



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.

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



1 Four types of cell are listed.

- 1 egg cell
- 2 palisade mesophyll cell
- 3 red blood cell
- 4 root hair cell

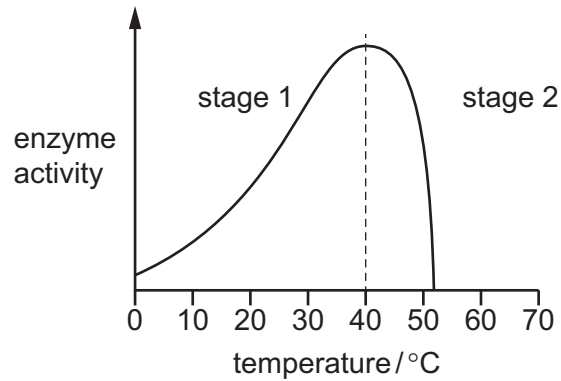
Which cell contains chlorophyll and which cell contains haemoglobin?

| | 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?

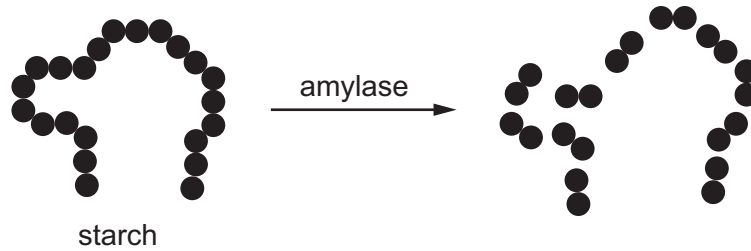
| | stage 1 | stage 2 |
|----------|---|---|
| A | change of shape of the active site of the enzyme | shape of the active site of the enzyme changes back to original |
| B | decrease in frequency of collisions of substrate and enzyme | increase in kinetic energy |
| C | increase in kinetic energy | change 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

- 5 The diagram shows starch being digested by amylase.



Which row shows the digestion taking place?

| | chemical | mechanical |
|----------|----------|------------|
| A | x | x |
| B | x | ✓ |
| C | ✓ | x |
| 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?

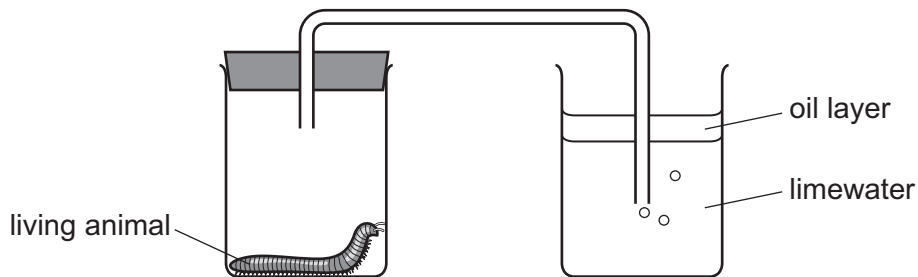
| | combines with haemoglobin | causes lung cancer |
|----------|---------------------------|--------------------|
| A | carbon monoxide | nicotine |
| B | carbon monoxide | tar |
| C | tar | carbon monoxide |
| D | nicotine | carbon monoxide |

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?

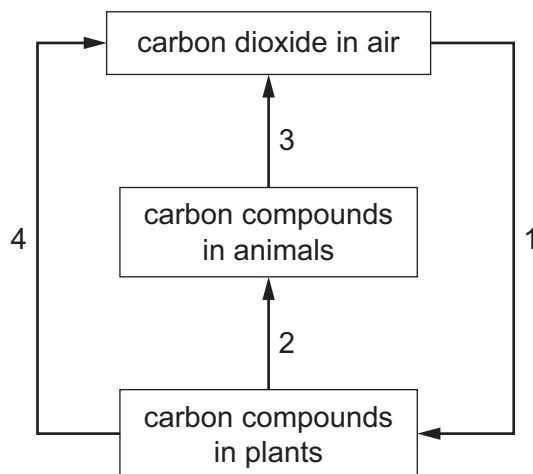
- A The limewater stays colourless because decomposition is occurring.
 - B The limewater stays colourless because photosynthesis is occurring.
 - C The limewater turns milky because aerobic respiration is occurring.
 - D The limewater turns milky because photosynthesis is occurring.
- 10 Which statement 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 |

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?

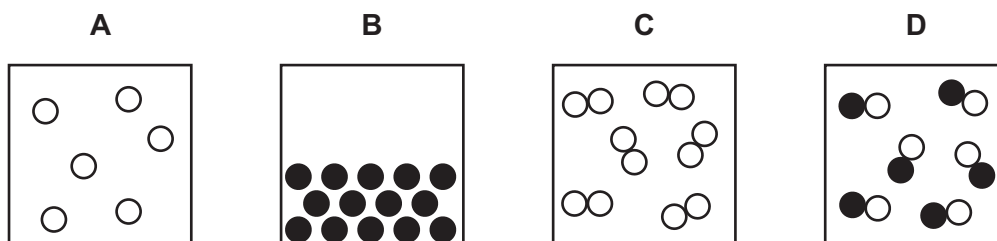
- A 1 only
- B 2 and 3
- C 3 and 4
- D 3 only

14 Substance X is an element.

It is a gas at room temperature.

It is made of X_2 molecules.

Which diagram represents X?



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?

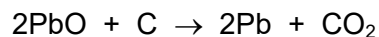
- A NH_4FeSO_4
- B $\text{NH}_4\text{Fe}(\text{SO}_4)_2$
- C $(\text{NH}_4)_2\text{FeSO}_4$
- D $\text{NH}_4\text{Fe}_3(\text{SO}_4)_2$

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.

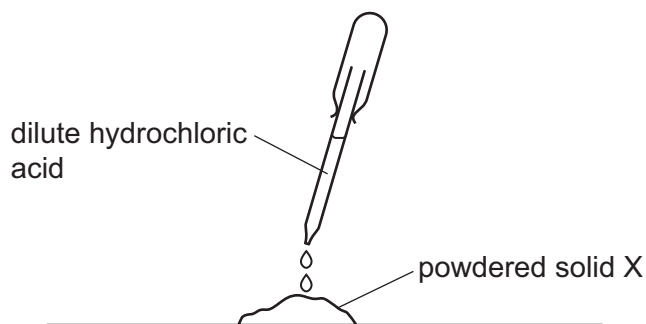


Which statement about this reaction is correct?

- 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?

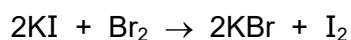
- A zinc
 - B zinc carbonate
 - C zinc hydroxide
 - D zinc oxide
- 21 Which test is used to identify ammonia?
- A A glowing splint relights.
 - B Damp blue litmus paper is bleached.
 - C Damp red litmus paper turns blue.
 - D Limewater turns milky.

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.



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

25 Part of the reactivity series of metals is shown.

| | |
|-----------|----------------|
| calcium | most reactive |
| magnesium | |
| aluminium | |
| iron | |
| copper | |
| silver | least reactive |

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

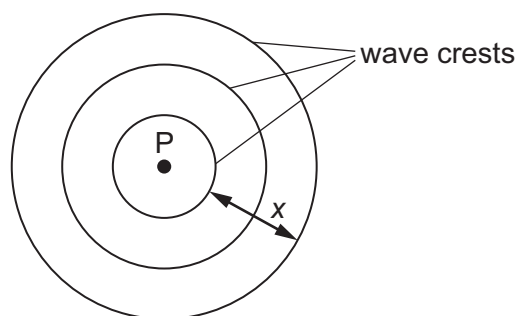
- 32 Which source of energy used on Earth is due mainly to the Moon?

- 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.

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

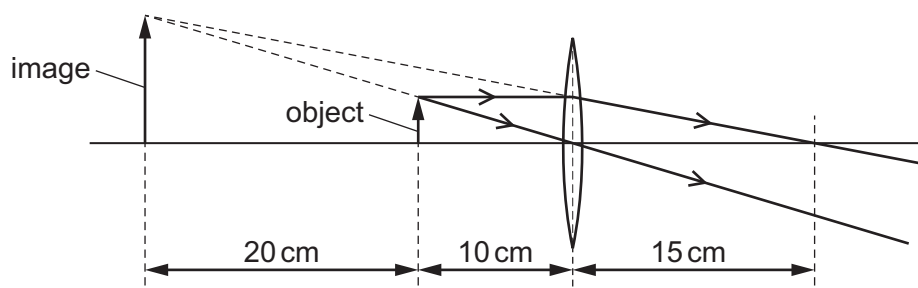


Three wave crests are produced every six seconds. Distance x is equal to 40 cm.

What is the speed and the frequency of the wave?

| | speed 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

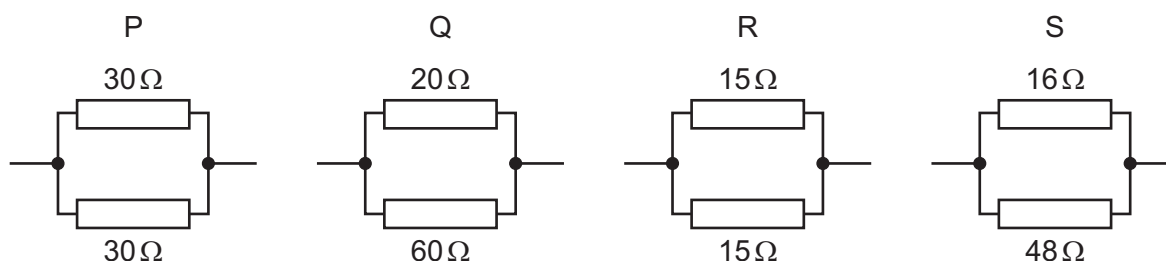
- 39 A copper wire has a resistance of $8.0\ \Omega$.

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 $1.0\ \Omega$
- B $4.0\ \Omega$
- C $8.0\ \Omega$
- D $16\ \Omega$

- 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

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The Periodic Table of Elements

| | | Group | | | | | | | | | | | | | | | |
|----------------------------|-----------------------------|----------------------------|---------------------------------|---|------------------------------|-----------------------------|------------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|------------------------------|-----------------------------|
| I | II | III | IV | V | VI | VII | VIII | | | | | | | | | | |
| 3 Li lithium 7 | 4 Be beryllium 9 | 11 Na sodium 23 | 12 Mg magnesium 24 | <div style="border: 1px solid black; padding: 5px; display: inline-block;"> Key atomic number atomic symbol name relative atomic mass </div> | | | | | | | | | | | | | |
| 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 — |

| | | | | | | | | | | | | | | | |
|-------------|------------------------------|----------------------------|---------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|----------------------------|-------------------------------|------------------------------|---------------------------|-------------------------------|------------------------------|------------------------------|
| 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 dm³ at room temperature and pressure (r.t.p.).