

RIVER VALLEY HIGH SCHOOL YEAR 6 PRELIMINARY EXAMINATION

CANDIDATE NAME			
CLASS	6		
CENTRE NUMBER	S	INDEX NUMBER	
H1 CHEM	IISTRY		8872/01
Paper 1 Multiple	e Choice		21st September 2012 50 minutes

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 **12** printed pages.

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Section A

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

1 Methane was burned with a faulty Bunsen burner. As a result, a mixture of carbon dioxide and carbon monoxide was produced in a ratio of 98:2, together with water vapour.

What was the volume of oxygen gas used when $y dm^3$ of methane was burned?



2 An ion of metal **M** can be oxidised by potassium manganate(VII) in acid solution to form MO_3^{-1} . In an experiment, 1.25×10^{-3} mol of the ion of **M** required 37.5 cm³ of 0.0200 mol dm⁻³ potassium manganate(VII) for complete reaction.

What is the initial oxidation state of the ion of M?

- A +1 B +2
- **C** +3 **D** +4
- **3** The table gives the successive ionization energies for element **X**.

	1 st	2 nd	3 rd	4 th	5 th	6 th
Ionization energies/kJ mol ⁻¹	950	1800	2700	4800	6000	12300

What could be the formula of the bromide of X?

- A XBr
- B XBr₂
- C XBr₃
- D XBr₄

- 4 Which of the following electrostatic attraction is **not** present in a sample of CH₃F?
 - A permanent dipole-permanent dipole interactions
 - **B** instantaneous dipole-induced dipole interactions
 - **C** hydrogen bonds
 - **D** covalent bonds
- **5** Trimethoprim (TMP) is used for the treatment of urinary tract infections. It has the following structure:



Trimethyoprim (TMP)

In which sequence is the bond angles quoted in decreasing order?

- **A** y > w > z > x
- **B** x > y > z > w
- $\mathbf{C} \quad y > z > w > x$
- $\mathbf{D} \quad x > y > w > z$

6 Which of the following molecules *do not* have all the atoms lying on the same plane?

- **A** H₂O
- B PH₃
- **C** AlCl₃
- **D** IC l_3

- 7 A chemist discovered that an element **X** forms X^{2+} ions with the electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8$. Element **X** has a relative atomic mass of 2y+5, with y representing the proton number. How many neutrons are present in an atom **X**.
 - **A** 28
 - **B** 30
 - **C** 32
 - **D** 33

8 Which of the following oxides is unlikely to dissolve in aqueous sodium hydroxide?

Α	MgO		В	Al_2O_3

- **C** SiO₂ **D** SO₂
- **9** Nitrogen dioxide decomposes on heating according to the following equation.

 $2NO_2(g) = 2NO(g) + O_2(g)$

When 2 mol of nitrogen dioxide is placed in a 4 dm³ container and heated, the equilibrium mixture contained 0.8 mol of oxygen.

What is the numerical value of the equilibrium constant, K_c , at the temperature of the experiment?

Α	0.0889	В	0.800

- **C** 3.20 **D** 12.8
- 10 Which statement about the effect of a catalyst on a reversible reaction is correct?
 - A It increases the yield of product in an equilibrium.
 - **B** It increases the equilibrium constant for the forward reaction.
 - **c** It increases the rate of the forward reaction and decreases the rate of the reverse reaction.
 - **D** It increases the rate constant for both the forward and the reverse reaction.

$$\begin{split} \mathsf{N}_2\mathsf{O}_4(\mathsf{g}) &\to 2\mathsf{N}\mathsf{O}_2(\mathsf{g}) & \Delta\mathsf{H}^\theta = +57.9 \text{ kJ mol}^{-1} \\ \mathsf{N}\mathsf{O}(\mathsf{g}) &+ \frac{1}{2}\,\mathsf{O}_2(\mathsf{g}) \to \mathsf{N}\mathsf{O}_2(\mathsf{g}) & \Delta\mathsf{H}^\theta = -56.6 \text{ kJ mol}^{-1} \end{split}$$



Determine the enthalpy change of the following reaction:

 $2NO(g) + O_2(g) \rightarrow N_2O_4(g)$

A +114.5 kJ mol⁻¹ **B** -114.5 kJ mol⁻¹ **C** +171 kJ mol⁻¹ **D** -171 kJ mol⁻¹

12 A 1 mol sample of a monobasic weak acid, CH_3COOH , is diluted at constant temperature to a volume *V*.

 $CH_3COOH(aq) + H_2O(l) = CH_3COO^-(aq) + H_3O^+(aq)$

Which of the following graphs correctly illustrates the relationship between V and the acid dissociation constant, K_a , of CH₃COOH?



13 Which one of the following elements has the same oxidation state in all of its known compounds?

Α	beryllium	В	bromine
С	nitrogen	D	sulfur

14 Lattice energy of an ionic salt **XY** is less exothermic than MgO. Which of the following about the ionic radii of **X** and **Y** and the charges of **X** and **Y** is correct when compared with that of magnesium and oxygen?

	lonic	radius	Charge of ions		
	X	Y	X	Y	
Α	Same	Same	Higher	Same	
В	Smaller	Smaller	Same	Same	
С	Larger	Larger	Higher	Higher	
D	Larger	Larger	Lower	Lower	

15 The product of the concentrations of X and Y, [X][Y], is plotted against time, t, for the following second-order reaction.



 $X + Y \rightarrow Z$

Which graph would be obtained?

Temperature / K	<i>K</i> _w / mol² dm⁻ ⁶
289	5 x 10 ⁻¹⁵
298	1 x10 ⁻¹⁴

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Which of the following can be used to explain this difference in K_w values?

- \mathbf{A} H⁺(aq) and OH⁻(aq) are formed through endothermic reaction.
- **B** Formation of $H^+(aq)$ and $OH^-(aq)$ is favoured at lower temperatures.
- **C** The pH of water is independent of the temperature.
- **D** The concentration of water is lower at higher temperature.
- **17** Element **X** is a solid with a very low electrical conductivity at room temperature. It forms only one chloride, which is a liquid at room temperature and is a non-conductor of electricity. The chloride hydrolyses in water forming a white solid and a strongly acidic solution.

Which of the following could be X?

- A AluminiumB PhosphorusC SiliconD Sulfur
- **18** The bond dissociation energy of H-Cl is 431 kJ mol⁻¹. In which of the following processes is 431 kJ of energy released?
 - $\mathbf{A} \quad \mathsf{HC}l(\mathsf{g}) \to \mathsf{H}(\mathsf{g}) + \mathsf{C}l(\mathsf{g})$
 - **B** $H(g) + Cl(g) \rightarrow HCl(g)$
 - **C** $HCl(g) \rightarrow \frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g)$
 - $\mathbf{D} \qquad \frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g) \rightarrow HCl(g)$

19 Deuterium, D, is a heavy isotope of hydrogen. Deuteriobenzene is reacted with a mixture of chlorine gas under suitable conditions such that only monosubstitution takes place.

Assuming that the carbon–deuterium bond is broken as easily as a carbon–hydrogen bond, which proportion of the chlorinated products will be 3–chlorodeuteriobenzene?



- **20** Which of the following could be best used to distinguish between hex-1-ene and methylbenzene?
 - A acidified K₂Cr₂O₇
 - B Br₂ in CCl₄
 - **C** I₂ in NaOH(aq)
 - **D** concentrated sulfuric acid
- **21** Which hydrocarbon, on treatment with hot acidified potassium manganate(VII), would give ethanoic acid as one of the products?



22 A reaction sequence is given below.



Which of the following structures represents the product Q?



- 23 Compound X
 - Changes the colour of acidified sodium dichromate(VI) from orange to green
 - Has no effect on Fehling's reagent
 - Produces an orange precipitate with 2,4 DNPH

What could **X** be?

- A CH₃COCH₂CHO
- B CH₃COCH₂COCH₃
- C CH₃COCH₂CH₂OH
- **D** HOCH₂CH₂CH₂CH₂OH

24 Citronellol is a colourless oily liquid with a rose-like smell. It is the active ingredient in over 30 essential oils and is a major component in perfumes, cosmetics and soaps. It may be prepared synthetically from compound S using reagent T.



25 Chlorofluorocarbons (CFCs) have been widely used in aerosol sprays, refrigerants and in making foamed plastics, but are now known to destroy ozone in the atmosphere.

What will **not** destroy ozone and therefore can be used as a safe replacement for CFCs?

- A CHBr₃
- **B** CCl₃CBr₃
- C CHC/FCC/F₂
- $D CH_3CH_2CH_2CH_3$

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

Α	В	С	D
1, 2 and 3 are	1 and 2 only are	2 and 3 only are	1 only is
correct	correct	correct	correct

- 26 Which statements about relative molecular mass are correct?
 - 1 It is the sum of relative molecular masses of all atoms within the molecule
 - 2 It is the ratio of the average mass of a molecule to the mass of a ¹²C atom
 - **3** It is the ratio of the masses of 1 mol of molecules to the mass of 1 mol of ¹H atom.
- 27 Which statements about the electronegativity of elements in the Periodic Table are correct?
 - 1 In Period 3, it decreases from sodium to chlorine.
 - 2 In Group II, it decreases from beryllium to barium.
 - **3** In Group VII, it decreases from fluorine to iodine.
- **28** The enthalpy changes of formation of carbon monoxide and carbon dioxide are given below.

 ΔH_{f} (CO) = -110 kJ mol⁻¹ ΔH_{f} (CO₂) = -393 kJ mol⁻¹

Which of the following statements are correct?

- 1 The enthalpy change of combustion of carbon monoxide is exothermic.
- 2 Carbon dioxide is energetically more stable than carbon monoxide.
- **3** The enthalpy change of combustion of carbon is -110 kJ mol^{-1} .

29 When light is shown for a fixed period into a solution of CH_2ICH_2I and I_2 in tetrachloromethane at 100 °C, the following reaction occurs.

Experiment	Relative concentrations		Relative light	Relative initial rate of	
	CH2ICH2I	2ICH2I I2		formation of lodine	
1	4	1	4	2	
2	4	1	1	1	
3	2	1	4	1	
4	2	2	4	1	

 $CH_2ICH_2I \rightarrow CH_2\text{=}CH_2 + I_2$

From the data above, the rate of formation of iodine is

- 1 independent of the initial concentration of I₂
- **2** proportional to the initial concentration of CH₂ICH₂I
- **3** proportional to the square root of light intensity
- **30** The diagram shows some laboratory apparatus:



Which preparations could this apparatus be used for?

- 1 Bromoethane, from ethanol, sodium bromide and concentrated sulfuric acid.
- 2 Ethanal, from ethanol, sodium dichromate(VI) and sulfuric acid.
- **3** 1,2–dibromoethane, from bromine and ethene.

– End of Paper 1 –

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