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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)

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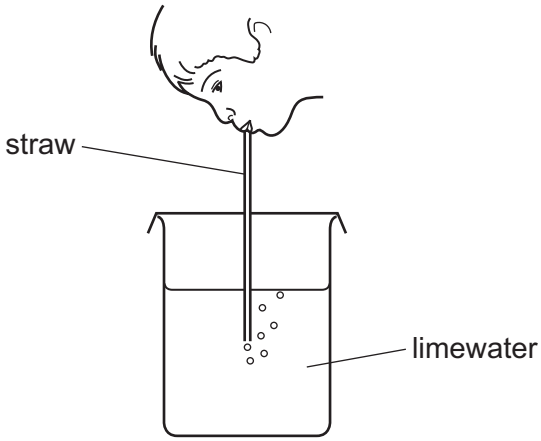
**7** A student tests her exhaled breath by blowing through a straw into some limewater.




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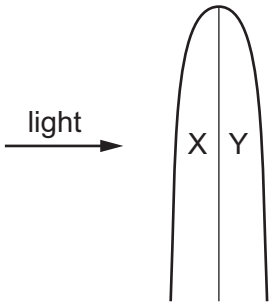
**10** Light shines on a shoot tip from the direction shown.




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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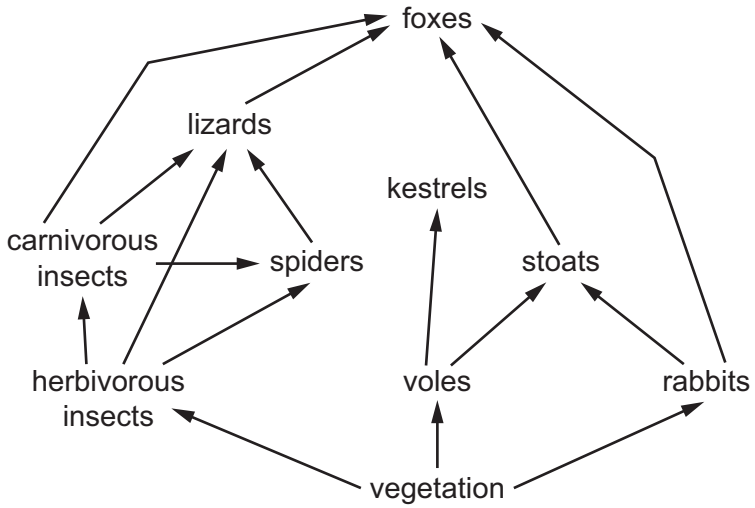
**13** The diagram shows a food web.




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** A*l* **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?

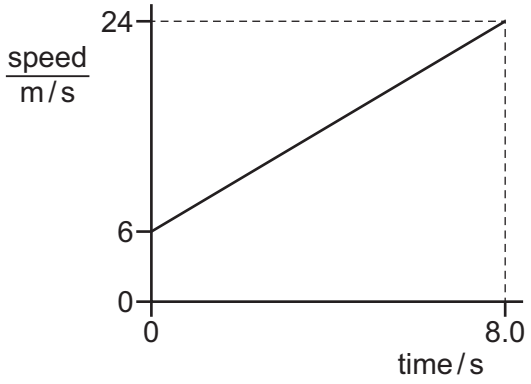
**A** cracking an alkane

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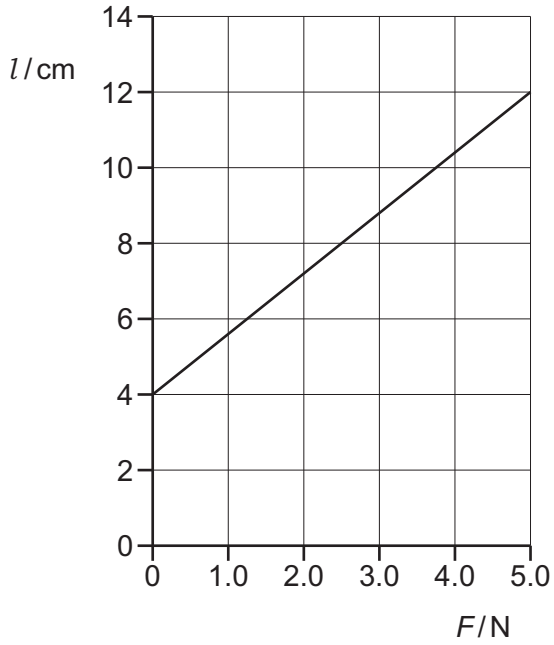
**29** A spring is stretched by a force *F*. The graph shows how the length $l$ of the spring changes with *F*.




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.

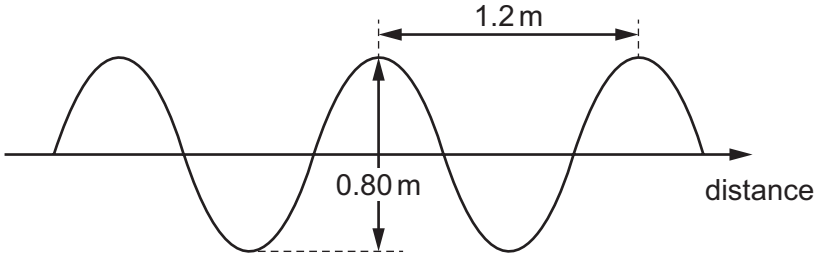
**C** They move more quickly.

**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?

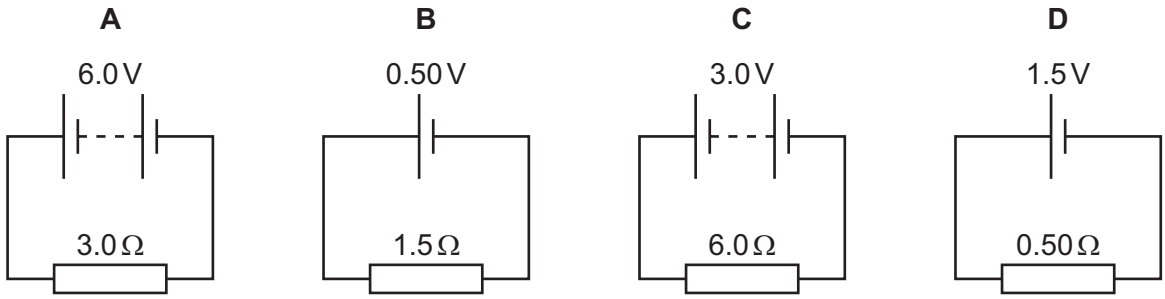
**A** charge = current × voltage across the resistor

**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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