Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/23**

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 Which row correctly describes a feature of a specialised cell?

	specialised cell	feature
A	egg cell	energy store
B	palisade cell	cilia
C	red blood cell	cell wall
D	root hair cell	chloroplasts

3 Which small molecules are used to make proteins?

A amino acids

B fatty acids

C glucose

D glycerol

4 What is a suitable range for investigating the effect of temperature on the activity of an enzyme from a human body?

A 0 °C to 30 °C

B 20 °C to 60 °C

C 40 °C to 60 °C

D 50 °C to 100 °C

5 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

6 Which type of digestion causes the breakdown of large, insoluble molecules into small, soluble molecules?

A chemical

B hormonal

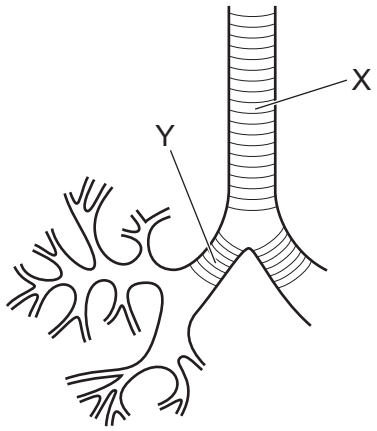
C mechanical

D physical

7 Which conditions cause plants to lose most mass by transpiration?

	humidity	temperature
A	high	high
B	high	low
C	low	high
D	low	low

8 The diagram shows part of the gas exchange system in humans.



What are the structures labelled X and Y?

	X	Y
A	bronchiole	trachea
B	bronchus	trachea
C	trachea	bronchiole
D	trachea	bronchus

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 What is a characteristic of **insect**-pollinated flowers?

A anthers hanging outside the flower

B hairy or sticky stigmas

C large quantities of smooth, light pollen

D no scent or nectar

11 Which comparison between human female and male gametes is correct?

	eggs	sperm
A	have a flagellum	have no flagellum
B	move a short distance	move a long distance
C	produced in greater numbers	produced in fewer numbers
D	smaller size	larger size

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 The eutrophication of water has a number of stages.

1 increased growth of producers	2 dissolved oxygen decreases and aquatic organisms die	3 available nitrate / ion levels increase
4 increased aerobic respiration by decomposers	5 death of producers	

What is the correct order of the stages?

A $1 \rightarrow 3 \rightarrow 5 \rightarrow 4 \rightarrow 2$

B $1 \rightarrow 2 \rightarrow 5 \rightarrow 4 \rightarrow 3$

C $3 \rightarrow 1 \rightarrow 5 \rightarrow 4 \rightarrow 2$

D $3 \rightarrow 1 \rightarrow 4 \rightarrow 2 \rightarrow 5$

14 How many electrons are shared by the atoms in a nitrogen molecule, N_2?

A 2 **B** 4 **C** 6 **D** 8

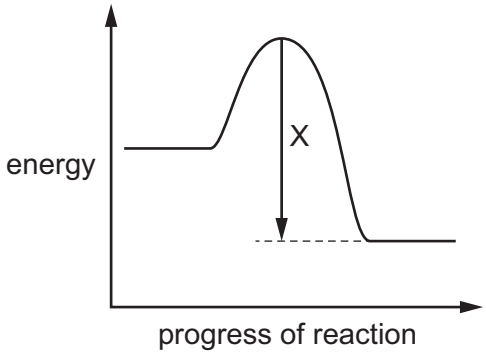
15 The formula of magnesium chloride is $MgCl_2$.

The formula of sodium phosphide is Na_3P.

What is the formula of magnesium phosphide?

A MgP **B** MgP_2 **C** Mg_2P_3 **D** Mg_3P_2

16 An energy level diagram for a reaction is shown.



Which statement describes and explains energy change X?

A Energy is given out as bonds break.

B Energy is given out as bonds form.

C Energy is taken in as bonds break.

D Energy is taken in as bonds form.

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 Iron oxide reacts with aluminium.

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

Which row identifies the oxidising agent and reducing agent in the reaction?

	oxidising agent	reducing agent
A	aluminium oxide	aluminium
B	aluminium oxide	iron
C	iron(III) oxide	aluminium
D	iron(III) oxide	iron

19 Which statement describes an acid?

A It has a pH less than 7.

B It reacts with calcium carbonate to form a white precipitate.

C It reacts with hydrochloric acid to form a salt and water.

D It turns universal indicator blue.

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 Some properties of noble gases are shown.

	melting point / °C	boiling point / °C	density / g / cm^3
helium	–272	–269	0.0002
neon			
argon	–189		
krypton		–152	0.0059
xenon	–112	–108	0.0097

What are the properties of neon?

	melting point / °C	boiling point / °C	density / g / cm^3
A	–251	–274	0.0004
B	–178	–174	0.0041
C	–249	–246	0.0008
D	–240	–236	0.0062

22 P, Q, R and S are four metals.

P is soft.

Q reacts violently with water.

R has a high melting point.

S forms blue compounds.

Which metals are transition elements?

A P and Q **B** P and R **C** Q and S **D** R and S

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 The results of mixing metal X with aqueous metal ions are shown.

$$X + Zn^{2+} \rightarrow X^{2+} + Zn$$

$$X + Cu^{2+} \rightarrow X^{2+} + Cu$$

$$X + Mg^{2+} \rightarrow Mg^{2+} + X$$

What is the position of X in the reactivity series?

	most reactive →			least reactive
A	X	Mg	Zn	Cu
B	Mg	X	Zn	Cu
C	Mg	Zn	X	Cu
D	Mg	Zn	Cu	X

25 Which substance reduces iron(III) oxide in the blast furnace?

A carbon dioxide

B carbon monoxide

C limestone

D oxygen

26 Which statements about the rusting of iron are correct?

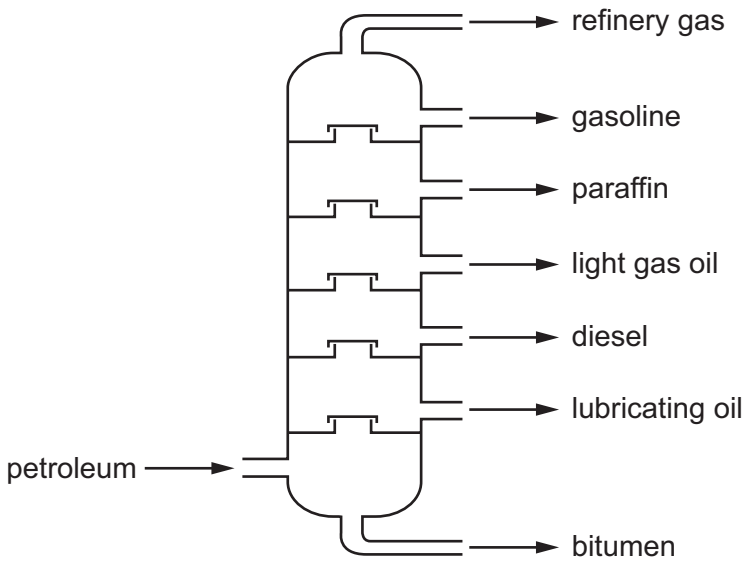
1 It requires oxygen and water.

2 It is prevented by coating with another metal.

3 Painted iron nails do not rust.

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

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 A distance–time graph and a speed–time graph are plotted for a moving vehicle.

Which feature gives the acceleration of the vehicle?

A the area under the distance–time graph

B the area under the speed–time graph

C the gradient of the distance–time graph

D the gradient of the speed–time graph

29 A container is filled to the top with water. An object is slowly lowered into the water until it is completely submerged. The water that overflows from the container is collected.

The mass of the object is 84 kg. The volume of water collected is $0.12\,m^3$.

What is the density of the object?

A $1.4\,kg/m^3$ **B** $10\,kg/m^3$ **C** $84\,kg/m^3$ **D** $700\,kg/m^3$

30 A spring that obeys Hooke's Law has unstretched length l.

A load F is suspended from the spring, and the spring extends by an amount x.

Which equation is used to define the spring constant k?

A $k = Fx$ **B** $k = \frac{F}{(l + x)}$ **C** $k = \frac{F}{x}$ **D** $k = \frac{x}{F}$

31 A force pushes an object in a straight line.

Which expression gives the work done by the force?

A force × distance moved

B force × time taken

C force ÷ distance moved

D force ÷ time taken

32 Water in a beaker evaporates quickly.

Which statements about the evaporation of the water from the beaker are correct?

1 Evaporation happens at all temperatures between 0 °C and 100 °C.

2 The more-energetic water molecules escape from the surface of the water.

3 The temperature of the water remaining in the beaker decreases.

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

33 A gas is heated.

Which statement explains how thermal energy is transferred by convection in the gas?

A The heated gas expands, becomes less dense and falls.

B The heated gas expands, becomes less dense and rises.

C The heated gas expands, becomes more dense and falls.

D The heated gas expands, becomes more dense and rises.

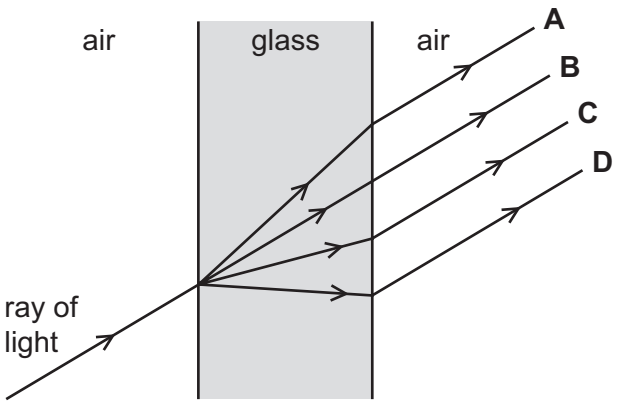
34 A microwave oven uses microwaves with a frequency of 2.5×10^9 Hz.

What is the wavelength of these microwaves?

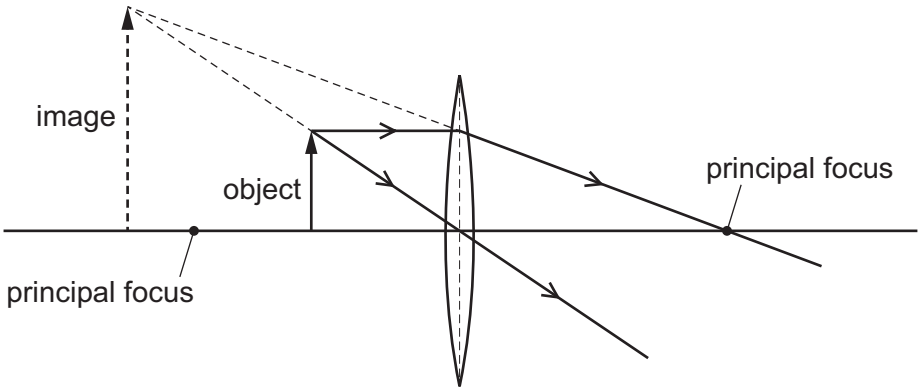
A 0.0075 m **B** 0.12 m **C** 7.5 m **D** 12 m

35 A ray of light passes through a glass window.

Which path does it take?



36 The diagram shows a thin converging lens used as a magnifying glass. Each principal focus of the lens is labelled.



The object is moved to the right, closer to the lens.

What happens to the image?

A It moves to the left and becomes larger.

B It moves to the left and becomes smaller.

C It moves to the right and becomes larger.

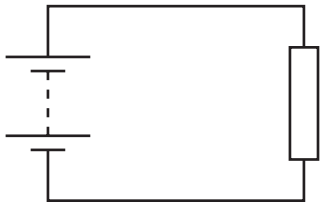
D It moves to the right and becomes smaller.

37 There is a potential difference of 4.0 V across a resistor of resistance 2.0 Ω.

How much charge passes through the resistor in 10 s?

A 0.80 C **B** 5.0 C **C** 20 C **D** 80 C

38 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

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

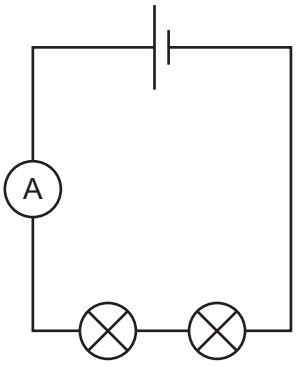
Which wire has the smallest resistance?

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

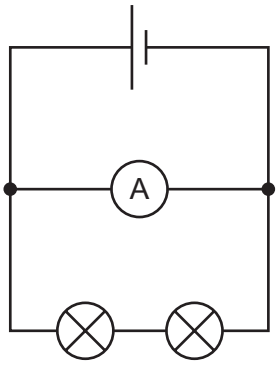
40 The diagrams show four circuits, each containing an ammeter and two lamps with different resistances.

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

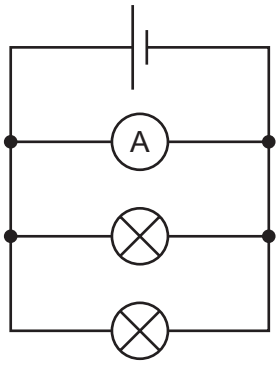
A



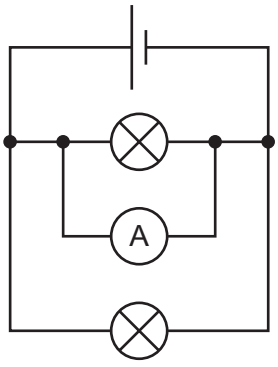
B



C



D



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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.).