



RIVER VALLEY HIGH SCHOOL

YEAR 6 PRELIMINARY EXAMINATION (II)

CANDIDATE
NAME

--

CLASS

6	
---	--

CENTRE
NUMBER

S				
---	--	--	--	--

INDEX
NUMBER

--	--	--	--

H1 CHEMISTRY

8872/01

Paper 1 Multiple Choice

26 September 2014

50 mins

Additional Materials: Multiple Choice Answer Sheet
 Data Booklet

READ THESE INSTRUCTIONS FIRST

Do not use staples, paper clips, highlighters, 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.

This document consists of **14** printed pages and **1** blank page.

Section A (25 marks)

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

- 1** Wines often contain a small amount of sulfur dioxide that is added as a preservative. The sulfur dioxide content of a wine is found by the following method:

A 50 cm³ sample of white wine is reacted with 40.0 cm³ of 0.01 mol dm⁻³ of excess aqueous iodine. The sulfur dioxide in the wine is oxidised to sulfate, SO₄²⁻, in the process. The unreacted iodine requires exactly 23.60 cm³ of 0.02 mol dm⁻³ sodium thiosulfate, Na₂S₂O₃, for complete reaction.

Determine the concentration of sulfur dioxide, in mol dm⁻³, in the wine.

- A** 1.64×10^{-4}
- B** 3.28×10^{-3}
- C** 4.72×10^{-3}
- D** 9.44×10^{-3}
- 2** An ion X²⁺ contains 24 protons.
What is the electronic configuration of X³⁺?

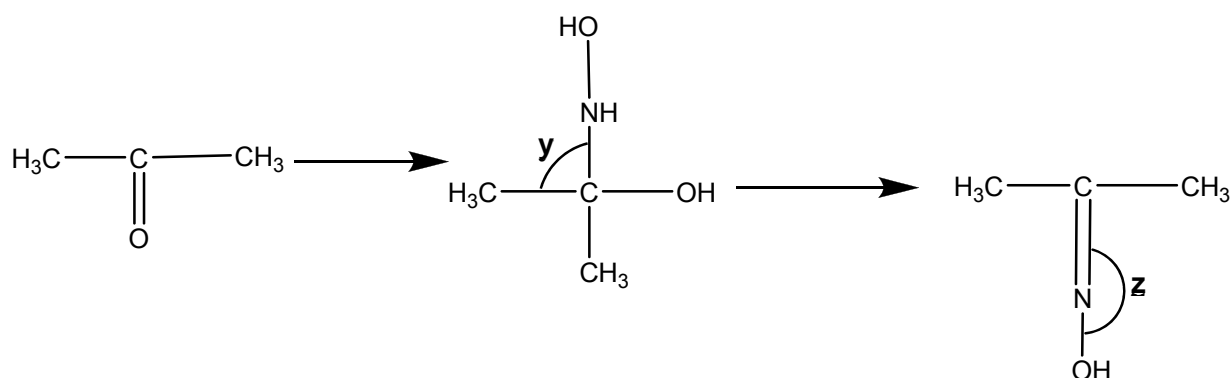
- A** 1s² 2s² 2p⁶ 3s² 3p⁶ 3d³
- B** 1s² 2s² 2p⁶ 3s² 3p⁶ 3d⁴
- C** 1s² 2s² 2p⁶ 3s² 3p⁶ 3d¹ 4s²
- D** 1s² 2s² 2p⁶ 3s² 3p⁶ 3d⁵ 4s¹

- 3** A solid **E** has the following physical properties.
- It is insoluble in hydrocarbon solvents.
 - It melts at 1290 °C.
 - It conducts electricity in aqueous and molten states.

What is the likely structure of **E**?

- A** A giant metallic structure
- B** A simple molecular structure
- C** An giant ionic crystal lattice
- D** A giant molecular structure

- 4 Hydroxylamine (NH_2OH) can react with propanone via a nucleophilic addition in the following manner:



What are the values of the bond angles y and z ?

- | | y | z |
|---|-------|-----|
| A | 109.5 | 118 |
| B | 90 | 118 |
| C | 109.5 | 180 |
| D | 90 | 180 |
- 5 Which of the following pairs of molecules have the same shape?
- A AlCl_3 and PCl_3
- B SO_3 and BF_3
- C NH_3 and BCl_3
- D SO_2 and CO_2
- 6 The enthalpy change for the neutralisation given below is -57 kJ mol^{-1} .
- $$\text{H}_2\text{SO}_4 (\text{aq}) + \text{NaOH} (\text{aq}) \rightarrow \text{Na}_2\text{SO}_4 (\text{aq}) + 2\text{H}_2\text{O} (\text{l})$$
- By using this information, predict a value for the enthalpy change for the reaction given below.
- $$\text{CH}_3\text{COOH} (\text{aq}) + \text{NaOH} (\text{aq}) \rightarrow \text{CH}_3\text{COONa} (\text{aq}) + \text{H}_2\text{O} (\text{l})$$
- A $-55.0 \text{ kJ mol}^{-1}$ C $-114.0 \text{ kJ mol}^{-1}$
- B $-57.0 \text{ kJ mol}^{-1}$ D $-120.0 \text{ kJ mol}^{-1}$

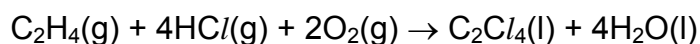
A -460 kJ mol^{-1}

B -550 kJ mol^{-1}

C -680 kJ mol^{-1}

D -800 kJ mol^{-1}

- 8** Tetrachloroethene is commonly used as degreasing solvent. The enthalpy change for the following reaction is $-878.5 \text{ kJ mol}^{-1}$.



$$\Delta H_f(\text{C}_2\text{H}_4(\text{g})) = +52.3 \text{ kJ mol}^{-1}$$

$$\Delta H_f(\text{HCl(g)}) = -92.3 \text{ kJ mol}^{-1}$$

$$\Delta H_f(\text{H}_2\text{O}(\text{l})) = -285.8 \text{ kJ mol}^{-1}$$

Which of the following is the enthalpy change of formation of tetrachloroethene given the information above?

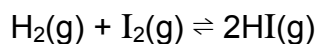
A $-52.2 \text{ kJ mol}^{-1}$

C -608 kJ mol^{-1}

B -582 kJ mol^{-1}

D -633 kJ mol^{-1}

- 9** When 0.20 mol of hydrogen gas and 0.15 mol of iodine gas are heated at 723 K until equilibrium is established, the equilibrium mixture is found to contain 0.26 mol of hydrogen iodide. The equation for the reaction is as follows:



What is the correct numerical value for the equilibrium constant, K_c ?

A 2.25

B 48.3

C 51.8

D 185.7

10 A system at equilibrium is subjected to the following changes separately:

- (i) The pressure is reduced at constant temperature
- (ii) The temperature is increased at constant pressure

For which equilibrium will both of these changes result in an increase in the proportion of products?

- A** $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$ $\Delta H = +53 \text{ kJ mol}^{-1}$
- B** $4\text{NH}_3(\text{g}) + 5\text{O}_2(\text{g}) \rightleftharpoons 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{g})$ $\Delta H = -950 \text{ kJ mol}^{-1}$
- C** $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ $\Delta H = -92 \text{ kJ mol}^{-1}$
- D** $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$ $\Delta H = +57 \text{ kJ mol}^{-1}$

11 What is the effect of a catalyst on rate constant, k_1 for the forward reaction and k_{-1} , for the reverse reaction, and on the equilibrium constant K , for a reversible reaction?

	k_1	k_{-1}	K
A	Increase	Decrease	Increase
B	Increase	Decrease	No effect
C	Increase	Increase	Increase
D	Increase	Increase	No effect

- 12 Solutions **P**, **R** and **S** contain a strong acid, a weak acid and a strong base, but not necessarily in the same order. The concentration and pH of each solution are shown below.

Solution	Concentration / mol dm ⁻³	pH
P	1.00	2.4
R	0.01	12
S	0.001	3

Which one of the following statements is correct?

- A** **P** contains a strong acid while **S** contains a weak acid.
- B** The pH at equivalence point when **R** is titrated against **S** is less than 7.
- C** Mixing 500 cm³ of **P** and 500 cm³ of **R** produces a buffer solution.
- D** Mixing 100 cm³ of **R** and 100 cm³ of **S** produces a buffer solution.
- 13 Stomach juices have a pH of 1.0.

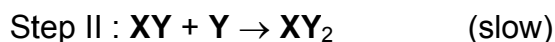
Aspirin is a monobasic acid represented by HX ($K_a = 10^{-14}$ mol dm⁻³) which dissociates into ions of H⁺ and X⁻.

What are the relative concentrations of H⁺, X⁻ and HX when an aspirin tablet is ingested and enters into the stomach?

- A** $[HX] > [H^+] = [X^-]$
- B** $[H^+] > [X^-] > [HX]$
- C** $[H^+] = [X^-] > [HX]$
- D** $[H^+] > [HX] > [X^-]$

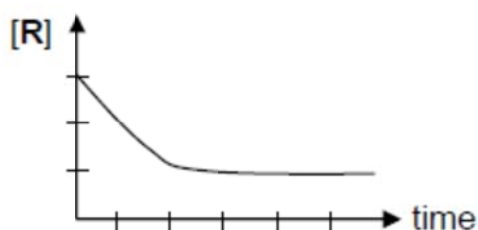
- 14 A rate equation can be determined from the coefficient of the reactants in the slow step of the mechanism.

The mechanism involved in the formation of XY_2 is shown below:

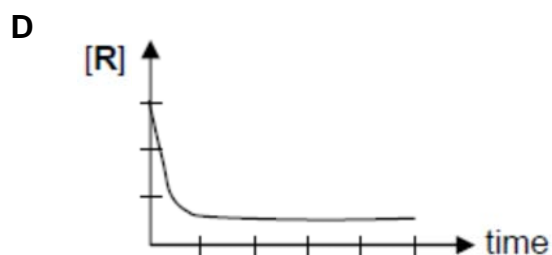
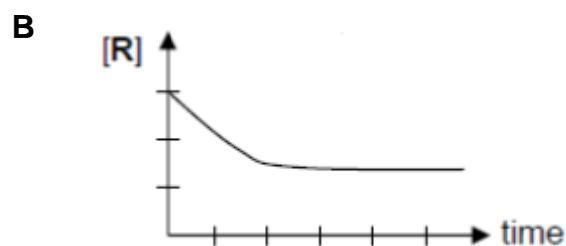
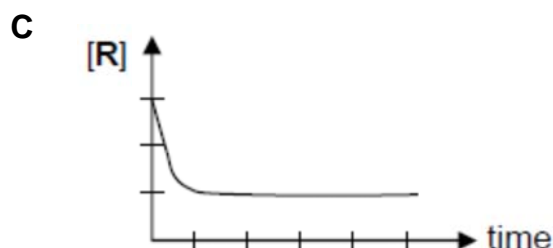
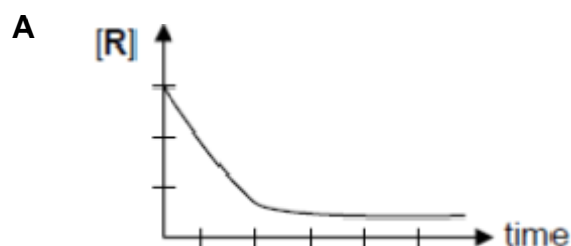


What is the rate equation for this reaction?

- A Rate = $k[XY][Y]$
 B Rate = $k[X][Y]$
 C Rate = $k[X][Y]^2$
 D Rate = $k[XY][Y]^2$
- 15 The concentration of a reactant, **R**, was plotted against time as it reacted with **S** to reach equilibrium.
 The graph shows the result.



Which of the following graphs could be obtained if the reaction was repeated at the same temperature and initial concentrations of **R** and **S** but with the addition of a catalyst?



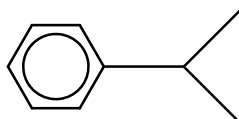
16 Which of the following oxides is **unlikely** to dissolve in concentrated sodium hydroxide?

- A Al_2O_3 B MgO C P_4O_{10} D SiO_2

17 The ionic radii of P^{3-} , S^{2-} and Cl^- are 0.212 nm, 0.184 nm and 0.181 nm respectively.

Which of the following statements correctly explains the decrease in radius from P^{3-} to Cl^- ?

- A an increase in the nuclear charge and a constant total number of electrons
B an increase in the nuclear charge and total number of electrons
C an increase in total number of electrons while nuclear charge remains constant
D a decrease in nuclear charge while total number of electrons remains constant
- 18 The organic molecule cumene is derived from cumin, a spice well-known for its distinctive flavour and aroma and an essential flavouring in South Asian dishes.



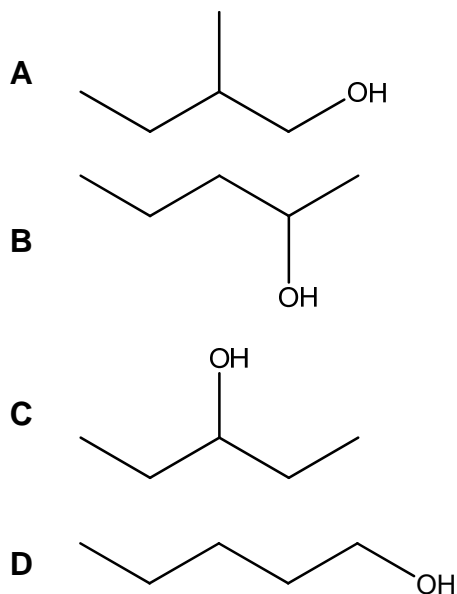
Cumene

When cumene undergoes free radical reaction with bromine, x mol of a non-chiral monosubstituted product is obtained.

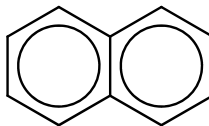
What is the amount of chiral monosubstituted product formed?

- A $\frac{x}{6}$ B x C 3x D 6x

- 19 Which of the following isomers of $C_5H_{11}OH$ gives, on dehydration, the greatest number of different alkenes (including stereoisomers)?



- 20 Naphthalene is an organic aromatic compound with the formula $C_{10}H_8$. It undergoes similar reactions as benzene and is best known as the main ingredient in traditional mothballs.



Naphthalene

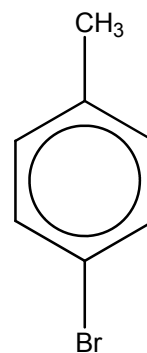
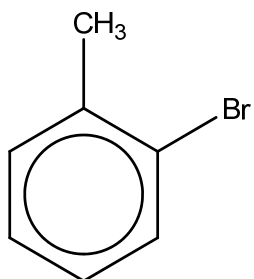
Which of the following statements about naphthalene is correct?

- A Naphthalene is a planar molecule.
- B Naphthalene has 12 π electrons.
- C Naphthalene undergoes electrophilic substitution with aqueous bromine.
- D Naphthalene undergoes free radical substitution to form two isomeric monobromo products.

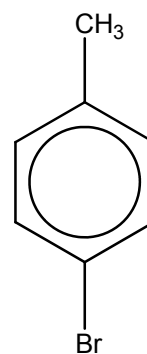
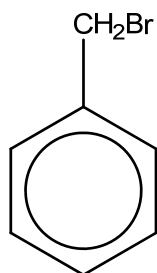
- 21 When methylbenzene is treated with bromine in the presence of a catalyst, a mixture of two monobromo isomers is formed.

What are the structures of these isomers?

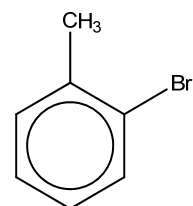
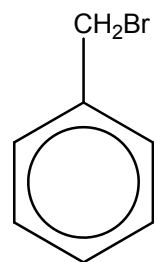
A



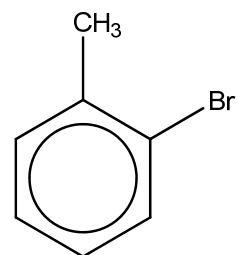
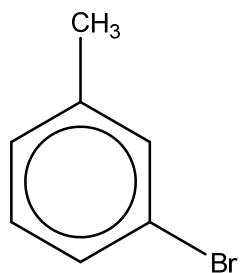
B



C



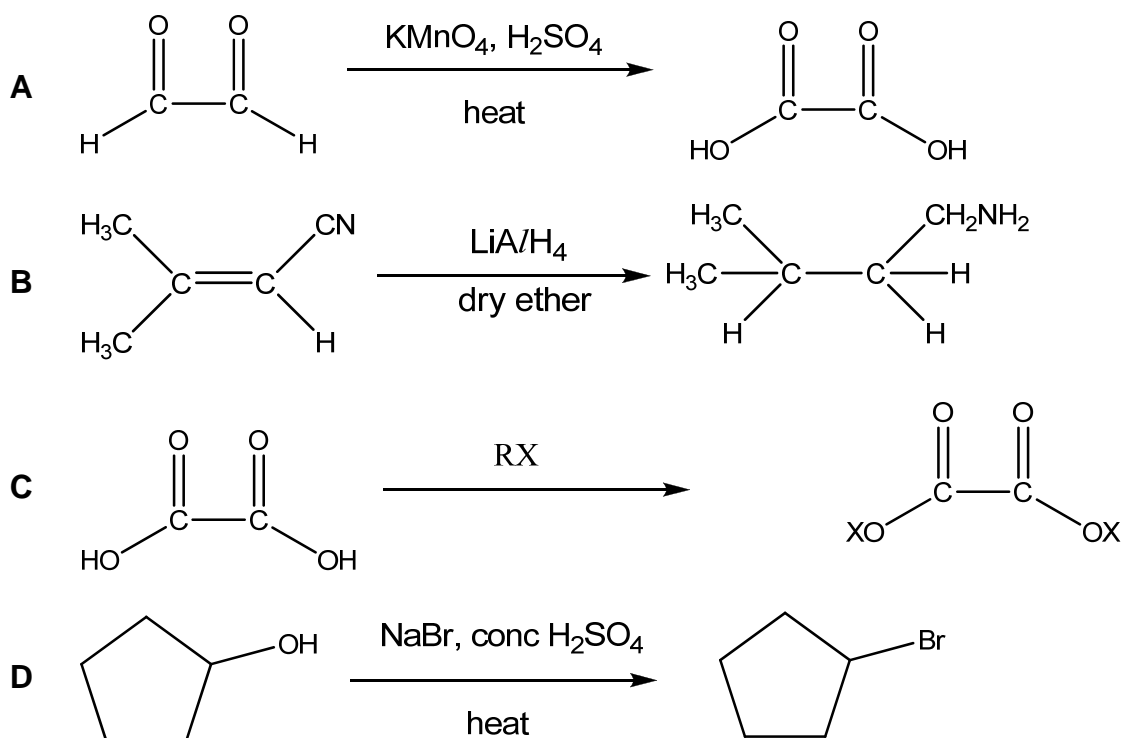
D



22 In which of the following reactions is the inorganic reagent acting as a nucleophile?

- A $\text{C}_6\text{H}_6 + \text{H}_2\text{SO}_4 \rightarrow \text{C}_6\text{H}_5\text{SO}_3\text{H} + \text{H}_2\text{O}$
- B $\text{CH}_3\text{CH}=\text{CH}_2 + \text{HBr} \rightarrow \text{CH}_3\text{CHBrCH}_3$
- C $\text{CH}_3\text{CH}_2\text{NH}_2 + \text{HCl} \rightarrow \text{CH}_3\text{CH}_2\text{NH}_3\text{Cl}$
- D $\text{CH}_3\text{CH}_2\text{Br} + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{CH}_2\text{OH} + \text{HBr}$

23 The reaction conditions of four different transformations are given below. Which transformation has a set of conditions that is correct?

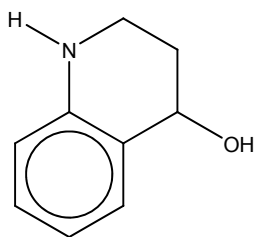
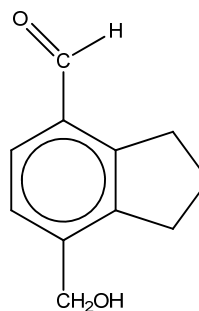


24 The planet Jupiter is known to have a reducing atmosphere consisting mainly of methane and ammonia, with some ethene and water in the form of ice crystals. Astronomers used the impact of fragments of Comet Shoemaker-Levy-9 with Jupiter to identify more complex molecules present in the planet's atmosphere.

Which molecule is **unlikely** to have been observed?

- A $\text{CH}_3\text{CH}_2\text{NH}_2$
- B $\text{CH}_3\text{CH}_2\text{OH}$
- C $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
- D $\text{CH}_3\text{CO}_2\text{H}$

- 25 Which of the following reagents and conditions can be used to distinguish between the two compounds **X** and **Y** below?

**X****Y**

- A Acidified $\text{K}_2\text{Cr}_2\text{O}_7$, heat
- B Tollen's reagent, warm
- C P_4 and Cl_2 , heat
- D Fehling's reagent, warm

Section B (5 marks)

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.

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** After an oil spillage at sea, liquid hydrocarbon layer floats on the surface of the sea water. Which of the following statements help to explain why liquid hydrocarbons both float on, and are less dense than water?

- 1** Hydrocarbons molecules are not solvated by water.
- 2** There are only van der Waals' interactions between hydrocarbon molecules.
- 3** Hydrogen bonds between the molecules in liquid water cause the water molecules to pack closer together.

- 27** The table gives data for the reaction between **X** and **Y** at constant temperature.



Experiment	[X] / mol dm ⁻³	[Y] / mol dm ⁻³	Initial rate / mol dm ⁻³ s ⁻¹
1	0.4	0.1	2.5×10^{-4}
2	0.2	0.2	5.0×10^{-4}
3	0.2	0.4	1.0×10^{-3}

Which statements follow from these results?

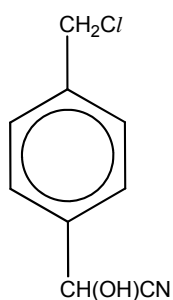
- 1** The half-life of this reaction is 277 s.
- 2** The rate constant is 0.150 min^{-1} .
- 3** The rate equation can be written as: $\text{rate} = k[\text{X}][\text{Y}]$.

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.

- 28** Which of the following trends concerning Period 3 elements (sodium to sulphur) are true?
- 1 There is a change from acidic oxide to basic oxide behaviour.
 - 2 Their compounds show an increase in the maximum oxidation number of the element across the period.
 - 3 Their compounds become less ionic and more covalent across the period.
- 29** Which of the following reactions produce organic compounds that could cause damage to the ozone layer?
- 1 Ethane reacting with chlorine in sunlight.
 - 2 Ethane-1,2-diol reacting with phosphorus pentachloride.
 - 3 Ethene reacting with hydrogen chloride.
- 30** A newly-discovered drug that is claimed to cure AIDs contains an active ingredient of the following structure:



Which of the following statements concerning its properties are **correct**?

- 1 It gives a white precipitate with ethanolic silver nitrate.
- 2 It gives a white precipitate with aqueous bromine.
- 3 It gives a pale yellow precipitate with alkaline aqueous iodine.

--- End of Paper ---

[Blank Page]