# Cambridge IGCSE<sup>™</sup>

## **COMBINED SCIENCE**

Paper 2 Multiple Choice (Extended)

October/November 2023 45 minutes

0653/21

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** The diagram shows a plant absorbing carbon dioxide in order to carry out photosynthesis.



Which characteristic of all living organisms is this?

- A movement
- **B** nutrition
- **C** excretion
- **D** reproduction
- 2 Four different cells and functions are shown.

Which cell has the correct function stated?



involved in reproduction



involved in photosynthesis



В

moves mucus in the trachea

D



absorbs water from the soil

- **3** What is diffusion?
  - A net movement of molecules down a concentration gradient
  - B net movement of molecules up a concentration gradient
  - **C** total movement of molecules down a concentration gradient
  - **D** total movement of molecules up a concentration gradient
- 4 Which graph shows the effect of increasing pH on enzyme activity?



- 5 What is the correct definition of a balanced diet?
  - A a diet in which all the components needed to maintain health are present in appropriate proportions
  - **B** a diet which contains only carbohydrates, fats and proteins
  - **C** a diet which contains mostly protein and dietary fibre
  - **D** a diet which contains only vitamins and minerals

6 The diagram shows what happens to fat in the alimentary canal.



Which row correctly identifies 1, 2, 3 and 4?

	1	2	3	4
Α	chemical digestion	lipase	mechanical digestion	soluble
В	chemical digestion	protease	ingestion	insoluble
С	mechanical digestion	lipase	chemical digestion	soluble
D	mechanical digestion	protease	ingestion	insoluble

7 The diagram shows a section through the heart.



What causes valve X to close?

- A contraction of the left ventricle
- **B** contraction of the left atrium
- **C** relaxation of the left ventricle
- D relaxation of the left atrium

8 Which chemical is used to test for carbon dioxide in expired air?

- **A** Benedict's solution
- B distilled water
- **C** iodine solution
- D limewater
- 9 Six molecules of glucose are aerobically respired in an animal cell.

How many molecules of carbon dioxide are released in this process?

**A** 1 **B** 6 **C** 12 **D** 36

- **10** Which statement about auxin is correct?
  - **A** Auxin is always equally distributed.
  - **B** Auxin is made in the carpels only.
  - **C** Auxin spreads through the plant from the sepals.
  - **D** Auxin stimulates cell elongation.
- 11 Which row is correct for sexual reproduction?

	genetically different offspring produced	one parent	zygote produced
Α	$\checkmark$	$\checkmark$	X
в	$\checkmark$	X	$\checkmark$
С	X	$\checkmark$	X
D	X	X	$\checkmark$

- 12 Which feature is a structural adaptation found in wind-pollinated flowers?
  - A Scent is produced.
  - **B** Nectar is produced.
  - C Petals are small or absent.
  - **D** Stigma is inside flower.

**13** The diagram shows part of the carbon cycle.



### What are X and Y?

	Х	Y	
Α	fossil fuel	carbon dioxide	
В	carbon dioxide	oxygen	
С	fossil fuel	oxygen	
D	oxygen	carbon dioxide	

**14** Which substance is liquid at 25 °C?

	melting point /°C	boiling point /°C
Α	-182	-161
В	-100	80
С	-77	-34
D	44	280

**15** A solid is added to a liquid and stirred until the solid is no longer visible.

Which word describes the type of mixture that is formed?

- **A** concentration
- B solute
- C solution
- D solvent

16 Which dot-and-cross diagram represents the outer shell electrons in a nitrogen molecule?



**17** Iron(III) sulfate contains  $Fe^{3+}$  ions and  $SO_4^{2-}$  ions.

What is the formula of iron(III) sulfate?

**A**  $FeSO_4$  **B**  $Fe_3SO_4$  **C**  $Fe_2(SO_4)_3$  **D**  $Fe_3(SO_4)_2$ 

**18** During electrolysis, positive ions are changed.

Which row describes what happens to the positive ions and identifies the electrode where this happens?

	what happens to the positive ions	electrode
Α	gain electrons	anode
В	gain electrons	cathode
С	lose electrons	anode
D	lose electrons	cathode

**19** Dilute hydrochloric acid and calcium carbonate react together to produce a gas.

The rate of reaction changes if the concentration of the hydrochloric acid or the temperature is changed.

Which row about a change and how it affects the activation energy and the frequency of collisions between reacting particles is correct?

	change	activation energy	frequency of collisions
Α	increased concentration	decreases	increases
в	increased concentration	no effect	no effect
С	increased temperature	decreases	no effect
D	increased temperature	no effect	increases

20 The equation for the redox reaction between aluminium and iron(III) oxide is shown.

$$2Al + Fe_2O_3 \rightarrow 2Fe + Al_2O_3$$

Which row identifies the substance that is reduced and the oxidising agent?

	substance reduced	oxidising agent	
Α	Al	$Fe_2O_3$	
В	Al	Al	
С	$Fe_2O_3$	Fe <sub>2</sub> O <sub>3</sub>	
D	$Fe_2O_3$	Al	

21 Calcium oxide is added to water containing universal indicator. The universal indicator turns blue.What is the pH of the solution?

Α	1	В	6	С	7	D	11

**22** Acid X reacts with metal Y.

A colourless gas is given off and a pale green solution is produced.

Two tests are carried out on the solution.

test	reagents added	result
1	aqueous silver nitrate and dilute nitric acid	white precipitate
2	aqueous sodium hydroxide	green precipitate

What are acid X and metal Y?

	acid X	metal Y
Α	hydrochloric	iron
В	hydrochloric	zinc
С	sulfuric	iron
D	sulfuric	zinc

**23** Fluorine is at the top of Group VII in the Periodic Table.

It reacts with potassium iodide as shown.

fluorine + potassium iodide  $\rightarrow$  iodine + substance Z

What is substance Z?

- A fluoride
- B potassium
- **C** potassium fluoride
- D potassium fluorine

24 Which statements about metals and their compounds are correct?

- 1 Copper reacts with dilute hydrochloric acid to give hydrogen.
- 2 Carbon does not react with aluminium oxide.
- 3 Hydrogen is formed when steam is passed over heated zinc.
- 4 Iron is more reactive than magnesium.
- **A** 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 2 and 4

25 Different reactions occur in the blast furnace.

Which substances are products in some reactions and reactants in other reactions in the blast furnace?

- **A** carbon dioxide and carbon monoxide
- **B** carbon dioxide and carbon
- C carbon monoxide and iron
- **D** iron and carbon
- 26 Which gases can directly cause an enhanced greenhouse effect?
  - A carbon monoxide and carbon dioxide
  - **B** carbon dioxide and methane
  - **C** nitrogen dioxide and sulfur dioxide
  - **D** sulfur dioxide and methane
- 27 Which statement about alkanes is correct?
  - A Their molecules are unsaturated.
  - **B** They are generally reactive compounds.
  - **C** They are mixtures of carbon and hydrogen atoms only.
  - **D** They produce water when they burn.



28 Which speed-time graph represents motion for which the acceleration is constant but not zero?

11



Α	0.50g/cm <sup>3</sup>	В	$2.0 \mathrm{g/cm^3}$	С	15g/cm <sup>3</sup>	D	$450\mathrm{g/cm^3}$
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**30** A spring that obeys Hooke's law is stretched by a force of 4.0 N.

The length of the spring changes from 10 cm to 12 cm.

What is the spring constant of the spring?

- **A** 0.33 N/cm **B** 0.50 N/cm **C** 2.0 N/cm **D** 3.0 N/cm
- 31 A car has a kinetic energy of 200 kJ as it passes a point P on a straight horizontal road. A constant resultant force of 500 N then causes the car to accelerate. What is the kinetic energy of the car when it has travelled a distance of 50 m past P?
  A 2000 J B 25000 J C 225000 J D 5000000 J

**32** A man lifts a heavy load vertically, from the ground to above his head.



He then moves the load horizontally at constant speed.

During which motion is work done on the load, and why?

	work is done	reason
Α	when lifting	the force exerted on the load is at right angles to the direction of movement of the load
в	when lifting	the force exerted on the load is in the same direction as the movement of the load
С	when moving horizontally	the force exerted on the load is at right angles to the direction of movement of the load
D	when moving horizontally	the force exerted on the load is in the same direction as the movement of the load

- 33 Which statement about a tidal energy power station is correct?
  - A It creates no environmental impact when being built.
  - **B** It does not work at night.
  - **C** It does not work when there is no wind.
  - **D** It supplies energy at predictable times.
- **34** The molecules in a substance are close together but free to change positions with each other.

Which substance at 20 °C matches this description?

- A air
- B copper
- **C** iron
- D water

**35** A sound wave passes from one medium into a second medium.

What happens to the sound wave entering the second medium and why does this happen?

	what happens	why it happens
Α	it is reflected	the frequency changes
В	it is reflected	the speed changes
С	it is refracted	the frequency changes
D	it is refracted	the speed changes

36 An earthquake wave shakes the ground at right angles to the direction of travel of the wave.

This wave has a frequency of 0.10 Hz and a wavelength of 30 000 m.

Which row shows the type of wave this is and its speed?

	type of wave	speed m/s
Α	longitudinal	3 000
В	longitudinal	300 000
С	transverse	3 000
D	transverse	300 000

**37** The diagram shows two light rays from an object that pass through a thin converging lens. Each point labelled F is a principal focus of the lens.



What is the nature of the image formed?

- A right way up and larger than the object
- **B** right way up and smaller than the object
- **C** upside down and larger than the object
- **D** upside down and smaller than the object

**38** The amplitude of a sound wave decreases and its frequency increases.

What happens to the sound heard?

- A It becomes louder and its pitch becomes higher.
- **B** It becomes louder and its pitch becomes lower.
- **C** It becomes quieter and its pitch becomes higher.
- **D** It becomes quieter and its pitch becomes lower.
- **39** There is a current of 6.0 A in a wire.

How much charge flows through the wire in 2.0 minutes?

- **A** 0.050 C **B** 3.0 C 12 C **D** 720 C
- **40** A circuit contains three ammeters, P, Q and R, and three identical lamps.



How do the readings on the ammeters compare?

- **A** All three ammeters show the same reading.
- **B** The reading on P is greater than the reading on Q and greater than the reading on R.
- **C** The reading on P is less than the reading on Q and less than the reading on R.
- **D** The three ammeters show three different readings.

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The Periodic Table of Elements

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						-										2
						т										He
			Key			hydrogen 1										helium 4
4		ď	atomic number		L						5	9	7	8	6	10
Be		ato	mic sym	lod							ш	ပ	z	0	LL	Ne
beryllium 9		rela	name tive atomic me	ISS							boron 11	carbon 12	nitrogen 14	oxygen 16	fluorine 19	neon 20
12											13	14	15	16	17	18
Mg											Al	S.	٩	ა	Cl	Ar
magnesium 24											aluminium 27	silicon 28	phosphorus 31	sulfur 32	chlorine 35.5	argon 40
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Ca	Sc	i	>	ŗ	Mn	Fe	ပိ	ïZ	Cu	Zn	Ga	Ge	As	Se	Ъ	, К
calcium 40	scandium 45	titanium 48	vanadium 51	chromium 52	manganese 55	iron 56	cobalt 50	nickel	copper 64	zinc	gallium 70	germanium 73	arsenic 75	selenium 79	bromine	krypton 84
38	39	40	41	42	43	8 4	45	46	47	48	49	50	51	52	53	54
Ś	≻	Zr	qN	Mo	ц	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Те	I	Xe
strontium	yttrium	zirconium	miobium	molybdenum	technetium	ruthenium	rhodium	palladium	silver	cadmium	indium 115	tin	antimony	tellurium	iodine	xenon
200	57_71	1.6	26	06	75	76	201	78	201	80	<u></u>	87	83	84	1 <i>21</i> 85	88
, eq	21-11 lanthanoids	Į H	2 4	2	2 Å	<sup>2</sup> Č	L .		Â	° T	۲ <i>۱</i>	Ph	3 <u>.</u>	<sup>t</sup> C	At 8	3 Å
barium		hafnium 178	tantalum	tungsten	rhenium 1 ac	osmium	iridium 100	platinum	gold	mercury	thallium	lead	bismuth	polonium	astatine	radon
88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
Ra	actinoids	Rf	Db	Sa	Bh	Hs	Mt	Ds	Ra	ы С	ЧN	Fl	Mc	2	L S	Ö
radium -		rutherfordium –	dubnium I	seaborgium -	bohrium –	hassium -	meitnerium -	darmstadtium 	roentgenium -	copernicium -	nihonium –	flerovium -	moscovium -	livermorium –	tennessine -	oganesson -
	-															
	57	58	59	60	61	62	63	64	65	99	67	68	69	70	71	
ds	La	Ce	Pr	ΡN	Pm	Sm	Eu	Ъd	Tb	D	Ч	ш	Tm	Υb	Lu	
	lanthanum 139	cerium 140	praseodymium 141	neodymium 144	promethium -	samarium 150	europium 152	gadolinium 157	terbium 159	dysprosium 163	holmium 165	erbium 167	thulium 169	ytterbium 173	lutetium 175	
	68	06	91	92	93	94	95	96	97	98	66	100	101	102	103	
	Ac	Th	Ра	⊃	Np	Pu	Am	Cm	異	Ç	ШS	Еm	Md	No	Ļ	

16

The volume of one mole of any gas is  $24\,dm^3$  at room temperature and pressure (r.t.p.).

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70 Ytterbium 173 102 NO nobelium

68 Er 167 100 Fm femium

67 holmium 165 99 ES

65 Tb 159 97 97 berkelium

64 adolinium 157 96 CM -

94 Pu Dutonium

protactinium 141 91 **Pa** 231 231

93 Np Ieptunium

uranium 238

thorium 232

57 La anthanum 139 89 89 AC

actinoids

lanthanoids

awrencium

mendelevium

californium

Am nericium

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