



# RIVER VALLEY HIGH SCHOOL

## YEAR 6 PRELIMINARY EXAMINATION II

CANDIDATE  
NAME

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CLASS

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CENTRE  
NUMBER

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INDEX  
NUMBER

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### H1 CHEMISTRY

**8872/01**

Paper 1 Multiple Choice

**23 September 2016**

**50 minutes**

Additional Materials:      Multiple Choice Answer Sheet  
Data Booklet

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### 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.

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This document consists of **12** printed pages and **1** 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 For complete combustion of 20.0 g of heptane, what is the minimum volume of oxygen gas required at s.t.p.?

<b>A</b> 0.2 dm <sup>3</sup>	<b>C</b> 49.3 dm <sup>3</sup>
<b>B</b> 2.2 dm <sup>3</sup>	<b>D</b> 52.8 dm <sup>3</sup>

- 2 Element **X** exists as 3 different isotopes on earth with a relative atomic mass of 66.6. Which of the following compositions of isotopes is correct?

**A** 25% <sup>65</sup>X, 50% <sup>66</sup>X and 25% <sup>67</sup>X  
**B** 30% <sup>65</sup>X, 60% <sup>66</sup>X and 10% <sup>67</sup>X  
**C** 50% <sup>65</sup>X, 20% <sup>66</sup>X and 30% <sup>67</sup>X  
**D** 10% <sup>65</sup>X, 20% <sup>66</sup>X and 70% <sup>67</sup>X

- 3 Which of the following does **not** contain a singly occupied orbital?

**A** N<sup>2+</sup>                      **B** S<sup>-</sup>                      **C** Br<sup>+</sup>                      **D** Sc<sup>3+</sup>

- 4 Dinitrogen tetroxide, N<sub>2</sub>O<sub>4</sub>, has a simple covalent structure.

Which of the following correctly describes the bonding within the dinitrogen tetroxide molecule?

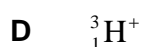
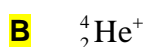
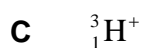
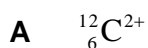
	<b>σ bond</b>	<b>π bond</b>	<b>dative bond</b>
<b>A</b>	3	2	2
<b>B</b>	5	0	4
<b>C</b>	5	2	2
<b>D</b>	5	4	0

- 5 The Valence Shell Electron Pair Repulsion (VSEPR) theory is used to predict the shapes of molecules.

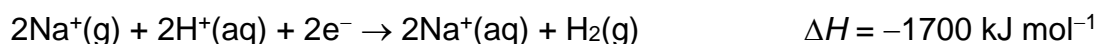
Which shape is correctly predicted by VSEPR?

	number of bonded electron pairs around central atom	number of lone pairs around central atom	shape
A	2	4	non-linear
B	3	2	T-shaped
C	4	1	square planar
D	3	2	see-saw

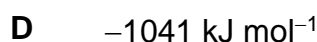
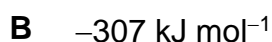
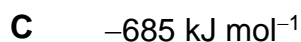
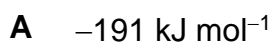
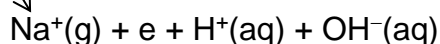
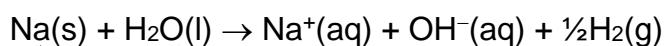
- 6 Which of the following species will experience the largest deflection when passing through an electric field?



- 7 The enthalpy changes for three reactions are given below:



What is the enthalpy change for the following reaction?



- 8 In an experiment to measure the enthalpy change of neutralisation, 20 cm<sup>3</sup> of aqueous sulphuric acid containing 0.02 mol of H<sub>2</sub>SO<sub>4</sub> is placed in a plastic cup of negligible heat capacity.

A 20 cm<sup>3</sup> sample of aqueous sodium hydroxide containing 0.04 mol of NaOH, at the same initial temperature, is added and the temperature rises by 15 K.

If the heat capacity per unit volume of the final solution is 4.2 J K<sup>-1</sup> cm<sup>-3</sup>, what is the enthalpy change of neutralisation?

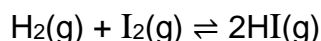
A  $-\left(\frac{20 \times 4.2 \times 15}{0.04 \times 1000}\right) \text{ kJmol}^{-1}$

C  $-\left(\frac{20 \times 4.2 \times 15}{0.02 \times 1000}\right) \text{ kJmol}^{-1}$

B  $-\left(\frac{40 \times 4.2 \times 15}{0.04 \times 1000}\right) \text{ kJmol}^{-1}$

D  $-\left(\frac{40 \times 4.2 \times 15}{0.02 \times 1000}\right) \text{ kJmol}^{-1}$

- 9 Hydrogen reacts with iodine according to the equation:



*P* atm of hydrogen is allowed to react with *Q* atm of iodine at constant temperature.

At equilibrium, it is found that

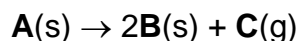
- A the partial pressure of hydrogen is greater than *P*.
- B the total pressure of the system is (*P* + *Q*) atm.
- C the total pressure of the system is greater than (*P* + *Q*) atm.
- D the total pressure of the system is less than (*P* + *Q*) atm.
- 10 Which statement is correct about a reaction for which the equilibrium constant is independent of temperature?
- A The rate constants for the forward and reverse reaction do not vary with temperature.
- B The activation energies for both the forward and reverse reactions are zero.
- C The enthalpy change is zero.
- D There are equal numbers of moles of reactants and products.

- 11 The auto-ionisation of water is represented by the following equation:



Given that the value of the equilibrium constant,  $K_w$ , is  $1.0 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$  at 298 K, which of the following statements is true?

- A** Water is not a neutral liquid at a temperature lower than 298 K.
- B** When water is heated, the concentration of  $\text{OH}^-$  increases.
- C** The pH of water at temperatures higher than 298 K is greater than 7.
- D** The association of water molecules by hydrogen bonding increases as temperature rises.
- 12 When  $0.10 \text{ mol dm}^{-3}$  ethanoic acid is titrated against  $0.10 \text{ mol dm}^{-3}$  aqueous ammonia, which of the following is a suitable indicator?
- |   |   |
|---|---|
| <b>A</b> Bromothymol Blue<br>(pH range 6.0 – 7.6) | <b>B</b> Phenolphthalein<br>(pH range 8.2 – 10.0) |
| <b>C</b> Methyl red<br>(pH range 4.2 – 6.3)       | <b>D</b> There is no suitable indicator.          |
- 13 The decomposition of compound **A** is a first order reaction which proceeds according to the equation:

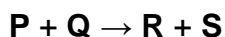


A certain sample of **A** gave  $80 \text{ cm}^3$  of **C** on complete decomposition and it took 40 min for  $40 \text{ cm}^3$  of **C** to be evolved.

How long would it take for  $70 \text{ cm}^3$  of **C** to be evolved?

- |                 |                  |
|-----------------|------------------|
| <b>A</b> 40 min | <b>B</b> 70 min  |
| <b>C</b> 80 min | <b>D</b> 120 min |

14 If the reaction



is described as being *zero order* with respect to **P**, which of the following statements correctly describes **P**?

- A There are no **P** molecules which possess enough energy to react.
- B The rate of reaction is independent of the concentration of **P**.
- C The concentration of **P** does not change during the reaction.
- D **P** is a catalyst in the above reaction.

15 Element **Q** forms an oxide with a giant structure and a chloride which is readily hydrolysed. What is element **Q**?

- A Magnesium      B Phosphorus      C Sodium      D Silicon

16 Which of the following is a trend across Period 3 of the Periodic Table?

- A The radii of ions decrease.
- B The first ionisation energy decreases.
- C The melting points of elements decrease.
- D The compounds of elements become increasingly covalent.

17 Which of the following changes **does not** take place in a period of elements with increasing atomic number?

- A The atomic radius of the elements decreases.
- B The oxides of the elements become less acidic.
- C The electrical conductivity generally decreases.
- D The electronegativity of the elements increases.

18 Which of the following compounds **cannot** be obtained from propene in a single reaction?

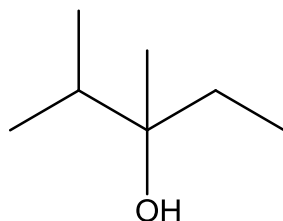
A  $\text{CO}_2$

B  $\text{CH}_3\text{CH}_2\text{CH}_3$

C  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CN}$

D  $\text{CH}_2(\text{OH})\text{CH}(\text{OH})\text{CH}_3$

19 How many alkenes (including stereoisomers) can be formed when the following alcohol is heated with concentrated sulfuric acid?



A 0

B 2

C 3

D 4

20 Fluothane,  $\text{CF}_3\text{CHBrCl}$ , is a volatile liquid widely used as an anaesthetic. Which of the following statements about fluothane is **not** correct?

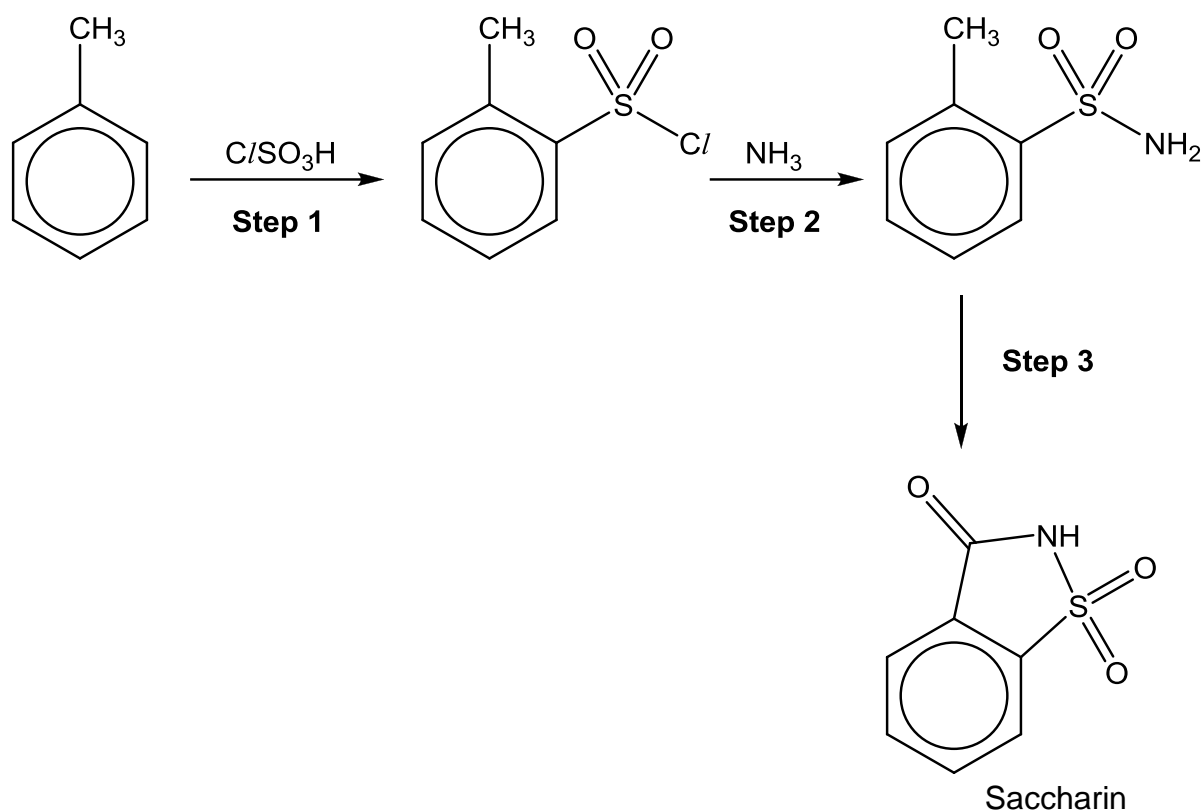
A Fluothane may cause the depletion of the ozone layer.

B Weak van der Waals' forces hold molecules of fluothane together.

C Fluothane undergoes elimination when treated with hot ethanolic  $\text{NaOH}$ .

D When a sample of fluothane is heated with aqueous silver nitrate, a mixture of white and cream precipitate is formed.

- 21** Saccharin, an artificial sweetening agent, can be synthesised from methylbenzene using the following reaction scheme:

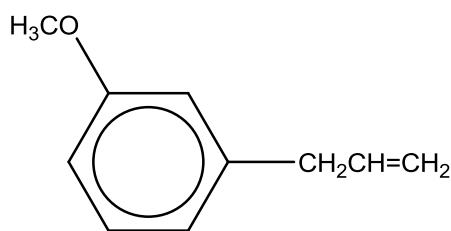


What type of reactions do steps **1** and **2** illustrate?

	<b>Step 1</b>	<b>Step 2</b>
<b>A</b>	Electrophilic substitution	Condensation
<b>B</b>	Electrophilic substitution	Nucleophilic Addition
<b>C</b>	Nucleophilic substitution	Condensation
<b>D</b>	Nucleophilic substitution	Nucleophilic Addition



- 22** Eugenol is a common component of perfumes and essential oils. It is also used as an antiseptic.



eugenol

*(You may treat the  $-OCH_3$  group attached to the benzene ring as inert.)*

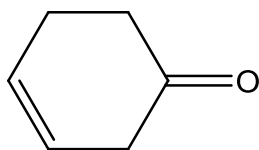
Which of the following statements about eugenol is correct?

- A** It reacts with 2,4-DNPH to give an orange precipitate.
  - B** It gives white fumes when reacted with thionyl chloride.
  - C** It decolourises hot acidified potassium manganate(VII).
  - D** It reacts with 1 mole of  $Br_2$  in a suitable solvent to form a product with 4 bromine atoms incorporated.
- 23** In the study of organic reaction mechanisms, radioactive oxygen-18,  $^{18}O$ , is often used to tag organic molecules. The radioactivity of the products can then be detected to deduce which products contain  $^{18}O$ .

When  $^{18}O$ -tagged propan-1-ol is heated with ethanoic acid in the presence of a small amount of concentrated sulfuric acid, which of the following set of products will be obtained?

- A**  $CH_3CH_2CH_2^{18}OCOCH_3$  and  $H_2O$
- B**  $CH_3CH_2CH_2OCOCH_3$  and  $H_2^{18}O$
- C**  $CH_3CH_2CH_2^{18}OCOCH_3$  and  $H_2^{18}O$
- D**  $CH_3CH_2CH_2OCOCH_3$  and  $H_2O$

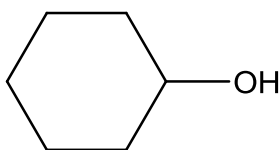
- 24 Cyclohex-3-en-1-one has the following structure:



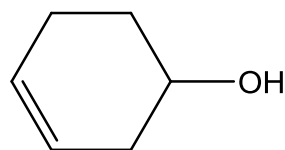
cyclohex-3-en-1-one

Which of the following compounds is formed when cyclohex-3-en-1-one is reacted with  $\text{NaBH}_4$  dissolved in an organic solvent?

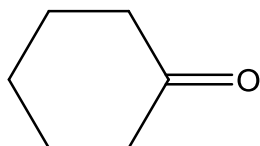
**A**



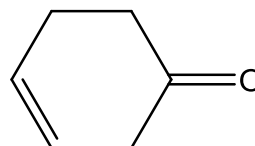
**B**



**C**



**D**



- 25 Compound **J** gives the following observations with Tollens' Reagent and  $\text{Na}_2\text{CO}_3(\text{aq})$ .

Reagent	Observation
Tollens' Reagent	Silver mirror observed
$\text{Na}_2\text{CO}_3(\text{aq})$	No effervescence observed

From the above observations, what could be a possible structure for **J**?

- A**  $(\text{COOH})_2$   
**B**  $\text{CH}_3\text{COCHO}$   
**C**  $\text{CH}_3\text{COCOOH}$   
**D**  $\text{CH}_3\text{COCOCH}_3$

**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

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1, 2 and 3</b> are correct	<b>1 and 2</b> only are correct	<b>2 and 3</b> only are correct	<b>1</b> only is correct

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

**26** Which statement about aluminium is correct?

- 1** It forms amphoteric oxides.
- 2** It forms an ionic compound with oxygen.
- 3** It forms an ionic compound with chlorine.

**27** Between ethanol molecules, there exists

- 1** hydrogen bonds.
- 2** instantaneous dipole-induced dipole interactions.
- 3** covalent bonds.

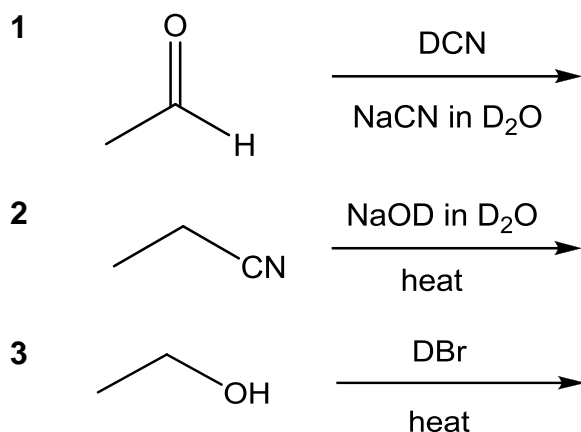
**28** For a first order reaction, which of the following graphs will be a straight line passing through the origin?

- 1** Initial rate vs concentration of reactant
- 2** Initial rate vs time taken for complete reaction
- 3** Concentration of reactant vs time taken for complete reaction

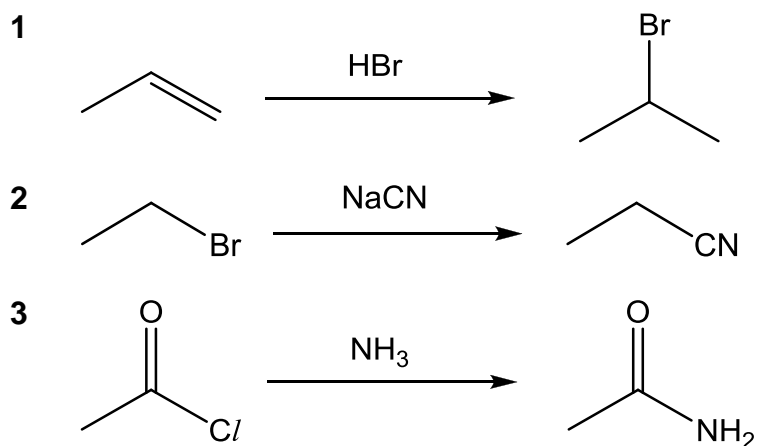
A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

**29** Deuterium, D, is the  $^2\text{H}$  isotope of hydrogen.

Which of the following reactions could give an organic compound having a deuterium atom incorporated?



**30** In which of the following reactions is the inorganic reagent acting as the nucleophile?



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