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Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/22**

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

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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.

This document has **16** pages. Any blank pages are indicated.

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1 What are characteristics of all living organisms?

A breathing, excretion, nutrition

B excretion, growth, nutrition

C reproduction, respiration, germination

D secretion, growth, sensitivity

2 Which row describes a correct structural adaptation for red blood cells and for cells lining the trachea?

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

3 Food tests are carried out on a biscuit.

The results of the food tests are shown.

test for	colour observed
fat	white emulsion
protein	blue
reducing sugar	orange
starch	blue-black

Which biological molecules are present in the biscuit?

	fat	protein	reducing sugar	starch
A	✓	✗	✗	✗
B	✓	✗	✓	✓
C	✗	✓	✓	✓
D	✗	✓	✗	✗

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4 Which substance in leaves traps light energy for use in photosynthesis?

A carbohydrate

B carbon

C carbon dioxide

D chlorophyll

5 Which types of malnutrition could lead to constipation and scurvy?

	constipation	scurvy
A	excess of fibre	lack of vitamin C
B	excess of fibre	lack of vitamin D
C	lack of fibre	lack of vitamin C
D	lack of fibre	lack of vitamin D

6 Where is amylase active in the alimentary canal?

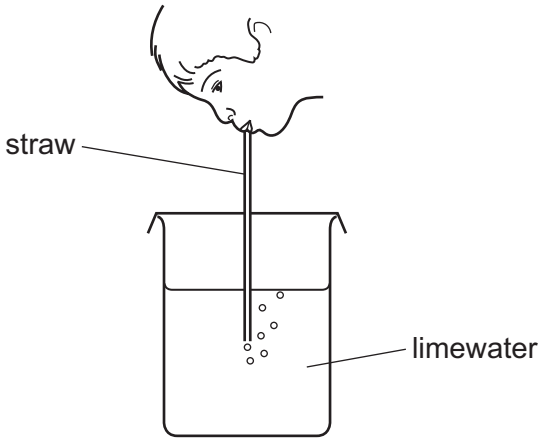
	stomach	small intestine
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

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7 A student tests her exhaled breath by blowing through a straw into some limewater.



Which statements are correct about this test?

	colour of limewater at **start** of test	colour of limewater at **end** of test	what the test shows
A	colourless	milky white	carbon dioxide is present in the exhaled breath
B	colourless	milky white	water vapour is present in the exhaled breath
C	milky white	colourless	carbon dioxide is present in the exhaled breath
D	milky white	colourless	water vapour is present in the exhaled breath

8 What is the word equation for aerobic respiration?

A carbon dioxide + chlorophyll → glucose + oxygen

B carbon dioxide + glucose → oxygen + water

C glucose + oxygen → carbon dioxide + water

D oxygen + light energy → carbon dioxide + water

9 What are two effects of the secretion of adrenaline on the human body?

A decreased blood glucose concentration and decreased pulse rate

B decreased blood glucose concentration and increased pulse rate

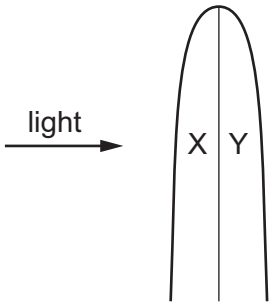
C increased blood glucose concentration and decreased pulse rate

D increased blood glucose concentration and increased pulse rate

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10 Light shines on a shoot tip from the direction shown.



After three days, the shoot tip has bent towards the light.

What is the reason for this change?

A Auxin moves away from the light causing cell elongation in area Y.

B Auxin moves away from the light preventing cell elongation in area Y.

C Auxin moves towards the light causing cell elongation in area X.

D Auxin moves towards the light preventing cell elongation in area X.

11 What are two features of sexual reproduction?

	feature 1	feature 2
A	fusion of two identical nuclei	requires two different parents
B	fusion of two zygotes	offspring are genetically identical
C	offspring are genetically different	fusion of two different nuclei
D	only requires a single parent	development from a single zygote

12 Which row is correct for the female gamete?

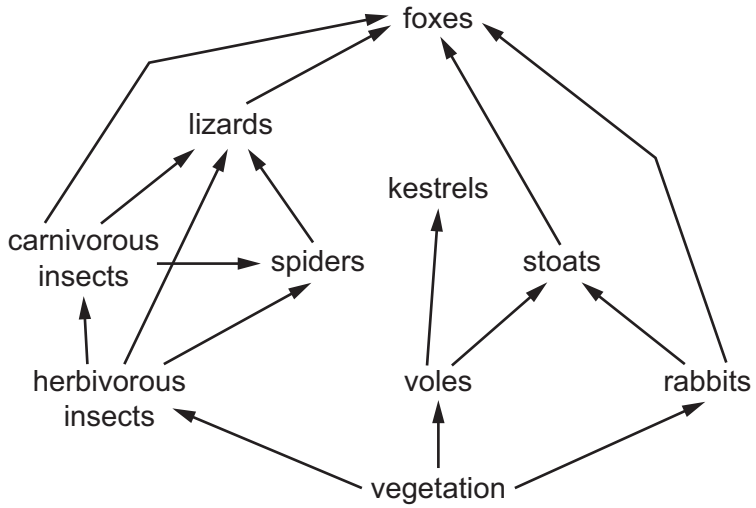
	released in large numbers	can move by itself
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

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13 The diagram shows a food web.



Which organisms in this web are quaternary consumers?

A carnivorous insects and foxes

B foxes and lizards

C kestrels and stoats

D lizards and stoats

14 An atom of aluminium and an atom of fluorine are represented as shown.

$$^{27}_{13}Al \qquad ^{19}_{9}F$$

Which statement is **not** correct?

A The aluminium atom contains four more electrons than the fluorine atom.

B The aluminium atom contains four more protons than the fluorine atom.

C The aluminium atom contains eight more neutrons than the fluorine atom.

D The aluminium atom contains eight more nucleons than the fluorine atom.

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15 Which row describes and explains the difference in melting points between ionic and covalent compounds?

	melting point	reason
A	ionic compounds have higher melting points	ionic bonds are stronger than covalent bonds
B	ionic compounds have higher melting points	attractive forces between ions are stronger than attractive forces between molecules
C	ionic compounds have lower melting points	ionic bonds are weaker than covalent bonds
D	ionic compounds have lower melting points	attractive forces between ions are weaker than attractive forces between molecules

16 Potassium phosphate is an ionic compound used in fertilisers.

Phosphate ions have the symbol PO_4^{3-}.

What is the formula for potassium phosphate?

A KPO_4 **B** $K(PO_4)_3$ **C** K_2PO_4 **D** K_3PO_4

17 Which equation represents the process that occurs at the cathode during the electrolysis of concentrated aqueous sodium chloride?

A $2O^{2-} \rightarrow O_2 + 4e^-$

B $2Cl^- \rightarrow Cl_2 + 2e^-$

C $Na^+ + e^- \rightarrow Na$

D $2H^+ + 2e^- \rightarrow H_2$

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18 The reaction between two aqueous reactants, P and Q, is carried out in two different beakers.



beaker 1 beaker 2

The temperature and the number of particles of P and Q are the **same** in both beakers.

Which statements about the collisions between the reacting particles in the two beakers must be correct?

1 The average energy of the collisions is greater in beaker 2.

2 The frequency of the collisions is greater in beaker 2.

3 The proportion of the collisions that result in a reaction is greater in beaker 2.

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

19 The word equation represents the reaction between substance J and hydrochloric acid.

substance J + hydrochloric acid → magnesium chloride + hydrogen

What is substance J?

A magnesium

B magnesium carbonate

C magnesium hydroxide

D magnesium oxide

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

A carbon dioxide and hydrogen

B chlorine and carbon dioxide

C chlorine and oxygen

D hydrogen and chlorine

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21 Which statement about the elements in Group VII is correct?

A Bromine reacts with potassium chloride to make chlorine.

B Chlorine is the least reactive element in Group VII.

C Chlorine reacts with potassium iodide to make iodine.

D Potassium bromide reacts with all of the elements in Group VII.

22 Element X has a high density and conducts electricity when solid and when molten.

Where in the Periodic Table is element X placed?

A Group 0

B Group I

C halogens

D transition elements

23 Which metal **cannot** be extracted from its ore by heating with carbon?

A Al **B** Cu **C** Fe **D** Zn

24 A few drops of liquid X are added to a white solid.

The white solid turns blue.

Which statements are correct?

1 The white solid is copper(II) sulfate.

2 Liquid X is water.

3 Liquid X turns blue cobalt(II) chloride paper pink.

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

25 Bitumen and gasoline are fractions obtained from petroleum by fractional distillation.

Which statement explains why the boiling range of the bitumen fraction is higher than the boiling range of the gasoline fraction?

A It contains smaller molecules.

B It leaves the fractional distillation column at the bottom.

C Its molecules have greater forces of attraction.

D Its molecules have stronger covalent bonds.

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26 The formula of the hydrocarbon octane is C_8H_{18}.

What are the products of the complete combustion of octane?

A carbon and hydrogen

B carbon and water

C carbon dioxide and water

D carbon monoxide and water

27 Which process is an example of thermal decomposition?

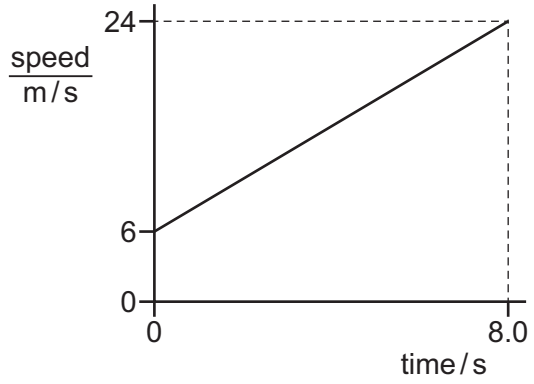
A cracking an alkane

B electrolysis of molten lead(II) bromide

C extraction of iron in the blast furnace

D fractional distillation of petroleum

28 The diagram shows a speed–time graph for a car.

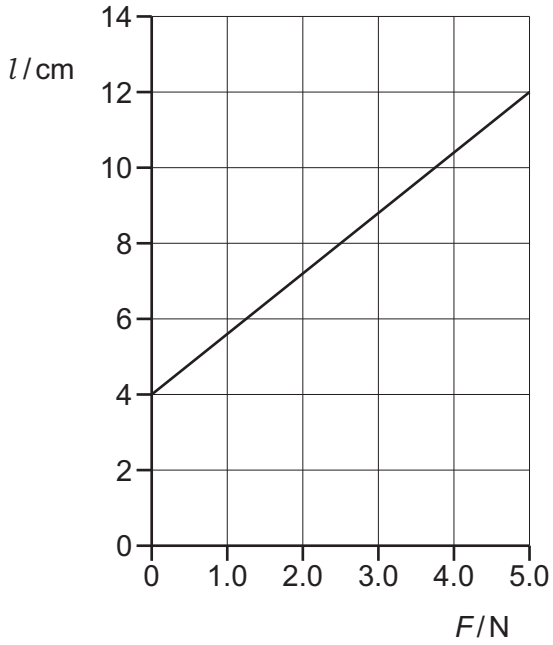


What is the distance travelled by the car between time = 0 and time = 8.0 s?

A 96 m **B** 120 m **C** 144 m **D** 192 m

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29 A spring is stretched by a force *F*. The graph shows how the length l of the spring changes with *F*.



What is the spring constant of the spring?

A 0.42 N / cm **B** 0.63 N / cm **C** 1.6 N / cm **D** 2.4 N / cm

30 A piece of scientific equipment is taken from the Earth to a distant planet.

Which row describes the properties of the equipment on the distant planet?

	mass	weight
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = the same as on Earth

✗ = different on each planet

31 Which statement about water is correct?

A It boils at 0 °C and melts at 100 °C.

B It boils at 0 °C and melts at –100 °C.

C It boils at 100 °C and melts at –100 °C.

D It boils at 100 °C and melts at 0 °C.

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32 The volume of a gas is increased but its temperature remains the same.

What happens to the molecules of the gas?

A They move closer together.

B They move further apart.

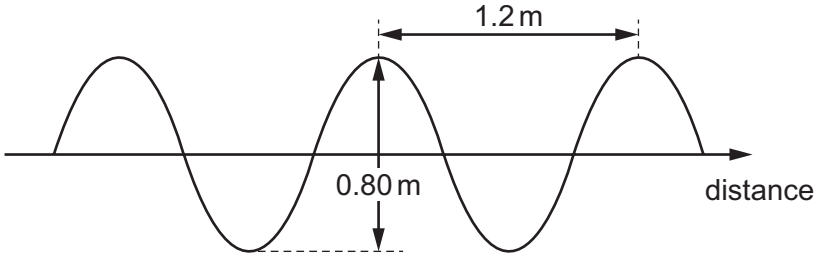
C They move more quickly.

D They move more slowly.

33 Which row compares how well a dull, black surface and a shiny, white surface emit and absorb thermal radiation?

	emitting thermal radiation	absorbing thermal radiation
A	dull, black is better	dull, black is better
B	dull, black is better	shiny, white is better
C	shiny, white is better	dull, black is better
D	shiny, white is better	shiny, white is better

34 The diagram represents a water wave that is moving at a speed of 6.0 m / s.



What is the frequency of the wave?

A 3.0 Hz **B** 4.8 Hz **C** 5.0 Hz **D** 7.5 Hz

35 Which statement about sound is **not** correct?

A A sound wave of frequency 2000 Hz can be heard by a healthy human ear.

B Sound waves can travel through a vacuum.

C The loudness of a sound depends on the amplitude of the sound wave.

D The pitch of a sound depends on the frequency of the sound wave.

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36 A circuit consists of a resistor, a switch and a battery. The switch is closed.

Which expression is used to calculate the charge that passes through the resistor?

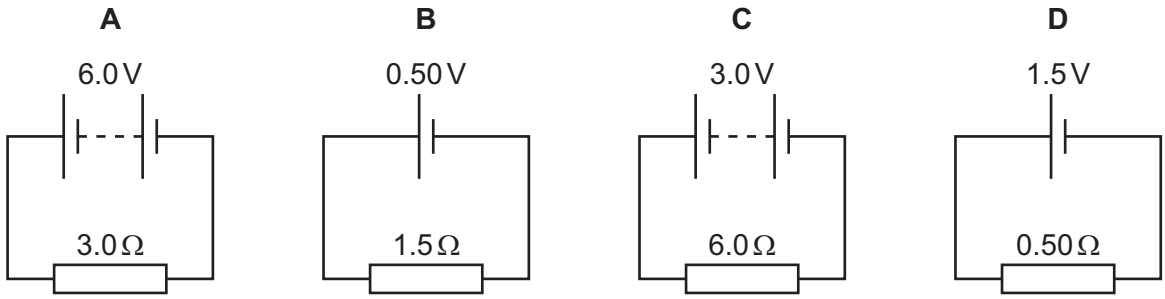
A charge = current × voltage across the resistor

B charge = $\frac{\text{current}}{\text{voltage across the resistor}}$

C charge = current × time for which the switch is closed

D charge = $\frac{\text{current}}{\text{time for which the switch is closed}}$

37 In which circuit is there a current of 2.0 A?



38 The resistance of a wire depends on its length and on its diameter.

Which row shows two changes that **both** increase the resistance of the wire?

	change to length	change to diameter
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

39 A 20 V power supply provides a current of 5.0 A for 1.0 minute.

How much energy does the power supply transfer?

A 4.0 J **B** 100 J **C** 240 J **D** 6000 J

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40 Why is the electricity supply to a mains circuit fitted with a fuse?

A to increase the current in the circuit

B to increase the resistance of the circuit

C to maintain a constant current in the circuit

D to prevent overheating of the cables in the circuit

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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.).

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