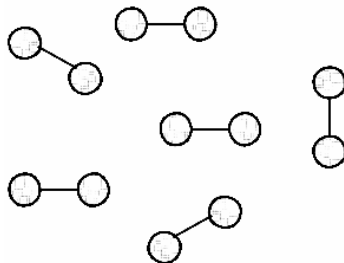


## SECTION A

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

1. The atmosphere is one of the sources of precious substances in our planet earth. The following shows the molecular arrangement of an element **L** that exists in the atmosphere.



- (a) The Z number for element **L** is 8. With reference to the Periodic Table on page 20, state the identity of **L** and the molecular interaction present in **L**.

(2 marks)

- (b) Based on the deduced identity, suggest a physical method to extract **L** from the atmosphere.

(1 mark)

- (c) If **L** is liquefied, do you expect that it is a good conductor of electricity? Explain.

(1 mark)

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2. A hydrocarbon is converted into a saturated compound **J** and an unsaturated compound **K** in an industrial process.

(a) How does the process affect various industrial fields ?

(1 mark)

(b) (i) Suggest a chemical method to distinguish between **J** and **K**.

(ii) Consider the following table:

	<b>J</b>	<b>K</b>
Relative molecular mass	58	42

Deduce ONE possible structure of **K**.  
(Relative atomic masses: H = 1.0, C = 12.0)

(4 marks)

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3. Sodium hypochlorite (NaOCl) is an active ingredient commonly present in sterilizing agents.

(a) Suggest a chemical equation that you would use to prepare sodium hypochlorite in laboratory.

(1 mark)

(b) Suggest ONE chemical test to show the presence of hypochlorite ions in a sample of sterilizing agent. State the expected observation and the relevant chemical equation in the test.

(2 marks)

(c) If the test stated in (b) is carried out on aqueous sulphur dioxide, what would be observed? Illustrate your answer with an appropriate chemical equation.

(2 marks)

(d) A 100 cm<sup>3</sup> sample of sterilizing agent contains 2.6 g of sodium hypochlorite. Calculate the molarity of the sodium hypochlorite solution.  
(Relative atomic masses: O = 16.0, Na = 23.0, Cl = 35.5)

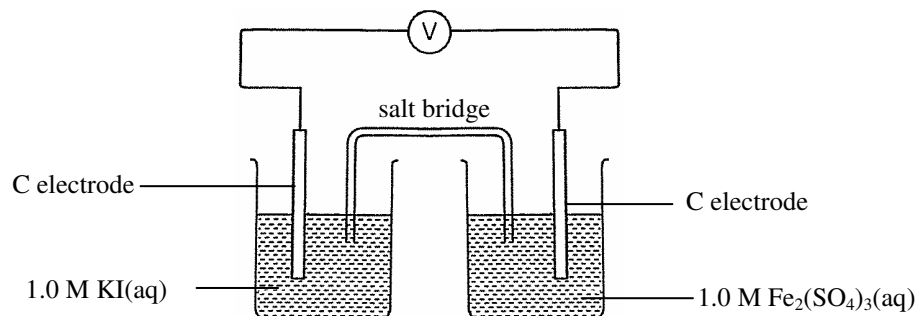
(2 marks)

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4. The following diagram shows a simple chemical cell using the carbon rod as cathode and anode.



- (a) Give one alternative device to measure the voltage of the chemical cell.

(1 mark)

- (b) State the expected observations at each electrode and write an half ionic equations for the reactions that occur.

(i) anode

(ii) cathode

(4 marks)

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5. The following procedures are used to determine the number of water of crystallization of hydrated copper(II) sulphate crystal ( $\text{CuSO}_4 \cdot n\text{H}_2\text{O}$ ).

*'3.77 g of the sample was dissolved in water. Upon adding excess sodium hydroxide solution, a precipitate was obtained. It was then washed and heated strongly to give a black solid. The mass of the solid was 1.20 g.'*

(a) Write a chemical equation for the formation of the black solid.

(1 mark)

(b) Why was it necessary to wash the solid obtained ?

(1 mark)

(c) Outline the data treatment that you would use to arrive the value of  $n$  in  $\text{CuSO}_4 \cdot n\text{H}_2\text{O}$ .

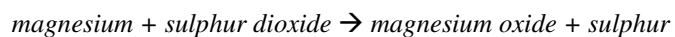
(4 marks)

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6. (a) Burning magnesium with sulphur dioxide gives magnesium oxide and sulphur.



- (i) Transcribe the above reaction into a chemical equation.
- (ii) Is the above conversion a redox reaction ? Explain with an appropriate theory.

(3 marks)

- (b) A magnesium ribbon was treated with excess concentrated sulphuric acid.

- (i) Give TWO expected observable changes.
- (ii) Suggest a method to collect the product of smallest density in the reaction.

(3 marks)

Answers written in the margins will not be marked.

7. Consider the substances listed below:

sulphur dioxide, concentrated sulphuric acid, ammonium sulphate,  
calcium oxide, nitrogen dioxide, concentrated hydrochloric acid

(a) Which of the substances is a pollutant derived from consumption of petrol ? Write a chemical equation for the reaction it causes potential harm to the environment.

(2 marks)

(b) Which of the substances can be used in esterification of alkanolic acid and alkanol ? Give its function.

(2 marks)

(c) Which of the substances is commonly used in agricultural industry ? Explain its principle.

(2 marks)

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8. But-1-ene molecules polymerize to form a polymer **P**.

(a) State the type of polymerization involved in the formation of **P**. Explain your answer.

(2 marks)

(b) Draw the repeating unit of **P** and write the equation to represent its formation.

(2 marks)

(c) Assuming **P** has a constant relative molecular mass of 196000, calculate the number of repeating units present in **P**.

(2 marks)

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Page Total







## SECTION B

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

10. A student carried out the following experiment to determine the concentration of phosphoric acid ( $\text{H}_3\text{PO}_4$ ). The experiment consisted of the following procedures:

*'10.0 cm<sup>3</sup> of the acid was first diluted to 250 cm<sup>3</sup> with distilled water. 25 cm<sup>3</sup> of the diluted solution was withdrawn to a conical flask and titrated against 0.025 M sodium hydroxide solution.'*

- (a) Name the apparatus used to transfer 25 cm<sup>3</sup> of the diluted sample to the conical flask. (1 mark)
- (b) Suggest a suitable indicator for the titration and state the colour change at the end point. (2 marks)
- (c) Suppose the titration gives disodium hydrogenphosphate and water as the **ONLY** products. Write a balanced chemical equation for the reaction. (1 mark)
- (d) The student carried out four titrations altogether. The results are listed in the table below:

**Burette reading:**

Titration	1	2	3	4
Final reading / cm <sup>3</sup>	17.60	19.8	23.11	27.89
Initial reading / cm <sup>3</sup>	0.00	2.20	5.50	10.20

Based on the titration results,

- (i) calculate a reasonable average volume of the sodium hydroxide solution used.
- (ii) determine the molarity of the phosphoric acid of the original sample. (5 marks)

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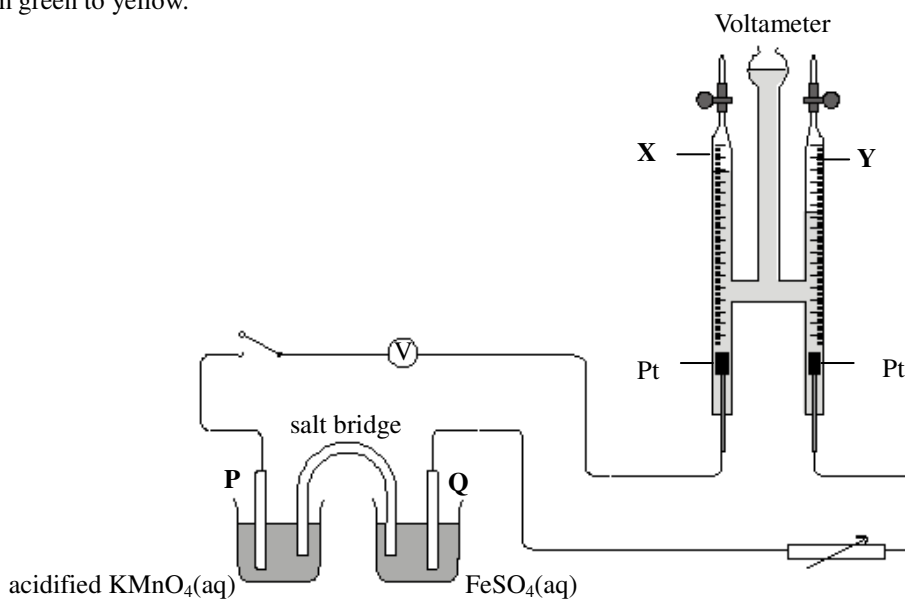
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Answers written in the margins will not be marked.

11. When the circuit in the set-up shown below is closed, the iron(II) sulphate solution changes its colour from green to yellow.



- (a) Write a half ionic equation for the reaction that occurs in the iron(II) sulphate solution. (1 mark)
- (b) Is electrode Q an anode or a cathode? Explain. (1 mark)
- (c) Write the overall equation that occurred in the electrolytic cell. (1 mark)
- (d) Deduce the ratio of the theoretical volumes of gases produced at X and Y. (2 marks)
- (e) After electrolysis, what is change of the following properties in sodium chloride solution? Explain briefly. (2 marks)
- (1) concentration (2) pH value
- (f) In order to obtain a gas with bleaching power in the electrolysis, specify TWO modifications that should be made to the above set-up. Explain briefly. (3 marks)

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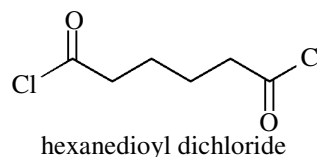
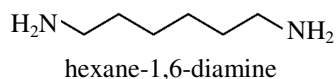






**For question 13 candidates are required to give a paragraph-length answer. For this question, 6 marks will be awarded for chemical knowledge and 3 marks for effective communication.**

- 13 In making nylon-6,6, hexane-1,6-diamine and hexanedioyl dichloride is used. Discuss how you can prepare nylon-6,6 string in laboratory. Also, suggest a way to prevent the formation of harmful gas during the process. Use the following condensed structural formulae and write an equation for the formation of the polymer.



(Each intersection represents a carbon atom in the above formulae.)

(9 marks)

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## GROUP 族

## PERIODIC TABLE 週期表

I		II												III	IV	V	VI	VII	0
3 <b>Li</b> 6.9	4 <b>Be</b> 9.0											5 <b>B</b> 10.8	6 <b>C</b> 12.0	7 <b>N</b> 14.0	8 <b>O</b> 16.0	9 <b>F</b> 19.0	10 <b>Ne</b> 20.2		
11 <b>Na</b> 23.0	12 <b>Mg</b> 24.3											13 <b>Al</b> 27.0	14 <b>Si</b> 28.1	15 <b>P</b> 31.0	16 <b>S</b> 32.1	17 <b>Cl</b> 35.5	18 <b>Ar</b> 40.0		
19 <b>K</b> 39.1	20 <b>Ca</b> 40.1	21 <b>Sc</b> 45.0	22 <b>Ti</b> 47.9	23 <b>V</b> 50.9	24 <b>Cr</b> 52.0	25 <b>Mn</b> 54.9	26 <b>Fe</b> 55.8	27 <b>Co</b> 58.9	28 <b>Ni</b> 58.7	29 <b>Cu</b> 63.5	30 <b>Zn</b> 65.4	31 <b>Ga</b> 69.7	32 <b>Ge</b> 72.6	33 <b>As</b> 74.9	34 <b>Se</b> 79.0	35 <b>Br</b> 79.9	36 <b>Kr</b> 83.8		
37 <b>Rb</b> 85.5	38 <b>Sr</b> 87.6	39 <b>Y</b> 88.9	40 <b>Zr</b> 91.2	41 <b>Nb</b> 92.9	42 <b>Mo</b> 95.9	43 <b>Tc</b> (98)	44 <b>Ru</b> 101.1	45 <b>Rh</b> 102.9	46 <b>Pd</b> 106.4	47 <b>Ag</b> 107.9	48 <b>Cd</b> 112.4	49 <b>In</b> 114.8	50 <b>Sn</b> 118.7	51 <b>Sb</b> 121.8	52 <b>Te</b> 127.6	53 <b>I</b> 126.9	54 <b>Xe</b> 131.3		
55 <b>Cs</b> 132.9	56 <b>Ba</b> 137.3	57 * <b>La</b> 138.9	72 <b>Hf</b> 178.5	73 <b>Ta</b> 180.9	74 <b>W</b> 183.9	75 <b>Re</b> 186.2	76 <b>Os</b> 190.2	77 <b>Ir</b> 192.2	78 <b>Pt</b> 195.1	79 <b>Au</b> 197.0	80 <b>Hg</b> 200.6	81 <b>Tl</b> 204.4	82 <b>Pb</b> 207.2	83 <b>Bi</b> 209.0	84 <b>Po</b> (209)	85 <b>At</b> (210)	86 <b>Rn</b> (222)		
87 <b>Fr</b> (223)	88 <b>Ra</b> (226)	89 ** <b>Ac</b> (227)	104 <b>Rf</b> (261)	105 <b>Db</b> (262)															
		* 58 <b>Ce</b> 140.1		59 <b>Pr</b> 140.9	60 <b>Nd</b> 144.2	61 <b>Pm</b> (145)	62 <b>Sm</b> 150.4	63 <b>Eu</b> 152.0	64 <b>Gd</b> 157.3	65 <b>Tb</b> 158.9	66 <b>Dy</b> 162.5	67 <b>Ho</b> 164.9	68 <b>Er</b> 167.3	69 <b>Tm</b> 168.9	70 <b>Yb</b> 173.0	71 <b>Lu</b> 175.0			
		** 90 <b>Th</b> 232.0		91 <b>Pa</b> (231)	92 <b>U</b> 238.0	93 <b>Np</b> (237)	94 <b>Pu</b> (244)	95 <b>Am</b> (243)	96 <b>Cm</b> (247)	97 <b>Bk</b> (247)	98 <b>Cf</b> (251)	99 <b>Es</b> (252)	100 <b>Fm</b> (257)	101 <b>Md</b> (258)	102 <b>No</b> (259)	103 <b>Lr</b> (260)			

atomic number 原子序

relative atomic mass 相對原子質量