc	iron	magnesium

24 Which statement about water is **not** correct?

- A A water molecule consists of three atoms covalently bonded together.
- B The water supply is treated with chlorine to kill the bacteria in it.
- C Water changes the colour of cobalt chloride paper from blue to pink.
- D Water has a low melting point because covalent bonds are weak.

25 Which statement shows that petroleum is a mixture?

- A Petroleum can be burned as a fuel.
- B Petroleum can be separated into fractions by distillation.
- C Petroleum is a fossil fuel formed over millions of years.
- D Petroleum is a thick, black liquid.

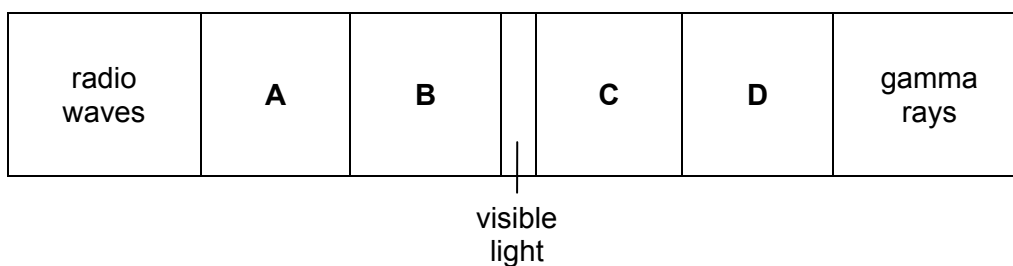
26 Which statement about alkanes is **not** correct?

- A Alkanes are unsaturated hydrocarbons.
- B Alkanes burn to release heat energy.
- C Alkanes form carbon dioxide and water when they burn.
- D Alkane molecules contain only single bonds.

27 Which reaction equation represents cracking?

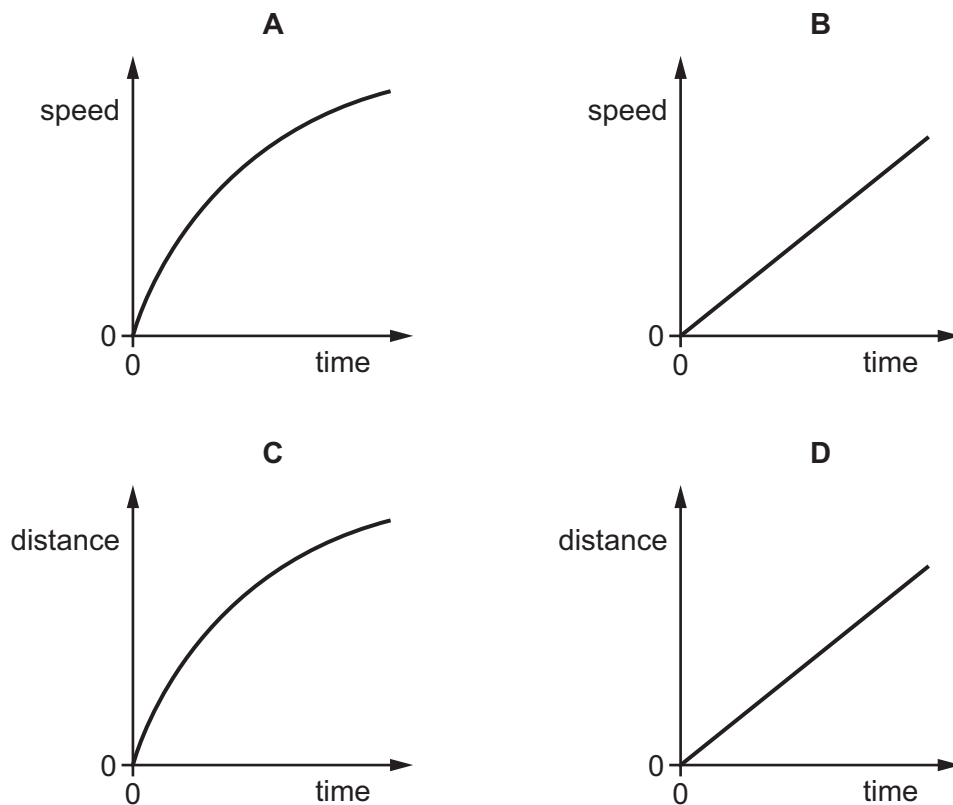
- A $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$
- B $\text{C}_2\text{H}_4 + \text{Br}_2 \rightarrow \text{C}_2\text{H}_4\text{Br}_2$
- C $n\text{C}_2\text{H}_4 \rightarrow -(\text{C}_2\text{H}_2)-_n$
- D $\text{C}_2\text{H}_6 \rightarrow \text{C}_2\text{H}_4 + \text{H}_2$

28 Which labelled part of the electromagnetic spectrum is often involved in thermal energy transfer by radiation?

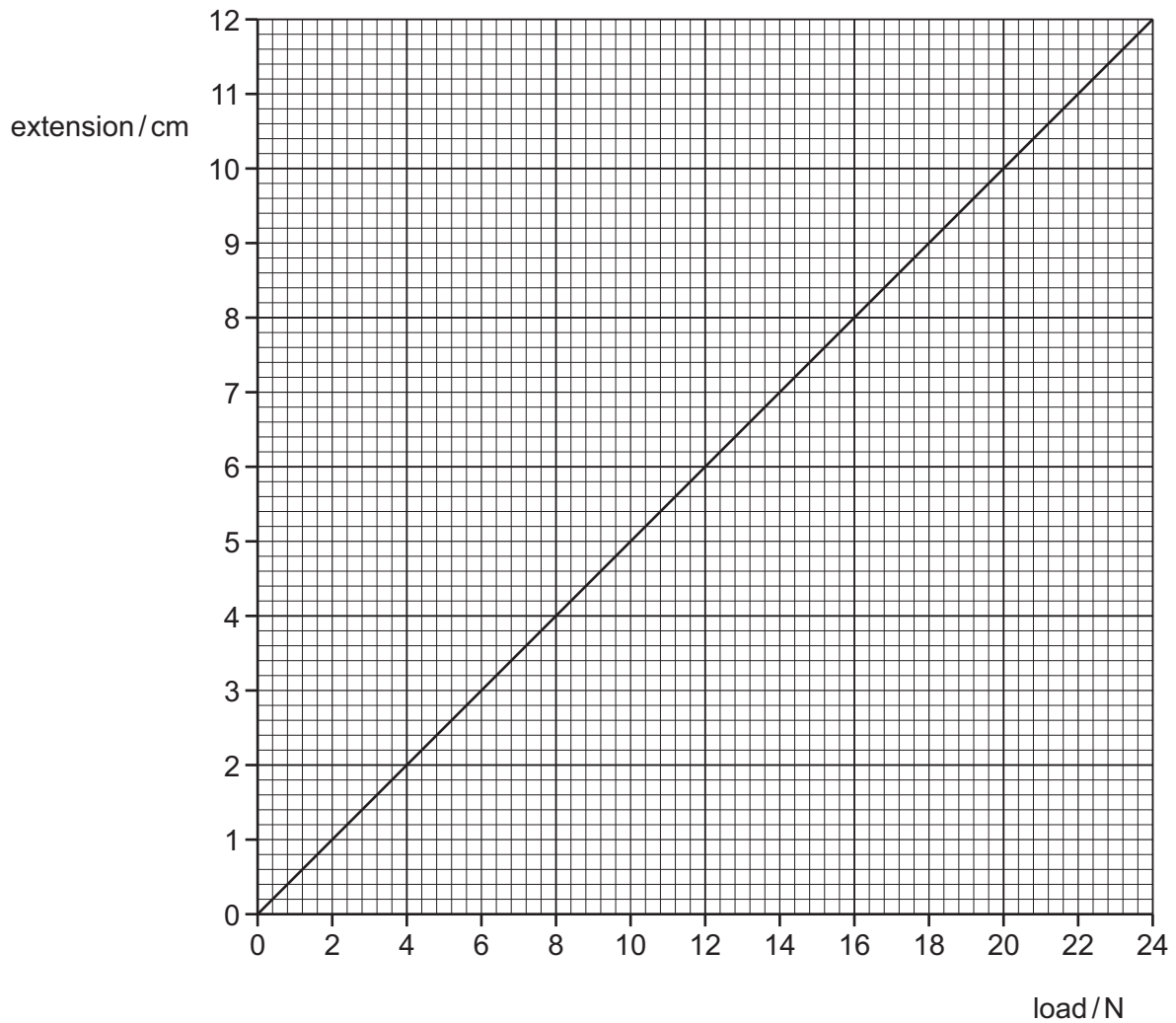


29 The diagrams show two speed–time graphs and two distance–time graphs.

Which graph represents the motion of a train with a positive acceleration that is **not** constant?



30 The diagram shows an extension-load graph for a spring.



The unstretched length of the spring is 10.0 cm.

What is the length of the spring when a load of 8.0 N is suspended from it?

- A** 4.0 cm **B** 14.0 cm **C** 16.0 cm **D** 26.0 cm

31 Which statement describes the process of convection in a liquid?

- A** Heated liquid becomes less dense and falls.
B Heated liquid becomes less dense and rises.
C Heated liquid becomes more dense and falls.
D Heated liquid becomes more dense and rises.

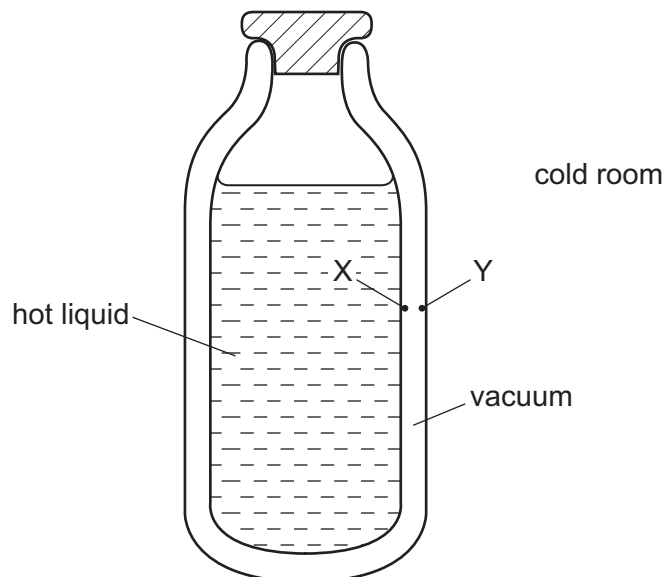
- 32** A balloon contains helium. The balloon is released and rises through the atmosphere. Its volume increases and the temperature of the helium inside it decreases.

What happens to the average distance between the helium molecules and what happens to their average speed?

	average distance between molecules	average speed of molecules
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 33** The diagram shows a vacuum flask containing a hot liquid in a cold room.

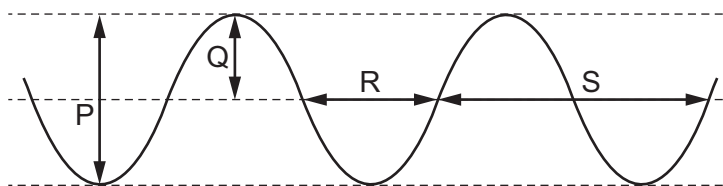
X and Y are points on the inside surfaces of the walls of the flask.



How is thermal energy transferred through the vacuum between X and Y?

- A** by conduction and convection
- B** by conduction only
- C** by radiation and convection
- D** by radiation only

- 34 The diagram represents a wave at one moment.



Which labelled arrows represent the amplitude and the wavelength of the wave?

	amplitude	wavelength
A	P	R
B	P	S
C	Q	R
D	Q	S

- 35 Which row describes what happens to sound waves as they travel from air into water, and from water into rock?

	sound travelling from air into water	sound travelling from water into rock
A	slows down	slows down
B	slows down	speeds up
C	speeds up	slows down
D	speeds up	speeds up

- 36 The amplitude of a sound wave decreases and its frequency increases.

What happens to the sound heard?

- A** It becomes louder and its pitch becomes higher.
- B** It becomes louder and its pitch becomes lower.
- C** It becomes quieter and its pitch becomes higher.
- D** It becomes quieter and its pitch becomes lower.

- 37 What is the unit of electric charge?

- A** ampere
- B** coulomb
- C** volt
- D** watt

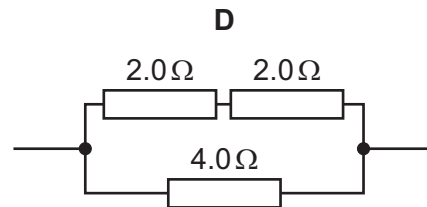
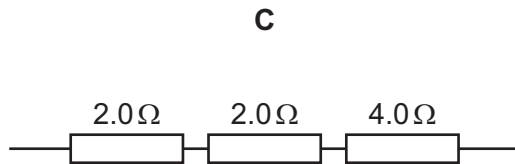
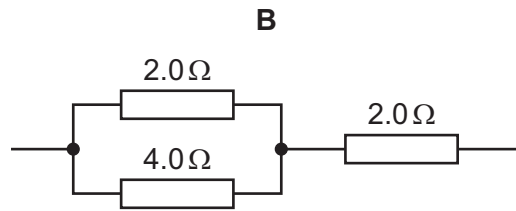
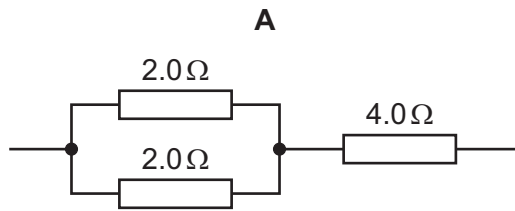
- 38 There is a current of 2.0 A in a resistor. The power produced in the resistor is 8.0 W .

What is the potential difference across the resistor?

- A 0.25 V B 4.0 V C 10 V D 16 V

- 39 Three resistors, one of resistance 4.0Ω and two of resistance 2.0Ω , are connected in different arrangements.

Which arrangement has a total resistance of 5.0Ω ?



- 40 A mains circuit can safely supply a current of up to 40 A .

The current in a hairdryer is 2 A when it is operating normally. The hairdryer is connected to the mains by a lead which can safely carry up to 5 A .

What is the correct fuse to protect the hairdryer?

- A 1 A fuse
B 3 A fuse
C 10 A fuse
D 50 A fuse

BLANK PAGE

BLANK PAGE

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

The Periodic Table of Elements

Group																		
I	II											III	IV	V	VI	VII	VIII	
		1Hhydrogen1																2Hehelium4
		Key atomic number atomic symbol name relative atomic mass																
3Li lithium 7	4Be beryllium 9											5B boron 11	6C carbon 12	7N nitrogen 14	8O oxygen 16	9F fluorine 19		
11Na sodium 23	12Mg magnesium 24											13Al aluminium 27	14Si silicon 28	15P phosphorus 31	16S sulfur 32	17Cl chlorine 35.5	18Ar argon 40	
19K potassium 39	20Ca calcium 40	21Sc scandium 45	22Ti titanium 48	23V vanadium 51	24Cr chromium 52	25Mn manganese 55	26Fe iron 56	27Co cobalt 59	28Ni nickel 59	29Cu copper 64	30Zn zinc 65	31Ga gallium 70	32Ge germanium 73	33As arsenic 75	34Se selenium 79	35Br bromine 80	36Kr krypton 84	
37Rb rubidium 85	38Sr strontium 88	39Y yttrium 89	40Zr zirconium 91	41Nb niobium 93	42Mo molybdenum 96	43Tc technetium —	44Ru ruthenium 101	45Rh rhodium 103	46Pd palladium 106	47Ag silver 108	48Cd cadmium 112	49In indium 115	50Sn tin 119	51Sb antimony 122	52Te tellurium 128	53I iodine 127	54Xe xenon 131	
55Cs caesium 133	56Ba barium 137	57–71 lanthanoids		72Hf hafnium 178	73Ta tantalum 181	74W tungsten 184	75Re rhenium 186	76Os osmium 190	77Ir iridium 192	78Pt platinum 195	79Au gold 197	80Hg mercury 201	81Tl thallium 204	82Pb lead 207	83Bi bismuth 209	84Po polonium —	85At astatine —	86Rn radon —
87Fr francium —	88Ra radium —	89–103 actinoids		104Rf rutherfordium —	105Db dubnium —	106Sg seaborgium —	107Bh bohrium —	108Hs hassium —	109Mt meitnerium —	110Ds darmstadtium —	111Rg roentgenium —	112Cn copernicium —	114Fl flerovium —	116Lv livermorium —				

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.).



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

Paper 2 Multiple Choice (Extended)

0653/22

May/June 2019

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 **15** printed pages and **1** blank page.

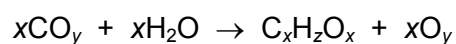
- 1 A student is reading a text book. He finds the following definition about how substances move in and out of cells.

The net movement of water molecules from a region of higher water potential to a region of lower water potential through a partially permeable membrane is called

The corner of the page has been torn.

What is the missing word at the end of the sentence?

- A** diffusion
B dissolving
C evaporation
D osmosis
- 2 An incomplete symbol equation for photosynthesis is given below.



Which row shows the numbers that should replace x , y and z to make the equation balanced?

	x	y	z
A	6	2	6
B	6	12	2
C	6	2	12
D	12	6	2

- 3 A person has bleeding gums.

Which vitamin could be deficient in his diet, and which food should he eat to provide this vitamin?

	vitamin	food
A	C	fish
B	C	oranges
C	D	fish
D	D	oranges

4 What is the purpose of mechanical digestion?

- A to break down food into smaller pieces
- B to break down insoluble foods into soluble particles
- C to change food so that it can be absorbed into the blood
- D to digest insoluble food components using enzymes

5 A student observes an artery using a microscope.

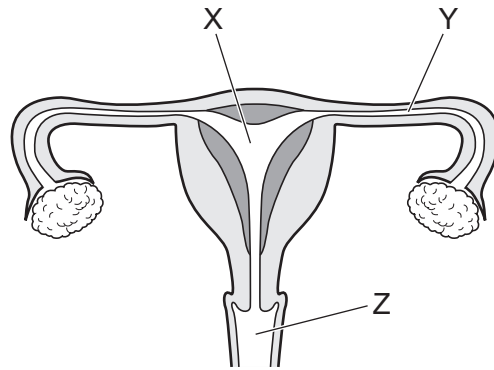
Which feature is present in an artery?

- A a wide lumen
- B valves
- C walls with a thick layer of muscle
- D wall only a single cell in thickness

6 What is the route for carbon dioxide passing out of the body?

- A alveoli → capillaries → bronchioles → bronchi → trachea → larynx
- B alveoli → capillaries → bronchi → bronchioles → larynx → trachea
- C capillaries → alveoli → bronchi → bronchioles → trachea → larynx
- D capillaries → alveoli → bronchioles → bronchi → trachea → larynx

7 The diagram shows the female reproductive system.



What are the functions of the parts labelled X, Y, and Z?

	X	Y	Z
A	development of fetus	release of female gametes	ring of muscle at opening of uterus
B	development of fetus	site of fertilisation	receives penis during intercourse
C	receives penis during intercourse	release of female gametes	ring of muscle at opening of uterus
D	receives penis during intercourse	site of fertilisation	development of fetus

8 How does adrenaline affect blood glucose concentration and pulse rate?

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

- 9 Diagram 1 shows a germinating bean seed placed horizontally.

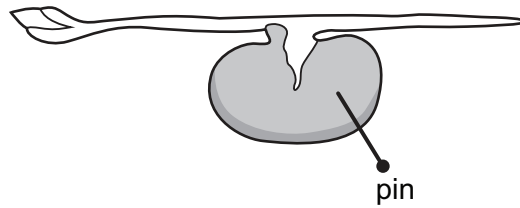


diagram 1

Diagram 2 shows the same seed after three days. The shoot has grown upwards because of the action of an auxin.

Where is the auxin produced?

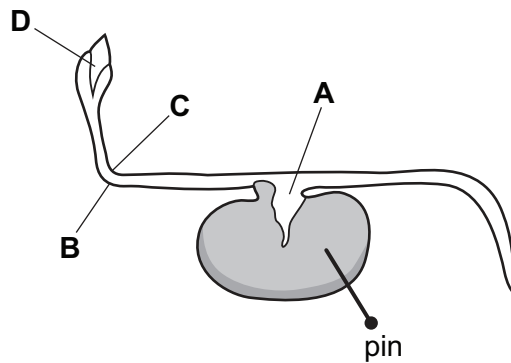
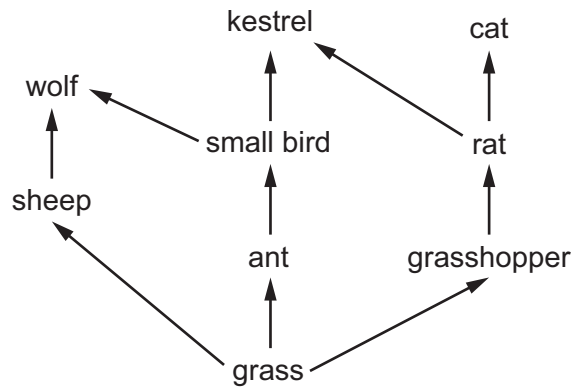


diagram 2

- 10 What are the features of sexual reproduction?

	fusion of nuclei	nature of offspring
A	no	genetically dissimilar
B	yes	genetically identical
C	no	genetically identical
D	yes	genetically dissimilar

11 The diagram represents several food chains in a food web.



How many different food chains are there in the food web shown?

- A** 3 **B** 4 **C** 5 **D** 9

12 Which row shows the substances that diffuse from the mother to the fetus at the placenta?

	carbon dioxide	nutrients	oxygen	waste products
A	✓	x	✓	x
B	✓	✓	x	✓
C	x	✓	✓	x
D	x	x	✓	✓

13 Which term is defined as a unit containing all of the organisms and their environment, interacting with each other?

- A** carbon cycle
B ecosystem
C food chain
D food web

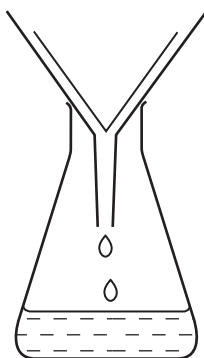
14 A molecule of hydrogen has the formula H_2 .

A molecule of a protein contains several different elements.

Which statement about these molecules is correct?

- A** They both contain cations and anions bonded together.
B They both contain different types of atom.
C They both contain more than one atom bonded together.
D They both contain only one type of atom.

15 The diagram shows apparatus used for filtration.



Why can sugar and salt **not** be separated by using this apparatus?

- A They are both compounds.
- B They are both white.
- C They both dissolve in water.
- D They both have the same size particles.

16 An atom of an element has the proton number 16 and the nucleon number 36.

Which row shows the number of neutrons in the atom and the group number of the element in the Periodic Table?

	number of neutrons in the atom	group number
A	20	VI
B	20	VIII
C	36	VI
D	36	VIII

17 Which statement about sodium ions and chloride ions in sodium chloride is **not** correct?

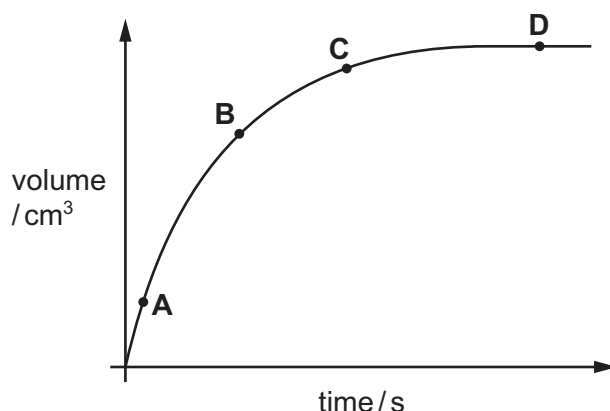
- A They are strongly attracted to each other.
- B They both have noble gas electronic structures.
- C They are arranged in a regular lattice.
- D They share pairs of electrons.

18 Which statement about the electrolysis of molten magnesium chloride is correct?

- A Cations form atoms by losing electrons.
- B Chlorine atoms gain electrons to form chloride ions.
- C Magnesium ions gain electrons to form magnesium atoms.
- D Magnesium is produced at the anode and chlorine is formed at the cathode.

19 The graph shows the volume of hydrogen gas produced when dilute hydrochloric acid reacts with zinc.

At which point is the rate of reaction greatest?



20 Which aqueous ion gives a white precipitate with aqueous sodium hydroxide and with aqueous ammonia?

- A Cu^{2+}
- B Fe^{2+}
- C Fe^{3+}
- D Zn^{2+}

21 Some properties of three metals in Group I are shown.

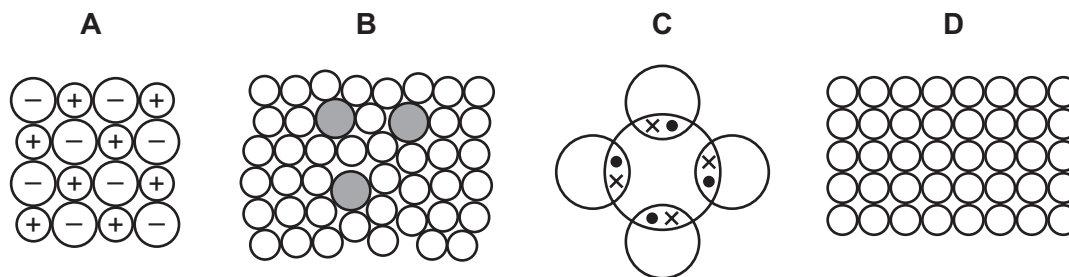
	melting point/ $^{\circ}\text{C}$	relative softness	reaction with water
sodium	98	soft	reacts rapidly
potassium	64	very soft	burns on contact with water
caesium	29	very, very soft	violently explosive

Rubidium is below potassium in Group I.

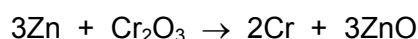
What is a property of rubidium?

- A It explodes on contact with water.
- B It is a hard solid.
- C It is a liquid at 20°C .
- D It is less dense than potassium.

22 Which diagram represents brass?



23 Zinc reacts with chromium oxide. The reaction equation is shown.



Which statement about this reaction is correct?

- A** Chromium is above zinc in the reactivity series.
 - B** Chromium oxide is the oxidising agent because it gains oxygen.
 - C** Chromium oxide is the reducing agent because it loses oxygen.
 - D** Zinc is the reducing agent because it gains oxygen.
- 24 Which statement about water is **not** correct?
- A** A water molecule consists of three atoms covalently bonded together.
 - B** The water supply is treated with chlorine to kill the bacteria in it.
 - C** Water changes the colour of cobalt chloride paper from blue to pink.
 - D** Water has a low melting point because covalent bonds are weak.
- 25 Which statement shows that petroleum is a mixture?
- A** Petroleum can be burned as a fuel.
 - B** Petroleum can be separated into fractions by distillation.
 - C** Petroleum is a fossil fuel formed over millions of years.
 - D** Petroleum is a thick, black liquid.
- 26 Which statement about alkanes is correct?
- A** Alkanes are compounds containing carbon, hydrogen and oxygen.
 - B** Alkanes are saturated hydrocarbons.
 - C** Ethane is used to make poly(ethene).
 - D** Methane is the only alkane that does not contain a double bond.

- 27 Which row identifies the temperature used and describes the change to the alkane molecules during the cracking process?

	temperature /°C	change to the alkane molecules
A	100	become larger
B	100	become smaller
C	500	become larger
D	500	become smaller

- 28 The speed of a car is measured at 1.0 s intervals. The results are shown in the table.

time/s	0	1.0	2.0	3.0	4.0
speed km/h	20	21	23	26	30

Which is a description of the motion of the car?

- A** at rest
- B** constant acceleration
- C** constant speed
- D** non-constant acceleration
- 29 A metal ball of mass 0.050 kg is released from rest and falls to the ground. It hits the ground with kinetic energy 1.2 J.

The gravitational field strength is 10 N/kg. Air resistance can be ignored.

From what height above the ground is the ball released?

- A** 0.042 m **B** 0.42 m **C** 2.4 m **D** 24 m
- 30 Which mode of transport uses a renewable energy source?
- A** a coal-fired steam train
- B** a nuclear-powered submarine
- C** a petrol-engined car
- D** a sailing boat moved by the wind

31 A solid is heated.

Which two properties of the solid **both** change as a result?

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

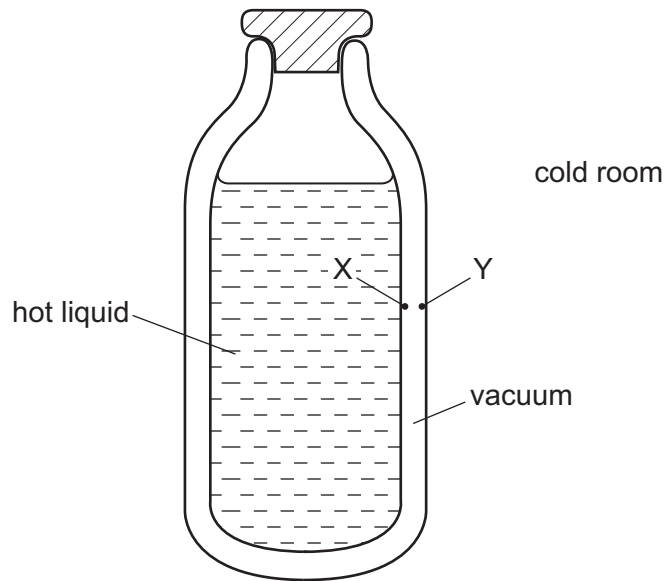
32 Non-metal solids conduct heat but not as well as metals.

Which row describes how non-metal solids conduct heat?

	molecular vibration	heat transfer by electrons
A	no	no
B	no	yes
C	yes	no
D	yes	yes

33 The diagram shows a vacuum flask containing a hot liquid in a cold room.

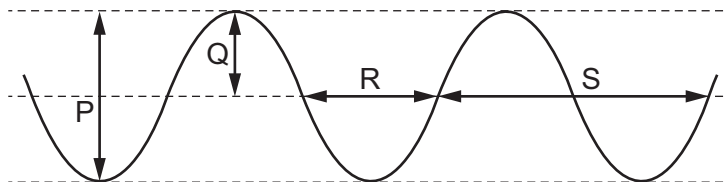
X and Y are points on the inside surfaces of the walls of the flask.



How is thermal energy transferred through the vacuum between X and Y?

- A** by conduction and convection
- B** by conduction only
- C** by radiation and convection
- D** by radiation only

34 The diagram represents a wave at one moment.



Which labelled arrows represent the amplitude and the wavelength of the wave?

	amplitude	wavelength
A	P	R
B	P	S
C	Q	R
D	Q	S

35 Which wave is longitudinal?

- A microwave
- B light wave
- C radio wave
- D sound wave

36 Which statement about gamma rays and radio waves is correct?

- A In a vacuum, gamma rays and radio waves travel at 300 m/s.
- B In a vacuum, gamma rays and radio waves travel at 3.0×10^8 m/s.
- C In a vacuum, gamma rays travel faster than radio waves.
- D In a vacuum, radio waves travel faster than gamma rays.

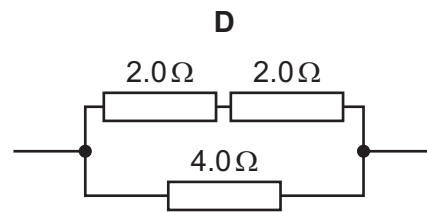
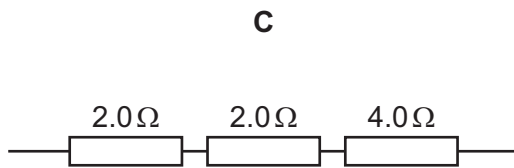
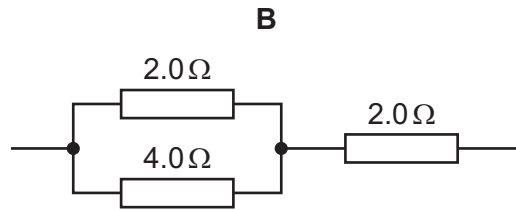
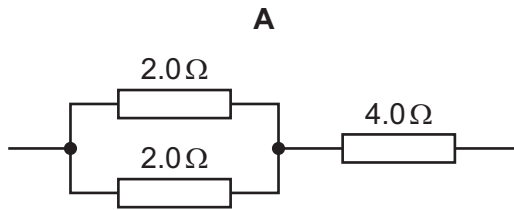
37 Four wires are made of the same material. They have different lengths and different cross-sectional areas.

Which wire has the smallest resistance?

	length	cross-sectional area
A	l	$\frac{A}{2}$
B	l	A
C	$2l$	$\frac{A}{2}$
D	$2l$	A

- 38** Three resistors, one of resistance 4.0Ω and two of resistance 2.0Ω , are connected in different arrangements.

Which arrangement has a total resistance of 5.0Ω ?



- 39** There is a current of 2.0 A in a resistor. The power produced in the resistor is 8.0 W .

What is the potential difference across the resistor?

- A** 0.25 V **B** 4.0 V **C** 10 V **D** 16 V

- 40** A mains circuit can safely supply a current of up to 40 A .

The current in a hairdryer is 2 A when it is operating normally. The hairdryer is connected to the mains by a lead which can safely carry up to 5 A .

What is the correct fuse to protect the hairdryer?

- A** 1 A fuse
B 3 A fuse
C 10 A fuse
D 50 A fuse

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

The Periodic Table of Elements

Group																							
I	II	1 H hydrogen 1										III	IV	V	VI	VII	VIII						
Key atomic number atomic symbol name relative atomic mass		3 Li lithium 7	4 Be beryllium 9															2 He helium 4					
		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 —								

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 Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

Paper 1 Multiple Choice (Extended)

0653/23

May/June 2019

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 **14** printed pages and **2** blank pages.

- 1 Which row has a correct structural adaptation for red blood cells and some of the cells lining the trachea?

	red blood cells	cells lining the trachea
A	nucleus absent	has cilia
B	nucleus present	has cilia
C	nucleus absent	large surface area
D	nucleus present	large surface area

- 2 A student is reading a text book. He finds the following definition about how substances move in and out of cells.

The net movement of water molecules from a region of higher water potential to a region of lower water potential through a partially permeable membrane is called

The corner of the page has been torn.

What is the missing word at the end of the sentence?

- A** diffusion
 - B** dissolving
 - C** evaporation
 - D** osmosis
- 3 The enzyme salivary amylase starts digesting starchy foods in the mouth.

This stops when the food reaches the stomach.

Why does this happen?

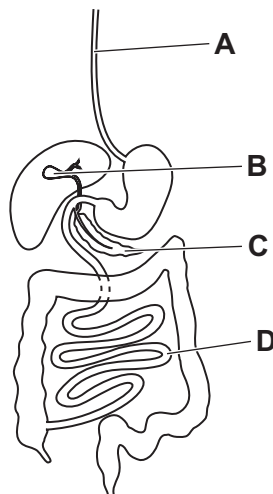
- A** The acid in the stomach slows down all reactions.
- B** The shape of the active site of the enzyme is altered by the low pH.
- C** The kinetic energy of molecules is reduced by acids.
- D** The shape of the substrate molecules is changed.

4 Which condition is caused by a lack of vitamin C in the diet?

- A breathlessness
- B rickets
- C scurvy
- D constipation

5 The diagram shows the alimentary canal and some associated organs.

In which structure is bile stored?



6 Physical activity affects our rate and depth of breathing.

What happens during **increased** physical activity?

	rate of breathing	depth of breathing
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

7 Which substances are used and produced during photosynthesis?

	substances used	substances produced
A	carbon dioxide and glucose	oxygen and water
B	carbon dioxide and water	glucose and oxygen
C	glucose and oxygen	carbon dioxide and water
D	oxygen and water	carbon dioxide and glucose

8 How does adrenaline affect blood glucose concentration and pulse rate?

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

9 Diagram 1 shows a germinating bean seed placed horizontally.

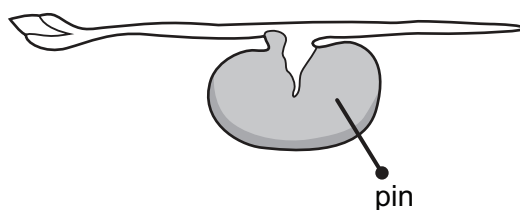


diagram 1

Diagram 2 shows the same seed after three days. The shoot has grown upwards because of the action of an auxin.

Where is the auxin produced?

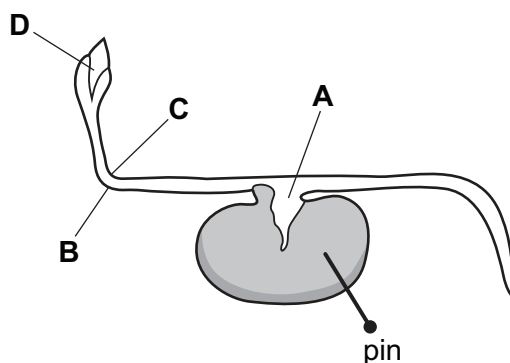


diagram 2

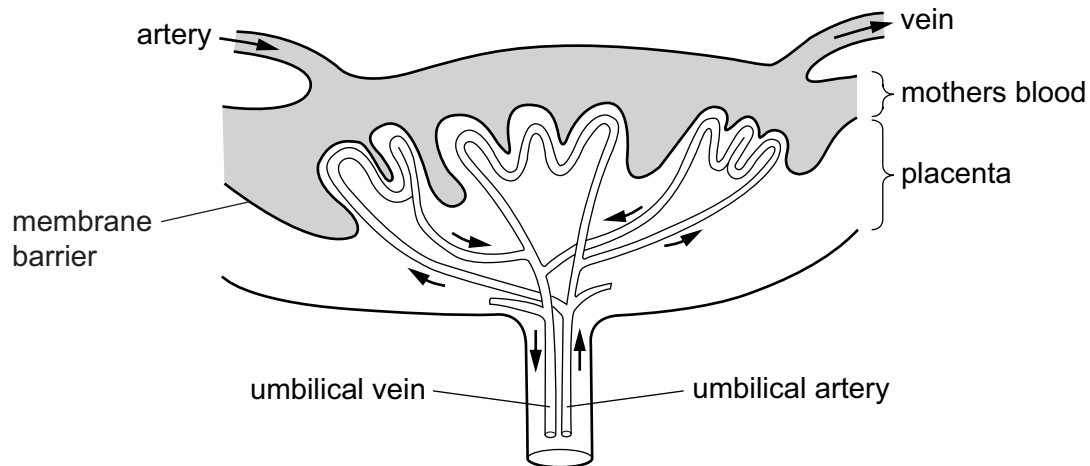
10 What are the features of sexual reproduction?

	fusion of nuclei	nature of offspring
A	no	genetically dissimilar
B	yes	genetically identical
C	no	genetically identical
D	yes	genetically dissimilar

11 Which process is the transfer of pollen grains from the anther to the stigma?

- A fertilisation
- B germination
- C pollination
- D transpiration

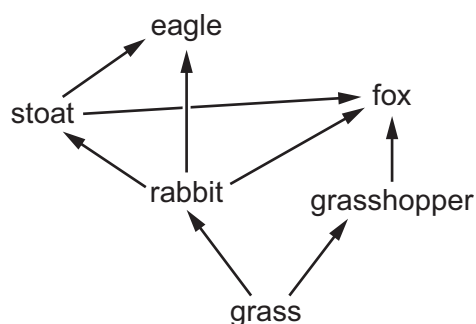
12 The diagram shows part of a placenta.



Why do nutrients in the mother's blood enter the blood in the umbilical vein?

- A A net movement of nutrient particles occurs from a region of high concentration to a lower concentration.
- B Nutrients move from a region of higher water potential to a region of lower water potential.
- C Pressure in the maternal blood forces nutrients into the umbilical vein.
- D The nutrients travel into the umbilical vein, across a partially permeable membrane by osmosis.

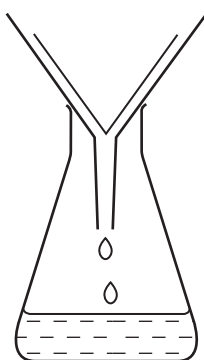
13 The diagram shows a food web.



Which type of organism is **not** represented in this food web?

- A carnivore
- B consumer
- C decomposer
- D herbivore

14 The diagram shows apparatus used for filtration.



Why can sugar and salt **not** be separated by using this apparatus?

- A They are both compounds.
- B They are both white.
- C They both dissolve in water.
- D They both have the same size particles.

15 Which description of the named substance is correct?

	substance	element or mixture
A	air	mixture
B	brass	element
C	carbon dioxide	element
D	hydrogen chloride	mixture

16 Which statement explains why sodium chloride has a much higher melting point than carbon dioxide?

- A Ionic bonding is weaker than covalent bonding.
- B Ionic bonding is stronger than covalent bonding.
- C The attractive forces between ions are stronger than the attractive forces between molecules.
- D The attractive forces between ions are weaker than the attractive forces between molecules.

17 Molten sodium chloride is electrolysed.

What are the products at the electrodes?

	product at anode	product at cathode
A	chlorine	hydrogen
B	chlorine	sodium
C	hydrogen	chlorine
D	sodium	chlorine

18 Zinc reacts with excess dilute sulfuric acid to form hydrogen gas.

Copper sulfate can act as a catalyst for this reaction.

Which statement is **not** correct?

- A If more concentrated sulfuric acid is used the rate of the reaction increases.
- B If the temperature is increased it takes less time for the zinc to react completely.
- C Larger pieces of zinc produce more hydrogen every ten seconds than the same mass of powdered zinc.
- D When copper sulfate is added to the mixture more hydrogen is formed every second.

19 Magnesium reacts with zinc oxide to make magnesium oxide and zinc.

Which substance is the oxidising agent in this reaction?

- A magnesium
- B magnesium oxide
- C zinc
- D zinc oxide

20 Which aqueous ion gives a white precipitate with aqueous sodium hydroxide and with aqueous ammonia?

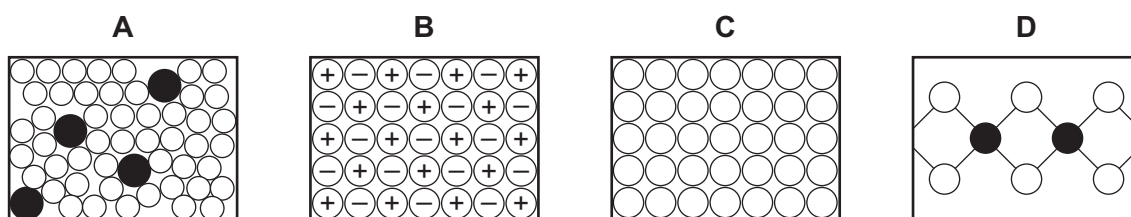
- A Cu^{2+} B Fe^{2+} C Fe^{3+} D Zn^{2+}

21 An element has the electronic structure 2,8,1.

Which row describes this element?

	group number in the Periodic Table	metal / non-metal
A	I	metal
B	I	non-metal
C	II	metal
D	II	non-metal

22 Which diagram represents an alloy?



23 In which mixture does the metal displace the aqueous metal ion?

- A copper and magnesium sulfate solution
 B iron and zinc sulfate solution
 C magnesium and copper sulfate solution
 D zinc and magnesium sulfate solution

24 Which statement about water is **not** correct?

- A A water molecule consists of three atoms covalently bonded together.
 B The water supply is treated with chlorine to kill the bacteria in it.
 C Water changes the colour of cobalt chloride paper from blue to pink.
 D Water has a low melting point because covalent bonds are weak.

25 Which statement shows that petroleum is a mixture?

- A Petroleum can be burned as a fuel.
- B Petroleum can be separated into fractions by distillation.
- C Petroleum is a fossil fuel formed over millions of years.
- D Petroleum is a thick, black liquid.

26 Which substances react together?

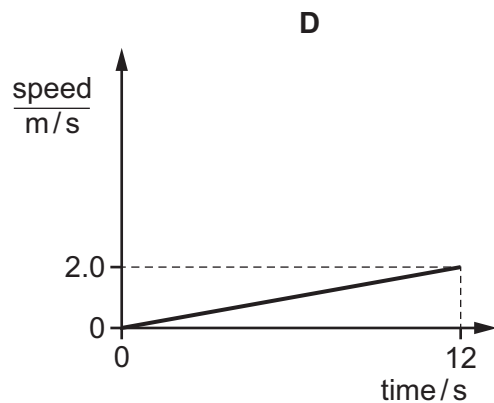
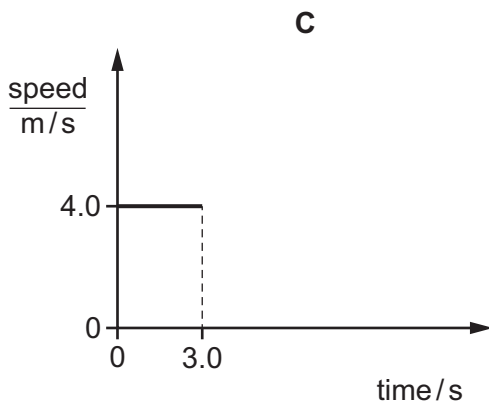
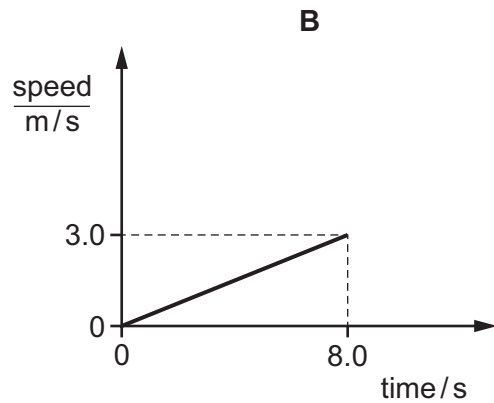
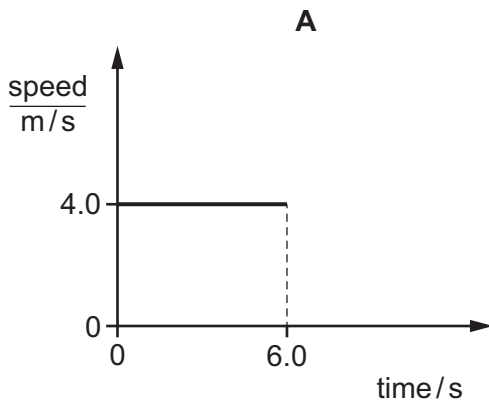
- 1 ethene and methane
- 2 ethene and bromine
- 3 ethene and oxygen

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

27 Which statement about cracking is **not** correct?

- A A high temperature and a catalyst are used.
- B Alkenes are made.
- C Hydrogen can be made.
- D Larger alkanes are made from smaller alkanes.

28 Which speed–time graph represents the motion of an object that travels a distance of 24 m?



29 Which property of a body is the effect of a gravitational field acting on the mass of the body?

- A** density
- B** surface area
- C** volume
- D** weight

30 What is the expression for density?

- | | | | |
|--|--|--|--|
| A $\frac{\text{mass}}{\text{volume}}$ | B $\frac{\text{volume}}{\text{mass}}$ | C $\frac{\text{volume}}{\text{weight}}$ | D $\frac{\text{weight}}{\text{volume}}$ |
|--|--|--|--|

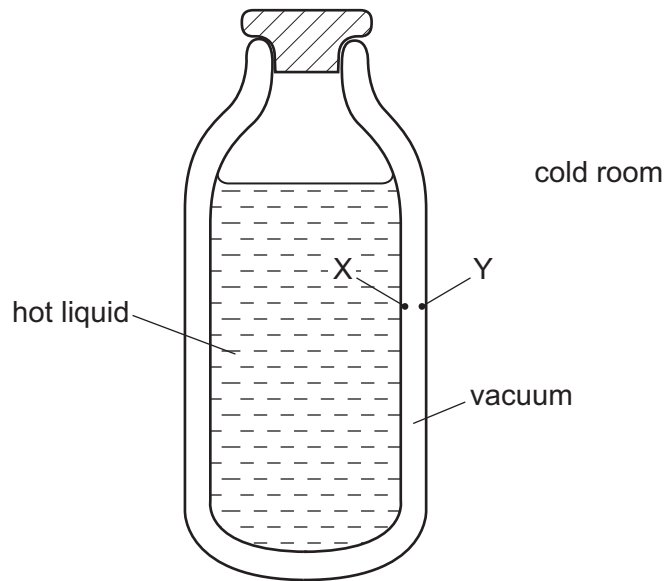
31 A body moving with a speed of 2.0 m/s has a kinetic energy of 8.0 J.

What is the mass of the body?

- | | | | |
|-----------------|-----------------|-----------------|-----------------|
| A 1.0 kg | B 2.0 kg | C 4.0 kg | D 8.0 kg |
|-----------------|-----------------|-----------------|-----------------|

32 The diagram shows a vacuum flask containing a hot liquid in a cold room.

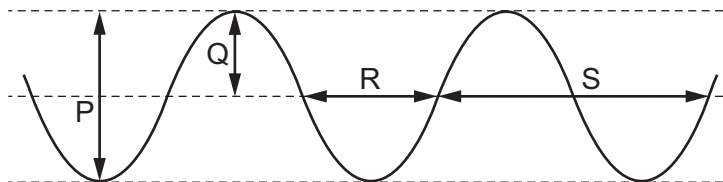
X and Y are points on the inside surfaces of the walls of the flask.



How is thermal energy transferred through the vacuum between X and Y?

- A** by conduction and convection
- B** by conduction only
- C** by radiation and convection
- D** by radiation only

33 The diagram represents a wave at one moment.



Which labelled arrows represent the amplitude and the wavelength of the wave?

	amplitude	wavelength
A	P	R
B	P	S
C	Q	R
D	Q	S

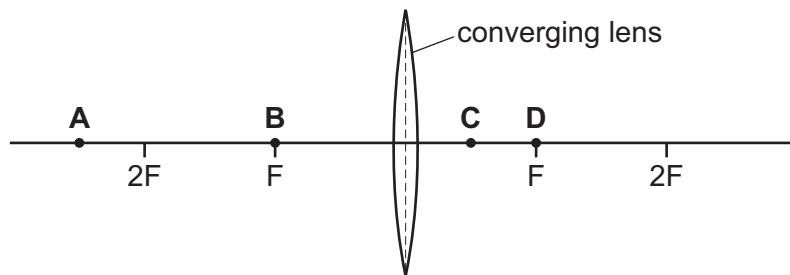
34 Which electromagnetic radiation has the lowest frequency?

- A gamma
- B infrared
- C radio
- D ultraviolet

35 A converging lens is placed in the position shown in the diagram.

Each principal focus is marked F, and two points that are two focal lengths from the lens are marked 2F.

At which labelled point is an object placed so that the lens acts as a magnifying glass?



36 Where does sound travel at the greatest speed?

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

37 There is a current of 2.0 A in a resistor. The power produced in the resistor is 8.0 W .

What is the potential difference across the resistor?

- A 0.25 V B 4.0 V C 10 V D 16 V

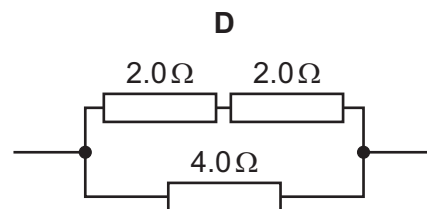
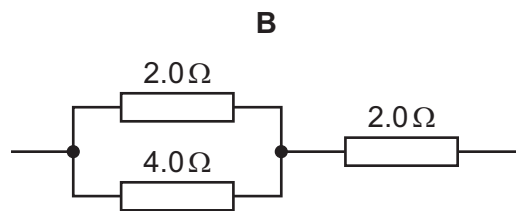
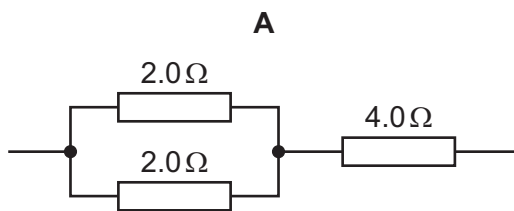
38 How is the resistance R of a wire related to its length l and to its cross-sectional area A ?

($\propto$ means *proportional to*)

- A** $R \propto \frac{1}{l}$ and $R \propto A$
- B** $R \propto \frac{1}{l}$ and $R \propto \frac{1}{A}$
- C** $R \propto l$ and $R \propto A$
- D** $R \propto l$ and $R \propto \frac{1}{A}$

39 Three resistors, one of resistance 4.0Ω and two of resistance 2.0Ω , are connected in different arrangements.

Which arrangement has a total resistance of 5.0Ω ?



40 A mains circuit can safely supply a current of up to 40 A .

The current in a hairdryer is 2 A when it is operating normally. The hairdryer is connected to the mains by a lead which can safely carry up to 5 A .

What is the correct fuse to protect the hairdryer?

- A** 1 A fuse
- B** 3 A fuse
- C** 10 A fuse
- D** 50 A fuse

BLANK PAGE

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

The Periodic Table of Elements

Group																		
I	II	1 Hhydrogen1										III	IV	V	VI	VII	VIII	
3 Li lithium 7	4 Be beryllium 9	Key atomic number atomic symbol name relative atomic mass																2 He helium 4
	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	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

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.).