Cambridge Assessment International Education

Cambridge IGCSE™

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)

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 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.

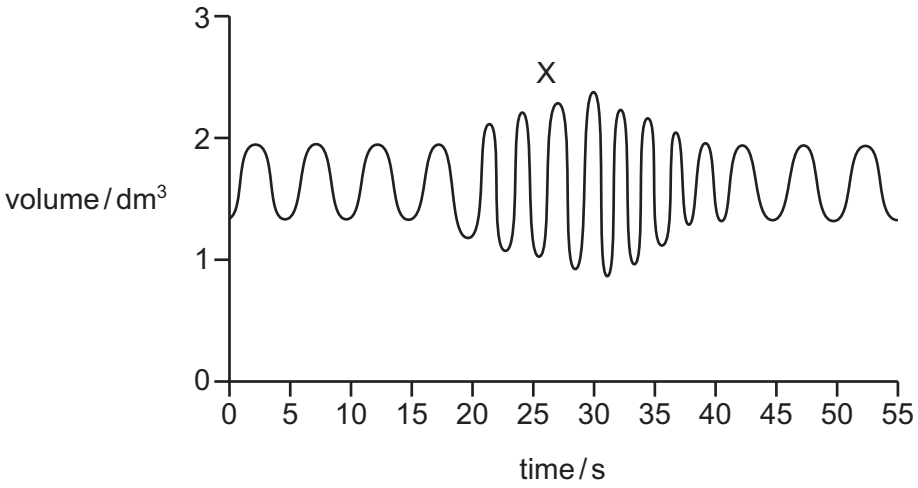
Which row correctly completes gaps 1, 2, 3 and 4?

	1	2	3	4
A	chemical	lipase	mechanical	soluble
B	chemical	protease	mechanical	insoluble
C	mechanical	lipase	chemical	soluble
D	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
A	high	high	oxygenated
B	high	low	deoxygenated
C	low	high	deoxygenated
D	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?

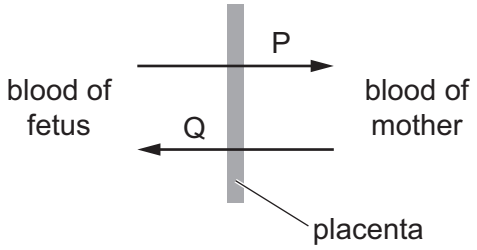
A anther

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
A	blood	urea
B	oxygen	carbon dioxide
C	excretory products	glucose
D	amino acids	toxins

12 The diagram represents four organisms in a food chain.

$$T \rightarrow U \rightarrow V \rightarrow W$$

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.

$$Mg + CuO \rightarrow MgO + Cu$$

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 → zinc sulfate + water

B sulfuric acid + zinc carbonate → zinc sulfate + carbon dioxide

C sulfuric acid + zinc hydroxide → zinc sulfate + water

D sulfuric acid + zinc oxide → 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	C*l*
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.

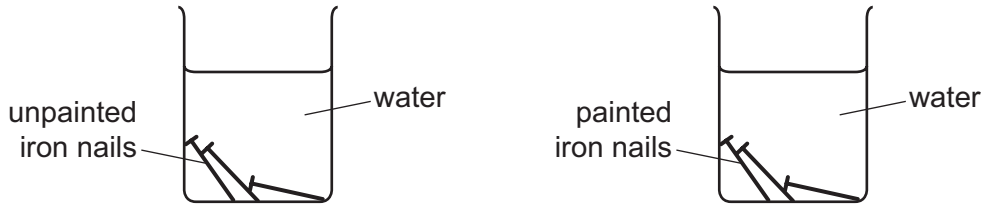
4 It reacts with carbon dioxide to form carbon monoxide.

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.

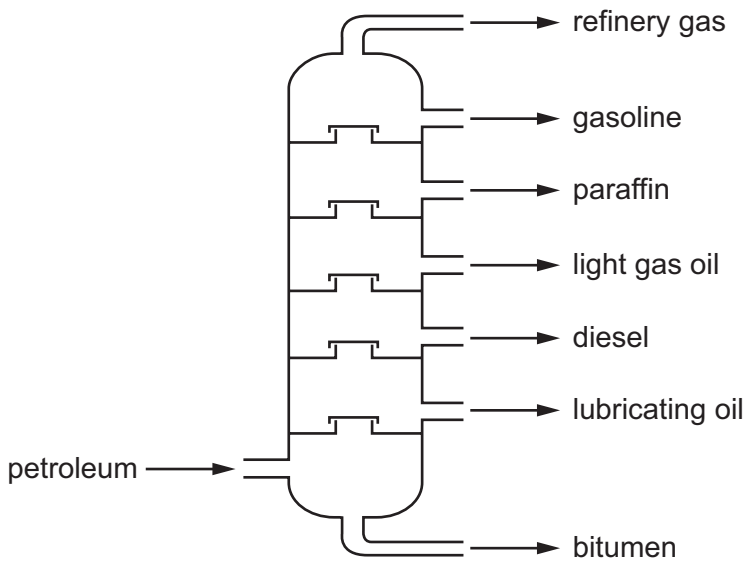


After one week, the student removes the nails from the beakers, dries them and measures the masses again.

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

	mass of unpainted iron nails	mass of painted iron nails
A	decreased	decreased
B	decreased	unchanged
C	increased	increased
D	increased	unchanged

27 The fractional distillation of petroleum is shown.



Which fraction contains molecules that have the largest attractive forces?

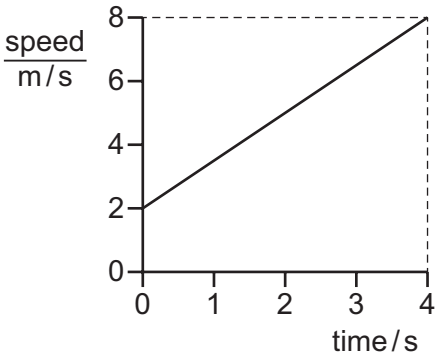
A bitumen

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 / m/s^2	distance / m
A	1.5	20
B	1.5	32
C	2.0	20
D	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 $\frac{1}{2}mv^2 + mgh$

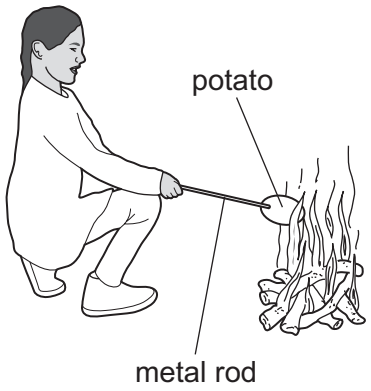
D $\frac{1}{2}mv^2 - mgh$

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
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	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

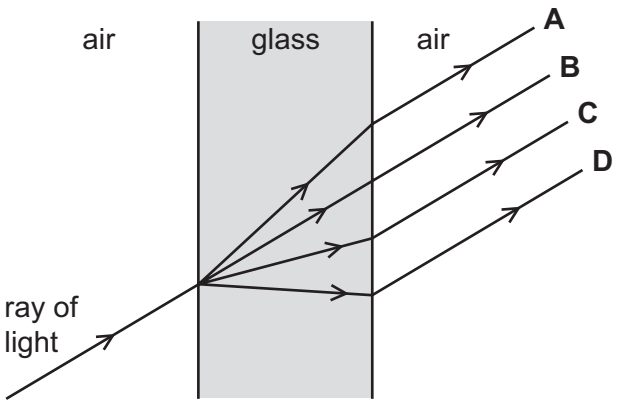
32 A microwave oven uses microwaves with a frequency of 2.5×10^9 Hz.

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.

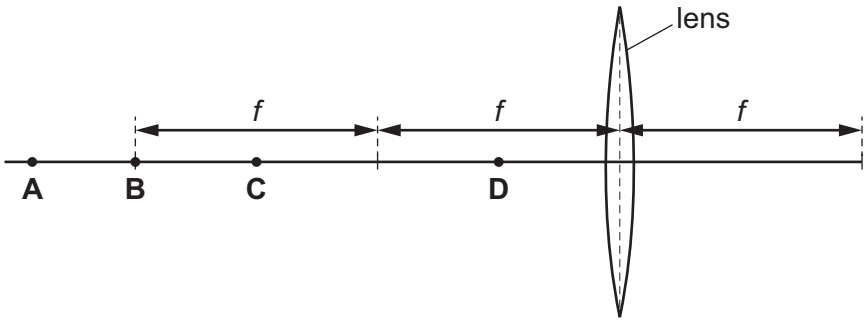
Which path does it take?



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 → water → glass

B glass → water → air

C water → air → glass

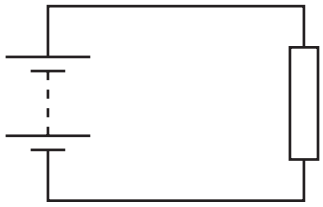
D water → glass → air

36 There is a current of 4.0 A in a resistor.

How much charge passes through the resistor in 8.0 s?

A 0.50 C **B** 2.0 C **C** 12 C **D** 32 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 / Ω
A	6.0	10
B	6.0	20
C	24	80
D	24	160

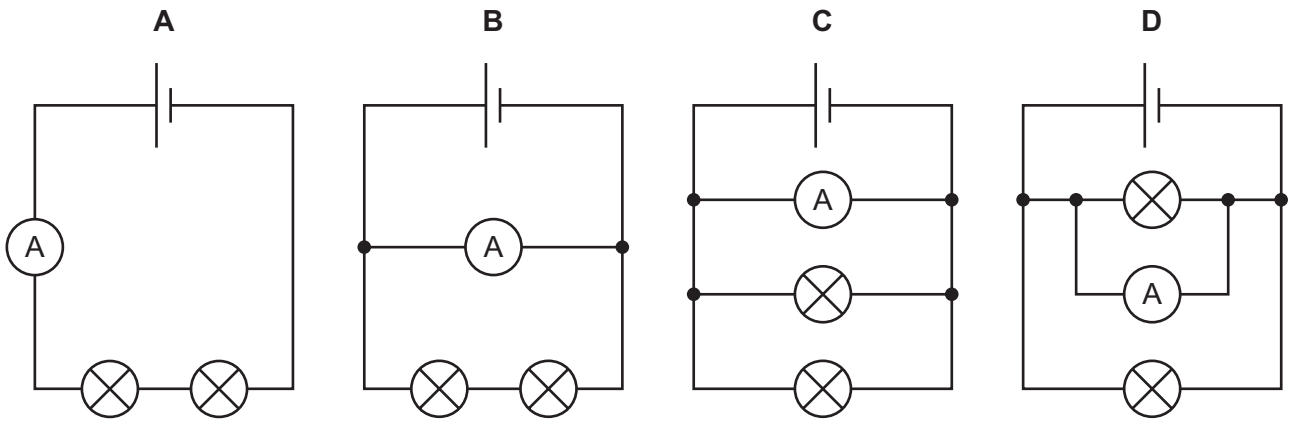
38 Four wires are made from the same material but have different lengths and diameters.

Which wire has the smallest resistance?

	length / cm	diameter / mm
A	50	0.10
B	50	0.20
C	100	0.10
D	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
							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.).