Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/22**

Paper 2 Multiple Choice (Extended) **May/June 2022**

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

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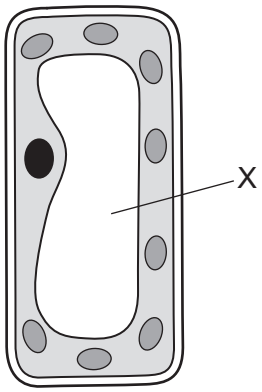
[Turn over

1 What is the outermost layer of an animal cell and a plant cell?

	animal cell	plant cell
A	cell membrane	cell membrane
B	cell membrane	cell wall
C	cell wall	cell membrane
D	cell wall	cell wall

2 The diagram shows a plant palisade mesophyll cell.



What will happen to structure X if this cell is immersed in distilled water or concentrated salty water?

	structure X in distilled water	structure X in concentrated salty water
A	shrink	shrink
B	shrink	swell
C	swell	swell
D	swell	shrink

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 two nutrients does a pregnant woman need in greater amounts to help her baby develop bones and blood?

A calcium and iron

B calcium and vitamin D

C carbohydrate and iron

D carbohydrate and vitamin D

5 Which row is correct for mechanical digestion?

	substance being broken down	broken down using	product of breakdown
A	large food molecules	enzymes	small pieces of food
B	large food molecules	teeth	small food molecules
C	large pieces of food	enzymes	small food molecules
D	large pieces of food	teeth	small pieces of food

6 What is a role of root hair cells?

A to decrease surface area, to decrease loss of water

B to decrease surface area, to increase uptake of water

C to increase surface area, to decrease loss of water

D to increase surface area, to increase uptake of water

7 The table shows two components of tobacco smoke and their possible effects on the body.

	component in tobacco smoke	effects on the body	
		decreased oxygen absorption by blood	increased blood pressure
1	carbon monoxide	✗	✓
2	carbon monoxide	✓	✗
3	nicotine	✗	✓
4	nicotine	✓	✗

Which rows show the correct effects of each component?

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

8 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

9 Some examples of responses in the body are listed.

1 decreased pupil diameter

2 increased breathing rate

3 increased pulse rate

Which responses are caused by the secretion of adrenaline?

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

10 Some examples of how parts of a plant grow are listed.

1 grow away from gravity

2 grow away from the direction of light

3 grow towards gravity

4 grow towards the direction of light

Which growth responses are due to gravitropism?

A 1, 2 and 4 **B** 1 only **C** 1 and 3 **D** 3 only

11 Which row is correct for a wind-pollinated flower?

	pollen shape	position of stigma
A		outside of flower
B		inside of flower
C		inside of flower
D		outside of flower

12 During sexual intercourse the penis transfers sperm cells to the vagina.

What is the pathway for sperm cells from their site of production to the vagina?

A sperm ducts → testes → urethra → vagina

B testes → sperm ducts → urethra → vagina

C testes → urethra → sperm ducts → vagina

D urethra → testes → sperm ducts → vagina

13 What is an ecosystem?

A a habitat containing organisms interacting together, in a given area

B a unit containing all of the organisms and their environment, interacting together, in a given area

C an environment containing some organisms, interacting together

D the positions of organisms in a food web, interacting together, with the environment, in a given area

14 Three changes are listed.

1 Dilute hydrochloric acid is reacted with aqueous sodium hydroxide.

2 The mixture formed is then heated until all of the water is evaporated.

3 The solid that is formed is then heated until it melts.

Which row describes changes 1, 2 and 3?

	1	2	3
A	chemical	chemical	physical
B	chemical	physical	physical
C	physical	physical	chemical
D	physical	chemical	chemical

15 Substance Z exists as molecules that contain only one type of atom.

What is Z?

A a compound

B a mixture

C an element

D a noble gas

16 Which statement about the electrolysis of molten lead(II) bromide using carbon electrodes is correct?

A Bromide ions gain electrons at the anode.

B Bromide ions lose electrons at the anode.

C Lead ions gain electrons at the anode.

D Lead ions lose electrons at the anode.

17 Zinc reacts with dilute hydrochloric acid to form hydrogen which is collected in a gas syringe.

$$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$$

Which statement is correct?

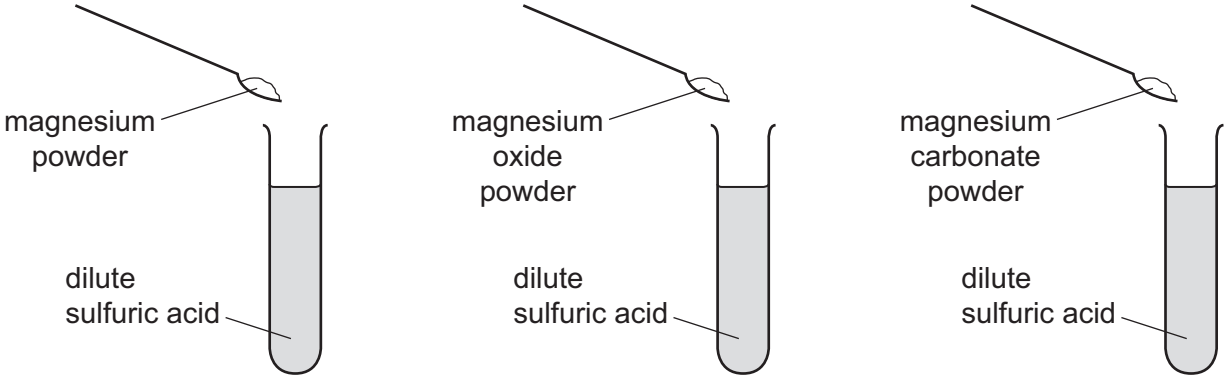
A Larger pieces of zinc react faster than the same mass of smaller pieces because they have a larger total surface area.

B When a catalyst is added, the time taken to collect 20 cm^3 of hydrogen is reduced because fewer particles have the activation energy.

C Hydrogen is produced faster when the acid is more concentrated because a larger proportion of the particles have the activation energy.

D Raising the temperature reduces the time taken to collect 20 cm^3 of hydrogen because more particles have the activation energy.

18 Three powders are added to dilute sulfuric acid, as shown.



Which powders react to produce water?

	magnesium	magnesium oxide	magnesium carbonate
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

key

✓ = does produce water

✗ = does not produce water

19 Magnesium nitrate is produced by reacting magnesium oxide with dilute nitric acid.

Which process is used to produce a pure sample of magnesium nitrate crystals?

A Add excess dilute nitric acid to magnesium oxide, filter and boil the filtrate to dryness.

B Add excess dilute nitric acid to magnesium oxide, filter and evaporate the filtrate to the point of crystallisation.

C Add excess magnesium oxide to dilute nitric acid, filter and boil the filtrate to dryness.

D Add excess magnesium oxide to dilute nitric acid, filter and evaporate the filtrate to the point of crystallisation.

20 The results of two tests on substance Q are shown.

test	result
add dilute hydrochloric acid to solid Q	bubbles of colourless gas, R, which turns limewater milky
add aqueous sodium hydroxide to a solution of Q	green precipitate

Which cation is present in Q and what is gas R?

	cation present in Q	gas R
A	iron(II)	carbon dioxide
B	iron(II)	chlorine
C	iron(III)	carbon dioxide
D	iron(III)	chlorine

21 Indium is an element in the Periodic Table.

Which row describes the electronic structure and character of indium?

	number of outer shell electrons	character
A	3	metal
B	3	non-metal
C	5	metal
D	5	non-metal

22 Which statements about the reactivity series of metals are correct?

1 Iron is higher in the reactivity series than copper because it cannot be extracted from its oxide using carbon.

2 Sodium is higher in the reactivity series than copper because it has a greater tendency to form positive ions.

3 Magnesium is higher in the reactivity series than zinc because it can displace zinc ions from aqueous solution.

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

23 Which equations represent reactions that take place in the blast furnace?

1 $C + O_2 \rightarrow CO_2$

2 $2CO_2 \rightarrow 2CO + O_2$

3 $2FeO + C \rightarrow 2Fe + CO_2$

4 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

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

24 Which colour change is seen when water is added to anhydrous cobalt(II) chloride?

A blue to pink

B blue to white

C pink to blue

D white to blue

25 Which statement about homologous series is correct?

A Alkanes and alkenes have the same general formula.

B Alkenes contain only double bonds.

C Alkanes and alkenes have similar chemical properties.

D Ethene, C_2H_4, and propene, C_3H_6, are members of the same homologous series.

26 Methane, ethane and propane are all alkanes. Their formulae are shown.

methane, CH_4

ethane, C_2H_6

propane, C_3H_8

Which statement is **not** correct?

A All three compounds are hydrocarbons.

B All three compounds burn.

C Methane is the main constituent of natural gas.

D Propane burns completely to form carbon dioxide and hydrogen.

27 Which substance rapidly turns aqueous bromine from orange to colourless?

A ethane

B ethanol

C ethene

D methane

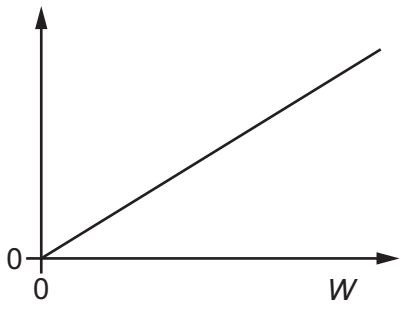
28 A student investigates a spring that obeys Hooke's law.

The student suspends loads with different weights from the spring and measures the length of the spring for each weight.

L_o is the length of the spring when there is no load on it.

L_w is the length of the spring when there is a load of weight W on it.

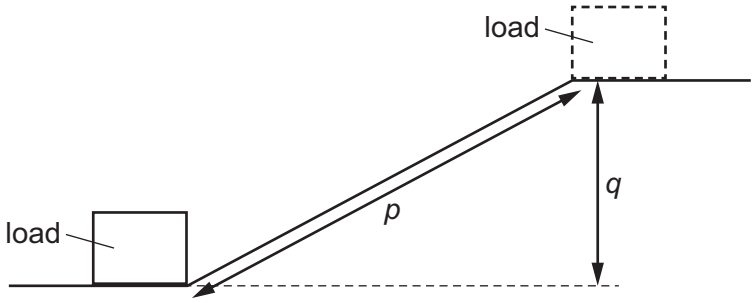
The graph shows the student's results.



Which quantity is plotted on the *y*-axis?

A $L_w - L_o$ **B** $L_w + L_o$ **C** L_w **D** $\frac{L_w}{L_o}$

29 A load of mass *m* is moved to the top of a slope of length *p* and vertical height *q*.



Which expression gives the gravitational potential energy gained by the load?

A *mgp** **B** *mgq** **C** *mp** **D** *mq*

30 Motor X does 300 J of work in 10 s.

Motor Y is twice as powerful as motor X.

Which row gives possible values for the work done and the time taken for motor Y?

	work done / J	time taken / s
A	300	5
B	300	20
C	600	5
D	600	20

31 Which group of energy sources consists of only renewable sources?

A geothermal, nuclear, solar

B geothermal, solar, wind

C nuclear, solar, wind

D oil, geothermal, solar

32 Air is trapped in a sealed glass bottle that has a fixed volume.

The temperature of the air in the bottle decreases.

Which statement describes what happens to the air in the bottle?

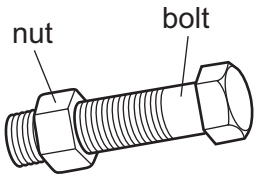
A The average separation of the molecules decreases and the pressure decreases.

B The average separation of the molecules decreases but the pressure remains the same.

C The average separation of the molecules remains the same but the pressure decreases.

D The average separation of the molecules remains the same and the pressure remains the same.

33 A mechanic cannot remove a large steel nut from a steel bolt because it is too tight.



What does the mechanic do to help remove the nut?

A cool the nut and heat the bolt

B heat the bolt only

C heat the nut and the bolt through the same temperature rise

D heat the nut only

34 Light travels at a speed of 3.0×10^8 m / s in a vacuum.

A radio station transmits radio waves at a frequency of 9.1×10^7 Hz.

What is the wavelength of the radio waves?

A 0.30 m **B** 0.33 m **C** 3.0 m **D** 3.3 m

35 Where does sound travel at the greatest speed?

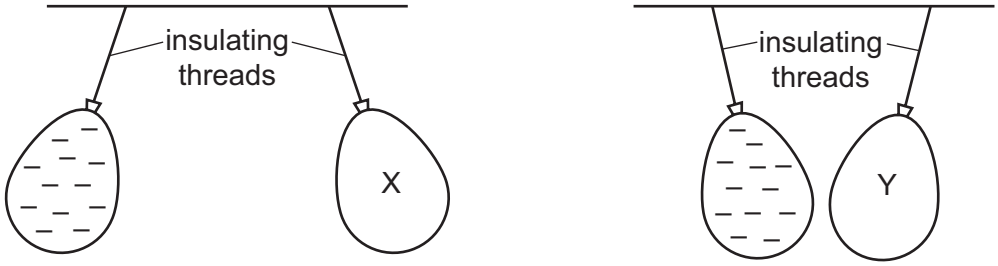
A in a gas

B in a liquid

C in a solid

D in a vacuum

36 Two balloons X and Y are suspended by insulating threads. They are each held near a negatively charged balloon. The balloons hang as shown.



What is the charge on balloon X and what is the charge on balloon Y?

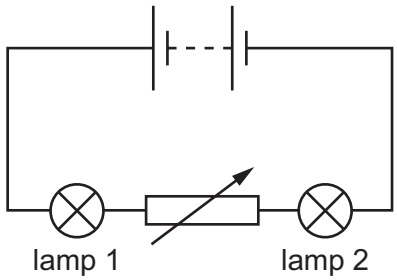
	balloon X	balloon Y
A	negative	negative
B	negative	positive
C	positive	negative
D	positive	positive

37 A 1.0 m length of resistance wire with a cross-sectional area of 0.032 mm^2 has a resistance of 15 Ω.

Which other wire, made from the same material, also has a resistance of 15 Ω?

	length / m	cross-sectional area / mm^2
A	0.50	0.0080
B	0.50	0.064
C	2.0	0.0080
D	2.0	0.064

38 A circuit contains two lamps and a variable resistor.

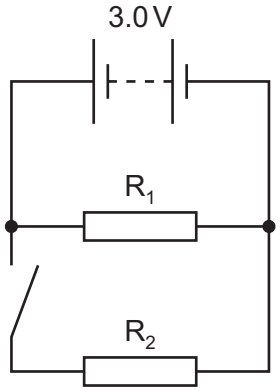


The resistance of the variable resistor is increased.

What happens to the brightness of lamp 1 and what happens to the brightness of lamp 2?

	brightness of lamp 1	brightness of lamp 2
A	decreases	decreases
B	decreases	increases
C	no change	decreases
D	no change	increases

39 Two identical resistors R_1 and R_2 are connected to a 3.0 V battery as shown. The switch in the circuit is open.



The switch is now closed.

What happens?

A The current in the battery halves.

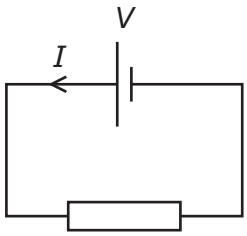
B The current in the battery stays the same.

C The potential difference across R_1 stays the same.

D The potential difference across R_2 becomes 1.5 V.

40 A cell produces a potential difference (p.d.) V across a resistor of resistance R.

There is a current I in the resistor.



Which expression gives the energy transferred in the resistor in a time t?

A $\frac{IV}{t}$ **B** IVt **C** $\frac{IR}{t}$ **D** IRt

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											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 –		

Key

atomic number
atomic symbol
name
relative atomic mass

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
actinoids	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 dm^3 at room temperature and pressure (r.t.p.).