

HONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY  
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2020

**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. The table below shows some information of elements Y and Z. BY I I

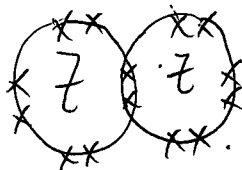
	Y	Z
Atomic number	85	53
Number of occupied electron shells in the atoms	4	5
Number of electrons in the outermost shell in the atoms	7	7

- (a) State the electronic arrangement of an atom of Y.

(2, 8, 18, 9)

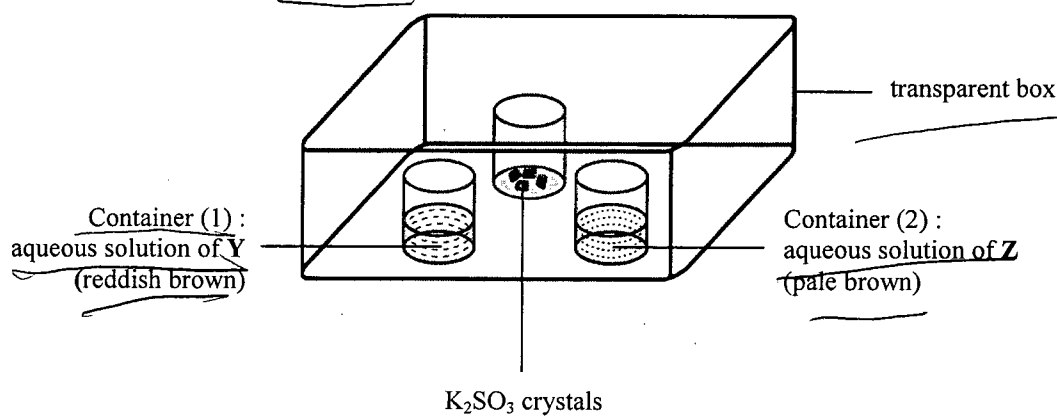
(1 mark)

- (b) Draw the electron diagram for a molecule of Z, showing ELECTRONS IN THE OUTERMOST SHELLS only.



(1 mark)

- (c) An experiment for Y and Z is performed as shown in the set-up below. Dilute hydrochloric acid is added to the  $K_2SO_3$  crystals, then the whole set-up is covered with a lid.

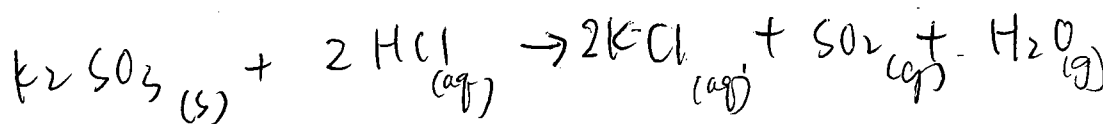


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1. (c) (i)  $K_2SO_3$  crystals react with dilute hydrochloric acid to give sulphur dioxide gas. Write a chemical equation for the reaction, showing all state symbols.



- (ii) State the expected observation in Container (1) and write an ionic equation for the reaction involved.

there will be colourless gas evolved.

- (iii) It is expected that the observation in Container (2) is similar to that in Container (1). Suggest a reason for this expectation based on electronic arrangement.

It is because X and Y both has 7 electrons in the outermost shell in the atoms. therefore, their chemical properties is similar.

(5 marks)

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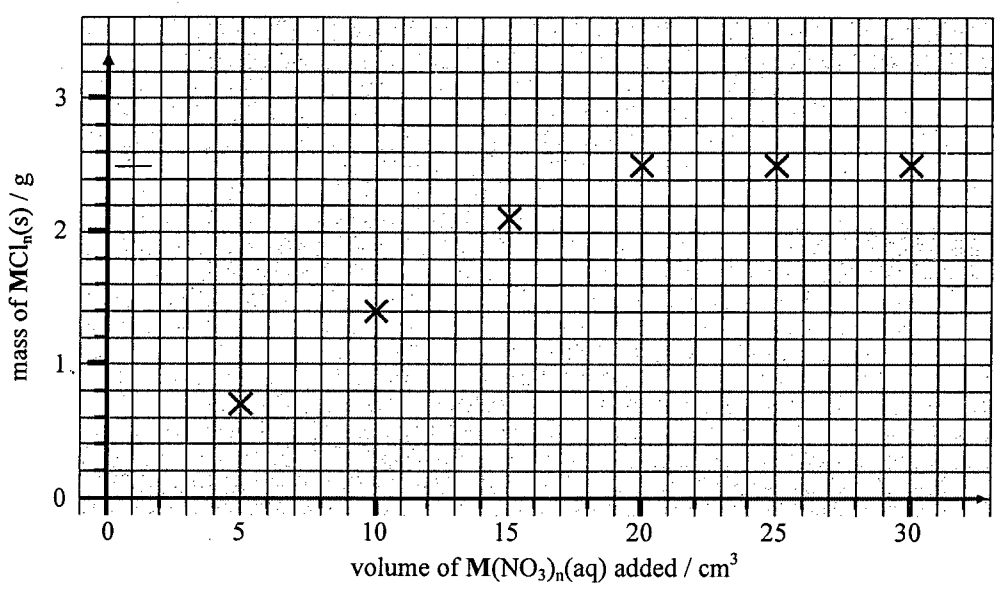
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v. :

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2. An experiment was performed to deduce the empirical formula of an insoluble chloride of a metal M. At room temperature, different volumes of a  $0.50 \text{ mol dm}^{-3} \text{ M(NO}_3)_n(\text{aq})$  were added to six beakers each containing  $50 \text{ cm}^3$  of  $0.36 \text{ mol dm}^{-3} \text{ HCl(aq)}$ . The  $\text{MCl}_n(\text{s})$  obtained in each beaker was filtered, washed, dried and weighed. The mass of  $\text{MCl}_n(\text{s})$  obtained and the corresponding volume of  $\text{M(NO}_3)_n(\text{aq})$  added were plotted on the graph below.



(a) Suggest why the masses of  $\text{MCl}_n(\text{s})$  for the last three points in the graph are the same.

It is because the reaction has already reach the equilibrium.

$V = \frac{0.5}{1000}$  0.5 (1 mark)

(b) (i) By sketching on the graph above, deduce the volume of the  $\text{M(NO}_3)_n(\text{aq})$  that can completely react with  $50 \text{ cm}^3$  of  $0.36 \text{ mol dm}^{-3} \text{ HCl(aq)}$ .

Volume of  $\text{M(NO}_3)_n(\text{aq}) =$  \_\_\_\_\_  $\text{cm}^3$

(ii) Hence, calculate the number of moles of  $\text{M(NO}_3)_n(\text{aq})$  that can completely react with the  $\text{HCl(aq)}$ .

No. of mole of  $\text{HCl} = 0.36 \times \frac{50}{1000} = 0.018 \text{ mol}$

(3 marks)

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2. (c) Determine, by calculation, the empirical formula of the chloride of M. Hence, deduce whether M would be silver or lead.

Mass : M. Cl.

no. of mole:

mole ratio

(3 marks)

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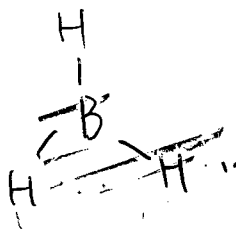
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3. (a) Draw a three-dimensional diagram to represent the shape of each of the following molecules :

(i)  $\text{NH}_3$

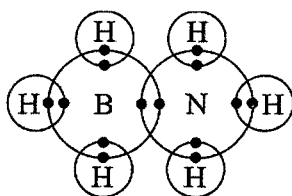


(ii)  $\text{BH}_3$



(2 marks)

(b)  $\text{H}_3\text{NBH}_3$  has a structure similar to that of ethane. Its electron diagram is shown below (showing electrons in the outermost shells only).

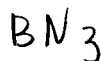


(i) Which of the H-B, B-N and N-H bonds would be dative covalent bond(s) ? Explain your answer.

The B-N bond would be dative covalent bond.  
It is because B has only 3 outermost shell electrons, while N has 5 outermost shell electrons.

3. (b) (ii) Explain why  $\text{H}_3\text{NBH}_3$  is a solid but ethane is a gas at room conditions.

It is because the size of the  $\text{H}_3\text{NBH}_3$  is larger than ethane. Between the molecules in ethane, therefore,



- (iii) Under suitable conditions,  $\text{H}_3\text{NBH}_3$  can decompose into boron nitride and hydrogen. The structure of solid boron nitride is similar to that of graphite. Draw the structure of ONE LAYER of solid boron nitride (Note : B and N are in alternate positions).



(6 marks)

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4. Eggshells mainly contain calcium carbonate and a small amount of organic substances. The percentage by mass of calcium carbonate in a sample of eggshell was determined by the following steps :

- Step (1): The sample was <sup>CaCO<sub>3</sub></sup> ground into powder. NaOH
- Step (2): 0.204 g of the powder was put into a conical flask. After that, 25.00 cm<sup>3</sup> of 0.200 M HCl(aq) and 5 cm<sup>3</sup> of ethanol were added. + CH<sub>3</sub>CH<sub>2</sub>OH
- Step (3): The mixture was heated for 15 minutes.
- Step (4): After cooling down, the mixture was titrated with 0.102 M NaOH(aq) using an indicator X.

(a) Explain why the sample was ground into powder in Step (1).

It is to increase the surface area for reaction and so to increase the reaction rate.

(1 mark)

(b) Suggest why ethanol was added in Step (2).

To remove the unreacted HCl.

(1 mark)

(c) Suggest why the mixture was heated for 15 minutes in Step (3).

(1 mark)

(d) The mixture turned from colourless to pale pink at the end point of titration in Step (4). Name indicator X.

phenolphthalein

(1 mark)

(e) 16.85 cm<sup>3</sup> of NaOH(aq) was needed to reach the end point of titration in Step (4). Calculate the percentage by mass of calcium carbonate in the sample. (Relative atomic masses : C = 12.0, O = 16.0, Ca = 40.1)

$$\begin{aligned} \text{No. of mole of HCl} &= 0.2 \times \frac{25}{1000} \\ &= 5 \times 10^{-3} \text{ mol} \end{aligned}$$

(3 marks)

Answers written in the margins will not be marked.





5. The molecular formula of an organic compound **W** is  $C_4H_6O_4$ . It is soluble in water.

- (a) When a piece of magnesium ribbon is placed into an aqueous solution of **W**, hydrogen gas evolves. According to this observation, suggest a functional group that **W** may contain.

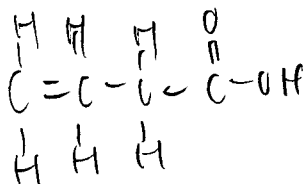
carboxylic acid

$H_2O$   
Mg COOH  
Mg(OH)<sub>2</sub>

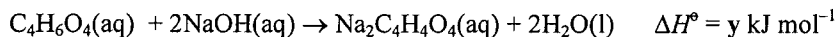
(1 mark)

- (b) It is known that one mole of **W** can completely react with two moles of NaOH.

- (i) Draw TWO possible structures of **W**.



- (ii) Consider the following thermochemical equation of a neutralisation reaction in standard conditions :



State the meaning of the term 'standard enthalpy change of neutralisation', and deduce the standard enthalpy change of neutralisation for this reaction in terms of  $y$ .

Standard enthalpy change of neutralisation is the standard enthalpy change of one mole of water formed from neutralization of acid and alkali under standard condition.

- (iii) The standard enthalpy change of neutralisation between  $HCl(aq)$  and  $NaOH(aq)$  is  $-57.3 \text{ kJ mol}^{-1}$ . Explain whether the enthalpy change deduced in (ii) above should be more negative than, less negative than or equal to  $-57.3 \text{ kJ mol}^{-1}$ .

The enthalpy change deduced in (ii) will be less negative, as there is heat loss to the surroundings.

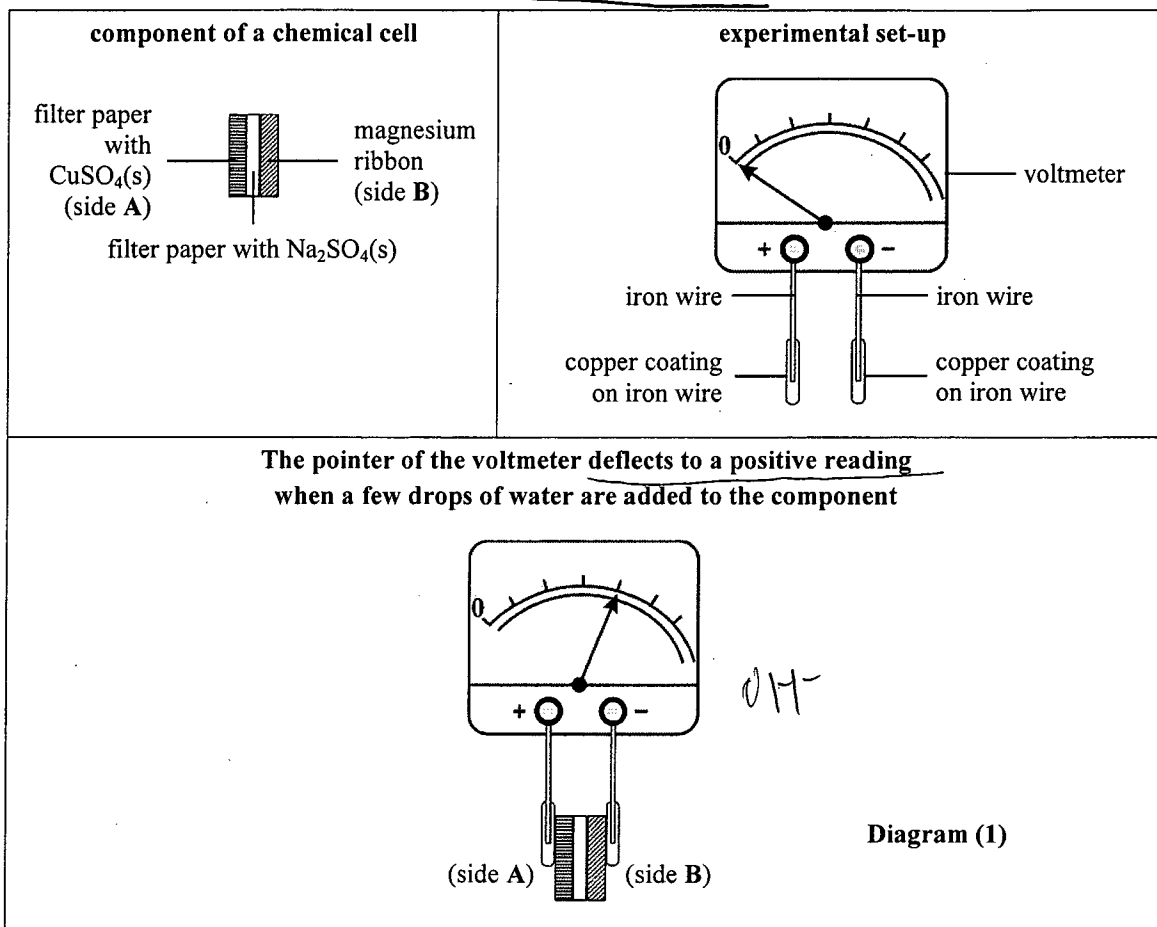
(6 marks)

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6. The diagrams below show the component of a chemical cell, an experimental set-up and how the pointer of the voltmeter deflects when the set-up is connected to the component.



- (a) Why does the pointer of the voltmeter deflect as shown when a few drops of water are added to the component?

The point of voltmeter changes from 0 to negative value. It is because there is addition of  $\text{H}_2\text{O}$ , of  $[\text{H}^+]$  and  $[\text{OH}^-]$ .

(2 marks)

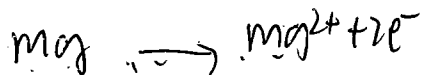
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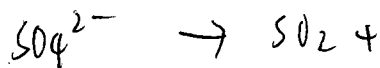
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6. (b) Write the half equation for the change that occurs at each of the following electrodes when the pointer of the voltmeter deflects :

(i) anode



(ii) cathode



(2 marks)

- (c) Consider the following design modified from **Diagram (1)** by only removing the copper coating at side A :

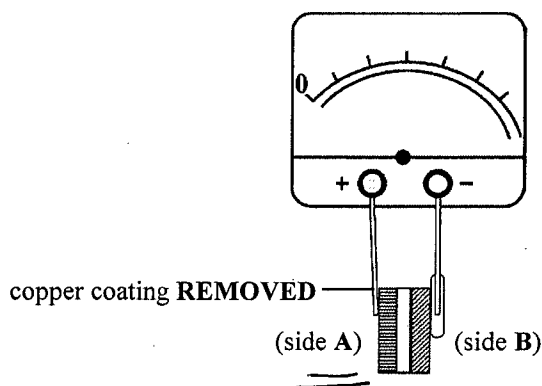


Diagram (2)

Draw on **Diagram (2)** the expected position of the pointer of the voltmeter when water is added to the component.

(1 mark)

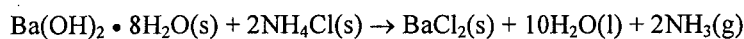
- (d) In the design in part (c) above, a redox reaction occurs at side A when water is added to the component.

(i) Write a chemical equation for the reaction.

(ii) Name this type of reaction.

(2 marks)

7. An experiment is performed to study the following reaction :



- (a) When the two solid reactants are mixed and stirred in a conical flask, ammonia gas with a characteristic pungent smell is formed. Explain how ammonia gas can be tested.

Test by placing concentrated hydrochloric acid next to it. There is white fume gas evolved.

(2 marks)

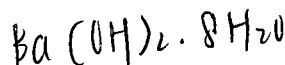
- (b)  $\text{Ba(OH)}_2 \cdot 8\text{H}_2\text{O(s)}$  is an alkali. What is meant by the term 'alkali'?

alkali is a base that can ionize in water to give  $\text{OH}^-$ .

(1 mark)

- (c) The standard enthalpy change of formation of  $\text{Ba(OH)}_2 \cdot 8\text{H}_2\text{O(s)}$  is  $-3345 \text{ kJ mol}^{-1}$ .

- (i) Write a thermochemical equation for the standard enthalpy change of formation of  $\text{Ba(OH)}_2 \cdot 8\text{H}_2\text{O(s)}$ .

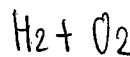
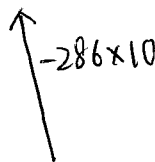
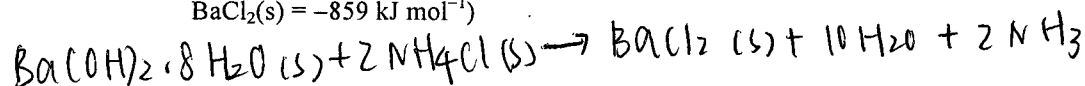


- (ii) Calculate the standard enthalpy change of the reaction between  $\text{Ba(OH)}_2 \cdot 8\text{H}_2\text{O(s)}$  and  $\text{NH}_4\text{Cl(s)}$

(Standard enthalpy changes of formation :

$\text{NH}_3\text{(g)} = -46 \text{ kJ mol}^{-1}$ ,  $\text{H}_2\text{O(l)} = -286 \text{ kJ mol}^{-1}$ ,  $\text{NH}_4\text{Cl(s)} = -314 \text{ kJ mol}^{-1}$ ,

$\text{BaCl}_2\text{(s)} = -859 \text{ kJ mol}^{-1}$ )



- (iii) Hence, explain whether the temperature of the mixture would increase, decrease or remain unchanged during the reaction.

The temperature will decrease as heat is released.

(4 marks)

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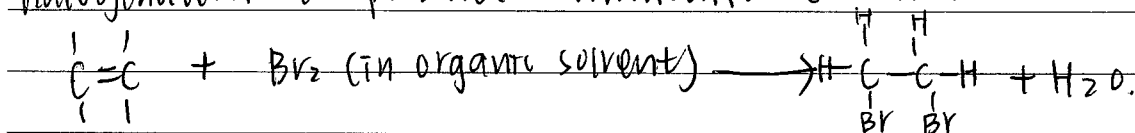
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- \*8. Describe how 1,2-dibromoethane can be produced from crude oil, via an alkene, using appropriate chemicals and processes. Write the chemical equations for the reactions involved. <sup>dihaloalkane</sup> <sup>HCl, Br<sub>2</sub></sup> <sup>halogen</sup> (6 marks)

Firstly, crude oil undergoes fractional distillation to separate into different hydrocarbons. Then, the hydrocarbons undergoes the cracking, in which the large hydrocarbon is broken down into the smaller alkenes.

After alkenes are obtained, it undergoes the halogenation to produce dihaloalkane. In this cases,



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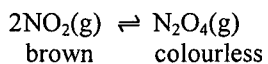
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PART II

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

9. Consider the following reaction mixture at 25°C in a closed container of fixed volume.:



(a) With reference to the table below, calculate a. Hence, determine the equilibrium constant  $K_c$  for the reaction at 25°C.

	$\text{NO}_2(\text{g})$	$\text{N}_2\text{O}_4(\text{g})$
Concentration at start / $\text{mol dm}^{-3}$	0.0400	0.0010
Concentration at equilibrium / $\text{mol dm}^{-3}$	0.0323	a

$8.7 \times 10^{-3}$

$$K_c = \frac{[\text{N}_2\text{O}_4(\text{g})]_{\text{eqm}}}{[\text{NO}_2(\text{g})]_{\text{eqm}}^2}$$

$$a = 0.001 + (0.04 - 0.0323)$$

$$= 8.7 \times 10^{-3}$$

$$K_c = \frac{8.7 \times 10^{-3}}{0.0323^2}$$

$$= 8.34 \text{ mol dm}^{-3}$$

(3 marks)

(b) The temperature of the mixture is increased to 55°C and its colour eventually turns darker. Deduce whether the reaction above is endothermic or exothermic.

The reaction is exothermic. The colour of the mixture turns darker, it means that the equilibrium position shifts to the left.

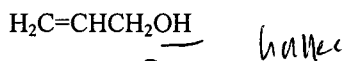
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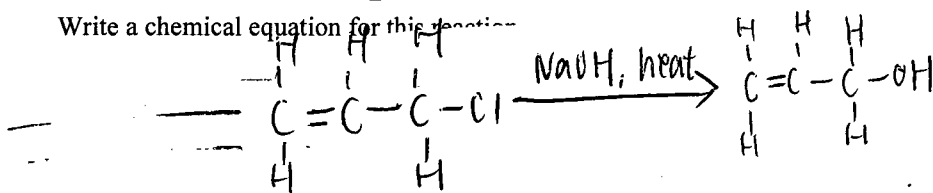
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10. The structure of a compound Y is shown below :



(a) Y can be prepared from reacting 3-chloropropene with an appropriate reagent.

(i) Write a chemical equation for this reaction.



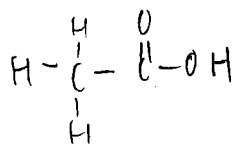
(ii) Name this type of reaction.

addition reaction.

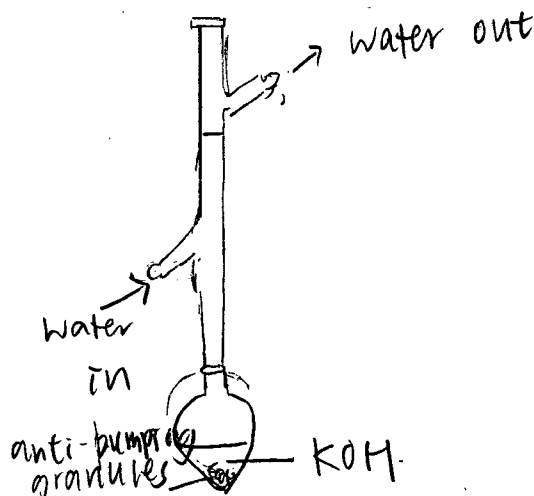
(2 marks)

(b) On heating under reflux, a compound L reacts with  $\text{KOH}(\text{aq})$  to give Y and  $\text{CH}_3\text{COO}^- \text{K}^+$ .

(i) Suggest the structural formula of L.

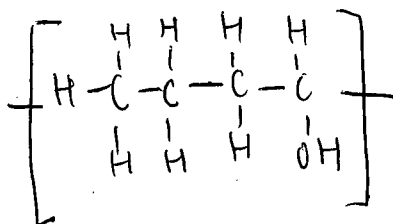


(ii) Draw a labelled diagram to show the set-up for this reaction.



(3 marks)

(c) Under suitable conditions, Y can form a polymer. Write the repeating unit of the polymer.



(1 mark)

11. The structures of some compounds are shown below :

Compound	Structure
W	
X	
Y	
Z	

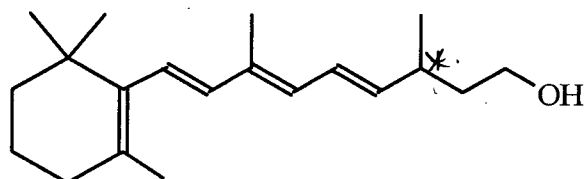
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(a) Which one of W, X, Y or Z is a tertiary alcohol ?

(1 mark)

(b) Label all chiral centre(s), if any, by using ‘ \* ’ on the structure of W below.



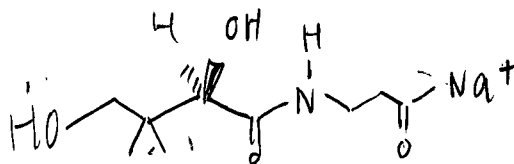
(1 mark)

Answers written in the margins will not be marked.



11. (c) Heating **X** under reflux in 2 M NaOH(aq) can form an **optically active** organic compound **U** and an **optically inactive** organic compound **V**. Draw the respective structures of **U** and **V**.

U:



V:

(2 marks)

- (d) Consider the following reagents :

Br<sub>2</sub>(aq)    acidified K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>(aq)    Na<sub>2</sub>CO<sub>3</sub>(aq)

- (i) Suggest which one of the reagents can be used to perform a chemical test, in order to distinguish **X** from **W**, **Y** and **Z**.

Na<sub>2</sub>CO<sub>3</sub>(aq). X contains the carboxylic acid.

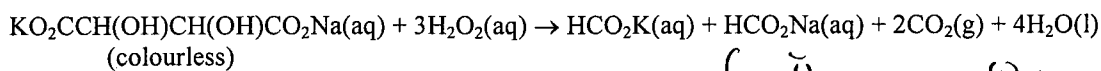
Na<sub>2</sub>CO<sub>3</sub> will react with the carboxylic acid but not the other groups from W, Y and Z.

- (ii) State the observation in the test involved in (i). Explain your answer.

There is heat evolved. As the reaction is an exothermic reaction.

(3 marks)

12. An experiment was performed to study the following reaction :



When 10 cm<sup>3</sup> of 0.25 M KO<sub>2</sub>CCH(OH)CH(OH)CO<sub>2</sub>Na(aq) and 3 cm<sup>3</sup> of 6% H<sub>2</sub>O<sub>2</sub>(aq) were mixed at 60°C, it was found that only a few gas bubbles evolved. Then a small amount of pink CoCl<sub>2</sub>(aq) solution was added to the mixture. Gas bubbles formed vigorously and the mixture turned to green due to the formation of a cobalt(III) compound. When no more gas evolved, the green mixture turned back to pink.

There is a view saying that cobalt illustrates THREE characteristics of transition metals according to the observation of this experiment. Suggest reasons to support this view.

Firstly, the first characteristics of transition metals is the coloured ion. This can be shown in the cobalt. as the CoCl<sub>2</sub>(aq) is pink in colour.

Second, transition metal can have catalytic properties. As in the experiment, initially the reaction is slow and only a few gas bubbles evolved. However, with CoCl<sub>2</sub>(aq) added, the gas bubbles formed vigorously. It shows that cobalt acts as a catalyst to speed up the reaction. (4 marks)

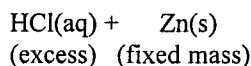
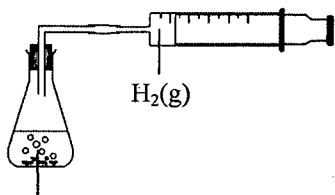
Third, transition metal has the variable oxidation state. From the CoCl<sub>2</sub> to cobalt (III) compound, the cobalt in CoCl<sub>2</sub> increase from 2 to 3 in cobalt (III) compound.

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- \*13. With reference to the set-up shown below, describe how the effect of concentration of  $\text{HCl(aq)}$  on the rate of the reaction can be studied. Your answer should include **TWO** labelled curves sketched on the graph below, one using **solid line** and the other one using **dotted line**. Label all curves and axes. (6 marks)

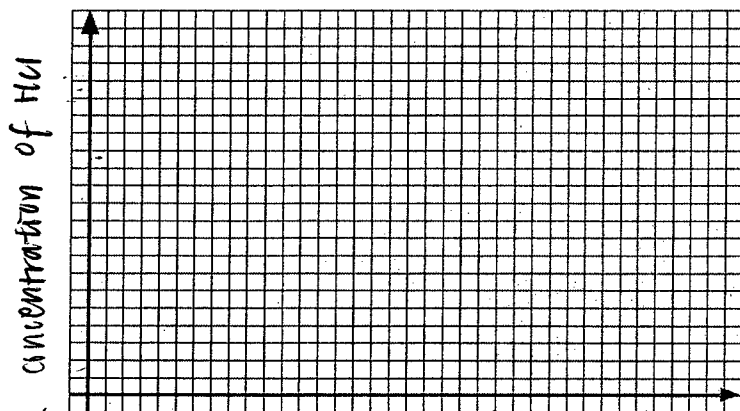


The increase in concentration of  $\text{HCl}$

will increase the rate of the reaction and vice versa.

It is because with the increase concentration of  $\text{HCl}$ , the  $[\text{H}^+]$  available to react with  $\text{Zn}$  to form  $\text{H}_2$

increases. Therefore the reaction equilibrium will be shifted to the right and the reaction increases.



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END OF SECTION B  
END OF PAPER

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PERIODIC TABLE 周期表

GROUP 族

atomic number 原子序																		0																
relative atomic mass 相對原子質量																		2																
1																		2																
H 1.0																		He 4.0																
		I				II				III				IV	V	VI	VII	VIII	IX	X														
3	4	11	12	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36													
Li 6.9	Be 9.0	Na 23.0	Mg 24.3	K 39.1	Ca 40.1	Sc 45.0	Ti 47.9	V 50.9	Cr 52.0	Mn 54.9	Fe 55.8	Co 58.9	Ni 58.7	Cu 63.5	Zn 65.4	Ga 69.7	Ge 72.6	As 74.9	Se 79.0	Br 79.9	Kr 83.8													
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57 *	58	59	60	61	62	63	64	65	66	67	68	69	70	71
Rb 85.5	Sr 87.6	Y 88.9	Zr 91.2	Nb 92.9	Mo 95.9	Tc (98)	Ru 101.1	Rh 102.9	Pd 106.4	Ag 107.9	Cd 112.4	In 114.8	Sn 118.7	Sb 121.8	Te 127.6	I 126.9	Xe 131.3	Cs 132.9	Ba 137.3	La 138.9	Ce 140.1	Pr 140.9	Nd 144.2	Pm (145)	Sm 150.4	Eu 152.0	Gd 157.3	Tb 158.9	Dy 162.5	Ho 164.9	Er 167.3	Tm 168.9	Yb 173.0	Lu 175.0
87	88	89 **	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	
Fr (223)	Ra (226)	Ac (227)	Th 232.0	Pa (231)	U 238.0	Np (237)	Pu (244)	Am (243)	Cm (247)	Bk (247)	Cf (251)	Es (252)	Fm (257)	Md (258)	No (259)	Lr (260)	Rf (261)	Db (262)	Sg (266)	Bh (264)	Hs (265)	Mt (268)	Dsb (270)	Ds (271)	Dt (272)	Dfl (273)	Dfs (274)	Dft (275)	Dfb (276)	Dfb (277)	Dfb (278)	Dfb (279)	Dfb (280)	

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# 2020 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(見下列)，並在第一頁之適當位置填寫作答的試題編號。
- (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), and write the question number(s) of the question(s) attempted in the space provided on Page 1.
- (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

試題編號 Question No.												
1	2	3	4	5	6	7	8	9	10	11	12	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
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13	14	15	16	17	18	19	20	21	22	23	24	≥25

## Level 3 Exemplar & Comments Paper 2

由考生填寫 To be filled in by the candidate	
試題編號 Question No.	1
	3

試題編號 Question No.

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13 14 15 16 17 18 19 20 21 22 23 24 ≥25

每題另起新頁作答。

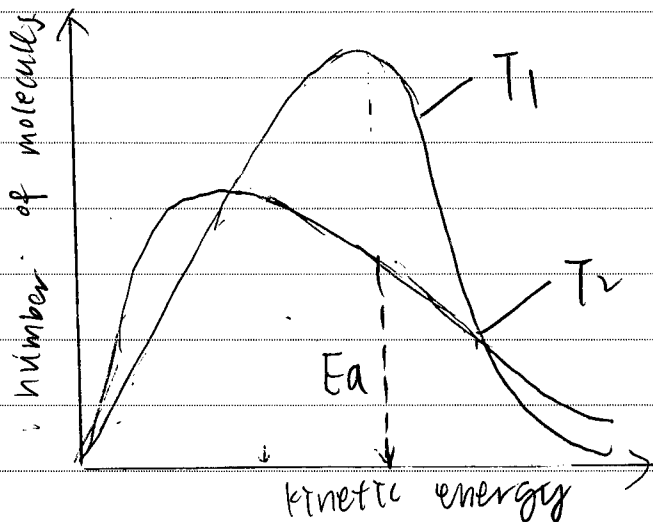
Start each question on a new page.

a(i) membrane electrolytic cell is more environmentally friendly than flowing mercury cell.

Besides, membrane electrolytic cell produce purer products.

a(ii) Iron

a(iii)



b(i) (1) Reaction (I) has a high energy efficiency.

(2) Reaction (II) has utilize the catalyst.

寫於邊界以外的答案，將不予評閱。

Answers written in the margins will not be marked.

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13 14 15 16 17 18 19 20 21 22 23 24 ≥25

每題另起新頁作答。

Start each question on a new page.

bii) no. of mole of methyl benzoate

$$\frac{3}{136} = 0.0221 \text{ mol}$$

no. of mole of hexan-1-amine

$$\frac{223}{101} = 0.0221 \text{ mol}$$

biii(1) It is because in exothermic reaction, the increase in pressure, <sup>to 30 atm</sup> can shift the equilibrium position to the right, to increase the yield of ethanoic acid produced.

biii(2) It is because in 180°C, the temperature is not too high and so the equilibrium position will shift to the right to increase the rate <sup>of reaction</sup>. Besides, 30 atm is an optimal pressure that is high enough to increase the yield and low enough to reduce the maintenance cost.

c) It is because the absorbance is directly proportional to the rate of reaction.

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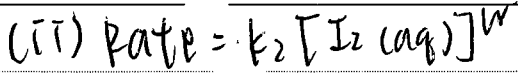
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13 14 15 16 17 18 19 20 21 22 23 24 ≥25

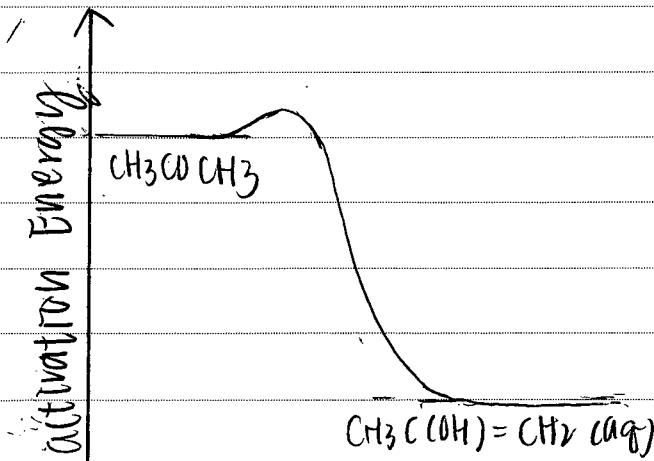
每題另起新頁作答。  
Start each question on a new page.



(ii)

(iv)

(v)



Reaction coordinate  
energy profile for the reaction

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13 14 15 16 17 18 19 20 21 22 23 24 ≥25

每題另起新頁作答。

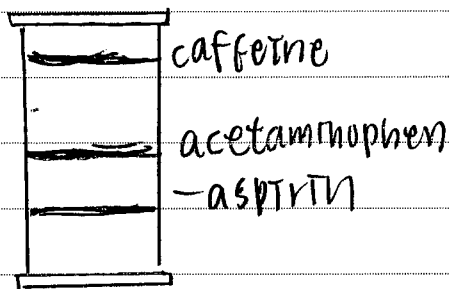
Start each question on a new page.

3a i) Test by a piece of dry cobalt (II) chloride paper.  
Then  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  turns pink dry cobalt (II) chloride paper from pink to blue, while  $\text{Na}_2\text{CO}_3$  does not.

a ii) From colourless to brown

a iii) Test by the Tollens' reagent. Only hexanal will give silver mirror, but hex-1-ene doesn't.

b i)



$$\begin{aligned} \text{b ii) } R_f &= \frac{\text{distance travelled by aspirin}}{\text{distance travelled by solvent}} \\ &= \frac{45}{100} \\ &= \frac{9}{20} \end{aligned}$$

b iii) drug Y would contain aspirin

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1 2 3 4 5 6 7 8 9 10 11 12

13 14 15 16 17 18 19 20 21 22 23 24 ≥25

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biv (1) In caffeine, there is an absorption peak at 2200 to 2280  $\text{cm}^{-1}$ , as it contains  $\text{C}\equiv\text{N}$ . However, there is no such absorption peak for aspirin. Besides, there is absorption peak at 3350 to 3500  $\text{cm}^{-1}$ , for Caffeine, indicating of N-H, while not for aspirin.

biv2) There is a major peak at  $m/z = 43$ , indicating the  $\text{CH}_3\text{CO}^+$  presence. However, for all aspirin, caffeine, acetaminophen, all of them have  $\text{CH}_3\text{CO}^+$ . Therefore, we cannot confirm what the sample is.

ci (1) The silica gel changes from orange to green  
 $\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+ + 6\text{e}^- \rightarrow 2\text{Cr}^{3+} + 7\text{H}_2\text{O}$

2) Driver B has a higher ethanol intake. It is because the movement of the ion is further.

3) The breath is ran again with a new solvent.

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試題編號 Question No.

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13 14 15 16 17 18 19 20 21 22 23 24 ≥25

每題另起新頁作答。

Start each question on a new page.

(ii) no. of mole of  $K_2Cr_2O_7$  in  $10\text{cm}^3$  sample

$$= 0.025 \times \frac{4.38}{1000}$$

$$= 1.095 \times 10^{-4} \text{ mol} \quad \text{C}_2\text{H}_5\text{OH} \cdot \text{K}_2\text{Cr}_2\text{O}_7 = 3:1$$

no. of mole of  $\text{C}_2\text{H}_5\text{OH}$  in  $10\text{cm}^3$  sample

$$= 1.095 \times 10^{-4} \times 3$$

$$= 3.285 \times 10^{-4} \text{ mol}$$

mass of the  $\text{C}_2\text{H}_5\text{OH}$  in  $10\text{cm}^3$  sample

$$= 3.285 \times 10^{-4} \times (12 \times 2 + 1 \times 5 + 16 \times 1)$$

$$= 0.015111 \text{ g}$$

mass of  $\text{C}_2\text{H}_5\text{OH}$  in  $100\text{cm}^3$  serum

$$= 0.015111 \times 10$$

$$= 0.15111 \text{ g}$$

$$= 151.11 \text{ mg}$$

∴ The driver would ... be found guilty.

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13 14 15 16 17 18 19 20 21 22 23 24  $\geq 25$

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### Comments

The candidate's answers show adequate understanding of the chemical concepts and principles in the curriculum (e.g. Paper 1 Qs. 1(b) & (c)(iii), 4(a), 9(b), 11(b), 12; Paper 2 Qs. 1(a)(ii) & (b)(iii)(1), 3(a)(iii)).

He/she can apply knowledge learnt to solve problems set on some unfamiliar situations (e.g. Paper 1 Q. 11(d)(i)).

Some of the questions set on chemical calculations are correctly answered (e.g. Paper 2 Q. 3(c)(ii)).

He/she can communicate using scientific terminology and diagrams in appropriate formats (e.g. Paper 1 Qs. 1(b), 3(a)(i), 4(d), 6(b)(i), 7(a), 12; Paper 2 Q. 3(c)(i)(1)).