



# Cambridge IGCSE™

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## COMBINED SCIENCE

0653/21

Paper 2 Multiple Choice (Extended)

October/November 2021

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 Movement is a characteristic of all living organisms.

Which two other characteristics of living organisms provide the energy for movement?

- A excretion and nutrition
- B growth and sensitivity
- C nutrition and respiration
- D respiration and growth

2 What are all living organisms made of?

- A cells
- B chloroplasts
- C muscles
- D organs

3 Which statement about enzymes is correct?

- A They are denatured at high temperatures.
- B They all have an optimum pH of 7.
- C They all have an optimum temperature of 10 °C.
- D They are made of carbohydrates.

4 Which letters from the list represent the balanced equation for photosynthesis?

P	$C_6H_{12}O_6$	T	$H_2O$
Q	$6C_6H_{12}O_6$	U	$6H_2O$
R	$CO_2$	V	$O_2$
S	$6CO_2$	W	$6O_2$

- A  $P + U \rightarrow R + V$
- B  $Q + T \rightarrow S + U$
- C  $R + T \rightarrow W + P$
- D  $U + S \rightarrow P + W$

5 What is an effect of iron deficiency in the diet?

- A anaemia
- B constipation
- C coronary heart disease
- D scurvy

6 The following paragraph is a description of the digestion of fats.

Large pieces of fat are broken down into smaller pieces of fat by .....1..... digestion. These smaller pieces of fat can then be broken down by the enzyme .....2..... . This is .....3..... digestion. During this process, the larger molecules are broken down into smaller, .....4..... molecules.

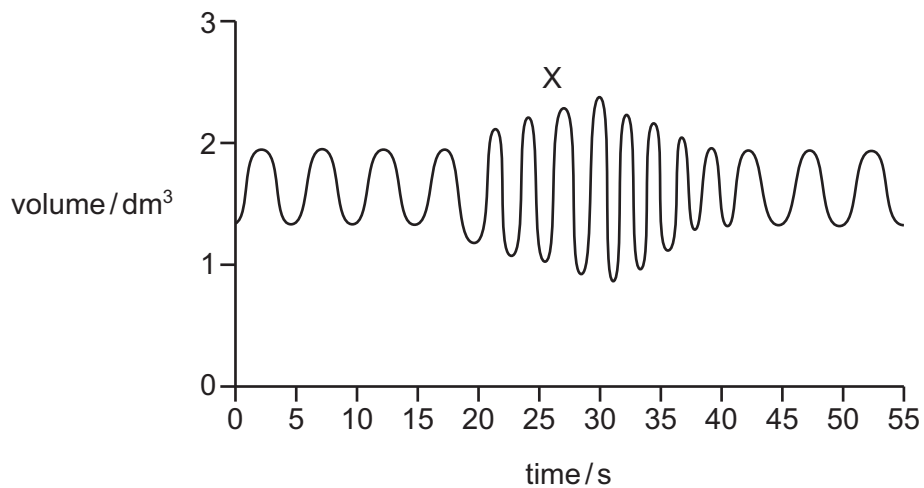
Which row correctly completes gaps 1, 2, 3 and 4?

	1	2	3	4
<b>A</b>	chemical	lipase	mechanical	soluble
<b>B</b>	chemical	protease	mechanical	insoluble
<b>C</b>	mechanical	lipase	chemical	soluble
<b>D</b>	mechanical	protease	chemical	insoluble

7 Which row correctly describes double circulation in mammals?

	pressure of blood from heart to body	pressure of blood from heart to lungs	type of blood from heart to lungs
<b>A</b>	high	high	oxygenated
<b>B</b>	high	low	deoxygenated
<b>C</b>	low	high	deoxygenated
<b>D</b>	low	low	oxygenated

8 What causes the change in breathing seen at X?



- A decreased oxygen in the blood
- B decreased lactic acid in the blood
- C increased carbon dioxide in the blood
- D increased sweating

9 A plant shoot is illuminated from one side only.

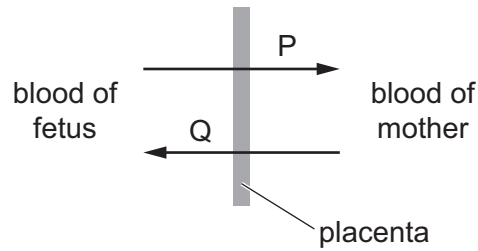
What collects on the shaded side of the plant shoot?

- A auxin
- B chlorophyll
- C glucose
- D starch

10 Which part of a flower is **not** required for pollination?

- A anther
- B sepal
- C stamen
- D stigma

11 The diagram represents the human placenta.

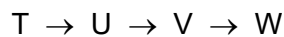


P and Q show the net movement of substances.

Which row identifies substances that travel in the directions of P and Q?

	in direction P	in direction Q
<b>A</b>	blood	urea
<b>B</b>	oxygen	carbon dioxide
<b>C</b>	excretory products	glucose
<b>D</b>	amino acids	toxins

12 The diagram represents four organisms in a food chain.



Which organisms are consumers?

- A** T, U and V    **B** T, U and W    **C** T, V and W    **D** U, V and W

13 Carbon dioxide levels in the atmosphere have risen by 30% in the last 60 years.

Which actions have contributed to this increase?

- 1 burning fossil fuels
- 2 deforestation
- 3 extinction of species

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

14 Which statement describes the change when water becomes ice at 0 °C?

- A** The particles collide with each other more frequently.  
**B** The particles have more kinetic energy.  
**C** The process is endothermic.  
**D** The process is exothermic.

15 Which statement explains why ionic compounds have higher melting points than covalent compounds?

- A Attractive forces are stronger between ions than between molecules.
- B Ionic bonds are stronger than covalent bonds.
- C Ions are formed by the transfer of electrons from one atom to another.
- D The atoms in covalent molecules share electrons.

16 Aluminium sulfate is made when aluminium hydroxide,  $Al(OH)_3$ , reacts with dilute sulfuric acid,  $H_2SO_4$ .

What is the formula of aluminium sulfate?

- A  $AlSO_4$       B  $Al_2SO_4$       C  $Al_2(SO_4)_3$       D  $Al_3(SO_4)_2$

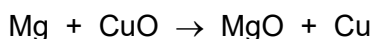
17 Hydrogen peroxide decomposes to form water and oxygen.

Which changes in temperature and in concentration **both** reduce the rate of this reaction?

	temperature of hydrogen peroxide	concentration of hydrogen peroxide
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

18 Magnesium reacts with copper oxide.

The equation for this reaction is shown.



Which substance is acting as an oxidising agent in this reaction?

- A Cu      B CuO      C Mg      D MgO

19 Which word equation correctly describes a reaction of dilute sulfuric acid?

- A sulfuric acid + zinc  $\rightarrow$  zinc sulfate + water
- B sulfuric acid + zinc carbonate  $\rightarrow$  zinc sulfate + carbon dioxide
- C sulfuric acid + zinc hydroxide  $\rightarrow$  zinc sulfate + water
- D sulfuric acid + zinc oxide  $\rightarrow$  zinc sulfate + hydrogen

- 20 A piece of damp blue litmus paper is placed in a gas.

The litmus paper turns red and then turns white.

What is the gas?

- A carbon dioxide
  - B chlorine
  - C hydrogen
  - D oxygen
- 21 Elements in Group I and Group VII of the Periodic Table are listed.

Group I	Group VII
Li	F
Na	Cl
K	Br
Rb	I

Group I elements react with Group VII elements.

Which compound is formed most vigorously?

- A LiF
  - B LiI
  - C RbF
  - D RbI
- 22 Which part of the Periodic Table contains elements that are used as catalysts?
- A Group I
  - B Group VII
  - C noble gases
  - D transition metals
- 23 Brass is an alloy.

What is brass?

- A a compound containing two metallic elements
- B a compound containing two non-metallic elements
- C a mixture containing two metallic elements
- D a mixture containing two non-metallic elements

**24** Four metals E, F, G and H are mixed with solutions of metal salts.

The results are shown.

metal	metal salt	result
H	E chloride	no reaction
E	F chloride	reacts
E	G chloride	reacts
F	H chloride	no reaction
G	H chloride	reacts

What is the order of reactivity of these metals, from most to least reactive?

- A** E → H → G → F
- B** E → G → H → F
- C** F → H → G → E
- D** F → G → H → E

**25** Carbon is used in the production of iron in a blast furnace.

A student suggests four reasons why carbon is added to the blast furnace.

- 1 It is an oxidising agent.
- 2 It burns to produce high temperatures.
- 3 It removes impurities by forming slag.
- 4 It reacts with carbon dioxide to form carbon monoxide.

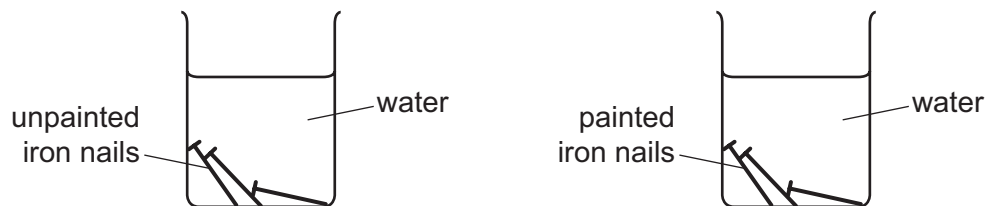
Which reasons are correct?

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



26 A student measures the masses of three unpainted and three painted iron nails.

The student places the nails into separate beakers of water.

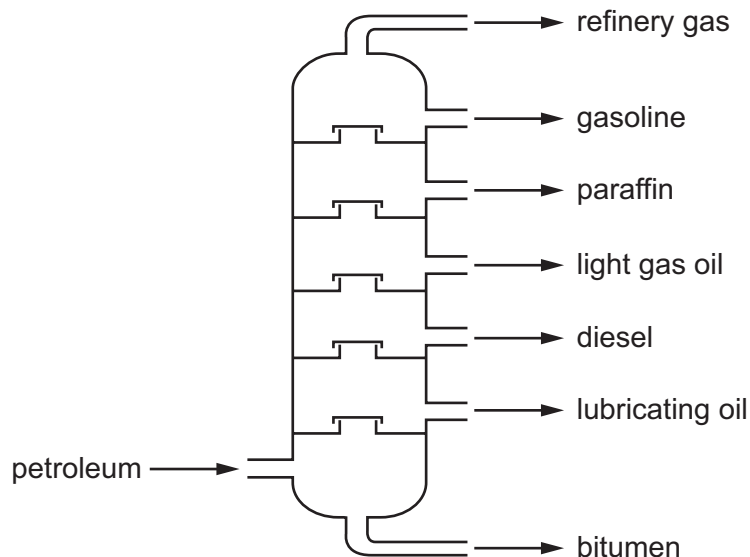


After one week, the student removes the nails from the beakers, dries them and measures the masses again.

Which row about the masses of the iron nails is correct?

	mass of unpainted iron nails	mass of painted iron nails
<b>A</b>	decreased	decreased
<b>B</b>	decreased	unchanged
<b>C</b>	increased	increased
<b>D</b>	increased	unchanged

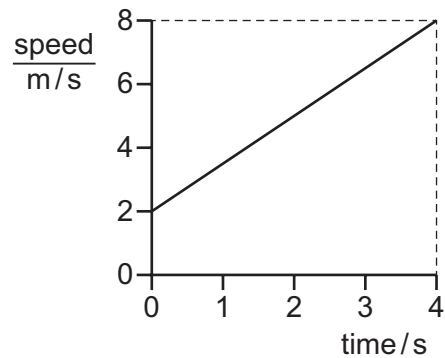
27 The fractional distillation of petroleum is shown.



Which fraction contains molecules that have the largest attractive forces?

- A** bitumen
- B** diesel
- C** gasoline
- D** refinery gas

- 28 The diagram shows the speed–time graph for an object that is accelerating.



What is the acceleration of the object and what is the distance it travels in 4.0 s?

	acceleration $\text{m/s}^2$	distance / m
<b>A</b>	1.5	20
<b>B</b>	1.5	32
<b>C</b>	2.0	20
<b>D</b>	2.0	32

- 29 A ball of mass  $m$  is thrown vertically upwards with an initial speed  $v$ .

The gravitational field strength is  $g$ .

What is the kinetic energy of the ball when it has risen through a height  $h$  above its starting point?

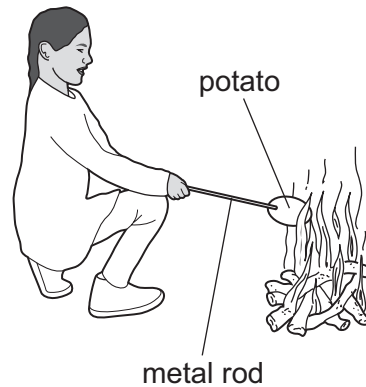
- A**  $\frac{1}{2}(mv)^2 + mgh$
- B**  $\frac{1}{2}(mv)^2 - mgh$
- C**  $\frac{1}{2}mv^2 + mgh$
- D**  $\frac{1}{2}mv^2 - mgh$

- 30 A gas loses energy and changes state to become a liquid.

How do the forces between the molecules and the distances between the molecules change?

	forces between molecules	distances between molecules
<b>A</b>	decrease	decrease
<b>B</b>	decrease	increase
<b>C</b>	increase	decrease
<b>D</b>	increase	increase

31 A student cooks a potato in a fire. The student holds the potato using a metal rod.



Which transfer of thermal energy is caused mainly by radiation?

- A from the fire to the air above the fire
- B from the fire to the student's face
- C from the inside of the potato to the student's hand
- D from the outside of the potato to the inside of the potato

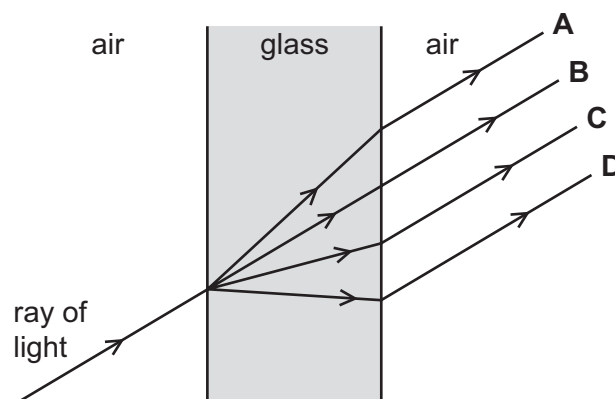
32 A microwave oven uses microwaves with a frequency of  $2.5 \times 10^9$  Hz.

What is the wavelength of these microwaves?

- A 0.0075 m
- B 0.12 m
- C 7.5 m
- D 12 m

33 A ray of light passes through a glass window.

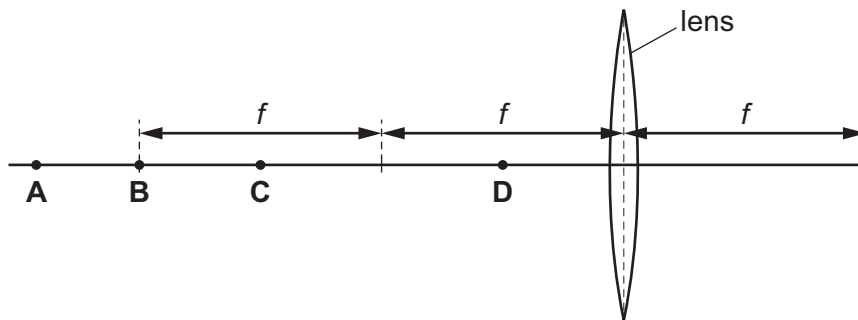
Which path does it take?



34 The diagram shows a thin converging lens with focal length  $f$ .

The lens forms a magnified, upright image of an object.

At which point is the object placed?



35 Sound travels at different speeds in air, glass and water.

Which list shows these three materials in the order of increasing speed of sound (slowest to fastest)?

- A air  $\rightarrow$  water  $\rightarrow$  glass
- B glass  $\rightarrow$  water  $\rightarrow$  air
- C water  $\rightarrow$  air  $\rightarrow$  glass
- D water  $\rightarrow$  glass  $\rightarrow$  air

36 There is a current of  $4.0\text{ A}$  in a resistor.

How much charge passes through the resistor in  $8.0\text{ s}$ ?

- A  $0.50\text{ C}$
- B  $2.0\text{ C}$
- C  $12\text{ C}$
- D  $32\text{ C}$

- 37 A circuit contains a battery connected to a resistor.



Which values of electromotive force (e.m.f.) and resistance produce the smallest current in the circuit?

	e.m.f./V	resistance/ $\Omega$
<b>A</b>	6.0	10
<b>B</b>	6.0	20
<b>C</b>	24	80
<b>D</b>	24	160

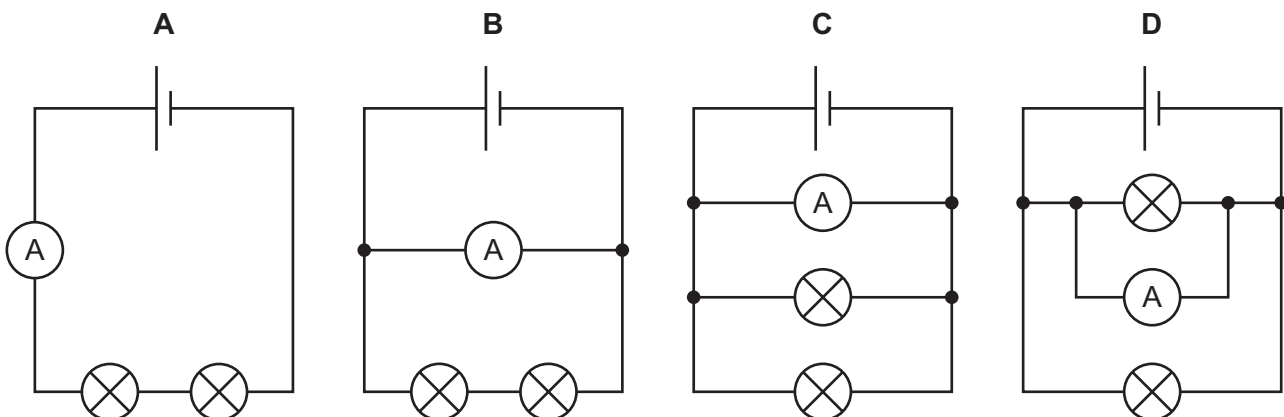
- 38 Four wires are made from the same material but have different lengths and diameters.

Which wire has the smallest resistance?

	length / cm	diameter / mm
<b>A</b>	50	0.10
<b>B</b>	50	0.20
<b>C</b>	100	0.10
<b>D</b>	100	0.20

- 39 The diagrams show four circuits, each containing an ammeter and two lamps with different resistances.

Which circuit shows an ammeter with a reading equal to the current in each lamp?



- 40 What is the purpose of a fuse in an electric circuit?
- A It acts as an extra resistor in the circuit.
  - B It keeps the current at a steady value.
  - C It keeps the voltage at a steady value.
  - D It protects the circuit from a current that is too large.

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The Periodic Table of Elements

Group																											
I	II	III										IV	V	VI	VII	VIII											
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20										
Li	Be	B	C	N	O	F	Ne											Na	Mg	Al	Si	P	S	Cl	Ar		
lithium	beryllium	boron	carbon	nitrogen	oxygen	fluorine	neon											sodium	magnesium	aluminium	silicon	phosphorus	sulfur	chlorine	argon		
7	9	11	12	14	16	19	20											23	24	27	28	31	32	33	34	35	40
11	12	13	14	15	16	17	18											23	24	27	28	31	32	33	34	35	40
19	20	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40				
K	Ca	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Kr	Rb	Sr	Y	Zr					
potassium	calcium	potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	krypton	rubidium	strontium	yttrium	zirconium					
39	40	39	40	45	48	51	52	55	56	59	59	64	65	70	73	75	79	84	85	88	89	91					
37	38	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	54	55	56	57-71	72					
Rb	Sr	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	Xe	Cs	Ba	lanthanoids	Hf					
rubidium	strontium	rubidium	strontium	yttrium	zirconium	niobium	molybdenum	technetium	ruthenium	rhodium	palladium	silver	cadmium	indium	tin	antimony	tellurium	xenon	caesium	barium	lanthanoids	hafnium					
85	88	85	88	89	91	93	96	101	101	103	106	108	112	115	119	122	128	131	133	137	lanthanoids	178					
55	56	55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	86	87	88	89-103	104					
Cs	Ba	Cs	Ba	lanthanoids	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	Rn	Fr	Ra	actinoids	Rf					
caesium	barium	caesium	barium	lanthanoids	hafnium	tantalum	tungsten	rhenium	osmium	iridium	platinum	gold	mercury	thallium	lead	bismuth	polonium	radon	francium	radium	actinoids	181					
133	137	133	137	139	181	181	184	186	190	192	195	197	201	204	207	209	209	210	210	226	226	223					
87	88	87	88	89-103	104	105	106	107	108	109	110	111	112	114	114	116	116	118	223	226	227	227					
Fr	Ra	Fr	Ra	actinoids	rutherfordium	dubnium	seaborgium	bohrium	hassium	meitnerium	darmstadtium	roentgenium	coppernium	flerovium	tennessium	oganesson	livermorium	118	223	226	227	227					

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	147	62	Sm	samarium	150	63	Eu	euroium	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	227	90	Th	thorium	232	91	Pa	protactinium	231	92	U	uranium	238	93	Np	neptunium	237	94	Pu	plutonium	244	95	Am	americium	243	96	Cm	curium	247	97	Bk	berkelium	247	98	Cf	californium	251	99	Es	einsteinium	252	100	Fm	fermium	257	101	Md	mendelevium	258	102	No	nobelium	259	103	Lr	lawrencium	260

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