



# Cambridge IGCSE™

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## 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.

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



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
<b>A</b>	nucleus absent	cilia present
<b>B</b>	nucleus present	cilia present
<b>C</b>	nucleus absent	small surface area
<b>D</b>	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
<b>A</b>	✓	x	x	x
<b>B</b>	✓	x	✓	✓
<b>C</b>	x	✓	✓	✓
<b>D</b>	x	✓	x	x

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

- A carbohydrate
- B carbon
- C carbon dioxide
- D chlorophyll

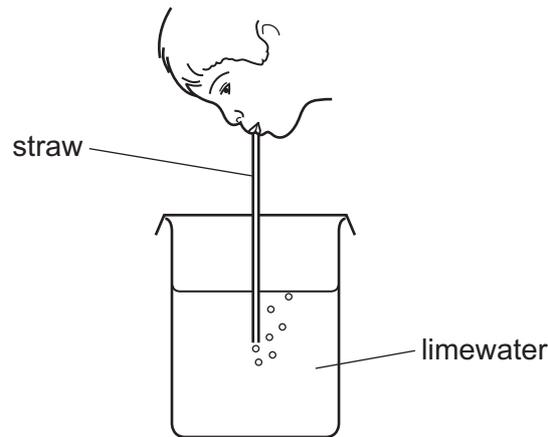
5 Which types of malnutrition could lead to constipation and scurvy?

	constipation	scurvy
<b>A</b>	excess of fibre	lack of vitamin C
<b>B</b>	excess of fibre	lack of vitamin D
<b>C</b>	lack of fibre	lack of vitamin C
<b>D</b>	lack of fibre	lack of vitamin D

6 Where is amylase active in the alimentary canal?

	stomach	small intestine
<b>A</b>	✓	✓
<b>B</b>	✓	x
<b>C</b>	x	✓
<b>D</b>	x	x

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

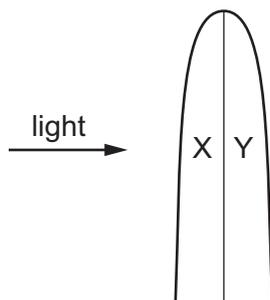
- 8 What is the word equation for aerobic respiration?

- 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

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.

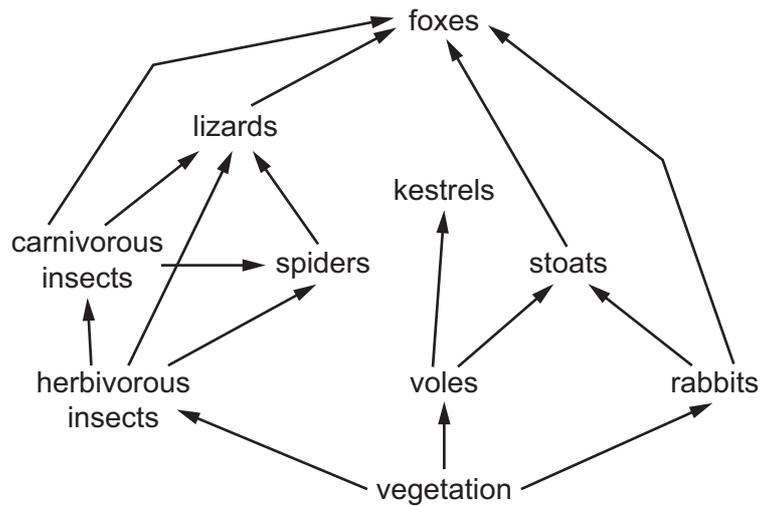
11 What are two features of sexual reproduction?

	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	✓	x
C	x	✓
D	x	x

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.



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.

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

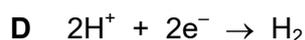
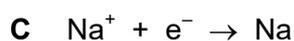
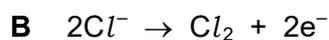
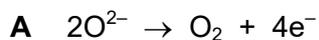
	melting point	reason
<b>A</b>	ionic compounds have higher melting points	ionic bonds are stronger than covalent bonds
<b>B</b>	ionic compounds have higher melting points	attractive forces between ions are stronger than attractive forces between molecules
<b>C</b>	ionic compounds have lower melting points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

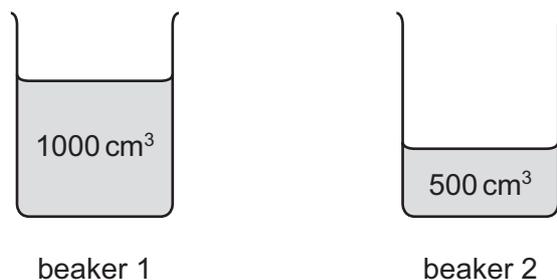
Phosphate ions have the symbol  $\text{PO}_4^{3-}$ .

What is the formula for potassium phosphate?

- A**  $\text{KPO}_4$       **B**  $\text{K}(\text{PO}_4)_3$       **C**  $\text{K}_2\text{PO}_4$       **D**  $\text{K}_3\text{PO}_4$
- 17 Which equation represents the process that occurs at the cathode during the electrolysis of concentrated aqueous sodium chloride?



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



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.



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

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.

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

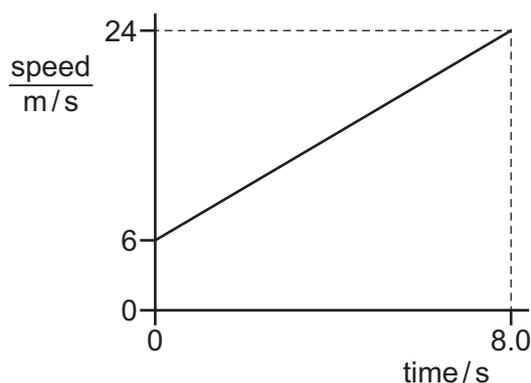
What are the products of the complete combustion of octane?

- 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

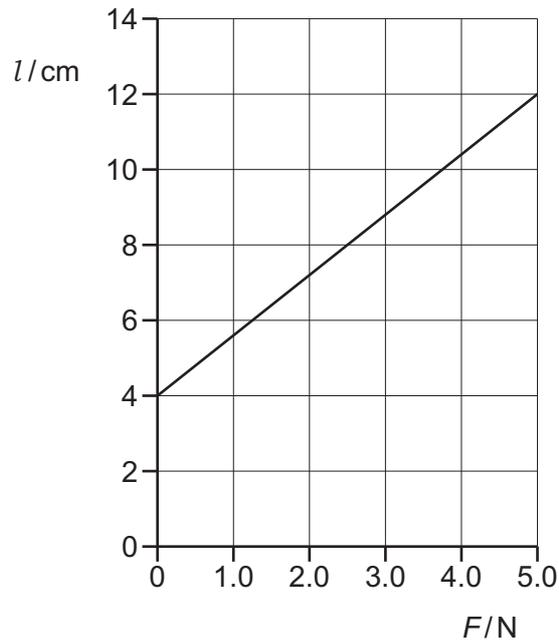
28 The diagram shows a speed–time graph for a car.



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

- 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
<b>A</b>	✓	✓
<b>B</b>	✓	✗
<b>C</b>	✗	✓
<b>D</b>	✗	✗

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.

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

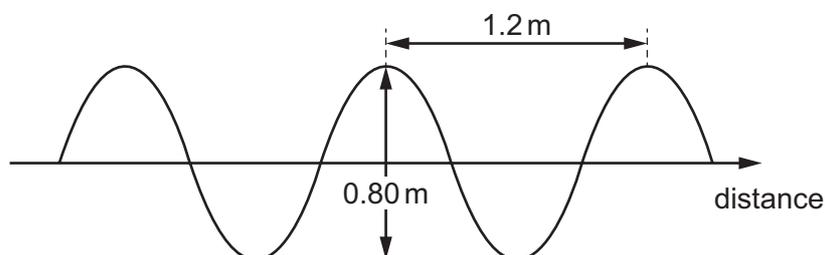
What happens to the molecules of the gas?

- 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.

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?

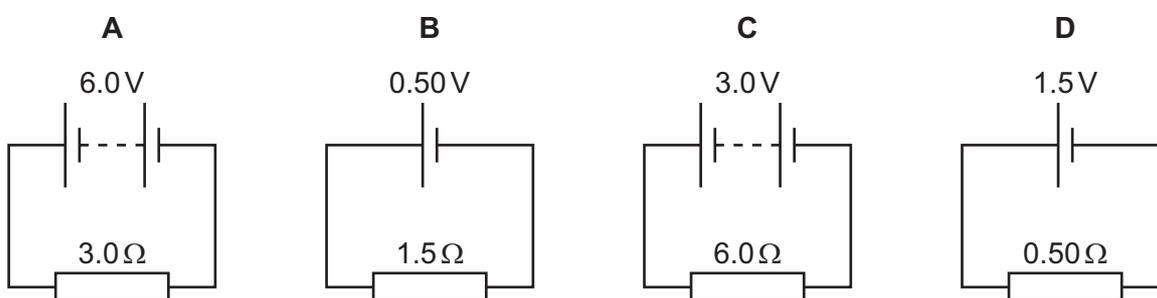
A charge = current  $\times$  voltage across the resistor

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

C charge = current  $\times$  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
<b>A</b>	decrease	decrease
<b>B</b>	decrease	increase
<b>C</b>	increase	decrease
<b>D</b>	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

- 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	Key										III	IV	V	VI	VII	VIII																		
3	4	atomic number atomic symbol name relative atomic mass																2																	
Li lithium 7	Be beryllium 9	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																
11	12	H hydrogen 1	He helium 4	Ne neon 20	Ar argon 40	K potassium 39	Ca calcium 40	Sc scandium 45	Ti titanium 48	V vanadium 51	Cr chromium 52	Mn manganese 55	Fe iron 56	Co cobalt 59	Ni nickel 59	Cu copper 64	Zn zinc 65	Ga gallium 70	Ge germanium 73	As arsenic 75	Se selenium 79	Br bromine 80	Kr krypton 84												
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Na sodium 23	Mg magnesium 24	Y yttrium 89	Zr zirconium 91	Nb niobium 93	Mo molybdenum 96	Tc technetium —	Ru ruthenium 101	Rh rhodium 103	Pd palladium 106	Ag silver 108	Cd cadmium 112	Al aluminium 27	Si silicon 28	P phosphorus 31	S sulfur 32	Cl chlorine 35.5	Ar argon 40	K potassium 39	Sr strontium 88	Y yttrium 89	Zr zirconium 91	Nb niobium 93	Mo molybdenum 96	Tc technetium —	Ru ruthenium 101	Rh rhodium 103	Pd palladium 106	Ag silver 108	Cd cadmium 112	In indium 115	Sn tin 119	Sb antimony 122	Te tellurium 128	I iodine 127	Xe xenon 131
55	56	57–71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89–103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
Cs caesium 133	Ba barium 137	lanthanoids	Hf hafnium 178	Ta tantalum 181	W tungsten 184	Re rhenium 186	Os osmium 190	Ir iridium 192	Pt platinum 195	Au gold 197	Hg mercury 201	Tl thallium 204	Pb lead 207	Bi bismuth 209	Po polonium —	At astatine —	Rn radon —	Fr francium —	Ra radium —	actinoids	Rf rutherfordium —	Db dubnium —	Sg seaborgium —	Bh bohrium —	Hs hassium —	Mt meitnerium —	Ds darmstadtium —	Rg roentgenium —	Cn copernicium —	Fl flerovium —	Lv livermorium —	Uu ununoctium —	Ug unquagium —	Uu ununoctium —	

lanthanoids	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
	La lanthanum 139	Ce cerium 140	Pr praseodymium 141	Nd neodymium 144	Pm promethium —	Sm samarium 150	Eu europium 152	Gd gadolinium 157	Tb terbium 159	Dy dysprosium 163	Ho holmium 165	Er erbium 167	Tm thulium 169	Yb ytterbium 173	Lu lutetium 175
actinoids	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
	Ac actinium —	Th thorium 232	Pa protactinium 231	U uranium 238	Np neptunium —	Pu plutonium —	Am americium —	Cm curium —	Bk berkelium —	Cf californium —	Es einsteinium —	Fm fermium —	Md mendelevium —	No nobelium —	Lr lawrencium —

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).