

CHEMISTRY PAPER 1
SECTION B : Question-Answer Book B

This paper must be answered in English

INSTRUCTIONS FOR SECTION B

- (1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5, 7 and 9.
- (2) Refer to the general instructions on the cover of the Question Paper for Section A.
- (3) This section consists of TWO parts, Parts I and II.
- (4) Answer ALL questions in both Parts I and II. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
- (5) An asterisk (*) has been put next to the questions where one mark will be awarded for effective communication.
- (6) Supplementary answer sheets will be provided on request. Write your candidate number, mark the question number box and stick a barcode label on each sheet, and fasten them with string **INSIDE** this Question-Answer Book.
- (7) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

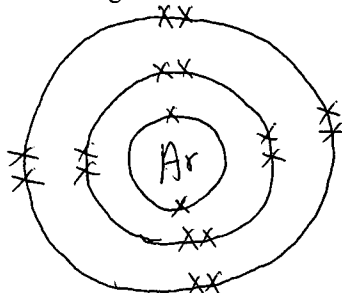


PART I

Answer **ALL** questions. Write your answers in the spaces provided.

1. Argon and chlorine are elements in the same period of the Periodic Table.

(a) Draw the electron diagram for a molecule of argon, showing *electrons in all shells*.



(1 mark)

(b) What is the type of intermolecular force in chlorine gas?

Weak Van der Waals' forces (dispersion force ~~is~~ only).
~~est~~ exist between chlorine gas molecules.

(1 mark)

(c) Complete the table below by stating the natural source and the method of extraction from the source for each element.

Element	Natural source	Method of extraction
Argon	Air in atmosphere	Fractional distillation of liquid air
Chlorine	Sea water (brine, concentrated sea sodium chloride)	Electrolysis of sea water.

(4 marks)

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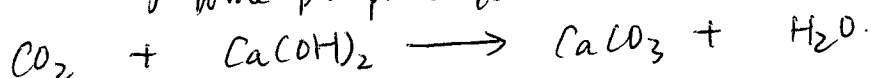
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2. For each of the following experiments, state the expected observation, and write the chemical equation(s) for the reaction(s) involved.

- (a) passing carbon dioxide gas into limewater until in excess

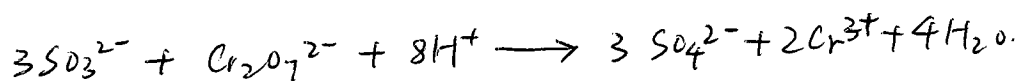
The limewater ~~turns~~ turns from clear to ~~white~~ milky,
~~and CO₂ dissolve in the solution~~
 many white precipitate formed.



(3 marks)

- (b) adding sodium sulphite solution to acidified potassium dichromate solution until in excess

~~350~~ The potassium dichromate solution turns from
~~purple~~ orange to green.



(2 marks)

3. Aluminium and iron are commonly used construction materials.

(a) Suggest why iron was used earlier than aluminium in history.

Because iron ore can be found in the surface of the Earth crust ^{more easily}, while the aluminium ore ~~is~~ can be found in the deeper position of the Earth crust.
~~Thus, mining ironing~~

(1 mark)

(b) A compound contains iron and oxygen only. In an experiment for determining the empirical formula of this compound, 2.31 g of the compound was heated with carbon monoxide. Upon complete reaction, carbon dioxide and 1.67 g of iron were formed.

(i) Calculate the empirical formula of this compound.

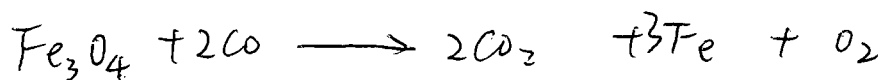
$$\frac{1.67}{55.8} = \frac{2.31 - 1.67}{16}$$

$$\frac{1.67}{55.8} = \frac{0.64}{16}$$

$$\approx 3 = 4$$

i.e. The ~~emp~~ empirical formula of this compound is Fe_3O_4 .

(ii) Write the chemical equation for the reaction involved in the experiment.



(iii) As carbon monoxide is poisonous, suggest one necessary safety precaution in carrying out the experiment.

Perform the experiment inside a fume ~~cupboard~~ cupboard.

(4 marks)

Answers written in the margins will not be marked.

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3. (c) Explain why a galvanised iron object does not easily rust even if the zinc layer is broken.

Zinc is more reactive than iron. Zinc ~~is~~ a stronger ~~reduct~~ reducing agent which is more readily to undergo oxidation and lose electron. ~~when~~ Even the zinc layer is broken ~~and~~ and can't prevent the direct contact of Iron and water and oxygen, when ~~the~~ iron undergo oxidation and starting rusting by losing electron, zinc will lose its electron and reduce Fe^{2+} ~~to~~ back to Fe and prevent rusting.

(2 marks)

- (d) Explain why anodisation can prevent aluminium objects from corrosion.

Anodisation can thicken the ~~thin~~ ~~is~~ impermeable, non-porous, ~~the~~ aluminium oxide layer which ahead well on aluminium objects' surface. The thick oxide layer prevent the direct contact between aluminium ~~and~~ oxygen and water and the entry of O_2 and H_2O better, thus ~~the~~ aluminium's ~~is~~ corrosion resistance can be enhanced by anodisation.

(2 marks)

4. Lead-acid accumulator is a secondary cell containing sulphuric acid. It is commonly used in starting up motor vehicle engines.

(a) What is meant by the term 'secondary cell'?

'Secondary cell' are the chemical cell ~~that~~ which is rechargeable.

(1 mark)

(b) Suggest why a lead-acid accumulator is suitable for starting up motor vehicle engines.

It can be recharged, ~~for the~~ and provide the voltage to start up the motor engines needed.

(1 mark)

(c) State one environmental impact that would be imposed from the disposal of lead-acid accumulators.

~~The concentrated sulphuric acid is corrosive.~~

Lead compound is toxic and harm to our nervous system

(1 mark)

(d) A student diluted a sample of concentrated sulphuric acid for making a lead-acid accumulator.

(i) Describe how concentrated sulphuric acid can be diluted in a laboratory. State a safety precaution needed during the dilution process.

Prepare a huge volume of water in a ~~beaker~~ ^{container}, and add the concentrated sulphuric acid to the water dropwise by ~~drop~~ and slowly.

Wear a pair of protective gloves during the dilution.

(ii) 5.00 cm³ of the solution in the lead-acid accumulator made contains 2.48 g of sulphuric acid. Calculate the molarity of the sulphuric acid in the solution.
(Molar mass of sulphuric acid = 98.1 g)

$$\text{No. of moles of } 2.48\text{g H}_2\text{SO}_4(\text{aq}) = \frac{2.48}{98.1} = 0.0253$$

$$\begin{aligned} \text{Molarity of the sulphuric acid in the solution} \\ &= \frac{0.0253}{\frac{5}{1000}} \\ &= 5.056 \text{ M} \end{aligned}$$

(5 marks)

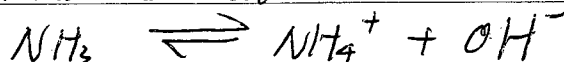
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- *5. Explain, with the aid of a chemical equation, why $\text{NH}_3(\text{aq})$ is regarded as a weak alkali. Suggest how you would show that $\text{NH}_3(\text{aq})$ is a weaker alkali than $\text{NaOH}(\text{aq})$ through an experiment. (6 marks)

$\text{NH}_3(\text{aq})$ is ^{only} partly ionized to give out $\text{OH}^-(\text{aq})$ when it dissolves in water. The ionization of $\text{NH}_3(\text{aq})$ is incomplete and it's a reversible reaction.



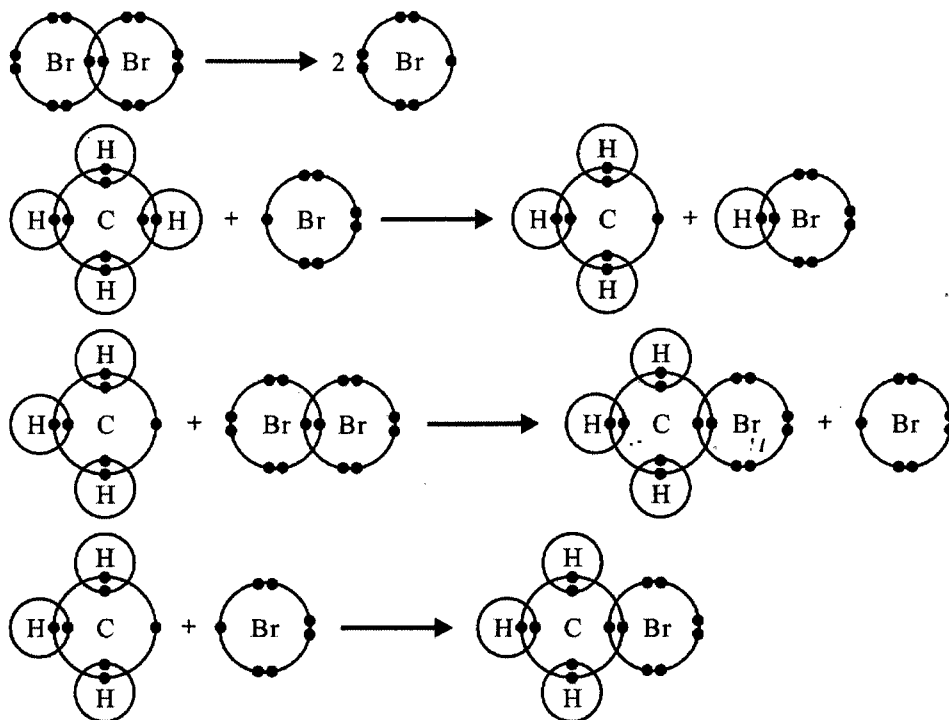
To show that $\text{NH}_3(\text{aq})$ is a weaker alkali ~~the~~ than $\text{NaOH}(\text{aq})$, adding same ^(25.0 cm³) volume 0.1 M ~~hydrochloric~~ $\text{HCl}(\text{aq})$ in 25.0 cm³ ^{0.1 M} $\text{NH}_3(\text{aq})$ and ^{25.0 cm³ 0.1 M} $\text{NaOH}(\text{aq})$ separately. Measure the maximum temperature rise of the experiment by thermometer. $\text{NaOH}(\text{aq})$ will show a ^{smaller} ~~greater~~ temperature rise ^{the reaction of $\text{NH}_3(\text{aq})$} which indicate ~~it is~~ it's a weaker alkali than $\text{NaOH}(\text{aq})$.

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6. The steps involved in the reaction of methane with bromine forming CH_3Br can be shown by the following diagram. Only electrons in the outermost shells are shown.



- (a) Name the type of the reaction for the formation of CH_3Br from methane and bromine.

Substitution.

(1 mark)

- (b) State the condition needed for the reaction to occur.

diffuse sunlight.

(1 mark)

- (c) State the expected observation for the reaction.

The yellow bromine will ~~decolourized~~ decolourized to colourless.

(1 mark)

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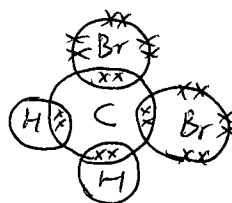
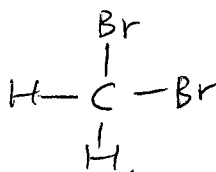
6. (d) With reference to its electronic structure, explain why the species $\text{Br}\cdot$ has a high reactivity.

(which is not stable) There are only 7 electrons in the outermost shell of $\text{Br}\cdot$, and it is willing to undergo reaction in order to ~~to~~ gain 1 more electron to fill up its outermost shell to obtain a octet structure.
more stable (1 mark)

- (e) The reaction of methane with bromine can also form other single-carbon-containing organic compounds.

- (i) Suggest one such compound.

dibromomethane.



- (ii) Suggest a condition so that the reaction of methane with bromine can form more CH_3Br but less other organic compounds.

Using limited bromine for the reaction.

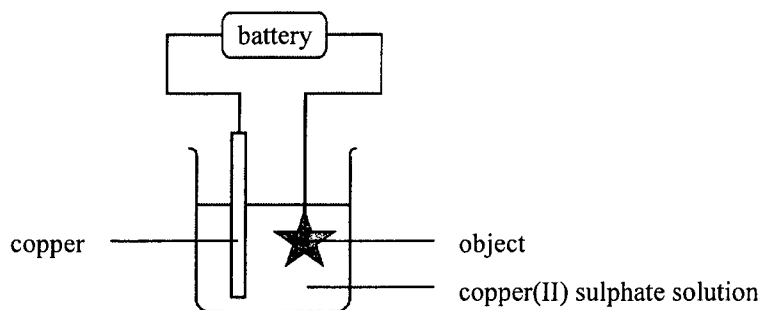
(2 marks)

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7. Refer to the set-up for electroplating an object shown in the diagram below.



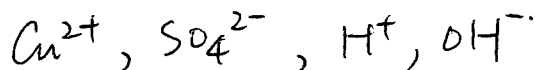
- (a) Explain why oily dirt on the object should be removed before electroplating.

Because the oily dirt ~~is~~ on the object ~~would~~ will affect the quality of electroplating. With the oily dirt, the plating is poor and easily flake ~~are~~ off. (1 mark)

- (b) Copper(II) sulphate is an electrolyte. What is meant by the term 'electrolyte'?

~~The~~ 'Electrolyte' is the solution providing mobile ions to complete circuit and ~~it~~ itself ~~will~~ ^{may} undergo decomposition during the process, electrolysis. (1 mark)

- (c) List ALL the ions existing in the solution.



(1 mark)

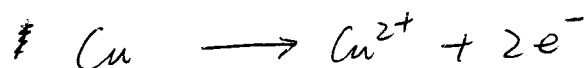
- (d) Explain why copper(II) ions are preferentially discharged during the electroplating process.

As ~~because~~ Cu^{2+} ions is the ~~most~~ ^{weakest} strongest ~~oxidizing~~ oxidizing agent among $\text{Cu}^{2+}, \text{SO}_4^{2-}, \text{H}^+, \text{OH}^-$ (ions existing in solution). Cu^{2+} ions ^{are} ~~is~~ favour to undergo reduction ^{to give out Cu(s)} in ~~the~~ CuSO_4 (aq) and ^{are} preferentially discharged during the electroplating process. (1 mark)

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7. (e) Write the half equation of the change that occurs at the anode.



(1 mark)

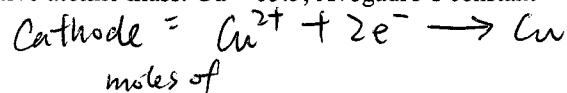
- (f) State the observable change, if any, in the solution during the electroplating process.

The copper anode will become smaller, 'dissolve' in the solution and there are brown solid (Cu) formed on the surface of the object.

(1 mark)

- (g) It is known that 2.28×10^{22} electrons have passed through the external circuit during the electroplating process. Calculate the mass of copper that would theoretically be plated on the object.

(Relative atomic mass: Cu = 63.5; Avogadro's constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)



No. of Cu(s) ~~formed~~ plated on the object

$$= \frac{2.28 \times 10^{22} \times 0.5}{6.02 \times 10^{23}}$$

$$= 0.0189$$

Mass of Cu plated on the object theoretically

$$= 0.0189 \times 63.5$$

$$= 1.202\text{g.}$$

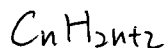
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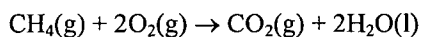
8. Natural gas is an important energy source for electricity generation. It contains mainly methane (CH_4).

(a) Write the general formula of the molecules in the homologous series that methane belongs to.



(1 mark)

(b) The combustion of methane is an exothermic reaction. Its chemical equation is shown below :



(i) Complete the table below by stating all the covalent bond(s) that are broken and formed during the combustion of methane.

Covalent bond(s) broken	$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{C}(\text{s}) + 2\text{H}_2(\text{g}) + 2\text{O}_2(\text{g})$
Covalent bond(s) formed	$\text{C}(\text{s}) + 2\text{H}_2(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$

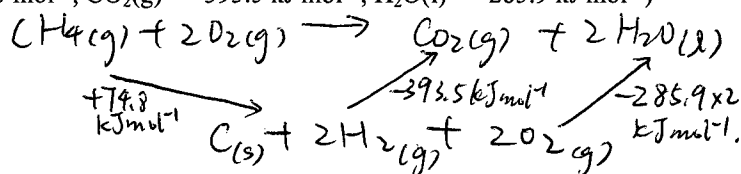
(ii) Suggest why the combustion is exothermic in terms of the breaking and forming of covalent bonds.

The breaking of covalent bonds is endothermic and the forming of covalent bonds is exothermic. The combustion is exothermic as the energy released from bond forming is larger than the energy used for bond breaking.

(iii) Calculate the standard enthalpy change of combustion of methane.

(Standard enthalpy changes of formation :

$\text{CH}_4(\text{g}) = -74.8 \text{ kJ mol}^{-1}$; $\text{CO}_2(\text{g}) = -393.5 \text{ kJ mol}^{-1}$; $\text{H}_2\text{O}(\text{l}) = -285.9 \text{ kJ mol}^{-1}$)



Standard enthalpy change
of combustion of methane

$$\begin{aligned} &= +74.8 + (-393.5) + (-285.9 \times 2) \\ &= -890.5 \text{ kJ mol}^{-1} \end{aligned}$$

(5 marks)

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Answers written in the margins will not be marked.

8. (c) Some regions tend to generate electricity more by natural gas but less by coal. Give TWO reasons from environmental protection consideration.

Natural gas doesn't contain ^{any} sulphur and the burning of natural gas will not produce SO_2 which ~~leads to~~ ^{causes} acid rain when dissolve in rainwater;

Natural gas has a less carbon content with burn more completely and produce near no soot and give out only harmless H_2O as product during burning to generate electricity.

(2 marks)

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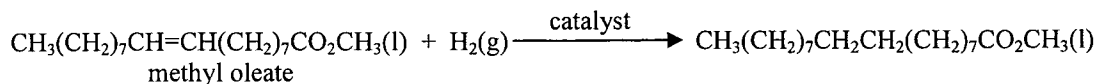
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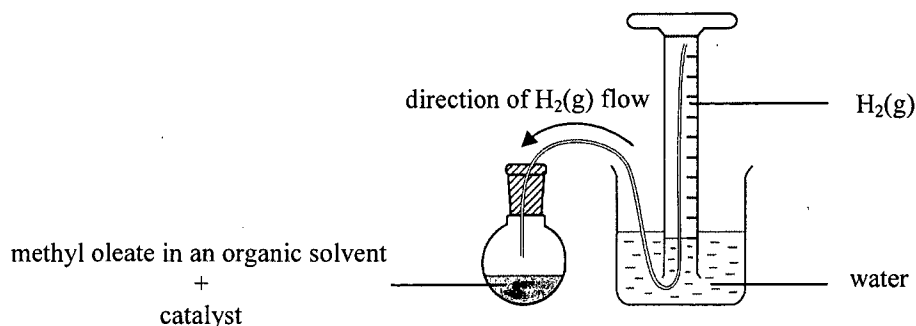
PART II

Answer **ALL** questions. Write your answers in the spaces provided.

9. Consider the reaction below :



At room temperature and pressure, a micro-scale experiment was performed using the set-up shown below in which 0.080 g of methyl oleate in an organic solvent was allowed to react with excess $\text{H}_2(\text{g})$. The $\text{H}_2(\text{g})$ flowed from the inverted measuring cylinder to the reacting flask through the tubing.



- (a) State one advantage of conducting this reaction in a micro-scale experiment.

Save chemical, ~~and~~

(1 mark)

- (b) Explain why the right end of the tubing was placed at the uppermost position of the inverted measuring cylinder.

Because the density of $\text{H}_2(\text{g})$ is lower than air, the remaining gases ~~will~~ ^{H_2} will flow at the uppermost position of the inverted measuring cylinder, so the tubing was placed there to allow the H_2 flow to the reacting flask.

(1 mark)

- (c) State an expected observation in the inverted measuring cylinder during the reaction.

The water level in the inverted measuring cylinder will ~~be~~ rise during the reaction.

(1 mark)

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9. (d) Calculate the theoretical volume of $\text{H}_2(\text{g})$ needed for the reaction to complete at room temperature and pressure.

(Molar volume of gas at room temperature and pressure = 24 dm^3 ;

Relative molecular mass: methyl oleate = 296.0)

$$\text{No. of moles of methyl oleate used} = \frac{0.080}{296} = 2.703 \times 10^{-4}$$

$$\text{No. of moles of } \text{H}_2(\text{g}) \text{ needed} = 2.703 \times 10^{-4}$$

Theoretical volume of $\text{H}_2(\text{g})$ needed for the reaction to complete at room temperature and pressure.

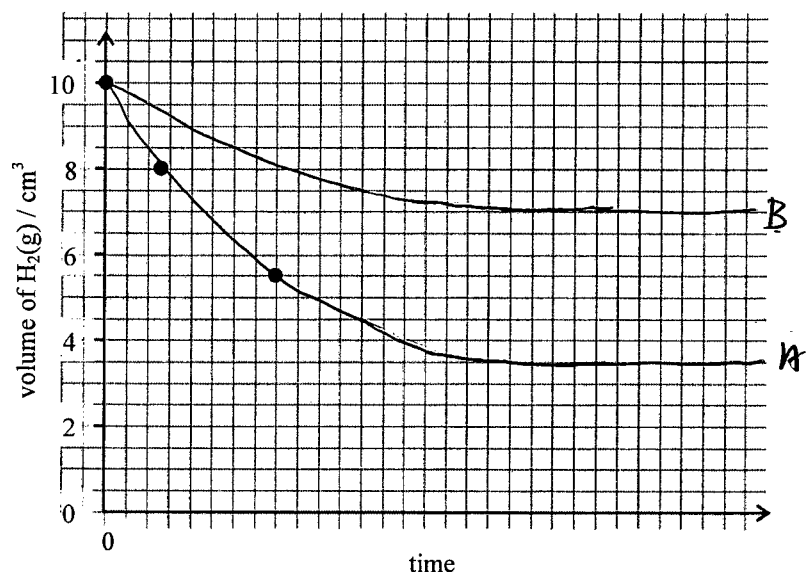
$$= 2.703 \times 10^{-4} \times 24$$

$$= \cancel{6.6} 6.486 \times 10^{-3} \text{ dm}^3$$

$$= 6.486 \text{ cm}^3$$

(3 marks)

- (e) (i) Sketch, in the graph below, the variation of the volume of $\text{H}_2(\text{g})$ in the measuring cylinder with time from start until the completion of the reaction. You should label this sketch as 'A'. (The measuring cylinder initially contained 10.0 cm^3 of $\text{H}_2(\text{g})$. The first few points have been given in the graph to facilitate the sketch.)



- (ii) In the same graph above, give another sketch as required in (i) but only using 0.040 g of methyl oleate for the reaction while the other conditions remain unchanged. You should label this sketch as 'B'.

(2 marks)

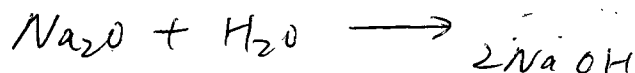
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10. (a) For each of the oxides below, draw its electron diagram (showing electrons in the outermost shells only), and state its behaviour in water.

(i) Na_2O

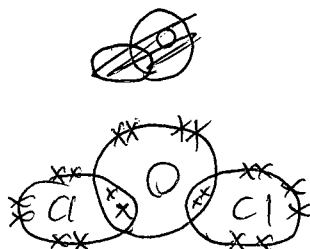


It's ~~behaviour~~ ~~have~~ a basic oxide in water.
When Na_2O dissolve in water, alkali solution formed.

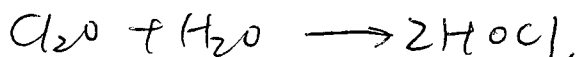


where NaOH is alkali.

(ii) Cl_2O



It's an acidic oxide in water.
When Cl_2O dissolve in water, acidic solution formed.



where HOCl is acidic.

(4 marks)

- (b) Using iron as an example, illustrate TWO characteristics of transition metals.

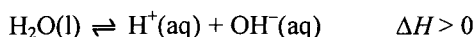
The transition metal can have various, many ^(more than one) oxidation state. For example the oxidation state of iron in $\text{Fe}(\text{OH})_2$ and Fe_2O_3 are +2 and +3 respectively.

The ions of transition metal are coloured.

For example, Fe^{2+} ions are green in colour, Fe^{3+} ions are brown in colour.

(2 marks)

11. Refer to the following chemical equation :



Under fixed conditions, $[\text{H}_2\text{O(l)}]$ is considered as a constant. In consideration of the definition of K_c , $[\text{H}^+(\text{aq})][\text{OH}^-(\text{aq})]$ would also be a constant.

- (a) The pH of an aqueous solution is defined as $-\log[\text{H}^+(\text{aq})]$. The pH of water equals 7.0 at 298 K. Find, at this temperature, the :

- (i) $[\text{H}^+(\text{aq})]$

$$-\log[\text{H}^+(\text{aq})] = 7$$

$$[\text{H}^+(\text{aq})] = 1 \times 10^{-7} \text{ M}$$

- (ii) $\frac{[\text{H}^+(\text{aq})][\text{OH}^-(\text{aq})]}{[\text{H}^+(\text{aq})][\text{OH}^-(\text{aq})]}$

$$= (1 \times 10^{-7})(1 \times 10^{-7})$$

$$= 1 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$$

(3 marks)

- (b) $[\text{H}_2\text{O(l)}]$ equals 55.6 mol dm^{-3} at 298 K. Suggest why $[\text{H}_2\text{O(l)}]$ is considered as a constant with reference to the values of $[\text{H}^+(\text{aq})]$ and $[\text{OH}^-(\text{aq})]$.

Because ^{its} under the fixed conditions ~~and~~ at same ~~temp~~ temperature.

(1 mark)

- (c) Explain whether the pH of water at 328 K would be less than 7.0, equal to 7.0, or greater than 7.0.

Equal to 7.0.

Although the rise in temperature would increase the forward reaction to a larger extent and increase the

$[\text{H}^+(\text{aq})]$ and $[\text{OH}^-(\text{aq})]$, the $[\text{H}^+(\text{aq})]$ and

$[\text{OH}^-(\text{aq})]$ increase in the same extent (as they have equal mole ratio), thus $[\text{H}^+(\text{aq})]$ $[\text{OH}^-(\text{aq})]$ ^{still equal to} (2 marks)

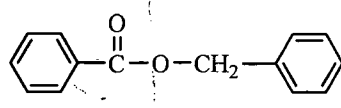
and the pH of water is equal to 7.0.

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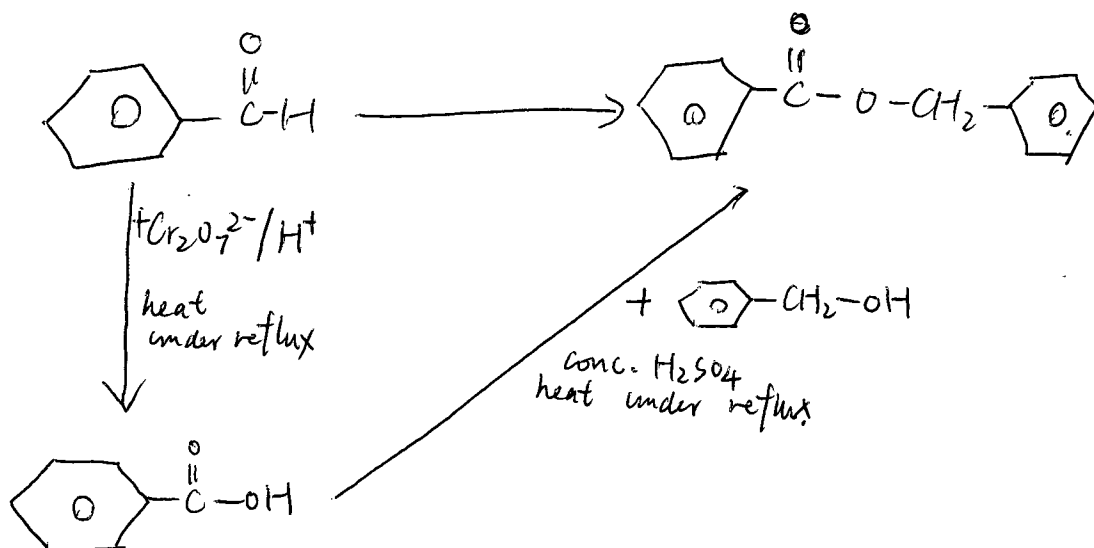
12.

You are provided with c1ccccc1C=O, inorganic reagents and organic solvents.

Outline a synthetic route, with no more than three steps, to obtain the following compound :



For each step, give the reagent(s), reaction conditions (as appropriate) and structure of the organic product.



(3 marks)

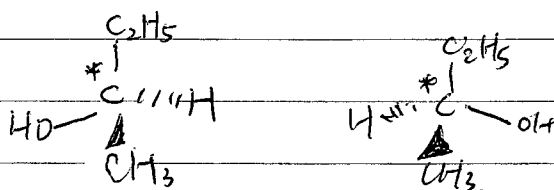
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- *13. Using $\text{C}_2\text{H}_5\text{CH}(\text{OH})\text{CH}_3$ as an example, write a paragraph to illustrate 'enantiomerism'. Suitable diagram(s) should be included in your answer.

(5 marks)

'Enantiomerism' occurs when there is ~~an~~ a chiral carbon which bonded with 4 different substances. The enantiomerism is due to the different arrangement of the 4 different substances lead to a slightly difference structure. The enantiomers always are the plane mirror image of itself.

Enantiomers of $\text{C}_2\text{H}_5\text{CH}(\text{OH})\text{CH}_3$.



For example In ~~the~~ $\text{C}_2\text{H}_5\text{CH}(\text{OH})\text{CH}_3$, ~~there~~ there is a chiral carbon exist and bonded with 4 different substances (OH , CH_3 , H and C_2H_5).

END OF SECTION B

END OF PAPER

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PERIODIC TABLE 周期表

GROUP 族

atomic number 原子序												0
1 H 1.0												2
												He
												4.0
												10
												Ne
												20.2
												18
												Ar
												40.0
												36
												Kr
												83.8
												54
												Xe
												131.3
												86
												Rn
												(222)
												(210)
												(209)
												209.0
												207.2
												204.4
												200.6
												197.0
												195.1
												192.2
												190.2
												186.2
												183.9
												180.9
												178.5
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2015 DSE (D)

香港考試及評核局
HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY

香港中學文憑考試
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION

答題簿 ANSWER BOOK

考生須知

- (一) 宣布開考後，考生須首先在第 1 頁之適當位置填寫考生編號，並在第 1 及 3 頁之適當位置貼上電腦條碼。
- (二) 每題(非指分題)必須另起新頁作答，並須在每一頁的相應試題編號方格填畫「X」號，以表示選答的題號(見下例)。
- (三) 紙張兩面均應使用，並應每行書寫。不可在各頁邊界以外位置書寫。寫於邊界以外的答案，將不予評閱。
- (四) 如有需要，可要求派發方格紙及補充答題紙。每一紙張均須填寫考生編號、填畫試題編號方格、貼上電腦條碼，並用繩縛於簿內。
- (五) 試場主任宣布停筆後，考生不會獲得額外時間貼上電腦條碼及填畫試題編號方格。

INSTRUCTIONS

- (1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1 and 3.
- (2) Start each question (not part of a question) on a new page. Put 'X' in the corresponding question number box on each page to indicate the appropriate question number (see the example below).
- (3) Write on both sides using each line. Do not write in the margins. Answers written in the margins will not be marked.
- (4) Graph paper and supplementary answer sheets will be supplied on request. Write your Candidate Number, mark the question number box and stick a barcode label on each sheet, and fasten them with string INSIDE this book.
- (5) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

例 Example:

試題編號 Question No. = 3

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Level 5 Exemplar & Comments Paper 2

由考生填寫 To be filled in by the candidate	由閱卷員填寫 Marker's Use Only	由試卷主席填寫 Examiner's Use Only
	閱卷員編號 Marker No.	試卷主席編號 Examiner No.

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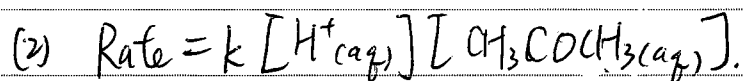
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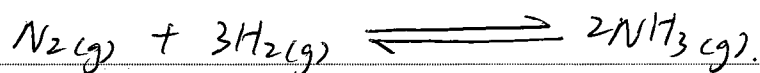
每題另起新頁作答。

Start each question on a new page.

(ai) (1) ~~The~~ The change in the concentration of $E_2(g)$ in the reaction mixture ~~on the~~ will not have any effect on the rate of reaction.



aii)



(iii) $\text{rate} \propto k$.

$k = A e^{\frac{-E_a}{RT}}$

$1 + 2 = \frac{A e^{\frac{-E_a}{R(308)}}}{A e^{\frac{-E_a}{R(298)}}}$

$\ln 2 = \left(\frac{1}{298R} - \frac{1}{308R} \right) E_a$

$E_a = 52.9 \text{ kJ mol}^{-1}$.

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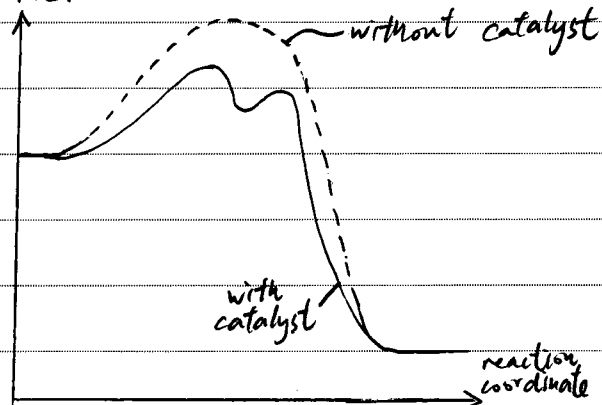
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Start each question on a new page.

1b) (1) P.E.



(2) Because there may have some impurity in the reaction mixture, it will ~~de~~ reduce the effectiveness of the work of heterogeneous catalyst, and for a long time, the catalyst doesn't work anymore, so ~~it is~~ ^{industry have} to replaced catalyst time by time.

b) (i) No toxic reactants and product involved in route 1.

(toxic CO is used in route 2).

Less heat energy is needed ^{for} route 1, as ^{reactions involve} ~~no~~ need high temperature for route 2 180°C is needed.ⁿ

b) (ii) Route (2) involved ^{less steps, it's} only ~~2~~ 1 step but Route (1) involved 2 step reaction.

The atom economy is higher in route (2) which is 100% ⁿ percentage of atom economy.

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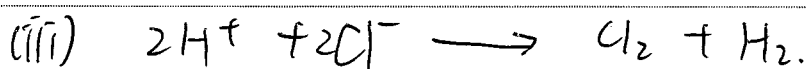
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1(i) ~~Sodium~~ concentrated sodium chloride solution (brine ^{pe} / sea water)

(ii) The chemical plant for a chloroalkane industry should be built near the sea, so that the ^(raw material) sea water is readily available to collect for the industry.



(iv) Mercury is toxic.

(v) Prevent the direct reaction between ~~the~~ acidic Cl_2 and $Al(OH)_3$ in the solution ~~to~~ (side reaction) to reduce the yield of Cl_2 .

(vi) It's because the chlorine bleach will set up an equilibrium with hydrochloric acid, which will reduce the yield of chlorine bleach and ~~the~~ hydrochloric acid.
~~Cl + H₂O~~

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Start each question on a new page.

3ai) Adding acidified silver nitrate ~~to~~ solution, ~~to the~~ creamy pale yellow precipitate formed if Br^- (aq) is presence.

aii) ~~Fractional distillation of petrol.~~
Thin layer ~~Paper~~ chromatography.

aii) Adding ~~hydrochloric~~ HCl to the mixture. HCl will react with only Fe_2O_3 and form a ~~soluble~~ salt and ~~then~~ then filter the mixture. The residue is Cu.

3bi) These ~~are~~ Orange / red ~~precipitate~~ ~~are~~ precipitate are formed

bii) Perform a silver mirror test. ~~Adding the Tollent's reagent~~
~~($[\text{Ag}(\text{NH}_3)_2]^+$)~~ Only $\text{C}_6\text{H}_5\text{CHO}$ (which is an aldehyde) gives a positive result and a silver mirror is form in the inner surface of the container

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每題另起新頁作答。
Start each question on a new page.

of Y. But no observable change for X (which is a ketone).

(ii) the bond near $\text{C}=\text{O}$ are more favour to fragmentation.
~~the mass spectrum~~

There are 4 peak with 1 z/e, 29 z/e, 91 z/e, 199 z/e in X's mass spectra, which represent correspond to the fragment ions H^+ , $[\text{C}-\text{H}]^+$, $[\text{C}_6\text{H}_5]^+$ and $[\text{C}_6\text{H}_5\text{C}(\text{CH}_3)_2]^+$ respectively. But in Y's mass spectrum,

there are 4 peak with 81 z/e, 32 z/e, 105 z/e, 15 z/e which correspond to the fragment ions $[\text{C}_6\text{H}_5]^+$, $[\text{CH}_3\text{C}]^+$, $[\text{C}_6\text{H}_5\text{C}]^+$, $[\text{CH}_3]^+$ respectively. The different of the mass to charge ratio.

peak can distinguish X and Y.

(iv) No. It cannot distinguish X and Y. As ~~X contain a aldehyde~~ the only difference between X and Y is X contain a aldehyde group, Y contain a ketones group. But Infra-red spectroscopy is fail to show the difference of aldehyde and ketone as both of their ^{infra-red} spectroscopy show absorption peak at a wavenumber 1680 cm^{-1} to 1800 cm^{-1} , so it cannot be used to distinguish X and Y.

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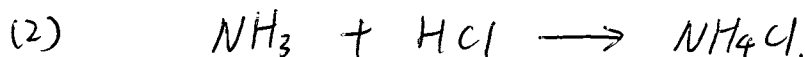
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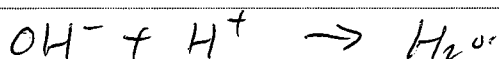
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3c(i) (1)



c(ii). Turns from red. to orange.

c(i)(i) No. of moles of KOH(aq) required = $\frac{13.55}{1000} \times 0.1$
 $= 1.355 \times 10^{-3}$



No. of moles of 25.0 cm^3 HCl = 1.355×10^{-3}

No. of moles of 250.0 cm^3 HCl = $1.355 \times 10^{-3} \times 10$
 $= 1.355 \times 10^{-2}$

No. of moles of HCl reacted with NH_3 =
 $= \frac{50}{1000} \times 1 - 1.355 \times 10^{-2}$
 $= 0.0486$

No. of moles of NH_3 ^{produced} = 0.0486

No. of moles of $(NH_4)_2SO_4$ ^{reacted} = $\frac{0.0486}{2} = 0.0243$

Mass of N in milk powder sample = $0.0243 \times 14 \times 2$
 $= 0.681 \text{ g}$

Percentage by mass of nitrogen in milk powder sample
 $= \frac{0.681}{3} \times 100\% = 22.7\%$

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Answers written in the margins will not be marked.

3c(iv) Not all the protein undergo complete hydrolysis.

寫於邊界以外的答案，將不予評閱。
Answers written in the margins will not be marked.

本頁積分 Page total

Comments

The candidate's answers show good understanding of the chemical concepts and principles in the curriculum (e.g. Paper 1 Qs. 1, 6 and 10 (a); Paper 2 Qs. 1(a) (i) (ii) and 3 (b) (i) (ii)). He/she demonstrates very good abilities of applying chemical concepts on unfamiliar situations for solving the problems (e.g. Paper 1 Qs. 6 (e) and 9 (e) (i); Paper 2 Qs. 1 (b) (ii) and 3 (b) (iv)). The candidate performs well on chemical calculations (e.g. Paper 1 Qs. 3 (b) (i), 4 (d) (ii), 7 (g), 8 (b) (iii) and 9 (d); Paper 2 Q. 1 (a) (iii)). He/she can effectively communicate ideas using scientific terminology, appropriate diagrams and chemical equations (e.g. Paper 1 Qs. 1 (a), 2 (b), 7 (e), 10 (a) and 12; Paper 2 Q. 1 (b) (i) (1)). His/her presentation of ideas in the essay questions (e.g. Paper 1 Qs. 5 and 13; Paper 2 Q. 2 (c) (ii)) demonstrates proficiency in the language used and a smooth flow of ideas. He/she can design appropriate method for carrying out scientific investigations (e.g. Paper 1 Q. 5).