SERANGOON JUNIOR COLLEGE
General Certificate of Education Advanced Level
Higher 1

CHEMISTRY 8872/01

PRELIMINARY EXAMINATION 28 August 2009
Paper 1 50 min

Additional Materials: Data Booklet
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, index number on the OMS Sheet in the spaces provided.

Write in soft pencil.

There are **thirty** questions in this paper. Answer **all** questions. For each question, there are four possible answers labelled **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in soft pencil on the OMR answer sheet.

Read very carefully the instructions on the OMR answer sheet.

You are advised to fill in the OMR Answer Sheet as you go along; no additional time will be given for the transfer of answers once the examination has ended.

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 question paper.

This document consists of **14** printed pages and **0** blank page.

Answer ALL Questions

1 0.5 g of zinc powder was found to reduce an acidified solution of 25.50 cm^3 of 0.200 mol dm^{-3} VO_2^+. Which one of the following is the reduced product of VO_2^+?

A VO_3^-
B VO^{2+}
C V^{3+}
D V^{2+}

2 3.920 g of an oxide of formula **M**O was completely dissolved in 30.0 cm^3 of 2.00 mol dm^{-3} sulphuric acid. The resulting solution was made up to 100 cm^3. 25.0 cm^3 of this solution was neutralised by 27.5 cm^3 of 0.100 mol dm^{-3} sodium hydroxide. What is the relative molecular mass of **M**?

A 48.6
B 54.9
C 55.9
D 101.0

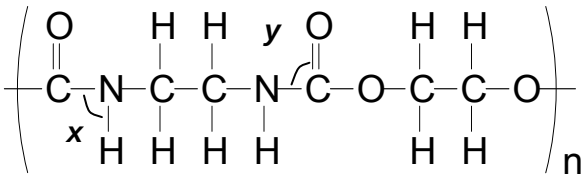
3 One of the isotopes of carbon is carbon-14. Carbon-14 is radioactive and is used in carbon dating by archaeologists. Which one of the following species has the same number of neutrons and electrons as an atom of carbon-14?

A $^{13}C^-$
B $^{14}N^+$
C $^{16}O^{2+}$
D $^{17}F^+$

4 The electronic configurations of two atoms, **E** and **F**, are $1s^22s^22p^3$ and $1s^22s^22p^4$ respectively. Compare the first and second ionisation energies of **E** and **F**.

	1st I.E.	**2nd I.E.**
A	E < F	E > F
B	E < F	E < F
C	E > F	E > F
D	E > F	E < F

5 Polyurethane is used in coatings, insulators and adhesives.



Polyurethane

What are the values of the bond angles marked ***x*** and ***y*** in polyurethane?

	x	**y**
A	90	90
B	120	120
C	107	120
D	109.5	90

6 Oxygen reacts with nitrogen monoxide in the equation shown.

$$O_2\,(g) + 2\,NO\,(g) \rightarrow 2\,NO_2\,(g)$$

In an experiment to investigate the effects of concentrations on the rate of the reaction, the following results were obtained.

Expt	$[O_2]$ / mol dm^{-3}	[NO] / mol dm^{-3}	Rate / mol dm^{-3} s^{-1}
1	1.0	1.0	0.0007
2	1.0	2.0	0.0028
3	2.0	1.0	0.0014
4	2.0	2.0	**z**

The value of **z** is

A 0.0007
B 0.0021
C 0.0056
D 0.0112

7 What can be deduced from the following equilibrium?

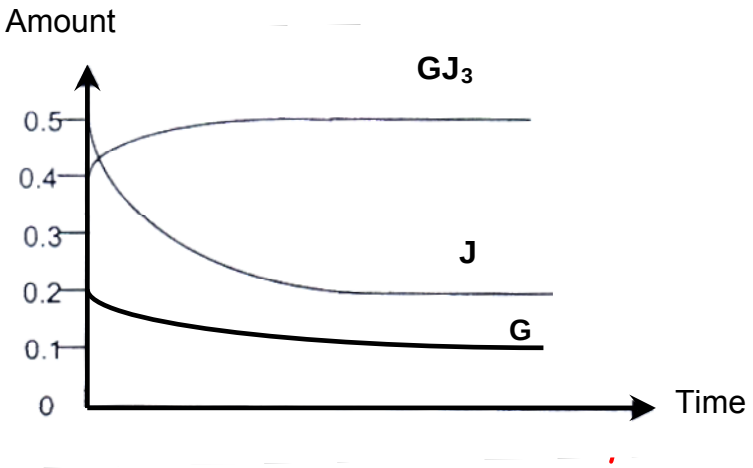
$$2\,SO_2\,(g) + O_2\,(g) \rightleftharpoons 2\,SO_3\,(g) \qquad \Delta H = -98\ kJ\ mol^{-1}$$

A Adding a catalyst increase the yield of SO_3 (g).
B Decreasing the pressure will cause the position of equilibrium to shift to the right.
C Decreasing the temperature will cause the position of equilibrium to shift to the left.
D The maximum mass of SO_3(g) that can be made from 64 g of SO_2(g) is 80 g

8 The system containing **G**, **J** and $\mathbf{GJ_3}$ is allowed to reach equilibrium in a 5 dm^3 vessel at a temperature of 1000K.

$$\mathbf{G}\,(g) + 3\,\mathbf{J}\,(g) \rightleftharpoons \mathbf{GJ_3}\,(g)$$

The diagram below shows the change in number of moles of **G**, **J** and $\mathbf{GJ_3}$ with time.



What is the equilibrium constant K_c for the reaction?

A $\dfrac{0.5}{0.1\times(0.2)^3}$

B $\dfrac{0.5}{0.2\times(0.2)^3}$

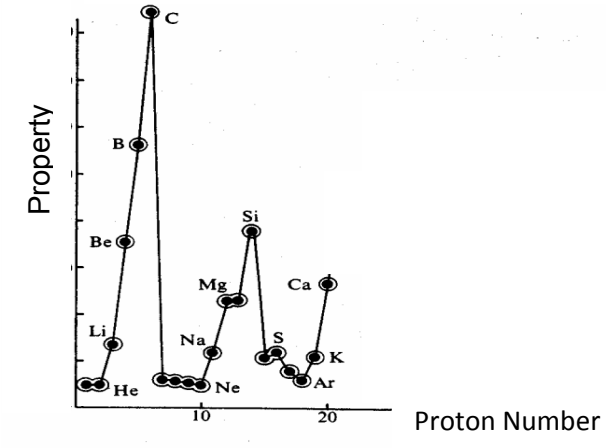
C $\dfrac{0.5\times5^3}{0.1\times(0.2)^3}$

D $\dfrac{0.5\times5^3}{0.2\times(0.2)^3}$

9 An enzyme was found to operate at maximum efficiency in an aqueous solution buffered at pH 5. Which of the following would give the necessary buffer solution when dissolved in 10 dm^3 of water?

A 1 mol of NaOH and 1 mol of CH_3COOH
B 1 mol of CH_3COOH and 1 mol of $CH_3COO^-Na^+$
C 1 mol of HC*l* and 1 mol of $CH_3COO^-Na^+$
D 1 mol of $CH_3COO^-NH_4^+$

10 The following shows the variation of a property of the first 20 elements in the Periodic Table with the proton number of the element.



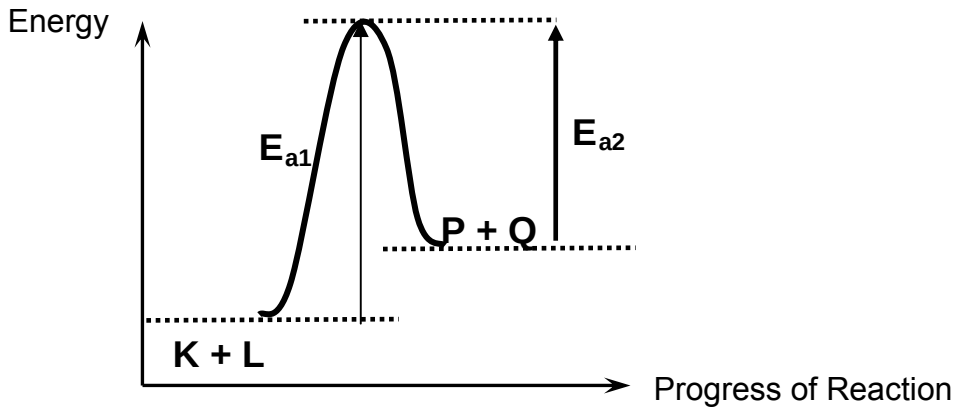
What is the property?

A Atomic Radius
B First ionisation energy
C Ionic radius
D Melting point

11 Which of the following elements has an oxide with a giant molecular structure and a chloride which is readily hydrolysed?

A Silicon
B Sodium
C Phosphorus
D Barium

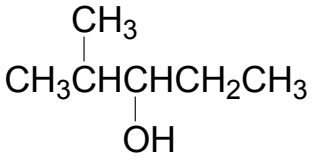
12 A certain reversible reaction, **K** + **L** $\rightleftharpoons$ **P** + **Q**, gives the following energy profile diagram.



Which of the following statements is false?

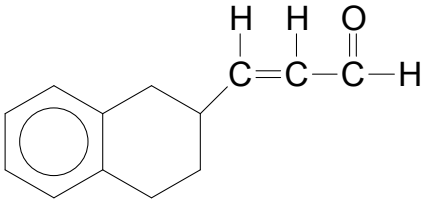
A $E_{a1} = E_{a2} - \Delta H$
B The formation of **K** and **L** is an exothermic reaction.
C Temperature of surrounding decreases during the formation of **P** and **Q**.
D The activation energy of the backward reaction is lower than the activation energy of the forward reaction.

13 How many alkenes (including geometric isomers) can be obtained when 2-methylpentan-3-ol undergoes dehydration?



A 1
B 2
C 3
D 4

14 Identify the number of sp^2 and sp^3 carbon atoms in the given structure:



	sp^2	**sp^3**
A	8	5
B	9	4
C	2	5
D	3	4

15 Which of the following statements is correct?

A But-2-ene undergoes electrophilic substitution with aqueous bromine to form alcohols.
B The halogen molecule undergoes heterolytic fission during free radical substitution.
C $CH_3CH_2CH_2OH$ is the major product formed when propene reacts with water under suitable conditions.
D Ethane reacts with chlorine in the presence of light to form CH_3CHCl_2.

16 Fly paper is used as a non-toxic method of trapping houseflies. To increase its effectiveness and attractiveness, *Muscalure*, which is a fly sex pheromone, is added to the paper during the manufacturing process.

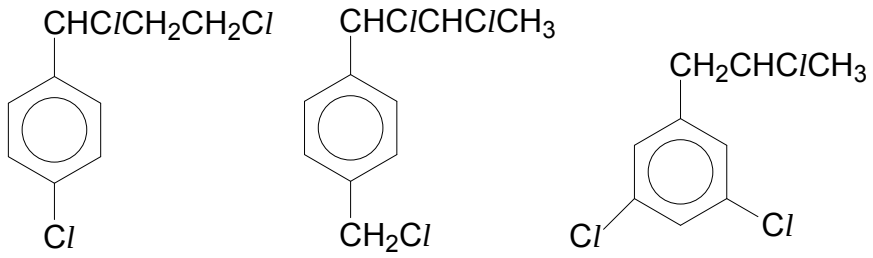
Muscalure has the following structure:

$$CH_3(CH_2)_7CH=C(CH_3)(CH_2)_{12}CH_3$$

Which of the following statements about *Muscalure* is **incorrect**?

A In the presence of excess bromine and uv light, it undergoes free radical substitution.
B It exists as a pair of geometrical isomers.
C It reacts with HBr to form single product only.
D It can be extracted from the fly paper by soaking the paper in benzene.

17 Experiments are carried out on three compounds: **R**, **S** and **T.**



R **S** **T**

A sample of 0.01 mol of each compound is refluxed with 40 cm^3 of 1 mol dm^{-3} of aqueous sodium hydroxide in excess. Excess aqueous silver nitrate is added to the resulting mixture in each case and the mass of the precipitate weighed.

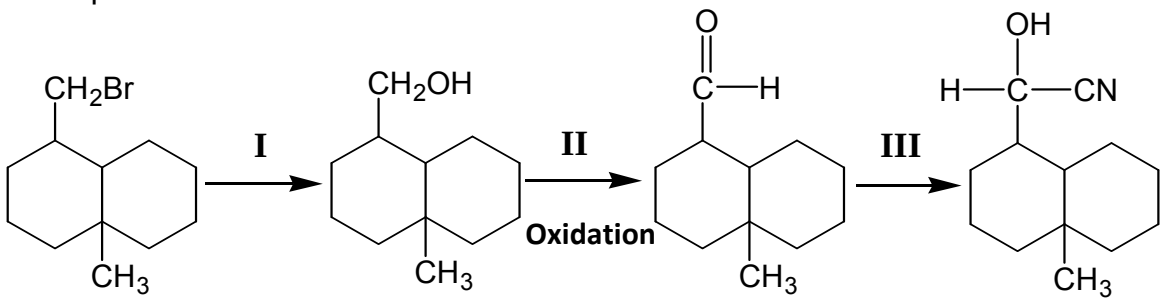
What is the mass in grams, of the precipitate formed by each compound?

	R	**S**	**T**
A	4.31	4.31	4.31
B	2.87	2.87	1.44
C	2.87	4.31	1.44
D	1.44	4.31	1.44

18 Which reagent could be used to distinguish between pentan-2-ol and pentan-2-one?

A aqueous bromine
B alkaline aqueous iodine
C acidified potassium manganate(VII)
D sodium carbonate

19 A 3-step reaction scheme is shown below.



Which one of the following correctly describes the types of organic reactions for steps **I** and **III**?

	Step I	**Step III**
A	Electrophilic substitution	Nucleophilic addition
B	Electrophilic substitution	Electrophilic addition
C	Nucleophilic substitution	Nucleophilic addition
D	Nucleophilic substitution	Electrophilic substitution

20 An ester **U** has the following chemical formula: $C_3H_7COOC_3H_7$. Which pair of compounds *cannot* be used to produce **U** in the presence of concentrated sulphuric acid?

A $CH_3CH_2CH_2COOH$ and $(CH_3)_2CHOH$
B $(CH_3)_2CHCOOH$ and $CH_3CH_2CH_2OH$
C CH_3CH_2COOH and $CH_3CH_2CH_2OH$
D $(CH_3)_2CHCOOH$ and $(CH_3)_2CHOH$

For **questions 21 – 30**, one or more of the 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

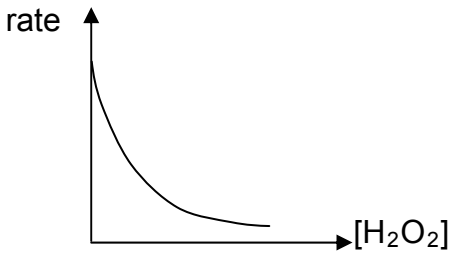
No other combination of statements is to be used as correct response.

21 Which of the following molecules are **not** polar?

1 CO_2 , CH_4
2 CCl_4 , $AlCl_3$
3 SF_4 , F_2O

22 Which graph would confirm that the rate of decomposition of hydrogen peroxide is first order with respect to the concentration of hydrogen peroxide?

1



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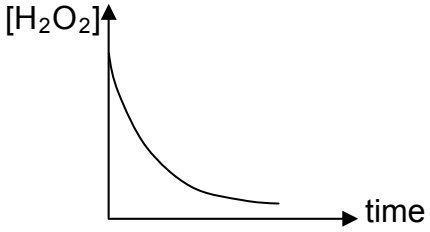

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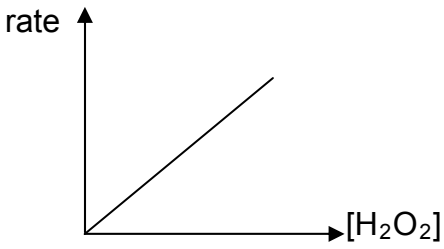


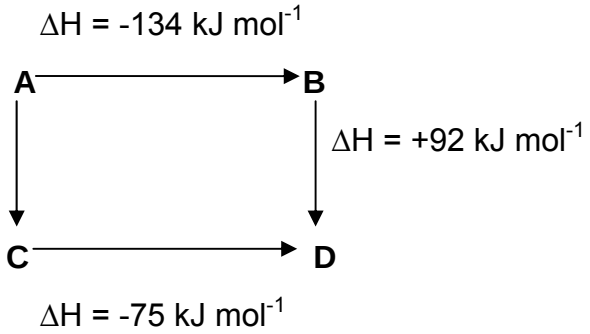
23 Which of the following are correct descriptions of a weak acid?

1 It has low pK_a value.
2 It has a relatively low electrical conductivity in dilute solutions.
3 Its conjugate base is strong.

24 Which of the following oxides can dissolve in aqueous sodium hydroxide?

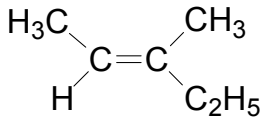
1 Al_2O_3
2 SiO_2
3 MgO

25 The diagram below illustrates the energy changes for a set of reactions. Which of the following statement(s) is/are correct?

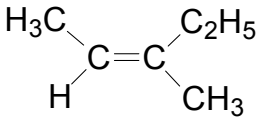


1 The enthalpy change for the transformation of **D**→**A** is +42 kJ mol^{-1}.
2 The enthalpy change for the transformation of **C**→**B** is endothermic.
3 The enthalpy change for the reaction **A**→**C** is -33 kJ mol^{-1}.

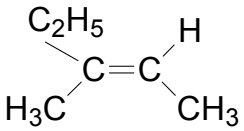
26 The four structures shown below are isomers of C_6H_{12}.



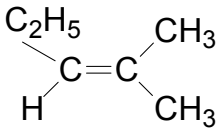
E



F



G



H

Which of the following pairs are cis-trans isomers?

1 **E** and **F**
2 **E** and **G**
3 **F** and **H**

27 2,2-dimethylpropylamine can be produced by this reaction scheme starting with compound **J**.

2,2-dimethylpropylamine

Which of the following statement(s) is / are correct?

1 **J** is $(CH_3)_3CBr$.
2 Conversion of **J** to **K** is a nucleophilic substitution reaction.
3 Conversion of **K** to 2,2-dimethylpropylamine could be carried out using hydrogen in the presence of nickel catalyst.

28 Which of the following compounds forms a yellow precipitate when warmed with alkaline aqueous iodine?

1 Butan-2-ol
2 1-phenylethanol
3 2-phenylethanol

29 Which of the following reagents can be used to distinguish between C_6H_5CHO and $C_6H_5COCH_3$?

1 Aqueous $[Ag(NH_3)_2]^+$
2 Alkaline solution of iodine
3 2,4-dinitrophenylhydrazine

30 Compound **L** has the general formula of $C_nH_{2n}O_2$.

What could be its possible identity?

1 It contains an ester group
2 It contains a carboxylic acid group.
3 It contains 2 carbonyl groups.

-END OF PAPER-