Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/22**

Paper 2 Multiple Choice (Extended) **October/November 2023**

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.

IB23 11_0653_22/3RP

[Turn over

1 Four types of cell are listed.

1 egg cell

2 palisade mesophyll cell

3 red blood cell

4 root hair cell

Which cell contains chlorophyll and which cell contains haemoglobin?

	contains chlorophyll	contains haemoglobin
A	1	3
B	1	4
C	2	3
D	2	4

2 What is osmosis?

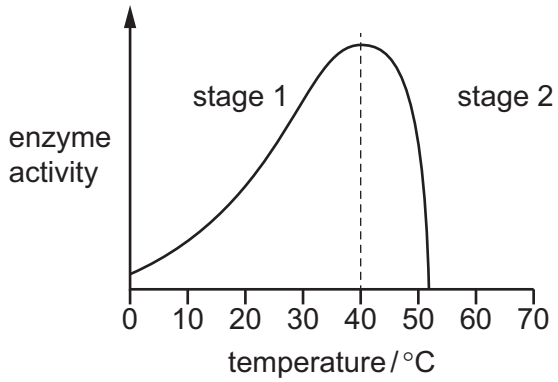
A the movement of salt across a cell wall

B the movement of salt across a partially permeable membrane

C the movement of water across a cell wall

D the movement of water across a partially permeable membrane

3 The graph shows enzyme activity as temperature increases.



Which row best explains the changes in enzyme activity as temperature increases?

	stage 1	stage 2
A	change of shape of the active site of the enzyme	shape of the active site of the enzyme changes back to original
B	decrease in frequency of collisions of substrate and enzyme	increase in kinetic energy
C	increase in kinetic energy	change of shape of the active site of the enzyme
D	no change of shape of the active site of the enzyme	decrease in frequency of collisions of substrate and enzyme

4 A vegetable contains a high concentration of iron.

A person suffering from which condition would benefit the most from eating this vegetable?

A anaemia

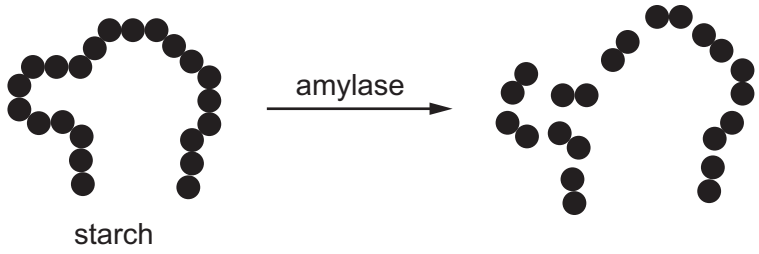
B coronary heart disease

C obesity

D scurvy

[Turn over

5 The diagram shows starch being digested by amylase.



Which row shows the digestion taking place?

	chemical	mechanical
A	✗	✗
B	✗	✓
C	✓	✗
D	✓	✓

6 Which combination of humidity and temperature would give the lowest transpiration rate in a plant?

	humidity	temperature
A	low	warm
B	low	cool
C	high	warm
D	high	cool

7 Cigarette smoke contains carbon monoxide, nicotine and tar.

These substances are harmful to human health.

Which row gives the correct information about the harmful effects?

	combines with haemoglobin	causes lung cancer
A	carbon monoxide	nicotine
B	carbon monoxide	tar
C	tar	carbon monoxide
D	nicotine	carbon monoxide

8 A student is investigating the differences in composition of samples of inspired and expired air.

What can he use to test for carbon dioxide?

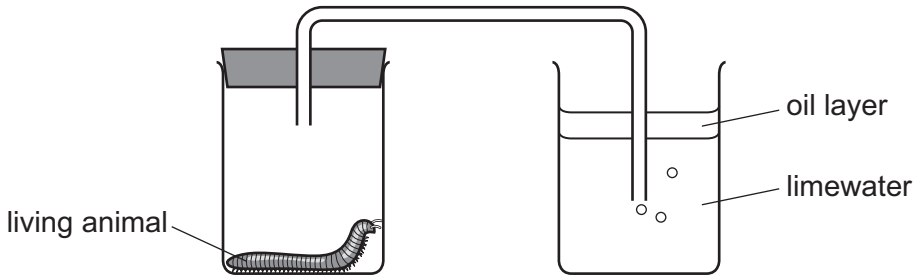
A biuret solution

B limewater

C ethanol

D iodine solution

9 A student sets up the experiment shown.



Which statement is correct?

A The limewater stays colourless because decomposition is occurring.

B The limewater stays colourless because photosynthesis is occurring.

C The limewater turns milky because aerobic respiration is occurring.

D The limewater turns milky because photosynthesis is occurring.

10 Which statement about the growth response of plant roots is correct?

A They grow away from gravity and away from light.

B They grow away from gravity and towards light.

C They grow towards gravity and away from light.

D They grow towards gravity and towards light.

11 Which row describes asexual reproduction?

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

[Turn over

12 Which statement describes fertilisation in a flowering plant?

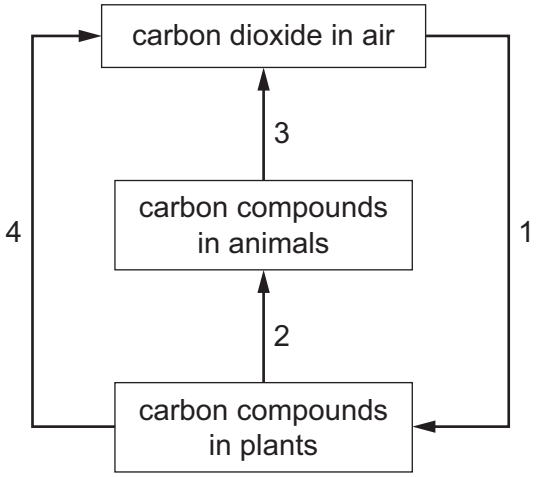
A fusion of a pollen nucleus with a nucleus in the ovule

B fusion of a pollen nucleus with the stigma

C transfer of a pollen grain from the anther to the stigma

D transfer of a pollen grain from the filament to the stigma

13 The diagram shows part of the carbon cycle.



Where does respiration occur?

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

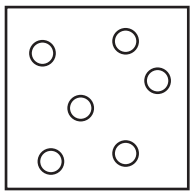
14 Substance X is an element.

It is a gas at room temperature.

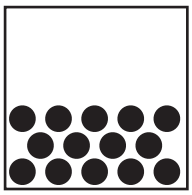
It is made of X_2 molecules.

Which diagram represents X?

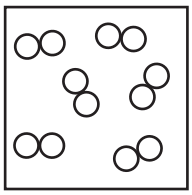
A



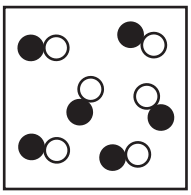
B



C



D



15 Which statement about tap water is correct?

A It is a compound.

B It is a mixture of elements.

C It is a pure substance.

D It is a solution.

16 Which statement about the boiling points of covalent compounds such as CO_2 and ionic compounds is correct?

A These covalent compounds have higher boiling points than ionic compounds because covalent bonds are stronger than ionic bonds.

B These covalent compounds have higher boiling points than ionic compounds because the attractive forces between covalent molecules are stronger than the attractive forces between ions.

C Ionic compounds have higher boiling points than these covalent compounds because ionic bonds are stronger than covalent bonds.

D Ionic compounds have higher boiling points than these covalent compounds because the attractive forces between ions are stronger than the attractive forces between covalent molecules.

17 An ionic compound contains ammonium ions, NH_4^+, iron(III) ions, Fe^{3+}, and sulfate ions, SO_4^{2-}.

What is the formula of this compound?

A NH_4FeSO_4

B $NH_4Fe(SO_4)_2$

C $(NH_4)_2FeSO_4$

D $NH_4Fe_3(SO_4)_2$

18 Which statement about chemical reactions is **not** correct?

A A higher temperature increases the rate of an endothermic reaction.

B Chemical energy is transferred to thermal energy in an endothermic reaction.

C Temperature decreases in an endothermic reaction and there is an increase in chemical energy.

D Temperature increases in an exothermic reaction because there is an increase in thermal energy.

19 Lead can be extracted from lead(II) oxide by heating with carbon.

The equation for the reaction is shown.

$$2PbO + C \rightarrow 2Pb + CO_2$$

Which statement about this reaction is correct?

A Carbon is a reducing agent because it removes oxygen from lead(II) oxide.

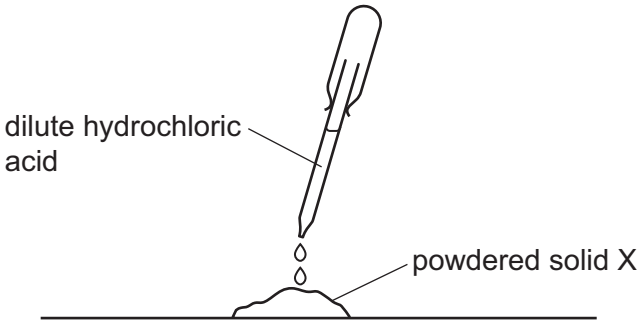
B Carbon is reduced because it forms a gas.

C Lead(II) oxide is a reducing agent because it forms an element.

D Lead is oxidised because lead(II) oxide contains oxygen.

20 Dilute hydrochloric acid is added to powdered solid X.

Hydrogen gas is produced.



What is X?

A zinc

B zinc carbonate

C zinc hydroxide

D zinc oxide

21 Which test is used to identify ammonia?

A A glowing splint relights.

B Damp blue litmus paper is bleached.

C Damp red litmus paper turns blue.

D Limewater turns milky.

22 Which properties of argon, Ar, can be determined from its position in the Periodic Table?

1 its number of outer-shell electrons

2 its density

3 its chemical reactivity

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

23 The equation for the reaction between aqueous potassium iodide and aqueous bromine is shown.

$$2KI + Br_2 \rightarrow 2KBr + I_2$$

Which statement about this reaction is correct?

A Bromine acts as a reducing agent.

B Bromine molecules change to bromine atoms in the reaction.

C Iodine is displaced from its salt because it is less reactive than bromine.

D The mixture becomes colourless as the reaction proceeds.

24 Which substance does **not** react with dilute hydrochloric acid to produce copper chloride?

A copper

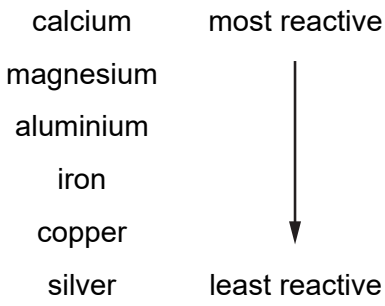
B copper carbonate

C copper hydroxide

D copper oxide

[Turn over

25 Part of the reactivity series of metals is shown.



Metal X is the most reactive metal that can be extracted from its ore using carbon.

Where is X placed in the reactivity series?

A above calcium

B between aluminium and iron

C between copper and silver

D between magnesium and aluminium

26 Which two substances react together to increase the concentration of a gas in the air that may contribute to climate change?

A sodium oxide and carbon

B potassium carbonate and dilute hydrochloric acid

C sodium and water

D zinc and dilute nitric acid

27 Decane is an alkane.

Which statement about decane is correct?

A It burns in air to form carbon dioxide and hydrogen.

B It is an unsaturated hydrocarbon.

C It only contains single C–C and C–H bonds.

D It rapidly decolourises bromine water.

28 An object travels 6.0 km in two minutes.

What is its speed?

A 0.050 m/s **B** 3.0 m/s **C** 50 m/s **D** 3000 m/s

29 An object is moved from one location to a second location where the gravitational field strength is different.

What happens to the mass of the object and what happens to the weight of the object because of this change of location?

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

30 A car has an initial kinetic energy of 120 kJ at the bottom of a slope. The car is driven up the slope. At the top of the slope, the car has 260 kJ of kinetic energy and has gained 570 kJ of gravitational potential energy.

What is the total increase in kinetic energy and gravitational potential energy of the car as it moves up the slope?

A 430 kJ **B** 710 kJ **C** 830 kJ **D** 950 kJ

31 For which energy resource is the Sun the only source?

A geothermal

B natural gas

C nuclear

D tidal

32 Which source of energy used on Earth is due mainly to the Moon?

A geothermal

B hydroelectric

C tidal

D wind

33 Which statement about the boiling point of a substance is correct?

A At all temperatures above its boiling point, a substance must be a gas.

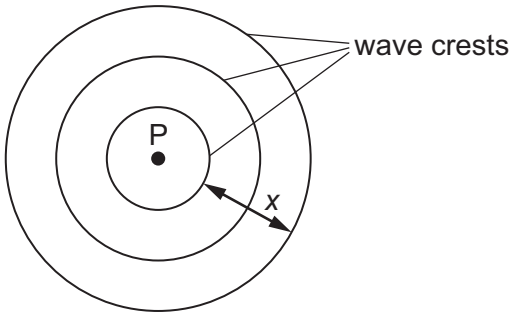
B At all temperatures above its boiling point, a substance must be a liquid.

C At all temperatures below its boiling point, a substance must be a gas.

D At all temperatures below its boiling point, a substance must be a liquid.

[Turn over

34 The diagram shows three wave crests on a wave formed by dipping a finger into water at P at regular intervals.

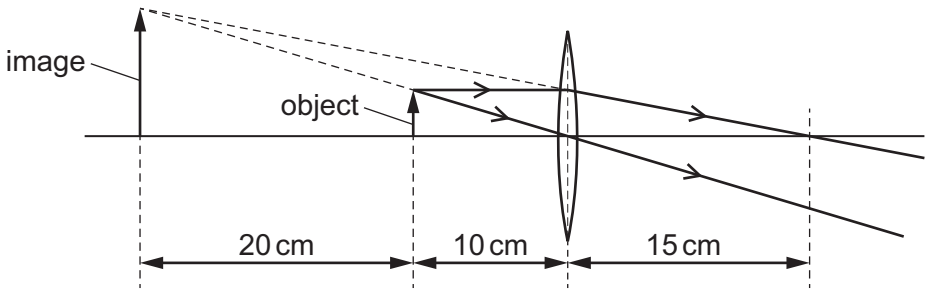


Three wave crests are produced every six seconds. Distance *x* is equal to 40 cm.

What is the speed and the frequency of the wave?

	$\frac{\text{speed}}{\text{cm/s}}$	frequency / Hz
A	10	0.50
B	10	2.0
C	40	0.50
D	40	2.0

35 The ray diagram shows a thin converging lens used as a magnifying glass.



What is the focal length of the lens?

A 10 cm **B** 15 cm **C** 20 cm **D** 30 cm

36 A loudspeaker vibrates at different frequencies.

Which frequency of vibration does **not** produce a sound that a human can hear?

A 60 Hz **B** 600 Hz **C** 6.0 kHz **D** 60 kHz

37 A plastic rod is rubbed with a woollen cloth. The rod becomes negatively charged.

What happens to the woollen cloth?

A It gains electrons and becomes negatively charged.

B It gains electrons and becomes positively charged.

C It loses electrons and becomes negatively charged.

D It loses electrons and becomes positively charged.

38 In an X-ray machine, a beam of electrons hits a metal block.

The moving electrons in the beam are a current of 0.30 A.

How long does it take for 60 mC of charge to hit the block?

A 0.018 s **B** 0.20 s **C** 5.0 s **D** 200 s

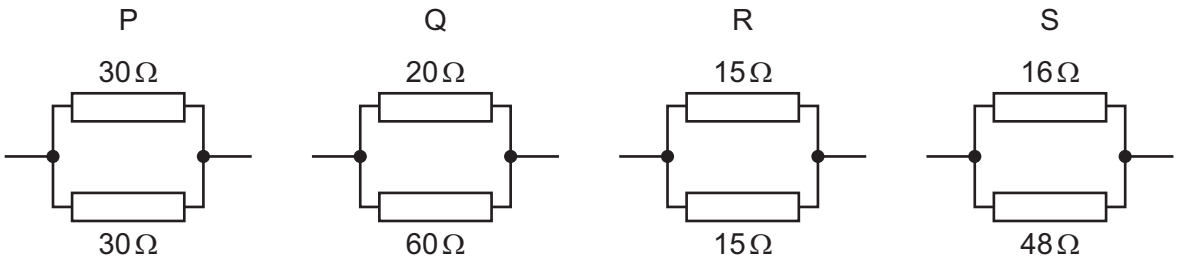
39 A copper wire has a resistance of 8.0 Ω.

A second copper wire has double the length and double the diameter of the first wire.

What is the resistance of the second copper wire?

A 1.0 Ω **B** 4.0 Ω **C** 8.0 Ω **D** 16 Ω

40 Which two combinations of resistors in parallel have an equal combined resistance?



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

BLANK PAGE

BLANK PAGE

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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

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.).