



RIVER VALLEY HIGH SCHOOL

JC 2 PRELIMINARY EXAMINATION

CANDIDATE
NAME

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CLASS

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H1 CHEMISTRY

8873/01

Paper 1 Multiple Choice

25 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, class, centre number and index number on the Answer Sheet in the spaces provided.

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.

This document consists of 12 printed pages.

- 1 Which of the species in their gaseous state shown below will be deflected by the largest angle in an electric field?

A $^{11}\text{B}^{3+}$ B $^9\text{Be}^{2+}$ C $^1\text{H}_2$ D $^4\text{He}^{2+}$

- 2 What is the electronic configuration of an element with a **second** ionisation energy higher than that of each of the elements on either side of it in the Periodic Table?

A $1s^2 2s^2 2p^6 3s^2$
 B $1s^2 2s^2 2p^6 3s^2 3p^1$
 C $1s^2 2s^2 2p^6 3s^2 3p^2$
 D $1s^2 2s^2 2p^6 3s^2 3p^3$

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

High concentrations of ozone, O_3 , in the atmosphere at sea-level are dangerous. An acceptable concentration of O_3 is $8.00 \times 10^{-9} \text{ g cm}^{-3}$.

How many molecules of ozone would be present in 1 cm^3 of air at this concentration of O_3 ?

[L = Avogadro constant]

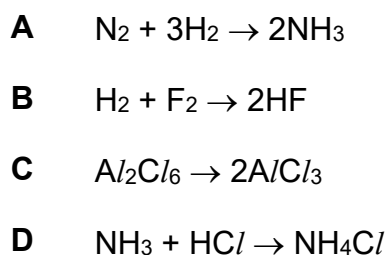
A $8.00 \times 10^{-9} \times L \times 48$ C $\frac{8.00 \times 10^{-9} \times 48}{L}$
 B $\frac{8.00 \times 10^{-9}}{L \times 48}$ D $\frac{8.00 \times 10^{-9} \times L}{48}$

- 4 When 20 cm^3 of a gaseous organic compound was completely burnt in 120 cm^3 of oxygen, there was a contraction of 50 cm^3 . On further treatment with aqueous potassium hydroxide, the volume decreased by 60 cm^3 .

Given that all volumes are measured at room temperature and pressure, what is the formula of the organic compound?

A C_2H_2 B C_2H_4 C C_3H_6 D C_3H_8

- 5 Which equation shows a reaction in which one or more co-ordinate (dative covalent) bonds are formed?



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

Why is the boiling point of hydrogen sulfide greater than that of fluorine?

- A** A molecule of hydrogen sulfide has more electrons than a molecule of fluorine.
- B** Molecules of hydrogen sulfide form hydrogen bonds, those of fluorine do not.
- C** Molecules of hydrogen sulfide has stronger permanent and induced dipoles than those of fluorine.
- D** The molecules of fluorine are polar, but those of hydrogen sulfide are non-polar.

- 7 Some physical properties of four substances that are crystalline in the solid state are given below.

Which substance is a simple molecular solid at room temperature?

	melting point/ °C	solubility in water at 25 °C/ g per 100 g of water	solubility in tetrachloromethane at 25 °C
A	0	very soluble	insoluble
B	112	0.03	very soluble
C	801	36	insoluble
D	1085	insoluble	soluble

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

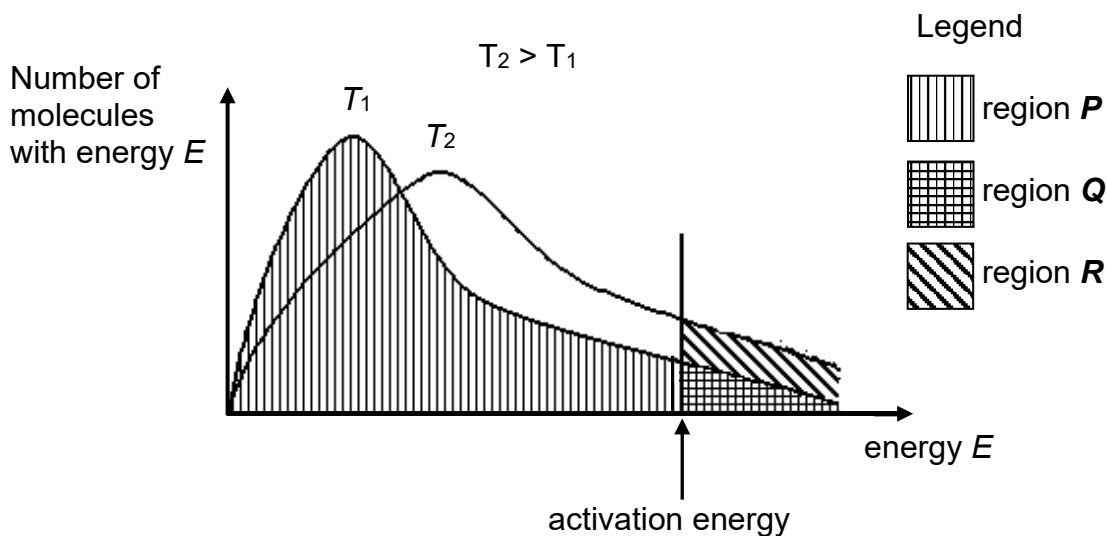
When 0.860 g of ethanol undergoes complete combustion below a beaker containing 300 g of water, the temperature of the water rises by 18 °C.

The theoretical enthalpy change of combustion of ethanol is $-1367 \text{ kJ mol}^{-1}$.

What is the efficiency of the process?

- A** 2%
B 7%
C 31%
D 88%
- 9 Which compound has the most negative lattice energy?
- A** Rubidium fluoride
B Rubidium oxide
C Potassium fluoride
D Potassium oxide
- 10 For which of the following reactions is the enthalpy change of reaction endothermic?
- 1 $\text{H}_2\text{SO}_4(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow \text{Na}_2\text{SO}_4(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
 2 $\text{Cl}_2(\text{g}) \rightarrow 2\text{Cl}(\text{g})$
 3 $\text{Mg}(\text{g}) \rightarrow \text{Mg}^+(\text{g}) + \text{e}^-$
 4 $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
- A** 2 and 3 only **B** 1 and 4 only **C** 3 and 4 only **D** 2, 3 and 4
- 11 The half-life of a radioactive isotope **P** is twice that of another radioactive isotope **Q**. In a sample of rock, it is found that the number of atoms of **Q** is 4 times that of **P**. What will be the ratio of the number of atoms of **P** to the number of atoms of **Q** in the rock after two half-lives of **P**?
- A** $\frac{1}{16}$ **B** $\frac{1}{4}$ **C** $\frac{1}{2}$ **D** 1

- 12 The distribution of the number of molecules with energy E is given in the sketch for two temperatures, T_1 and a higher temperature T_2 . The letters **P**, **Q**, **R** refer to the separate and differently shaded areas. The activation energy is marked on the energy axis.



Which expression gives the fraction of the molecules present which have at least the activation energy at the higher temperature T_2 ?

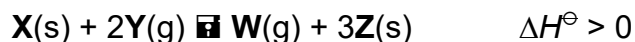
- A** $\frac{Q}{P}$ **B** $\frac{Q+R}{P}$ **C** $\frac{Q+R}{P+Q}$ **D** $\frac{Q+R}{P+Q+R}$

- 13 Which statements explain why the introduction of a catalyst leads to an increase in the rate of reaction?

- 1 The catalyst alters the mechanism of the reaction.
- 2 The proportion of molecules with energies above the activation energy increases.
- 3 The average kinetic energy of the molecules increases.

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

- 14 Consider the following equilibrium system:



Which of the following statements is correct?

	change made	position of equilibrium
A	add solid Z(s)	shifts to the left
B	reduce the temperature	shifts to the left
C	increase the concentration of W(g)	shifts to the right
D	increase the volume of the reaction vessel	shifts to the right

- 15 Contact process is a method of producing high concentrations of sulfuric acid for industrial applications. It involves reacting sulfur dioxide with excess oxygen to form sulfur trioxide.



The reaction is carried out at 450 °C and 1 atm. Vanadium(V) oxide is also used.

Which of the following statements is correct?

- A** A low pressure of 1 atm is used to increase the percentage of SO_3 in the equilibrium mixture.
- B** A high temperature of 450 °C is used to increase the rate of the forward reaction to generate a higher yield of SO_3 .
- C** Vanadium(V) oxide is added to decrease the activation energy of the forward reaction.
- D** Vanadium(V) oxide is added to increase the percentage of SO_3 in the equilibrium mixture.

16 Which row shows the correct trend for Group 1 elements down the group?

	reducing power	ionic radius	electronegativity
A	increases	increases	decreases
B	decreases	decreases	increases
C	increases	increases	increases
D	increases	decreases	decreases

17 Which statement about the chlorides of Period 3 elements is **incorrect**?

- A** The pH of the solutions of chlorides generally increases across the period.
- B** The extent of hydrolysis of the chlorides from MgCl_2 to SiCl_4 increases.
- C** When limited amount of water is added to the covalent chlorides, they give acidic white fumes.
- D** Adding NaOH(aq) to a solution of AlCl_3 produces a white precipitate which is soluble in an excess of NaOH .

18 Which statement explains why HCl has a higher thermal stability than HBr and HI ?

- A** HCl has the strongest intermolecular forces of attraction.
- B** The HCl bond has the highest bond energy.
- C** The ionic bond formed between H^+ and Cl^- is the strongest.
- D** The HCl bond has the longest length.

19 Which of the following statements are correct?

- 1 The ionic radii of Period 3 metals decrease across the period.
- 2 The pH of Period 3 oxides in water decreases across the period.
- 3 The electrical conductivity of Period 3 elements decreases across the period.

A 1 and 2 only

B 3 only

C 1 only

D 1, 2 and 3

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

indicator	approximate pH range of colour change	colour change	
		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 neutral.

B It is weakly alkaline.

C It is strongly alkaline.

D It is weakly acidic.

21 Which acids have a pH of 1 in a 0.1 mol dm^{-3} solution?

- 1 hydrochloric acid
- 2 sulfuric acid
- 3 ethanoic acid

A 1 only

B 3 only

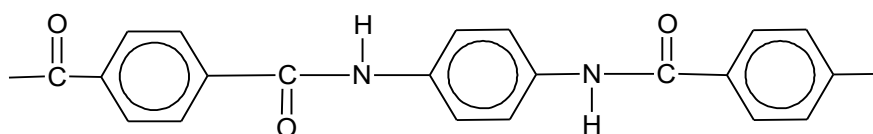
C 1 and 2

D 1 and 3

22 Which of the following statements is true for thermoplastic polymers but not true for thermoset polymers?

- A The polymer burns upon heating.
- B The polymers can be recycled.
- C The polymer has many cross-linkages between polymer chains.
- D The polymer has covalent bonds between the polymer chains.

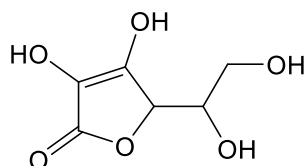
23 The structure shows part of the Kevlar polymer.



Which of the following statements correctly describes Kevlar?

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

24 Ascorbic acid, also known as vitamin C, is necessary for the growth and repair of body tissues.

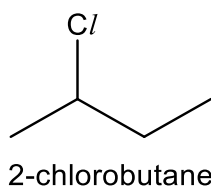


ascorbic acid

What is the empirical formula of ascorbic acid?

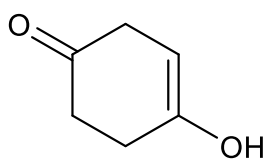
- A $C_3H_2O_3$
- B $C_3H_4O_3$
- C $C_3H_5O_3$
- D $C_6H_8O_6$

- 25 How many isomeric products (constitutional and *cis-trans*) will be formed when 2-chlorobutane is reacted with hot ethanolic potassium hydroxide?



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

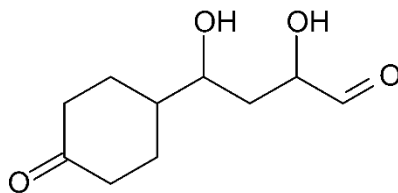
- 26 How many σ and π bonds are present in compound **P**?



P

	number of σ bonds	number of π bonds
A	9	4
B	13	4
C	16	2
D	17	2

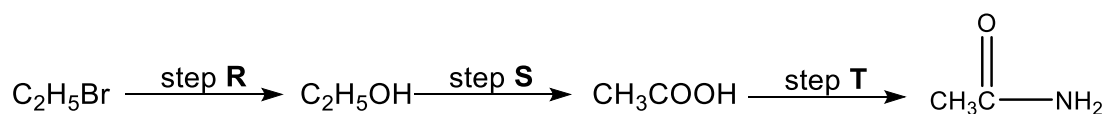
27 Which statements are true about the following compound?



- 1 Its molecular formula is $C_{10}H_{14}O_4$.
- 2 It reacts with sodium hydrogen carbonate to give carbon dioxide gas.
- 3 It reacts with hot acidified potassium dichromate to form a product with 5 O atoms.

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

28 Ethanamide can be formed from bromoethane in three steps.



Which statements about these steps are correct?

- 1 Step **R** involves substitution.
- 2 Step **S** involves reduction.
- 3 Hot aqueous H_2SO_4 is the reagent used in Step **S**.
- 4 DCC is the reagent used in Step **T**.

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

29 Which statements about nanomaterials is correct?

- A** They will not pose any health risks.
- B** They can have a length of more than 100 nm.
- C** They can only be man-made.
- D** They are all able to stick onto any type of surface.

30 A gecko can climb up a smooth glass window. It has millions of microscopic hairs on its toes, and each hair has thousands of pads at its tip. The result is that the molecules in the pads are extremely close to the glass surface on which the gecko is climbing.

What is the interaction between the gecko's toe pads and the glass surface?

- A** dative covalent bonds
- B** ion-dipole interactions
- C** instantaneous dipole–induced dipole attractions
- D** permanent dipole-permanent dipole attractions

END OF PAPER