

**NATIONAL JUNIOR COLLEGE
SH2 PRELIMINARY EXAMINATION**

Higher 1

CANDIDATE
NAME

SUBJECT
CLASS

REGISTRATION
NUMBER

CHEMISTRY

Paper 1 Multiple Choice

8872/01

Additional Materials:

Multiple Choice Answer Sheet
Data Booklet

18 September 2014

50 min

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, subject class and registration number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **30** 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.

This paper consists of **12** printed pages and **0** blank page.

Section A

For each question there are four possible answers, **A**, **B**, **C**, and **D**. Choose the **one** you consider to be correct.

- 1 Hydrogen cyanide gas is a highly poisonous gas that can cause permanent damage to the central nervous system. The toxic level of cyanide gas in the air is about 0.005 mg dm^{-3} . How many molecules of HCN are present at this toxic level per dm^3 ?

A $\frac{0.005}{6 \times 10^{23}} \times 27$

B $\frac{0.005}{27} \times 6 \times 10^{23}$

C $\frac{0.005}{1000} \times \frac{1}{27} \times 6 \times 10^{23}$

D $\frac{0.005}{1000} \times 27 \times 6 \times 10^{23}$

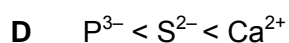
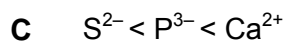
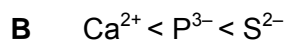
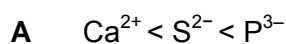
- 2 Elements **E** and **G** have the following successive ionisation energies in kJ mol^{-1} .

	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th
E	587	1817	2745	11577	14842	18379	23326
G	870	1790	2698	3610	5668	6820	13200

What is the likely formula of the compound that is formed when **E** reacts with **G**?



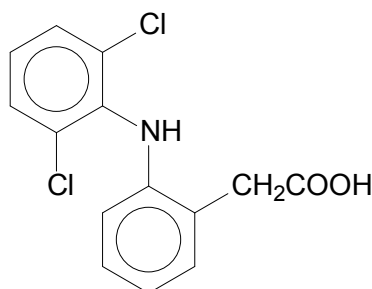
- 3 In which row are the isoelectronic ions, S^{2-} , P^{3-} and Ca^{2+} , arranged in the order of increasing size?



- 4 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+}

- 5 Diclofenac is a drug (NSAID) taken to reduce inflammation and as an analgesic to reduce pain in certain conditions.



Diclofenac

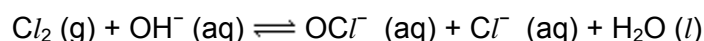
How many lone pairs of electrons are present in this molecule?

- A 9
B 10
C 11
D 12
- 6 C_2H_4 and C_2H_2 are unsaturated hydrocarbons.
Which statement is correct regarding these two molecules?
- A Both C_2H_4 and C_2H_2 are polar molecules.
B Both C_2H_4 and C_2H_2 have the same shape.
C C_2H_4 has more σ bonds but fewer π bonds than C_2H_2 .
D The carbon-carbon-hydrogen bond angle is larger in C_2H_4 than in C_2H_2 .
- 7 Which element will form an ionic compound with the least covalent character?
- A Barium
B Lithium
C Strontium
D Francium

- 8 Which of the following will have a positive ΔH value?
- A $O^{2-}(g) \rightarrow O^{2-}(aq)$
- B $\frac{1}{2}O_2(g) \rightarrow O(g)$
- C $2Na^+(g) + O^{2-}(g) \rightarrow Na_2O(s)$
- D $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$
- 9 Which quantity has the same value as the standard enthalpy change of formation of carbon monoxide?
- A $\frac{1}{2} \Delta H_f^\circ (CO_2(g))$
- B $\frac{1}{2} \Delta H_c^\circ (\text{graphite})$
- C $\Delta H_c^\circ (\text{graphite}) - \Delta H_c^\circ (CO(g))$
- D $\Delta H_f^\circ (CO_2(g)) - \frac{1}{2} \Delta H_c^\circ (\text{graphite})$
- 10 10 cm^3 of $0.30 \text{ mol dm}^{-3} K_2YO_4$ reacts exactly with 40 cm^3 of 0.15 mol dm^{-3} iron(II) sulfate solution.

If Fe^{2+} is oxidised to Fe^{3+} by K_2YO_4 , what is the final oxidation state of Y?

- | | |
|------|------|
| A +2 | C +4 |
| B +3 | D +5 |
- 11 Bleaching solutions are manufactured by dissolving chlorine gas in sodium hydroxide solution to give the following reaction.

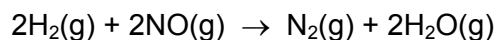


Users are warned not to mix the bleach with other cleaning solutions to prevent evolution of hazardous chlorine gas.

Which action will lead to liberation of chlorine gas?

- A Adding $NaCl$ to bleach
- B Mixing bleach with alkali solution
- C Subjecting bleach to high pressure
- D Removing Cl^- formed in the reaction

- 12 What is the pH of the final solution formed when equal volumes of dilute sulfuric acid of pH 2.0 and pH 4.0 are mixed?
- A 2.0
B 2.3
C 3.0
D 3.6
- 13 One mole of a monoprotic acid dissociates to give 1 mol of H^+ while one mole of a diprotic acid dissociates to give 2 mol of H^+ . Which statement is **not** a correct description of a strong monoprotic acid?
- A It always has a lower pH than a weak acid.
B It has a relatively high electrical conductivity in dilute solution.
C It requires the same volume of alkali for complete neutralisation compared to a weak monoprotic acid of the same concentration.
D It requires half the volume of alkali for complete neutralisation compared to a strong diprotic acid of the same concentration.
- 14 Hydrogen and nitrogen monoxide can react to form nitrogen and steam.



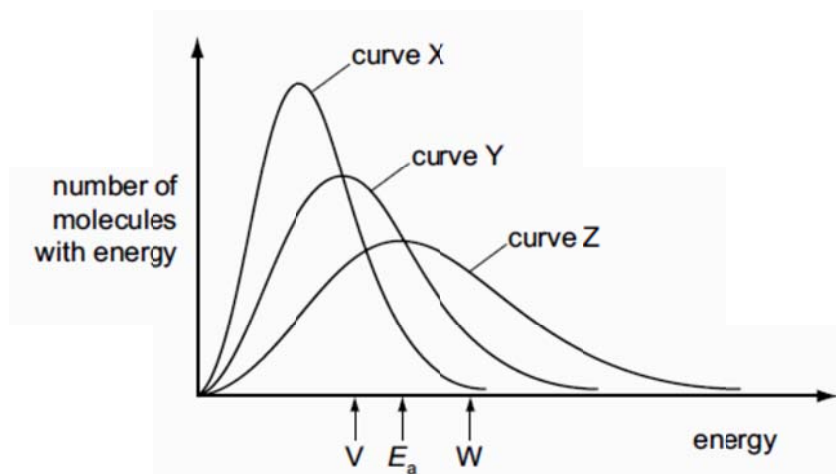
The rate of reaction is first order with respect to hydrogen and second order with respect to nitrogen monoxide.

0.100 mol dm^{-3} of H_2 and 5.00 mol dm^{-3} of NO were put into a sealed flask of fixed volume. It was found that there was 0.0250 mol dm^{-3} of H_2 left 40 minutes later.

What is the half life of this reaction?

- A 10 minutes
B 20 minutes
C 30 minutes
D 40 minutes

- 15 The curve **Y** and the value E_a represent the distribution of energies of the molecules and the activation energy for an uncatalysed gaseous reaction.



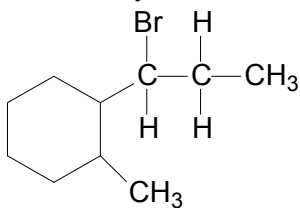
Which statement is correct for a catalysed reaction?

- A** The distribution of energies will be given by curve **X** and the activation energy by value **V**.
- B** The distribution of energies will be given by curve **Y** and the activation energy by value **V**.
- C** The distribution of energies will be given by curve **Y** and the activation energy by value **W**.
- D** The distribution of energies will be given by curve **Z** and the activation energy by value **W**.
- 16 Element **Q** is in Period 3. It is burnt in air to produce an orange flame and forms a white solid. The white solid is then dissolved in an aqueous solution containing universal indicator.

Which of the following can be deduced from the above observation?

	Identity of Q	Colour of aqueous solution
A	Sodium	Blue
B	Magnesium	Red
C	Silicon	Blue
D	Sulfur	Red

- 18** How many different alkenes, including geometrical isomers, can be produced when



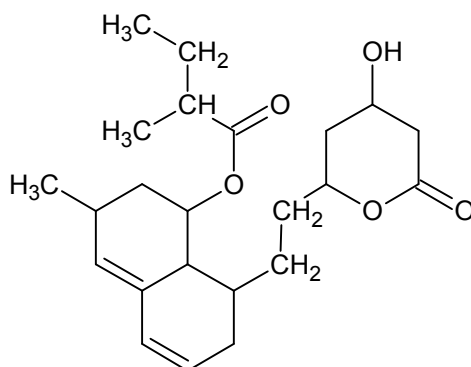
reacts with hot ethanolic NaOH?

- 19** Bromine in tetrachloromethane is added separately to benzene, methylbenzene, hexane and hexene in the dark.

Which pair will show the same observation?

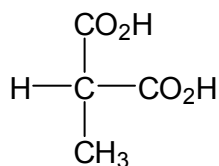
- A** hexane and benzene
- B** hexane and hexene
- C** hexene and benzene
- D** hexene and methylbenzene

- 20 Lovastatin is often prescribed to patients suffering from cardiovascular disease because it helps to lower the cholesterol level in bloodstream.

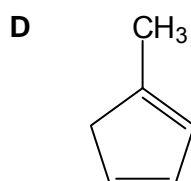
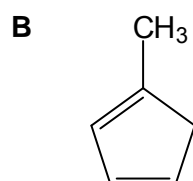
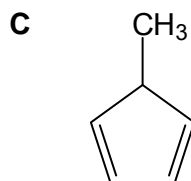
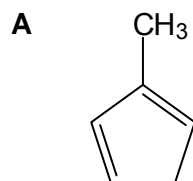


Which statement about Lovastatin is **not** correct?

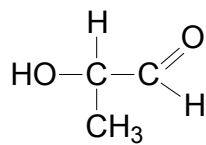
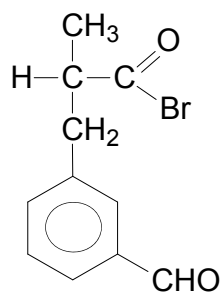
- A 1 mol of Lovastatin reacts with 1 mole of anhydrous phosphorus pentachloride.
- B 1 mole of Lovastatin reacts with 2 moles of bromine dissolved in tetrachloromethane.
- C 1 mole of Lovastatin reacts with 2 moles of hot aqueous sodium hydroxide.
- D 1 mole of Lovastatin reacts with 2 moles of 2,4-dinitrophenylhydrazine to form an orange precipitate.
- 21 A hydrocarbon C_6H_8 on refluxing with acidified potassium manganate(VII) produces the structure below as the only organic product.



What could be a possible structure of the hydrocarbon?



- 25 Which reagent cannot be used to distinguish between compounds **R** and **S** under suitable conditions?

**R****S**

- A** Sodium
- B** Potassium manganate(VII)
- C** alkaline copper(II) solution
- D** silver diammine complex

Section B

For each of the questions in this section, one or more of the three numbered statements **1** to **3** may be correct.

Decide whether each of the statements is or is not correct (you may find it helpful to put a tick against the statements that you consider to be correct).

The responses **A** to **D** should be selected on the basis of

A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct.

No other combination of statements is used as a correct response.

26 Which statements about a 28.0 g sample of $^{14}\text{N}_2$ are correct?

- 1** The number of molecules is twice the number of atoms in 8.0 g of $^{16}\text{O}_2$
- 2** The number of atoms is twice the number of atoms in 10.0 g of ^{20}Ne .
- 3** The number of atoms is the same as the number of atoms in 12.0 g of ^{12}C .

27 Covalent bonds are formed by orbitals overlap. The shape of unsaturated hydrocarbon molecules can be explained in terms of hybridisation of orbitals.

Which bonds are present in $\text{HC}\equiv\text{CCH}_2\text{CH}=\text{CH}_2$?

- 1** a σ bond formed by $\text{sp}^2\text{--sp}^2$ overlap
- 2** a σ bond formed by sp--sp^3 overlap
- 3** a π bond formed by sp--sp overlap

- 28 The position of equilibrium lies to the right in each of these reactions.



Based on this information, which statements are correct?

- 1 Br^- is the conjugate base of HBr.
 - 2 N_2H_5^+ is the acid in reaction 2.
 - 3 The order of acid strength is $\text{HBr} > \text{N}_2\text{H}_5^+ > \text{NH}_4^+$.
- 29 Which statements about butanal and butanone are correct?
- 1 Both butanal and butanone react with 2,4-dinitrophenylhydrazine.
 - 2 Both butanal and butanone have the same molecular formula.
 - 3 Both butanal and butanone decolourises acidified potassium manganate(VII).
- 30 Compound **T** is reacted with excess NaOH(aq) while compound **V** is reacted with LiAlH_4 in dry ether.

Which pairs of **T** and **V** give the same product?

	T	V
1	$\text{BrCH}_2\text{CH}_2\text{CH}_2\text{OH}$	$\text{CHOCH}_2\text{CO}_2\text{H}$
2	$\text{C}_6\text{H}_5\text{CH}(\text{Cl})\text{CH}_3$	$\text{C}_6\text{H}_5\text{COCH}_3$
3	$\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$	$(\text{CH}_3)_2\text{CO}$