



CANDIDATE
NAME

CG

H1 GROUP

1 / 2

CHEMISTRY

8873/01

Paper 1 Multiple Choice

18 September 2025

1 hour

Additional Materials: Multiple Choice Answer Sheet
Data Booklet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name and class in the spaces at the top of this page and on the Answer Sheet in the spaces provided unless this has been done for you.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

- 1 The table below contains incomplete information about three ions, E, F and G, which are isoelectronic (same number of electrons).

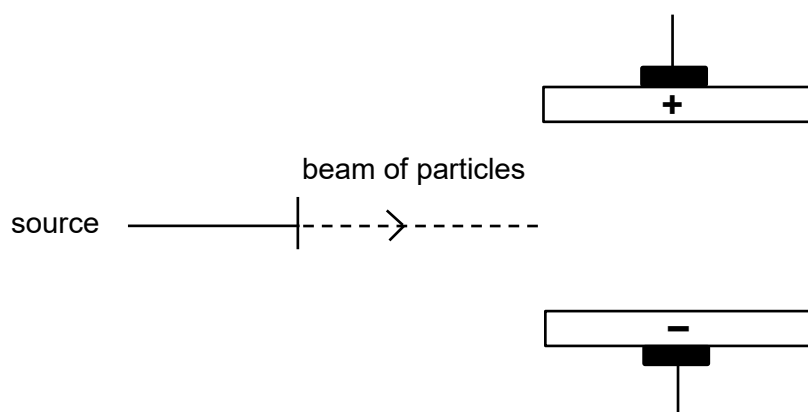
The atoms of F and G are isotopes.

ion	mass number	atomic number	number of neutrons	number of electrons	charge
E	55	25			y
F	56	26			
G	x		31		3+

What are the possible values of **x** and **y**?

	x	y
A	56	2+
B	56	3+
C	57	2+
D	57	3+

- 2 In two separate experiments, a beam of protons and a beam of electrons, travelling at the same velocity, pass through an electric field as shown.



Which set of observations is correct?

- A** The two beams are deflected in opposite directions. The electron beam is deflected the most.
B The two beams are deflected in opposite directions. The proton beam is deflected the most.
C The two beams are deflected in the same direction. The electron beam is deflected the most.
D The two beams are deflected in the same direction. The proton beam is deflected the most.

- 3 *Use of the Data Booklet is relevant to this question.*

Which species has three unpaired electrons?

- A** Al **B** Ti^{3+} **C** Zn^{2+} **D** Cr^{3+}

- 4 *Use of the Data Booklet is relevant to this question.*

How many atoms are there in 100 cm^3 of oxygen gas measured at s.t.p.?

- A** 2.51×10^{21} **B** 2.65×10^{21} **C** 5.02×10^{21} **D** 5.30×10^{21}

- 5 The relative atomic mass of antimony, which consists of the isotopes ^{121}Sb and ^{123}Sb , is 121.8.

What is the percentage of ^{123}Sb in the isotopic mixture?

- A** 40% **B** 45% **C** 50% **D** 60%

- 6 The boiling point of ethylamine, $\text{CH}_3\text{CH}_2\text{NH}_2$, is 16.6°C .

Which bonds are broken when ethylamine is boiled?

- 1 instantaneous dipole–induced dipole interactions
- 2 hydrogen bonds
- 3 covalent bonds

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

- 7 Three substances, H, J and K, have physical properties as shown.

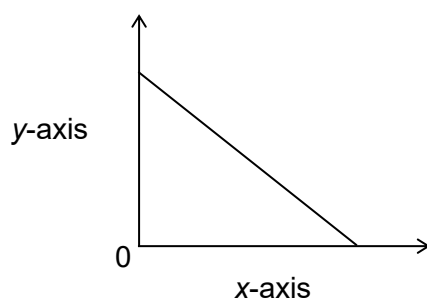
substance	H	J	K
melting point / °C	801	-7	3550
boiling point / °C	1413	59	4827
electrical conductivity when in solid state	poor	poor	good

What could be the identities of H, J and K?

	H	J	K
A	bromine	sodium chloride	graphite
B	bromine	sodium chloride	silicon dioxide
C	sodium chloride	bromine	graphite
D	sodium chloride	bromine	silicon dioxide

- 8 The kinetics of a zero order reaction $L \rightarrow M$ was investigated.

A pair of quantities was plotted and the following graph was obtained.



Which pair of quantities gives the graph above?

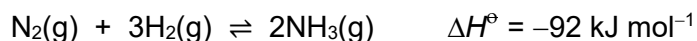
	y-axis	x-axis
A	rate	[L]
B	rate	[M]
C	[L]	time
D	[M]	time

- 9 There are 39 known isotopes of radon (Rn) from ^{193}Rn to ^{241}Rn . The most stable isotope is ^{222}Rn with a half-life of 3.8 days.

Given that the decay of ^{222}Rn is a first order reaction, how long will it take for ^{222}Rn to decrease to one-eighth of its original amount?

- A** 7.6 days **B** 11.4 days **C** 15.2 days **D** 30.4 days

- 10 Which changes in conditions would result in a change in the value of the equilibrium constant, K_c , for the following reaction?

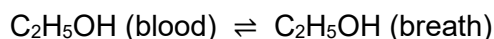


- 1 increasing temperature
- 2 increasing the concentration of N_2
- 3 adding a catalyst

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

- 11 Ethanol in blood can be assumed to be in dynamic equilibrium with ethanol in breath.

This equilibrium forms the basis of the roadside breathalyser test.



The equilibrium constant, K_c , for this equilibrium is 4.3×10^{-4} .

The concentration of ethanol in a motorist's blood is found to be 75 mg in 100 cm^3 of blood.

What is the concentration of ethanol in the motorist's breath in mg per 100 cm^3 ?

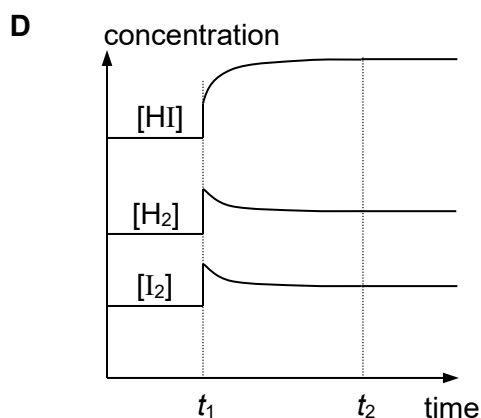
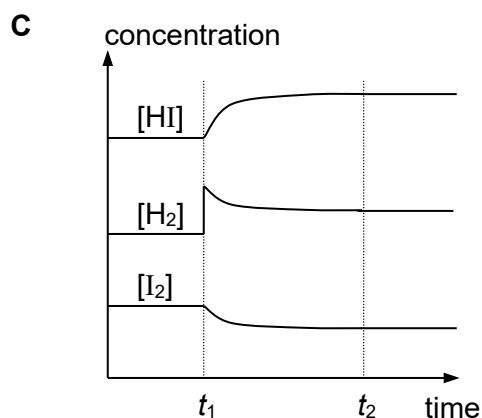
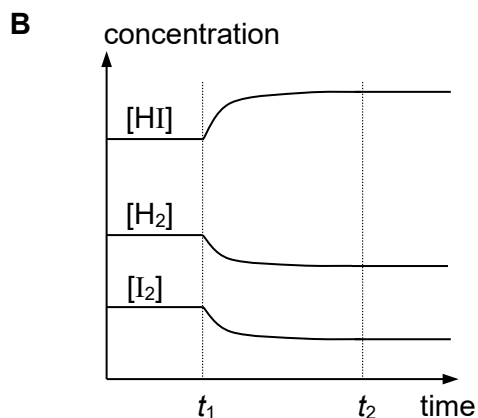
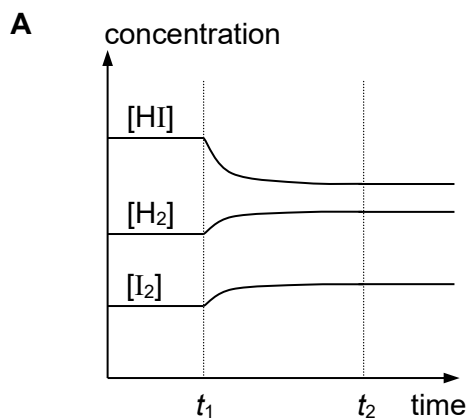
- A** 3.23×10^{-4} **B** 3.23×10^{-2} **C** 1.74×10^5 **D** 3.23×10^6

- 12 Hydrogen reacts with iodine to form hydrogen iodide. This reaction is reversible and is allowed to reach an equilibrium.



At time = t_1 , the temperature was increased.

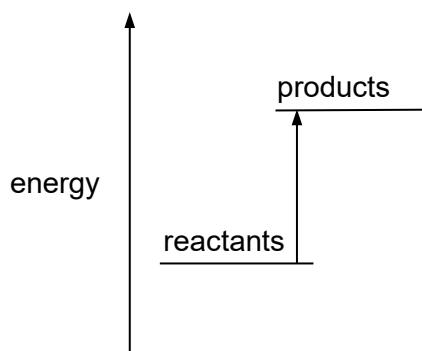
Which graph correctly shows the changes in the concentrations of hydrogen, iodine and hydrogen iodide?



- 13 Which statement best defines the term *bond energy* for HBr?

- A Energy released when one mole of HBr is formed from its gaseous atoms.
- B Energy released when one mole of HBr is formed from its gaseous ions.
- C Energy required when one molecule of HBr is broken down into its gaseous atoms.
- D Energy required when one mole of HBr is broken down into its gaseous atoms.

14 Which change could have the energy level diagram shown?



- A $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$
- B $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
- C $\text{Li}^+(\text{g}) + \text{H}^-(\text{g}) \rightarrow \text{LiH}(\text{s})$
- D $\text{LiOH}(\text{s}) \rightarrow \text{Li}^+(\text{g}) + \text{OH}^-(\text{g})$

15 Use of the Data Booklet is relevant to this question.

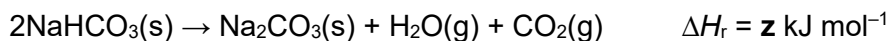
The lattice energies of rubidium fluoride, RbF , and caesium chloride, CsCl , are shown in the table.

compound	lattice energy / kJ mol^{-1}
RbF	-760
CsCl	-650

Which value is likely to be the lattice energy of caesium fluoride, CsF , in kJ mol^{-1} ?

- A -460
- B -550
- C -680
- D -800

- 16** Sodium bicarbonate, NaHCO_3 , decomposes into sodium carbonate, water and carbon dioxide when heated.



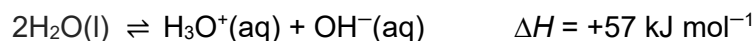
The following enthalpy changes of formation are given.

compound	$\Delta H_f / \text{kJ mol}^{-1}$
$\text{NaHCO}_3(\text{s})$	-948
$\text{Na}_2\text{CO}_3(\text{s})$	-1131
$\text{H}_2\text{O}(\text{g})$	-286
$\text{CO}_2(\text{g})$	-394

What is the value of **z**?

- A** -85 **B** +85 **C** -863 **D** +863
- 17** What is the definition of an Arrhenius base?
- A** A substance that accepts hydrogen ions.
- B** A substance that donates a lone pair of electrons.
- C** A substance that produces hydroxide ions in aqueous solution.
- D** A substance that readily reacts with an acid to form a salt and water only.

- 18** The equation for the dissociation of water is as follows:



Which statement about pure water is correct?

- A** As the volume of water increases, the pH of water also increases.
- B** As temperature increases, the pH of water also increases.
- C** The sum of pH and pOH is 14 at all temperatures.
- D** $[\text{H}^+]$ will always equal to $[\text{OH}^-]$ at all temperatures.

19 What is the pH of a solution containing 0.3 mol dm^{-3} sulfuric acid?

- A** 0.22 **B** 0.52 **C** 1.00 **D** 13.8

20 The table below describes the reaction of oxides of three elements in Period 3 of the Periodic Table, when the oxides are reacted with acid or base.

element	reaction of oxide of element
P	dissolves in HCl(aq) to give a colourless solution
Q	dissolves in NaOH(aq) to give a colourless solution
R	dissolves in both NaOH(aq) and HCl(aq) , each giving a colourless solution

What could be the identities of P, Q and R?

	P	Q	R
A	Mg	S	Al
B	Na	Si	Al
C	Al	S	Si
D	S	Al	Mg

21 Which physical properties of the elements Na to Cl in Period 3 of the Periodic Table show a strictly decreasing trend across the period?

- 1 melting point
- 2 atomic radius
- 3 ionic radius

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

- 22 For the hydrides of the elements in Group 17, which trends down the group are correct?

	ease of decomposition	bond length
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 23 Which row regarding the shapes of ethane, ethene and benzene is correct?

	ethane	ethene	benzene
A	non-planar	non-planar	planar
B	non-planar	planar	planar
C	planar	non-planar	non-planar
D	planar	planar	non-planar

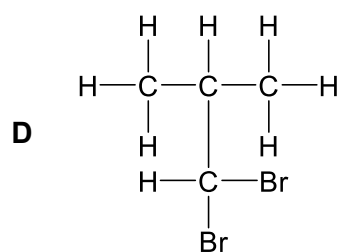
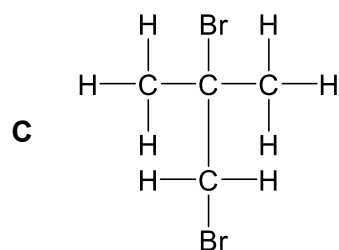
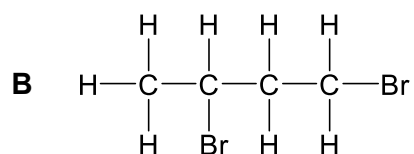
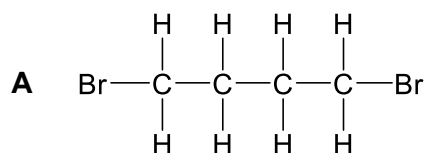
- 24 Which molecule can exhibit *cis-trans* isomerism?

- A 1,1-dichloroethene
- B 1,2-dichloroethene
- C 1,1,2-trichloroethene
- D tetrachloroethene

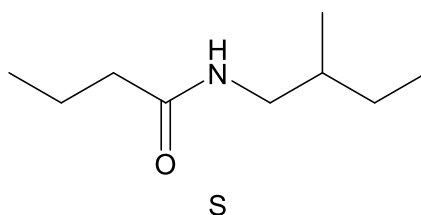
25 Which row **incorrectly** describes the change in bond angle about the carbon atom after a reaction?

	reaction	bond angle
A	CH_4 with $\text{Cl}_2(\text{g})$ under UV light	no change
B	$\text{CH}_3\text{CH}_2\text{OH}$ with conc. H_2SO_4 and heat	increased
C	$\text{CH}_3\text{CH}_2\text{Br}$ with aqueous NaOH and heat	no change
D	$\text{CH}_3\text{CH}_2\text{Br}$ with ethanolic NaOH and heat	decreased

26 Which compound could be formed by the action of bromine on an alkene of formula C_4H_8 ?



27 The skeletal formula of S is shown.



S can be made by reacting compounds T and U in the presence of dichlorohexylcarbodiimide, DCC.

What are the identities of T and U?

	T	U
A	propanoic acid	2-methylbutylamine
B	propanoic acid	3-methylbutylamine
C	butanoic acid	2-methylbutylamine
D	butanoic acid	3-methylbutylamine

28 Platinum nanoparticles are used in a catalytic converter.

Which statements regarding platinum nanoparticles are correct?

- 1 For the same mass of platinum, there is an increase in frequency of effective collisions between reactants and platinum nanoparticles when the diameter of nanoparticles is decreased.
- 2 Platinum nanoparticles are used since they have a large surface area to volume ratio.
- 3 Platinum nanoparticles form stronger bonds with reactants than bulk platinum.

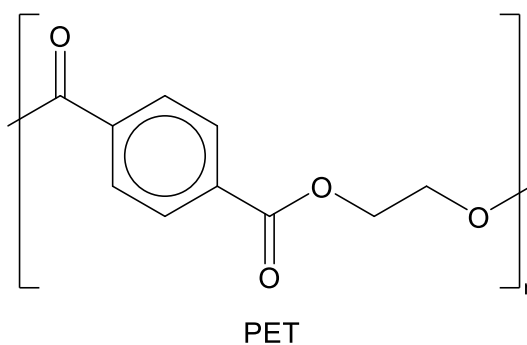
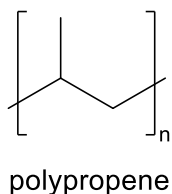
A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1 only

- 29 Some properties of polymers W, X, Y and Z are shown.

polymer	properties of the polymer
W	decomposes when heated and cannot be reshaped easily
X	low tensile strength and can be recycled
Y	softens when heated and can be reshaped easily
Z	high tensile strength and rigid

Which polymers are thermosets?

- A** W and X **B** W and Z **C** X and Y **D** Y and Z
- 30 Many bottles used to contain liquids are made with polypropene or poly(ethylene terephthalate), also known as PET.



Which statement is correct?

- A** PET can be used for storing alkaline detergent because it is a condensation polymer.
- B** Polypropene can be used for storing alkaline detergent because it has no double bonds.
- C** PET cannot be used for storing alkaline detergent because the ester functional group in PET can react with alkali.
- D** Polypropene cannot be used for storing alkaline detergent because the C–C bonds in polypropene can react with alkali.

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