



MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
CAMBRIDGE INTERNATIONAL EDUCATION
General Certificate of Education Advanced Level

CHEMISTRY

8873/01

Paper 1 Multiple Choice

For examination from 2026

SPECIMEN PAPER

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet Data booklet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **thirty** 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 index number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use an approved calculator.

INFORMATION

- The total mark for this paper is 30.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

This document has **12** pages.



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- 1 The hydrogen molecule contains a covalent bond.

What holds the atoms together in this covalent molecule?

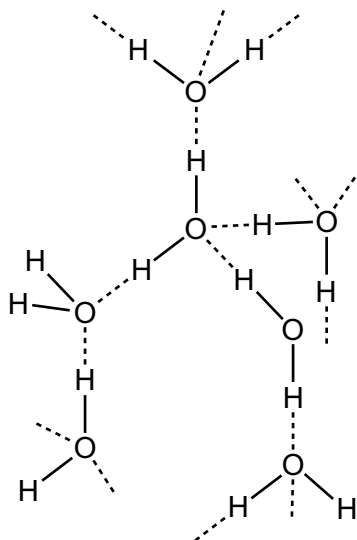
- A** the electrostatic attraction between the atoms in the molecule
B the electrostatic attraction between the electron of one hydrogen atom and the nucleus of the other hydrogen atom
C the electrostatic attraction between the electrons in the bond pair and the two nuclei
D the energy released in the formation of the covalent bond
- 2 The actual values of the masses of three sub-atomic particles are shown in the table.

	proton	neutron	electron
mass/kg	1.673×10^{-27}	1.675×10^{-27}	9.109×10^{-31}

Which nickel ion is predicted to have a mass of 1.038×10^{-25} kg from these data?

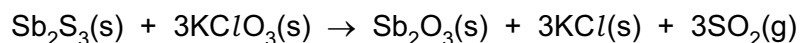
- A** ${}_{28}^{58}\text{Ni}^{3+}$ **B** ${}_{28}^{60}\text{Ni}^{2+}$ **C** ${}_{28}^{62}\text{Ni}^{2+}$ **D** ${}_{28}^{64}\text{Ni}^{3+}$
- 3 Which statement about 1 mol of a metal is always correct?
- A** It contains the same number of atoms as 1 mol of hydrogen atoms.
B It contains the same number of atoms as $\frac{1}{12}$ mol of ${}^{12}\text{C}$ atoms.
C It has the same mass as 1 mol of hydrogen atoms.
D It is liberated from its ions by 1 mol of electrons.

- 4 The diagram shows the structure of part of a crystal of ice.



Which statement about this structure is correct?

- A** All the bond angles surrounding each oxygen atom are 120° .
- B** Four electrons from each oxygen atom are involved in forming hydrogen bonds.
- C** The hydrogen bonds, shown by the dotted line, are stronger than the O-H covalent bonds.
- D** The open structure of ice causes ice to be denser than water.
- 5 The head of the first type of match, called a 'lucifer', contained a mixture of antimony(III) sulfide and potassium chlorate(V). When the match was 'struck', the following reaction took place.



Which element is reduced in the reaction?

- A** antimony **B** chlorine **C** oxygen **D** sulfur
- 6 Use of the data booklet is relevant to this question.

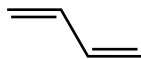
The successive ionisation energies, in kJ mol^{-1} , of an element X are given.

870 1800 3000 3600 5800 7000 13200

What is X?

- A** ${}_{33}\text{As}$ **B** ${}_{40}\text{Zr}$ **C** ${}_{52}\text{Te}$ **D** ${}_{53}\text{I}$

- 7 Synthetic rubber is commonly produced from the monomer buta-1,3-diene.



buta-1,3-diene

What are the numbers of σ bonds and π bonds present in one molecule of buta-1,3-diene?

	σ	π
A	6	4
B	7	4
C	8	2
D	9	2

- 8 Polymerisation of ethene gives poly(ethene).

How does the carbon-carbon bond in poly(ethene) compare with that in ethene?

- A** The carbon-carbon bond is longer and stronger in poly(ethene).
B The carbon-carbon bond is longer and weaker in poly(ethene).
C The carbon-carbon bond is shorter and stronger in poly(ethene).
D The carbon-carbon bond is shorter and weaker in poly(ethene).
- 9 The elements phosphorus, sulfur and chlorine all exhibit covalent bonding. Their melting points are listed.

phosphorus 44 °C

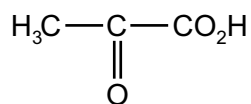
sulfur 115 °C

chlorine -101 °C

What accounts for these differences in melting points?

- A** the number of bond pairs in the molecules
B the number of electrons in the atoms
C the number of electrons in the molecules
D the number of unpaired electrons in the atoms

- 10 The diagram shows the structure of pyruvic acid.



pyruvic acid

Which set of bond angles in pyruvic acid would be predicted by Valence Shell Electron Pair Repulsion theory?

- A 105°, 109°, 120°
 B 105°, 120° only
 C 109°, 120°, 180°
 D 109°, 120° only
- 11 The gases butane, 2-methylpropane and propane are kept in a sealed container at atmospheric pressure and room temperature.

Which row represents the order in which these gases will liquefy as the pressure in the container is gradually increased?

	increasing pressure →		
A	butane	2-methylpropane	propane
B	2-methylpropane	butane	propane
C	propane	butane	2-methylpropane
D	propane	2-methylpropane	butane

- 12 Ammonia gas reacts with gaseous hydrogen chloride to form a white smoke of ammonium chloride.

Which statements correctly describe the behaviour of ammonia in this reaction?

- 1 It acts as an Arrhenius acid.
- 2 It acts as an Arrhenius base.
- 3 It acts as a Brønsted–Lowry acid.
- 4 It acts as a Brønsted–Lowry base.

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

13 Which solution, when added to 25 cm³ of 0.100 mol dm⁻³ NaOH, produces a buffer solution?

- A 25 cm³ of 0.075 mol dm⁻³ CH₃CO₂H
- B 25 cm³ of 0.100 mol dm⁻³ HCl
- C 100 cm³ of 0.050 mol dm⁻³ HCl
- D 150 cm³ of 0.025 mol dm⁻³ CH₃CO₂H

14 The table shows some data on two acid-base indicators.

indicator	approximate pH range of colour change	colour range	
		acid	alkali
bromocresol-green	3.8–5.5	yellow	blue
phenol-red	6.8–8.5	yellow	red

Which conclusion can be drawn about a solution in which bromocresol-green is blue and phenol-red is yellow?

- A It is weakly acidic.
 - B It is neutral.
 - C It is weakly alkaline.
 - D It is strongly alkaline.
- 15 When there is a small increase in the amount of CO₂(g) in the atmosphere, the pH of an ocean is maintained by a series of chemical reactions.

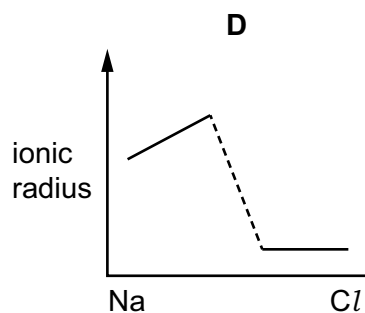
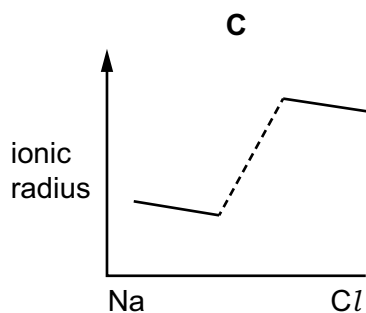
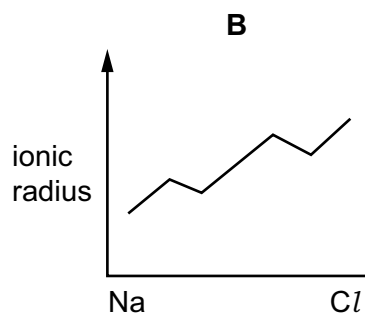
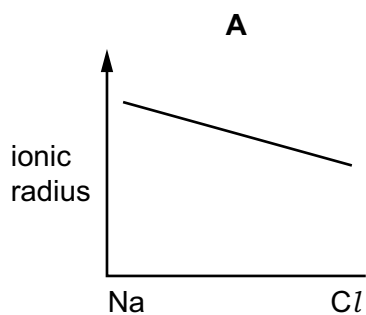
Which equation maintains the pH in the ocean?

- A $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$
- B $\text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-$
- C $\text{Ca}^{2+} + 2\text{H}^- \rightarrow \text{CaH}_2$
- D $\text{H}^+ + \text{CO}_3^{2-} \rightarrow \text{HCO}_3^-$

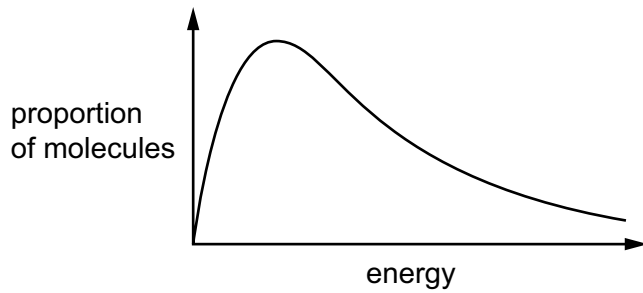
16 Which row describes and explains the trend in electronegativity from fluorine to iodine?

	trend in electronegativity	explanation
A	decreases	the bonding pair of electrons becomes further away from the nucleus and so is less attracted to it
B	decreases	ionisation energy decreases down the group because the outer electron is strongly attracted to the nucleus
C	increases	the bonding pair of electrons becomes further away from the nucleus and so is less attracted to it
D	increases	ionisation energy decreases down the group because the outer electron is strongly attracted to the nucleus

17 Which diagram represents the change in ionic radius of the ions of the elements across the third period (Na to Cl)?



- 18 The diagram represents the Boltzmann distribution of molecular energies of a sample of gas at a given temperature.



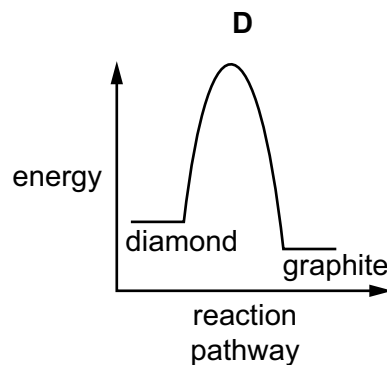
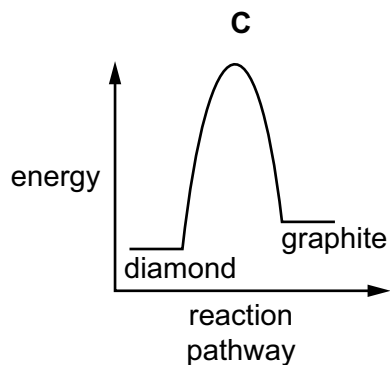
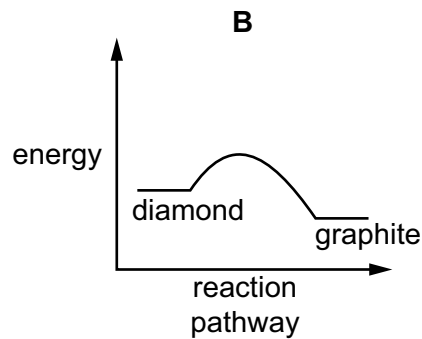
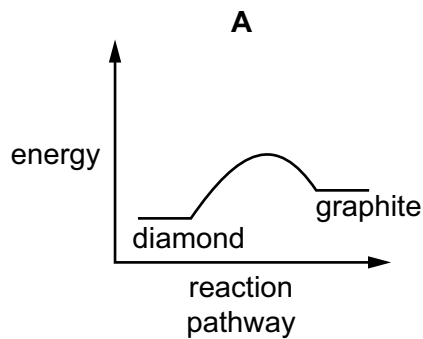
As temperature increases, which statements are correct?

- 1 The maximum of the curve is displaced to the right.
- 2 The proportion of molecules with energies **above** any given value increases.
- 3 The proportion of molecules **with** any given energy increases.

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

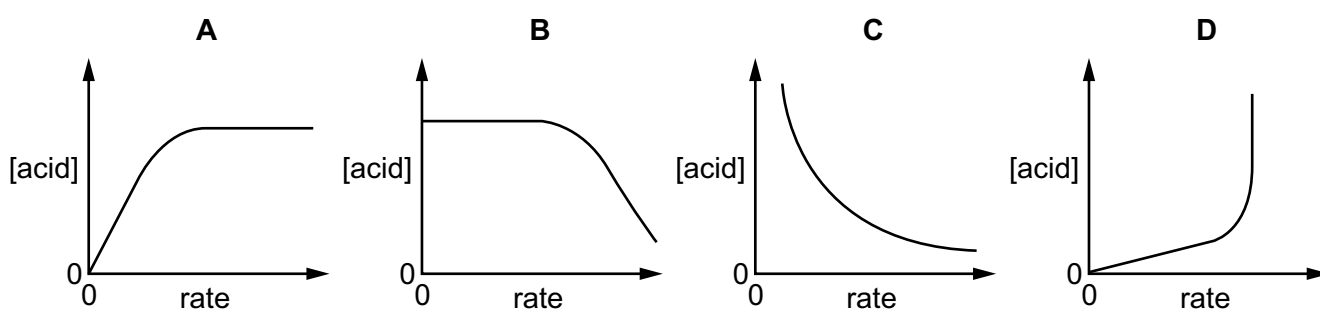
- 19 The conversion of diamond into graphite is slightly exothermic. Diamond does not readily change into graphite.

Which reaction pathway diagram correctly represents this conversion?



- 20 Which statement about the effect of a catalyst on a system at equilibrium is correct?
- A It increases the equilibrium constant for the forward reaction.
 B It increases the equilibrium yield of product.
 C It increases the rate constant equally for both the forward reaction and the reverse reaction.
 D It increases the rate constant for the forward reaction, but not that of the reverse reaction.
- 21 In the reaction between aqueous sodium thiosulfate and dilute acid, the reaction is found to be first order with respect to [acid] at low concentration, but zero order with respect to [acid] at high concentration.

Which graph represents the experimental results?



- 22 The use of catalytic converters in car exhaust systems reduces the amount of harmful nitrogen oxides emitted into the atmosphere.

Which statements about the catalytic converter are correct?

- 1 The catalyst is coated onto a honeycomb surface to provide a smaller surface area to increase the rate of the reaction.
- 2 The catalyst used is a heterogenous catalyst which lowers the activation energy for the conversion of NO into N_2 .
- 3 The forces of attraction holding the CO and NO molecules onto the surface of the catalyst are weaker than the forces of attraction holding the product molecules onto the surface.
- 4 Rhodium can be used as a catalyst in the catalytic converter.

- A 1, 2 and 4 B 1 and 3 C 2, 3 and 4 D 2 and 4 only

- 23 In which reaction will the equilibrium yield of the right hand product be increased by **both** of the indicated changes in pressure and temperature?

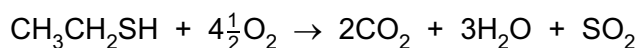
	reaction	$\Delta H/\text{kJ mol}^{-1}$	pressure	temperature
A	$2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{SO}_3(\text{g})$	-96	increase	increase
B	$\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$	-10	decrease	decrease
C	$\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$	+58	decrease	increase
D	$\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$	+180	increase	decrease

- 24 Iodine trichloride, ICl_3 , is made by reacting iodine with chlorine.



What is the standard enthalpy change of formation for solid iodine trichloride?

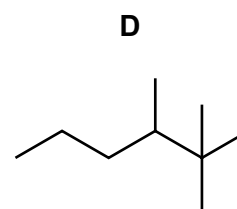
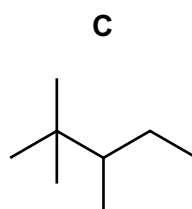
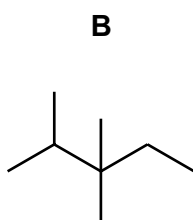
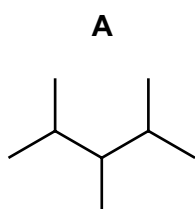
- A** -60 kJ mol^{-1} **B** -74 kJ mol^{-1} **C** -81 kJ mol^{-1} **D** -162 kJ mol^{-1}
- 25 The equation for the complete combustion of ethanethiol is shown.



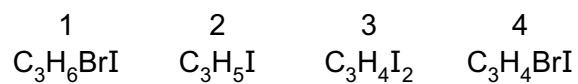
A 20 cm^3 sample of ethanethiol vapour is ignited with 100 cm^3 of oxygen. After burning, the gas is cooled to room temperature. The cooled gas is then treated with an excess of aqueous alkali.

What percentage of the final volume of cooled gas dissolves in the alkali?

- A** 29% **B** 57% **C** 86% **D** 100%
- 26 What is the skeletal formula for 2,2,3-trimethylpentane?

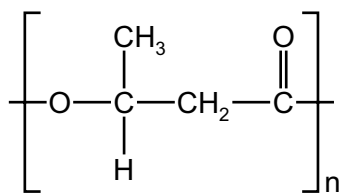


27 Which molecular formulae could represent molecules that exhibit *cis-trans* isomerism?



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

28 PHB is a polymer made by bacteria.

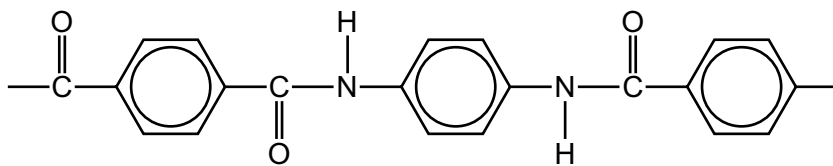


PHB

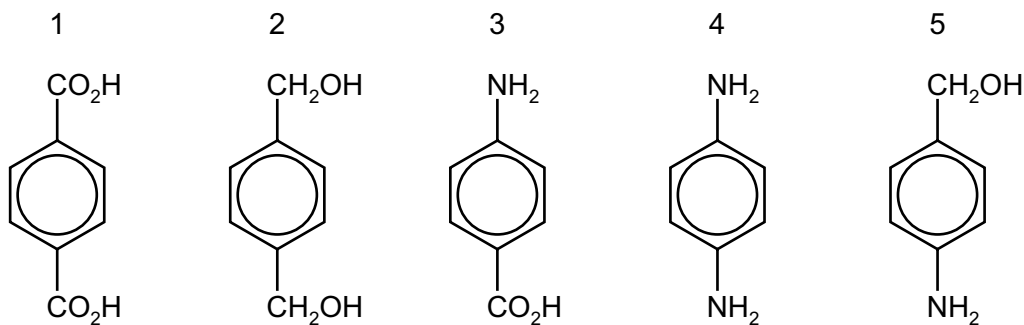
Which row correctly describes PHB?

	type of polymer	reaction of polymer with strong acid and heat
A	addition	hydrolysis
B	condensation	hydrolysis
C	addition	no reaction
D	condensation	no reaction

29 Part of the structure of the polymer Kevlar[®] is shown.



Which monomers could be used to make Kevlar[®]?



- A** 1 and 4 **B** 2 and 4 **C** 3 **D** 5

30 When egg white is heated, protein molecules are denatured.

Which statements describe what happens in this process?

- 1 The hydrogen bonds and induced dipole interactions are broken.
- 2 The peptide bonds are broken by hydrolysis.
- 3 The three-dimensional structure of the molecule changes.

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

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