Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/22**

Paper 2 Multiple Choice (Extended) **October/November 2024**

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 A car is filled with fuel and is driven away.

Which characteristic of living organisms is **not** matched by a similar process in the car?

A excretion

B growth

C movement

D respiration

2 Which row shows the site of chemical reactions in a cell and identifies the partially permeable structure in a cell?

	site of chemical reactions	partially permeable structure
A	cytoplasm	cell membrane
B	cytoplasm	cell wall
C	vacuole	cell membrane
D	vacuole	cell wall

3 Uncooked potato pieces of identical size and mass are placed in different sugar solutions for two hours.

Which sugar solutions cause a decrease in the mass of a potato piece?

1 a solution with a higher sugar concentration than the potato piece

2 a solution with a lower sugar concentration than the potato piece

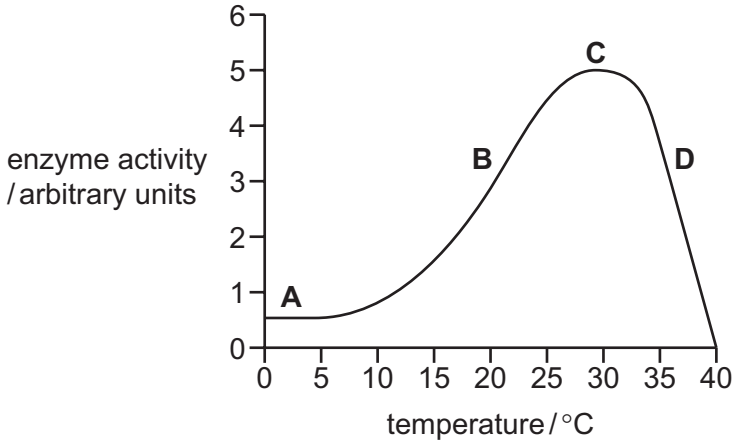
3 a solution with a higher water potential than the potato piece

4 a solution with a lower water potential than the potato piece

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

4 The graph shows the effect of temperature on the activity of an enzyme.

At which point is the frequency of effective collisions the highest?



5 Which substances produced by plants contain either magnesium ions or nitrogen atoms?

	chlorophyll	enzymes	starch
A	✗	✓	✓
B	✓	✗	✓
C	✓	✗	✗
D	✓	✓	✗

6 The table shows two plant tissues with their possible functions.

	tissue	functions	
		support	transport
1	phloem	✓	✓
2	phloem	✗	✓
3	xylem	✓	✓
4	xylem	✓	✗

Which rows show the correct functions for phloem and xylem?

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

7 What is **not** a possible risk factor for coronary heart disease?

A genetic predisposition

B healthy diet

C smoking

D stress

8 What is the sequence of structures that air passes through when entering the body?

A larynx → trachea → bronchi → bronchioles

B larynx → trachea → bronchioles → bronchi

C trachea → larynx → bronchi → bronchioles

D trachea → larynx → bronchioles → bronchi

9 The chemical equation for aerobic respiration is shown with the numbers replaced by the letters P, Q and R.

$$C_PH_QO_P + PO_R \rightarrow PCO_R + PH_RO$$

Which row shows the correct values for P, Q and R?

	P	Q	R
A	2	12	6
B	6	2	12
C	6	12	2
D	12	2	6

10 Which row shows the changes in pulse rate and pupil width that occur when a person is frightened?

	pulse rate	pupil width
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

11 Which statement about auxin is correct?

A It causes cell division.

B It is equally distributed in response to gravity.

C It is made in the leaves.

D It is unequally distributed in response to light.

12 During pregnancy in humans, gas exchange occurs between a mother and her fetus.

Where does this gas exchange occur?

A amniotic fluid

B amniotic sac

C placenta

D umbilical cord

13 Which animal gets its energy from eating other animals only?

A carnivore

B decomposer

C herbivore

D producer

14 Which process produces a chemical change?

A adding ethanol to water

B adding sodium to water

C boiling water

D melting ice

15 Which row describes an element and a compound?

	element	compound
A	contains more than one type of atom	contains elements chemically combined
B	contains more than one type of atom	contains elements mixed together
C	contains only one type of atom	contains elements chemically combined
D	contains only one type of atom	contains elements mixed together

16 Potassium chloride, KCl, is a solid at room temperature.

Ammonia, NH_3, is a gas at room temperature.

Which statement explains this difference?

A Ionic bonds are stronger than covalent bonds.

B Covalent bonds are stronger than ionic bonds.

C The attractive forces between ions in KCl are much stronger than the covalent bonds in NH_3.

D Attractive forces between molecules are weaker than ionic bonds.

17 Titanium oxide contains Ti^{4+} ions and O^{2-} ions.

What is the formula of titanium oxide?

A TiO **B** TiO_2 **C** Ti_2O **D** Ti_4O_2

18 Which statement about changes at the electrodes during electrolysis is correct?

A Anions gain electrons at the positive electrode.

B Anions lose electrons at the negative electrode.

C Cations gain electrons at the negative electrode.

D Cations lose electrons at the positive electrode.

19 The equation representing the formation of a chlorine molecule from two chlorine atoms is shown.

$$2Cl(g) \rightarrow Cl_2(g)$$

Which statement about this process is correct?

A The chlorine molecule has less chemical energy than two chlorine atoms.

B The two chlorine atoms obtain full outer electron shells by forming a double covalent bond.

C The process is endothermic and energy is taken in.

D The process involves only chlorine so energy is neither given out nor taken in.

20 The rate of a reaction increases when the temperature or the concentration of the reactants is increased.

Which row explains why the rate of reaction increases?

	change	activation energy	collisions per second	number of particles with energy greater than the activation energy
A	increase in concentration	increases	increases	stays the same
B	increase in concentration	stays the same	stays the same	increases
C	increase in temperature	stays the same	increases	stays the same
D	increase in temperature	stays the same	increases	increases

21 Magnesium chloride is a soluble salt which is made when excess magnesium reacts with dilute hydrochloric acid.

Four separation techniques are listed.

1 chromatography

2 crystallisation

3 distillation

4 filtration

Which processes are used to obtain a sample of magnesium chloride crystals from the reaction mixture?

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

22 What is used to show that a compound contains potassium?

A a flame test

B aqueous ammonia

C aqueous silver nitrate

D aqueous sodium hydroxide

23 Sodium has a melting point of 98 °C and a density of 0.97 g / cm^3.

Which row shows the melting point and density of rubidium?

	melting point / °C	$\frac{\text{density}}{\text{g/cm}^3}$
A	39	0.53
B	39	1.53
C	180	0.53
D	180	1.53

24 Which group of the Periodic Table contains monoatomic gaseous elements?

A Group I

B Group II

C Group VII

D Group VIII

25 W, X, Y and Z are metals.

The metals are added to separate aqueous metal ion solutions.

Some of the results are shown.

$$W + Z^{2+} \rightarrow Z + W^{2+}$$

$$X + Z^{2+} \rightarrow \text{no reaction}$$

$$Y + Z^{2+} \rightarrow Z + Y^{2+}$$

$$Y + W^{2+} \rightarrow \text{no reaction}$$

Which row shows the order of reactivity of the metals?

	most reactive ⟶ least reactive			
A	W	Y	Z	X
B	W	Z	Y	X
C	X	Y	Z	W
D	X	Z	Y	W

26 Which metal can be extracted from its ore using hydrogen?

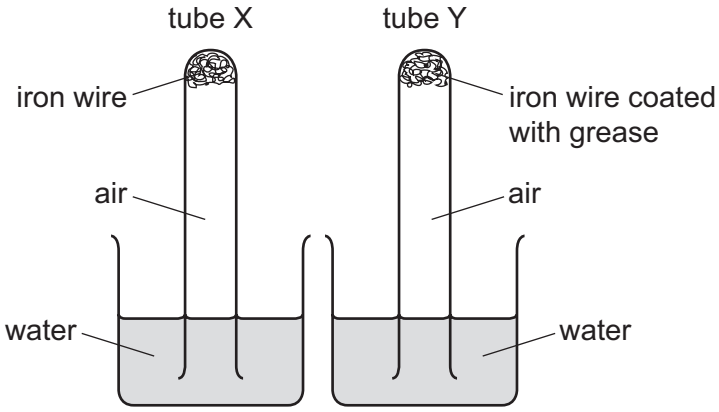
A calcium

B sodium

C copper

D zinc

27 An experiment is set up to show the effect of air and water on iron.

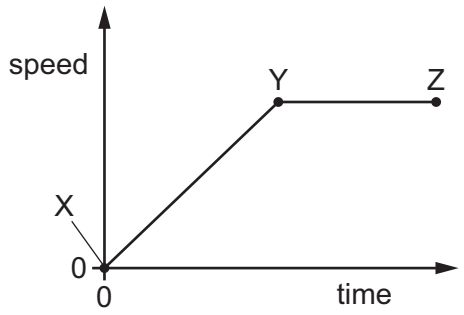


The experiment is left for one week.

What happens to the water level in each tube?

	tube X	tube Y
A	falls	falls
B	no change	rises
C	rises	rises
D	rises	no change

28 A car is travelling along a straight road. The speed–time graph for part of its journey is shown.

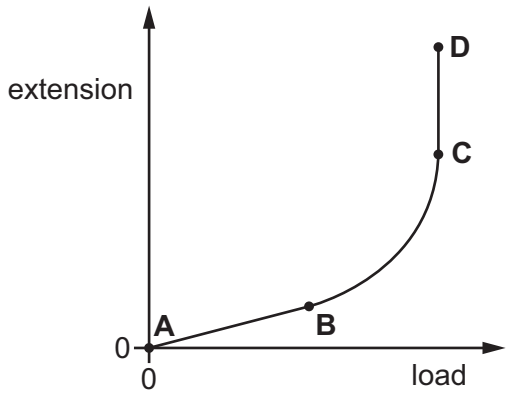


Which row describes the motion of the car between X and Y and between Y and Z?

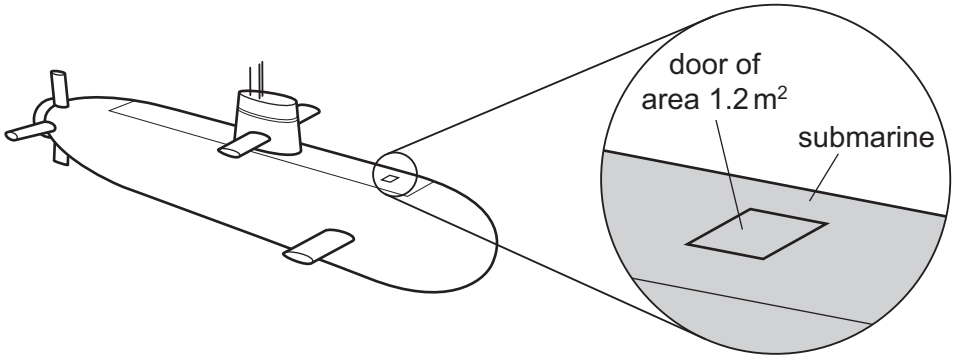
	between X and Y	between Y and Z
A	changing speed	constant speed
B	changing speed	not moving
C	constant speed	constant speed
D	constant speed	not moving

29 The extension–load graph for a wire is shown.

Which labelled point represents the limit of proportionality of the wire?



30 A flat door on the top of a submarine has an area of $1.2\,m^2$.



The pressure of the water above the door of the submarine is 3.0×10^5 Pa, and the pressure of the air inside the submarine is 1.0×10^5 Pa.

What is the magnitude of the resultant force on the door?

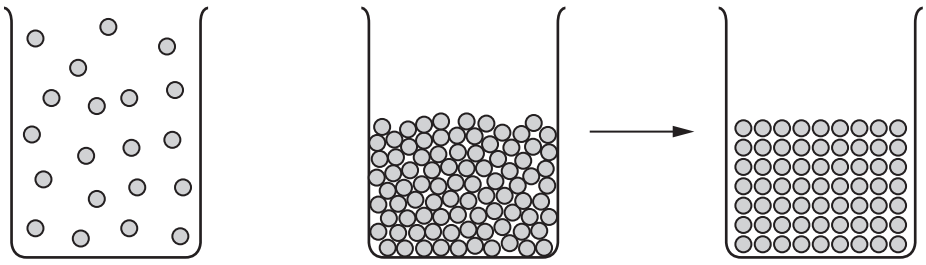
A 1.2×10^5 N **B** 2.4×10^5 N **C** 3.6×10^5 N **D** 4.8×10^5 N

31 A force F acts on an object as it moves a distance d across a smooth surface. The energy of the object changes by ΔE.

Which equation gives the work done W on the object by the force?

A $W = \frac{\Delta E}{F \times d}$ **B** $W = \Delta E \times d$ **C** $W = \frac{\Delta E}{d}$ **D** $W = \Delta E$

32 Three beakers contain samples of the same substance. The diagrams indicate the molecular structures of the substance in each of the beakers.



Which change of state is represented by the arrow?

A liquid to gas

B liquid to solid

C solid to gas

D solid to liquid

33 A room is heated by a heater on a wall.

Which statement describes what happens to the heated air just above the heater?

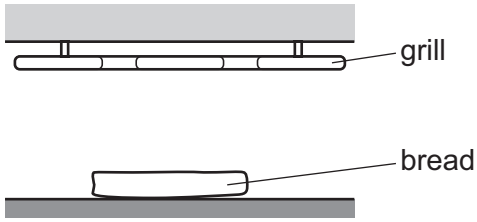
A The heated air becomes denser and falls.

B The heated air becomes denser and rises.

C The heated air becomes less dense and falls.

D The heated air becomes less dense and rises.

34 Bread is toasted under a hot grill.



What is the main part of the electromagnetic spectrum involved in transferring thermal energy from the grill to the bread?

A infrared

B gamma radiation

C radio waves

D X-rays

35 A sound wave is travelling at a speed of 300 m / s in air. The sound wave has a frequency of 7.5 kHz.

What is the wavelength of the sound wave?

A 4.0 cm **B** 25 cm **C** 4.0 m **D** 25 m

36 A ray of light is incident on a plane mirror at an angle of incidence of 20°.

What is the angle between the incident ray and the reflected ray?

A 10° **B** 20° **C** 40° **D** 70°

37 A thin converging lens is used as a magnifying glass to view an object.

Where is the object placed?

A further than two focal lengths from the lens

B at exactly two focal lengths from the lens

C between one and two focal lengths from the lens

D closer to the lens than one focal length

38 A potential difference (p.d.) of 10 V across a resistor produces a current of 2.0 A in the resistor.

What is the resistance of the resistor?

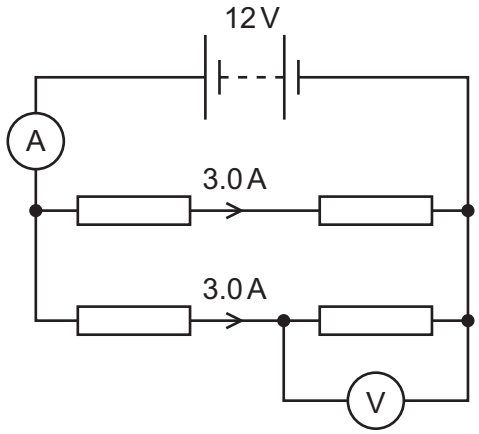
A 0.050 Ω **B** 0.20 Ω **C** 5.0 Ω **D** 20 Ω

39 Four wires are made of the same material. They have different lengths and different cross-sectional areas.

Which wire has the smallest resistance?

	length	cross-sectional area
A	l	$\frac{A}{2}$
B	l	A
C	$2l$	$\frac{A}{2}$
D	$2l$	A

40 The diagram shows a circuit containing a 12 V battery, four identical resistors, an ammeter and a voltmeter. Two values of current are shown.



What is the reading on the ammeter, and what is the reading on the voltmeter?

	reading on ammeter / A	reading on voltmeter / V
A	3.0	6.0
B	3.0	12
C	6.0	6.0
D	6.0	12

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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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

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.).