Cambridge Assessment International Education

Cambridge O Level

COMBINED SCIENCE **5129/11**

Paper 1 Multiple Choice **May/June 2025**

1 hour

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 Which functions are carried out by the liver?

1 assimilation

2 breakdown of excess amino acids

3 excretion of urea

4 glycogen storage

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

2 What is the term for the movement of nutrients from the intestine into the cells lining the digestive system?

A absorption

B digestion

C excretion

D osmosis

3 Which process produces oxygen?

A combustion

B deforestation

C photosynthesis

D transpiration

4 Which raw materials are needed for a plant to make carbohydrates?

A carbon dioxide and glucose

B glucose and oxygen

C oxygen and water

D water and carbon dioxide

5 Which statements explain why bacteria are used in biotechnology?

1 They can produce complex molecules.

2 Their reproduction rate is slow.

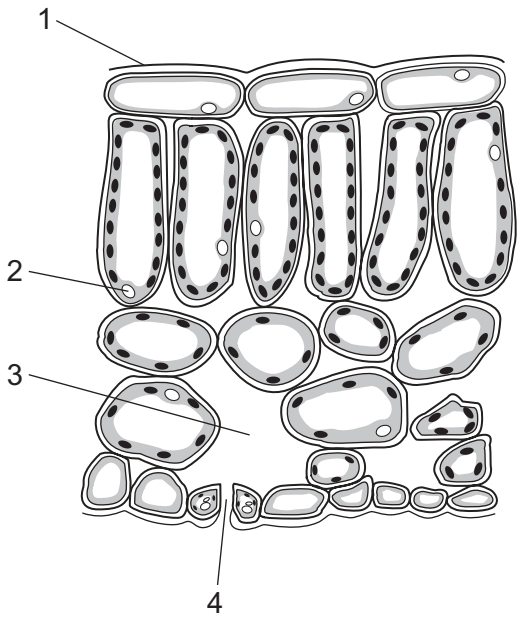
3 There are no ethical concerns with their use.

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

6 Which pair of statements are correct for the process of osmosis?

	movement of water molecules	type of membrane
A	from a higher to a lower water potential	fully permeable membrane
B	from a higher to a lower water potential	partially permeable membrane
C	from a lower to a higher water potential	fully permeable membrane
D	from a lower to a higher water potential	partially permeable membrane

7 The diagram shows the cross-section of a dicotyledonous leaf.



Which labels show features of a leaf that are directly involved in gas transport into and out of the leaf?

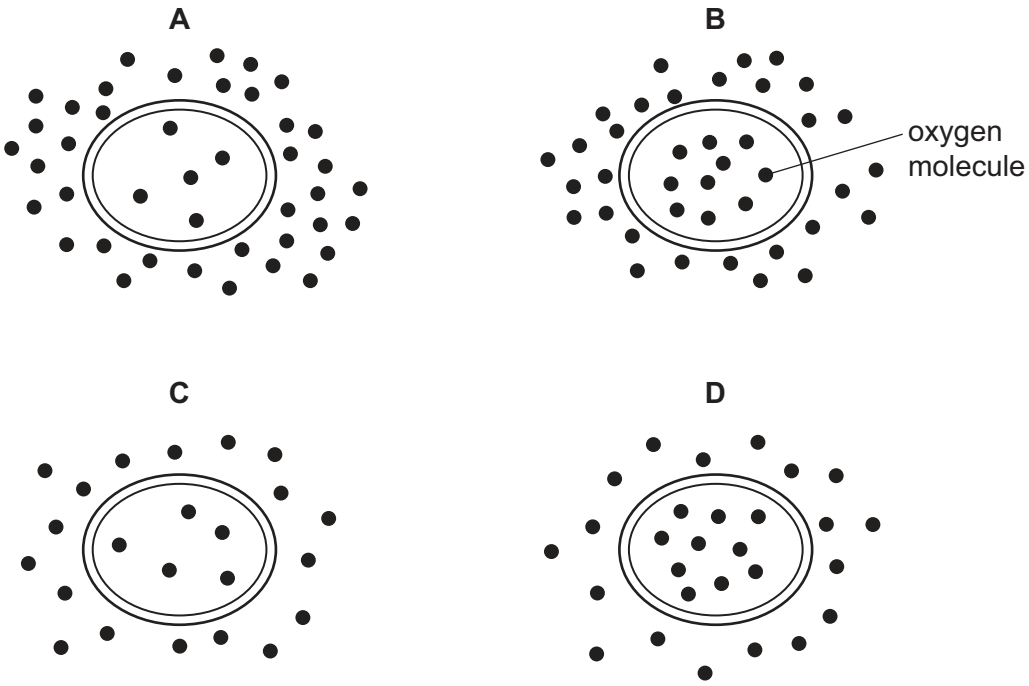
A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

8 Which row describes a vein?

	walls	valves
A	thick	no
B	thick	yes
C	thin	no
D	thin	yes

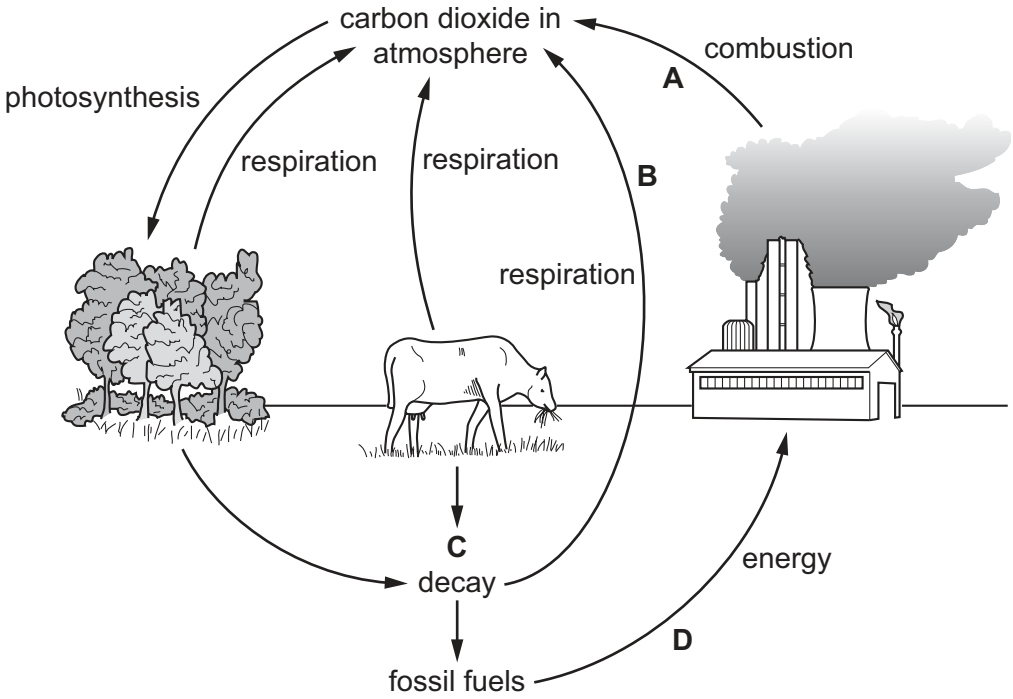
9 The diagrams show four cells with concentrations of oxygen inside and outside of the cell.

In which cell would diffusion occur at the fastest rate?



10 The diagram shows some stages of the carbon cycle.

At which stage are bacteria directly involved?



11 Nicotine in inhaled tobacco smoke enters the blood at the lungs.

What is the first part of the heart to receive blood containing nicotine?

A left atrium

B right atrium

C left ventricle

D right ventricle

12 What are the products of anaerobic respiration in muscle cells?

A carbon dioxide and a relatively large amount of energy

B carbon dioxide and a relatively small amount of energy

C lactic acid and a relatively large amount of energy

D lactic acid and a relatively small amount of energy

13 A palisade mesophyll cell from a leaf and a human cheek cell are observed under a light microscope.

Which structure will only be present in the palisade mesophyll cell?

A cell membrane

B chloroplast

C mitochondria

D nucleus

14 Which statement describes the changes in kinetic energy, movement and bunching of particles when a solid is heated through a temperature change of 5 °C and changes state to become a liquid?

A The particles lose kinetic energy, slow down and bunch closer together.

B The particles gain kinetic energy, move about rapidly and fill up all the available space.

C The particles gain kinetic energy, move around and remain bunched together.

D The particles gain kinetic energy, slow down and bunch closer together.

15 Brine is made by dissolving solid sodium chloride in water.

Which statements are correct?

1 Brine is a mixture.

2 Water is a solvent.

3 Brine is a solute.

4 Sodium chloride is a solution.

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

16 The mass number of an atom of aluminium is 27 and the atomic number is 13.

Which statement about this atom is correct?

A It contains 13 neutrons and 27 protons.

B It contains 13 nucleons and 27 protons.

C It contains 13 protons and 27 neutrons.

D It contains 13 protons and 27 nucleons.

17 Which statement about covalent compounds is correct?

A Each atom in a molecule has a full outer shell of electrons.

B In covalent bonding, electrons are transferred from one atom to another.

C A hydrogen molecule contains two covalent bonds.

D Sodium chloride is a covalent compound.

18 The formula of aluminium chloride is $AlCl_3$.

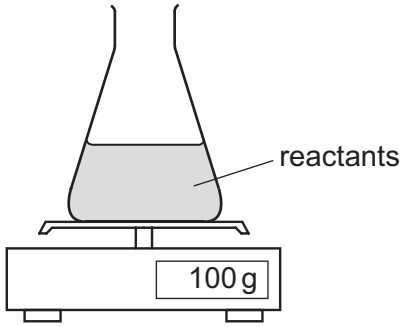
What are the charges on the aluminium and chloride ions?

	aluminium ion	chloride ion
A	+1	–3
B	+1	–1
C	+3	–3
D	+3	–1

19 Which statements about dissolving ammonium nitrate in water are correct?

	statement 1	statement 2
A	the process is endothermic	the temperature of the surroundings decreases
B	the process is endothermic	the temperature of the surroundings increases
C	the process is exothermic	the temperature of the surroundings decreases
D	the process is exothermic	the temperature of the surroundings increases

20 The apparatus used to measure the rate of reaction is shown.



Which reaction is studied using this apparatus?

A $MgCO_3 + 2HCl \rightarrow MgCl_2 + CO_2 + H_2O$

B $Ca(OH)_2 + 2HNO_3 \rightarrow Ca(NO_3)_2 + H_2O$

C $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

D $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

21 Which statements about alkalis are correct?

1 They turn universal indicator green.

2 They produce hydroxide ions in water.

3 They have a pH greater than 7.

4 They react with ammonia to form ammonium salts.

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

22 Which properties of elements decrease from left to right across a period of the Periodic Table?

1 metallic character

2 number of electron shells

3 number of electrons in the outer shell

4 tendency to form positive ions

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

23 The results of two separate tests on aqueous cation P are shown.

test	observations
add aqueous sodium hydroxide	white precipitate, soluble in excess
add aqueous ammonia	white precipitate, insoluble in excess

What is P?

A aluminium, $A\ell^{3+}$

B ammonium, NH_4^+

C calcium, Ca^{2+}

D zinc, Zn^{2+}

24 The results of reactions involving three metals and the aqueous solutions of their ions are shown.

- No reaction is observed when nickel is added to aqueous cobalt sulfate.
- A black solid is produced when cadmium is added to aqueous cobalt sulfate.

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

A cadmium → cobalt → nickel

B cadmium → nickel → cobalt

C nickel → cobalt → cadmium

D nickel → cadmium → cobalt

25 Which row shows the volume of the gases in a sample of clean air?

	volume of air sample / cm^3	volume of nitrogen / cm^3	volume of oxygen / cm^3	volume of other gases / cm^3
A	50	39	10.5	0.50
B	50	40	5.0	5.0
C	100	71	21	8.0
D	100	78	16	6.0

26 Which statement about drinking water is correct?

A Drinking water contains dissolved ions.

B Drinking water is treated with chlorine to remove impurities.

C Drinking water is filtered to remove dissolved solids.

D Drinking water is treated with carbon to remove microbes.

27 The properties of four fractions obtained from the fractional distillation of petroleum are listed.

- Fraction Y is more volatile than fraction W.
- Fraction X contains molecules with a shorter chain length than fraction Z.
- Fraction Z is more flammable than fraction Y.
- Fraction W is more viscous than fraction X.

Which row identifies the four fractions?

	W	X	Y	Z
A	gasoline	diesel oil	refinery gas	lubricating oil
B	gasoline	refinery gas	diesel oil	lubricating oil
C	lubricating oil	diesel oil	refinery gas	gasoline
D	lubricating oil	refinery gas	diesel oil	gasoline

28 A force is exerted on an object so that it accelerates.

Which change would double the size of the acceleration?

A doubling the force and halving the mass of the object

B doubling the force only

C doubling the mass of the object and halving the force

D doubling the mass only

29 Which electromagnetic radiation can be used to sterilise water **and** to make security markings on banknotes glow?

A microwaves

B ultraviolet light

C visible light

D X-rays

30 Which quantity is measured in coulombs?

A charge

B current

C energy

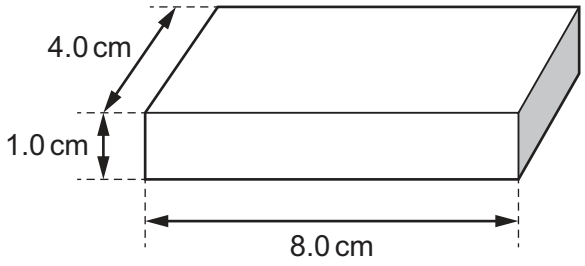
D potential difference

31 A radio wave has a frequency of 5.0×10^4 Hz.

What is the wavelength of the radio wave in a vacuum?

A 1.7×10^{-4} m **B** 6.0×10^3 m **C** 3.0×10^8 m **D** 1.5×10^{13} m

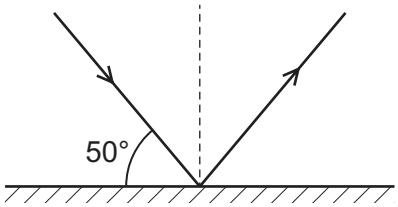
32 A block of wood has the dimensions shown and a mass of 24.0 g.



What is the density of the wood?

A $0.75\,g/cm^3$ **B** $1.33\,g/cm^3$ **C** $1.85\,g/cm^3$ **D** $3.00\,g/cm^3$

33 The diagram shows a ray of light being reflected from a plane mirror.

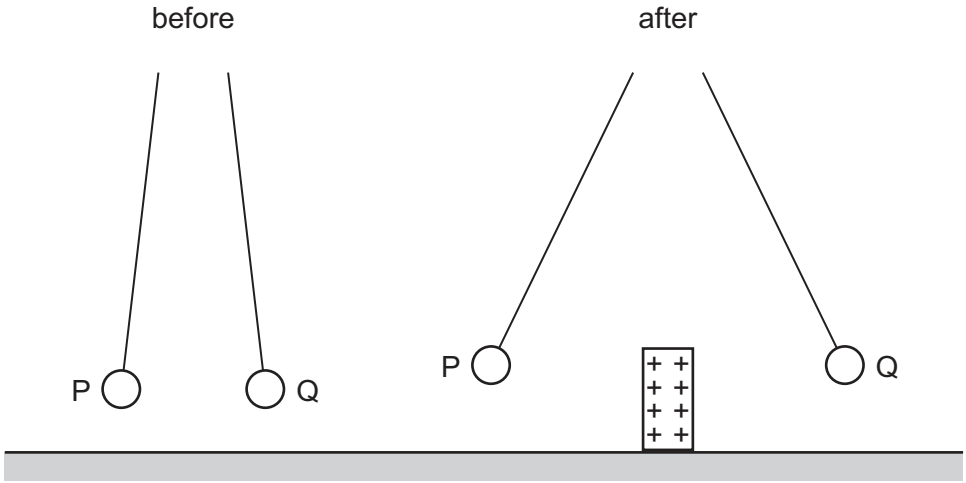


The angle of incidence is increased by 10°.

What does the angle of reflection become?

A 30° **B** 40° **C** 50° **D** 60°

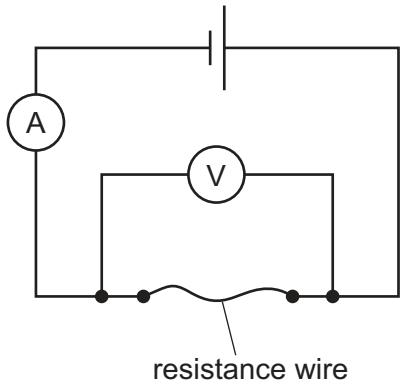
34 The diagram shows two charged spheres, P and Q, hanging from nylon threads before and after a positively charged strip is placed between them.



What are the charges on P and Q?

	charge on P	charge on Q
A	negative	negative
B	negative	positive
C	positive	negative
D	positive	positive

35 The circuit shown is used to find the resistance of a length of resistance wire.



Which equation is used to calculate the resistance of the wire?

A $\text{resistance} = \dfrac{\text{reading on ammeter}}{\text{reading on voltmeter}}$

B resistance = reading on ammeter – reading on voltmeter

C $\text{resistance} = \dfrac{\text{reading on voltmeter}}{\text{reading on ammeter}}$

D resistance = reading on voltmeter – reading on ammeter

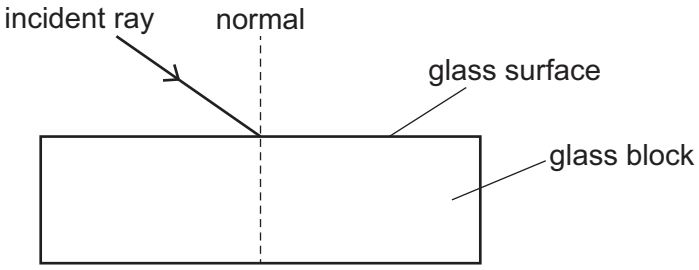
36 A cylindrical length of material hangs from a fixed point.

A weight is then suspended from the lower end of the material.

What happens to the length and to the diameter of the material?

	length	diameter
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

37 A ray of light is incident on a rectangular glass block. The angle of incidence is 55°.



Some of the light enters the glass.

What is the angle between the ray of light in the glass and the surface of the glass?

A below 20°

B between 25° and 35°

C between 35° and 89°

D 90°

38 In the generation of electricity, some energy resources produce a significant quantity of polluting gases.

Which list includes a resource that produces polluting gases?

A biofuels, wave power, wind power

B geothermal, hydroelectric, wind power

C nuclear, solar, tidal

D tidal, wind power, wave power

39 Which symbol is a unit for energy?

A kWh **B** N/m **C** V **D** W

40 Which statement about elements and isotopes is **not** correct?

A An element and its isotope are chemically identical.

B An element and its isotope have the same atomic number.

C An isotope is always the radioactive form of an element.

D Elements can have more than one isotope.

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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.).