INNOVA JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATION 2
in preparation for General Certificate of Education Advanced Level
Higher 1

CANDIDATE NAME			
CLASS		INDEX NUMBER	

CHEMISTRY 8872/01

Paper 1 Multiple Choice **24 September 2009**

50 minutes

Additional Materials: *Data Booklet*
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name and class on all the work you hand in.
Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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 **11** 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 Consider the following half-equations.

$$Fe^{2+} \longrightarrow Fe^{3+} + e$$
$$C_2O_4^{2-} \longrightarrow 2CO_2 + 2e$$

What volume of 0.01 mol dm^{-3} $K_2Cr_2O_7$ is required to oxidise 20 cm^3 of an acidified solution of 0.01 mol dm^{-3} FeC_2O_4?

A 10 cm^3 **C** 30 cm^3

B 20 cm^3 **D** 40 cm^3

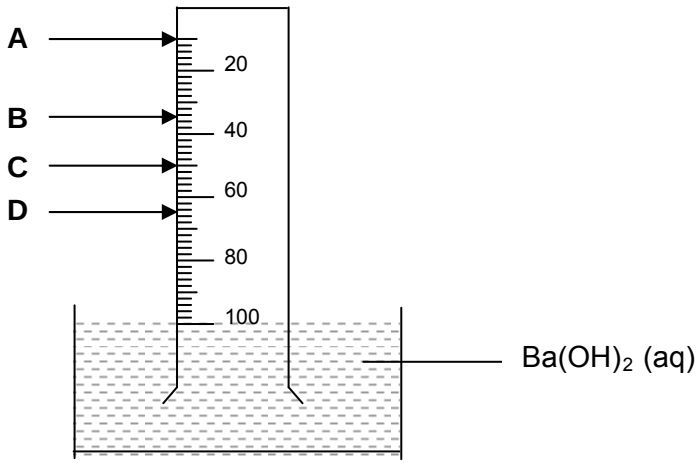
2 A sample containing ammonium sulphate (M_r = 132) was warmed with 100 cm^3 of 0.500 mol dm^{-3} sodium hydroxide. When the evolution of ammonia ceased, the excess sodium hydroxide solution was neutralised with 25.00 cm^3 of 0.500 mol dm^{-3} hydrochloric acid. What was the mass of ammonium sulphate in the sample?

A 2.48 g **C** 6.60 g

B 4.95 g **D** 13.20 g

3 A tube was filled with a mixture composing of 10 cm^3 of methane, 15 cm^3 of ethene and 75 cm^3 of oxygen at room temperature. The open end of the tube was placed in a beaker of $Ba(OH)_2$ (aq) as shown below.

The gas mixture was then sparked and the reaction was allowed to proceed till completion.



What would be the final level of the liquid in the tube after cooling it to room temperature?

4 The electronic configurations of four elements are given below. Which of these elements has the highest first ionisation energy?

A $1s^2\ 2s^2\ 2p^6\ 3s^1$

B $1s^2\ 2s^2\ 2p^6$

C $1s^2\ 2s^2\ 2p^1$

D $1s^2\ 2s^2$

5 Which property of the first seven elements in Period 3 continuously increases numerically?

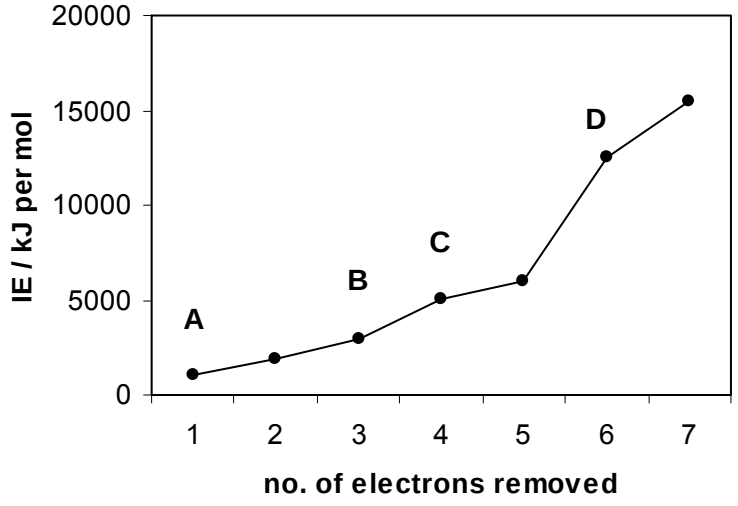
A boiling point

B ionic radius

C first ionisation energy

D highest oxidation number in oxide

6 The first seven ionisation energies of an element **W** are plotted as below.
Which of the following ionisation energies correspond to the removal of the first electron from the s orbital?



7 The ions P^{3-}, S^{2-} and Cl^- have radii 0.212 nm, 0.184 nm and 0.181 nm respectively. Which one of the following correctly explains the decrease in radius in going from P^{3-} to Cl^-?

A An increase in the total number of electrons and in the nuclear charge.

B An increase in the total number of electrons with the nuclear charge remaining constant.

C A constant total number of electrons and an increase in the nuclear charge.

D A decrease in the total number of electrons and an increase in the nuclear charge.

8 Which of the following statements is correct for the Period 3 elements Na, Mg, A*l*, Si, P, S, C*l*?

A Chlorine has the largest atomic radius

B Sodium has the highest electrical conductivity

C C*l* (g) has the highest first ionisation enthalpy

D Cl^- (g) and S^{2-} (g) have the same ionic radius

9 Which one of the following statements is **incorrect**?

A $AlCl_3$ has a higher melting point than Al_2O_3

B Al_2Cl_6 dimer contains two co-ordinate bonds.

C $AlCl_3$ is trigonal planar in shape.

D $AlCl_3$ acts as a catalyst in chlorination of benzene.

10 Three substances, **X**, **Y** and **Z** have physical properties as shown.

Substance	Melting point/ °C	Boiling point/ °C	Electrical conductivity in	
			solid state	liquid state
X	801	1413	Poor	Good
Y	2852	3600	Poor	Good
Z	3550	4827	Good	Not known

What could be the identities of **X**, **Y** and **Z?**

	X	**Y**	**Z**
A	NaBr	CaO	SiO_2
B	NaC*l*	MgO	Graphite
C	NaF	$BeCl_2$	Cu
D	NaI	Al_2O_3	Diamond

11 In which of the following pairs of compounds is the bond angle in particle **I** greater than that in particle **II**?

	I	**II**
A	PH_3	BH_3
B	NO_3^-	ClO_2^-
C	SF_6	ClF_3
D	I_3^-	$BeCl_2$

12 The enthalpy change of reaction between zinc and hydrochloric acid can be measured in the laboratory.

$$Zn(s) + 2HCl\,(aq) \longrightarrow ZnCl_2(aq) + H_2\,(g)$$

What information, other than that obtained in this experiment, is needed to calculate a value for the enthalpy change of formation of aqueous $ZnCl_2$?

A enthalpy change of formation of aqueous H^+ and Cl^- ions.

B enthalpy change of formation of zinc

C lattice energy of zinc (II) chloride

D first and second ionisation energies of zinc

13 The value of the ionic product of water, K_w, varies with temperature.

Temperature / ^oC	K_w / $mol^2\ dm^{-6}$
25	1.0×10^{-14}
62	1.0×10^{-13}

What can be deduced from this information?

A The ionic dissociation of water is an exothermic process.

B The association of water molecules by hydrogen bonding increases as temperature increases.

C The pH of pure water increases with temperature.

D At 62 ^oC, water with a pH of 6.5 is neutral.

14 Gas **X** reacts with gas **Y** according to the following equation

$$\mathbf{X}(g) + \mathbf{Y}(g) \rightarrow \mathbf{XY}(g)$$

The rate equation for the reaction is

$$\text{rate} = k[\mathbf{X}][\mathbf{Y}]^2$$

Which of the following statements is correct at constant temperature?

A Doubling the concentration of **X** and of **Y**, will double the rate of reaction.

B Halving the concentration of **Y**, keeping the concentration of **X** constant, will decrease the rate by a factor of 8.

C Tripling the concentration of both **X** and **Y** will increase the rate by a factor of 27.

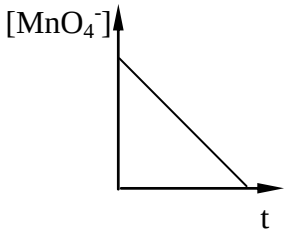
D Quadrupling the concentration of **Y**, keeping the concentration of **X** constant, will increase the rate by a factor of 8.

15 Ethanedioate ions, $C_2O_4^{2-}$, are oxidised by acidified, aqueous potassium manganate (VII) according to the equation:

$$2\ MnO_4^-(aq) + 5\ C_2O_4^{2-}(aq) + 16\ H^+(aq) \rightarrow 2\ Mn^{2+}(aq) + 10\ CO_2(g) + 8\ H_2O(l)$$

Which of the following graphs would be obtained if the concentration of manganate (VII) was plotted against time for the reaction?

A



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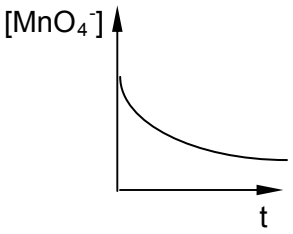
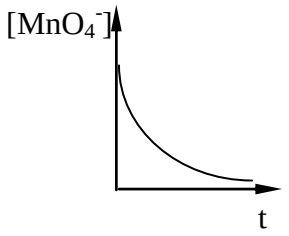
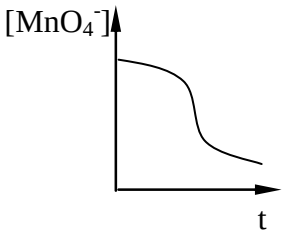


B



D



16 A mixture of nitrogen monoxide and carbon dioxide will form an equilibrium mixture as shown by the equation.

$$NO\ (g) + CO_2\ (g) \rightleftharpoons NO_2\ (g) + CO\ (g)$$

If 1.0 mol of nitrogen monoxide and 1.0 mol of carbon dioxide are allowed to reach equilibrium, 20 % of the resulting mixture is nitrogen dioxide.

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

A $\frac{2}{3}$ **B** $\frac{4}{9}$ **C** $\frac{1}{4}$ **D** $\frac{1}{16}$

17 Two equilibria are shown below.

Reaction I: $X_2Y(g) \rightleftharpoons X_2(g) + \frac{1}{2}Y_2(s)$

Reaction II: $2X_2(g) + Y_2(s) \rightleftharpoons 2X_2Y(g)$

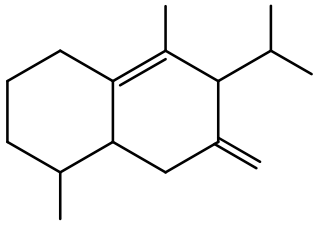
The numerical value of K_c for reaction I is 2.

Under the same conditions, what is the numerical value of K_c for reaction II?

A $\sqrt{\frac{1}{2}}$ **C** $\frac{1}{4}$

B $\frac{1}{2}$ **D** 4

18 When the molecule below is heated with hydrogen gas in the presence of nickel catalyst, how many sp^2 hybridised carbon atoms does the product molecule possess?



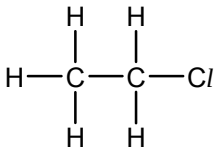
A 0
B 2
C 1
D 3

19 Concentrated ammonia was heated in a sealed tube with excess bromoethane, C_2H_5Br. Which of the following products will **not** be formed?

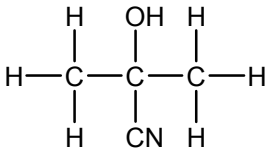
A $C_4H_{11}N$
B $C_5H_{13}N$
C $C_6H_{15}N$
D $C_8H_{20}NBr$

20 Which compound can be synthesized from prop-1-ene in less than 3 steps?

A



B



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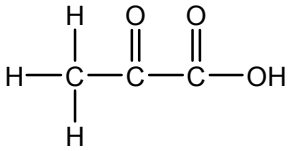

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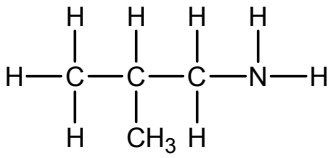
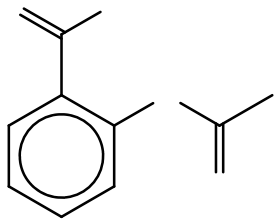


21 In which of the following sequences does the value of pK_a increase continuously?

A $CH_3CHClCOOH$, CH_3CH_2COOH, CH_3COOH
B $CH_3CHClCOOH$, CH_2ClCH_2COOH, CH_3CH_2COOH
C CH_3CH_2COOH, $CH_3CHClCOOH$, $CH_3CHFCOOH$
D CH_3CH_2COOH, $CH_3CHFCOOH$, CH_3CF_2COOH

22 Aspirin is a medication given to relieve pain and reduce fever. It was developed by a German chemist named Felix Hoffman as a treatment for his father's arthritis.



Which of the following is true about aspirin?

A It dissolves in aqueous sodium hydroxide to give a colourless solution.

B It gives a yellow precipitate when warmed with aqueous alkaline iodine.

C It gives one mol of hydrogen gas when sodium metal is added to 1 mole of aspirin.

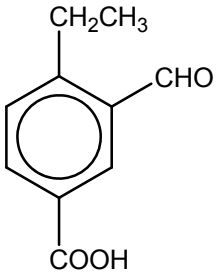
D It is resistant to acidic and alkaline hydrolysis.

23 Compound **Q** has the following properties.

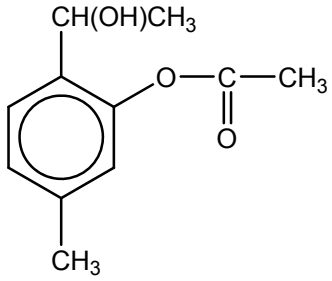
- It produces white fumes when PCl_5 is added.
- It reacts with Na_2CO_3 to give rapid effervescence.
- It does not react with Cu^{2+} in alkaline solution but gives an orange precipitate with 2,4–DNPH.
- It results in the formation of green Cr^{3+} ions from an acidified solution of $Cr_2O_7^{2-}$ ions.

Which one of the following could be **Q**?

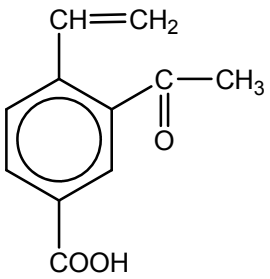
A



C



B



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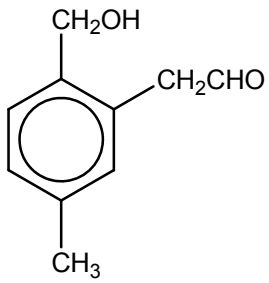
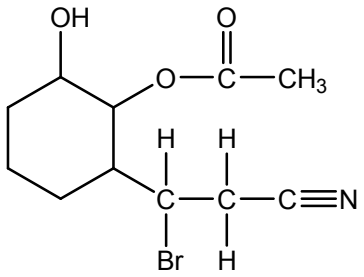


24 0.01 mol of compound **R** is refluxed with 50 cm^3 of 1 mol dm^{-3} aqueous NaOH and all ammonia gas evolved is expelled. The resulting solution is subsequently titrated with 1 mol dm^{-3} HC*l* solution.



Compound **R**

What is the volume of HC*l* required for complete neutralisation of the resulting solution?

A 10 cm^3 **C** 30 cm^3

B 20 cm^3 **D** 40 cm^3

25 0.10 mol of an organic compound **F** gives 0.40 mol of carbon dioxide and 0.50 mol of water on complete combustion. 2.00 g of F when vaporised, was found to occupy 0.497 dm^3 at 273 K and 1 atm. Which of the following could be the formula of **F**?

A $CH_3OCH_2CH_2CH_3$ **C** $CH_2(OH)CH_2CH_2CH_2(OH)$

B $CH_3CH_2CH_2CH_3$ **D** $CH_3COCHClCHO$

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, B, C,** and **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 Ethyl propanoate $CH_3CH_2OCOCH_2CH_3$ undergoes acidic hydrolysis in the presence of $H_2{}^{18}O$. Which of the following products are formed?

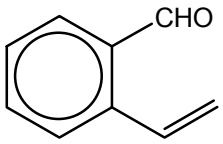
1 CH_3CH_2OH

2 $CH_3CH_2CO^{18}OH$

3 $CH_3CH_2{}^{18}OH$

27 Which of the following molecules are planar?

1



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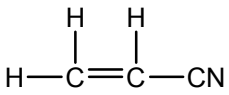

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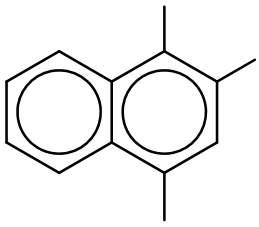

28 Phosphorus forms phosphorus pentachloride but not phosphorus pentaiodide. Which of the following statements explain this phenomenon?

1 Steric hinderance due to large iodine atoms.

2 Chlorine is more electronegative than iodine.

3 Iodine has smaller first ionisation energy than chlorine.

29 Which of the following statements are correct?

1 The atomic number of an element is the number of protons in one atom of the element.

2 The relative mass of an electron is the same as that of a proton.

3 The nucleon number of an element is the number of neutrons in one atom of the element.

30 Anhydrous compounds of Period 3 elements that react with water to give solutions with a pH value less than 5 include

1 covalent oxides.

2 covalent chlorides.

3 ionic chlorides.

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