

SECTION A

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

1. In 1897, Ernest Rutherford performed the gold foil scattering experiment. It is discovered that majority of ${}^4\text{He}^{2+}$ ion does not deflect when passing through a gold foil but some does deflect from their original paths and rebounded back.

(a) How many protons, neutrons and electrons are present in a ${}^4\text{He}^{2+}$ ion ? What are the *A* number and *Z* number for ${}^4\text{He}^{2+}$?

proton: _____

A number: _____

neutron: _____

Z number: _____

electron: _____

(2 marks)

(b) Suggest why most He^{2+} ions pass through the foil without deflection and some He^{2+} ions deflect from their original paths and rebound back in the experiment.

(2 marks)

(c) What can be concluded from the above experiment on the model of atomic structure ?

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

2. An element has isotopes ^{79}Y and ^{81}Y . Y exists as a diatomic molecule.

(a) What is the relative isotopic mass of ^{79}Y and ^{81}Y ?

(1 mark)

(b) In the case of Y , elaborate the meaning of the relative molecular mass.

(1 marks)

(c) How many physically distinguishable forms does Y_2 exist ? Show your reasoning.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. The table below lists some information about two metals **R** and **P**.

Metal	R	P
Z number	12	20
Heating in air	burns with bright light	burns with brick-red
Reaction with water	No observable change	gas bubbles evolved increasingly fast

- (a) Metal **R** does not react with water but reacts with steam readily.
- (i) Write a chemical equation for the reaction between **R** and steam.
- (ii) Draw an electron diagram for the solid product formed in (i), showing electrons in the *outermost shells* only.
- (2 marks)
- (b) (i) Write an equation for the reaction between **P** and water.
- (ii) Suggest an explanation for the observation made when **P** reacts with water.
- (iii) Draw a labelled diagram of the set-up for carrying out the reaction between **P** and water, with the collection of the gaseous product.
- (5 marks)
- (c) With reference to the electronic arrangements, suggest why **P** is more reactive than **R**.
- (2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

4. Acidic wastes in some industrial process should be treated before discharge into the river. A certain factory used slaked lime to neutralize its liquid waste, which consisted of 0.5 M hydrochloric acid, discharging at a rate of 20 dm³ per minute.

(a) Why are the liquid wastes neutralized before discharging into the sea ?

(1 mark)

(b) Write an equation for the reaction between hydrochloric acid and slaked lime.

(1 marks)

(c) Calculate the mass of slaked lime required per minute to neutralize the acid in the liquid wastes. (Relative atomic masses: H = 1.0, O = 16.0, Ca = 40.0)

(2 marks)

(d) Although slaked lime is cheaper, some factories nowadays use sodium carbonate instead for the treatment of acidic wastes. Suggest a reason.

(1 mark)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

5. (a) Write a chemical equation for the reaction between sodium hydrogensulphate and hydrated iron(III) oxide. Suggest an application of the reaction.

(2 marks)

(b) A certain brand of candy foams when it is added into a cup of soda pop. Suggest a compound in the candy responsible for the phenomena and write a chemical equation for the reaction.

(2 marks)

(c) Suggest how you would distinguish baking soda and baking powder. Write a chemical equation for the reaction.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

6. Peter poured 150 cm^3 of the bleach to a conical flask and then added dilute hydrochloric acid to the solution. Unexpected large amount of pale green gas was given off. He left the laboratory immediately.

(a) (i) Name the gas given off.

(ii) Write an equation for the formation of the gas.

(2 marks)

(b) On the other day, he came back to the laboratory and found that the coloured paper near the beaker turned white. Explain briefly with the help of equations.

(2 marks)

(c) John, the supervisor of Peter, suggested he should put a warning statement on the bottle. Write the warning statement that should be stated on the bottle of bleach.

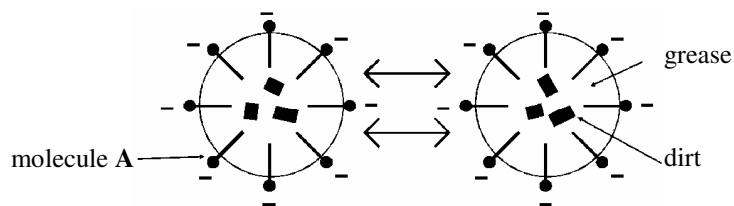
(1 mark)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

7. When a compound **A** is added into greasy dirt, it turns into oil droplets. The following shows a simplified model of their interaction in molecular level.



- (a) Give a suitable terminology for the above process. (1 mark)
- (b) Suggest a structural property that allows molecule **A** to perform the above function. (1 mark)
- (c) State the interaction present in the oil droplets. (1 mark)
- (d) Describe how the process takes place and hence explain how a soapy detergent could be benefited from the above process. (3 marks)

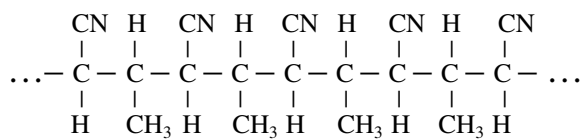
Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Please stick the barcode label here.

8. The following shows a portion of a polymer **J**:



(a) Give the repeating unit of polymer **J**.

(1 mark)

(b) Write a chemical equation for the formation of **J** from its monomer.

(1 mark)

(c) What type of polymerization is involved in the formation of polymer **J**? Explain your answer.

(2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

For question 9 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.

9. Devise an experiment to determine the percentage by mass of copper in a sample of copper(II) oxide. Provide the relevant procedures and data treatment as appropriate.

(Relative atomic masses: O = 16.0, Cu = 63.5)

(9 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Lined writing area for student answers.

Marker's Use Only	A	B	C

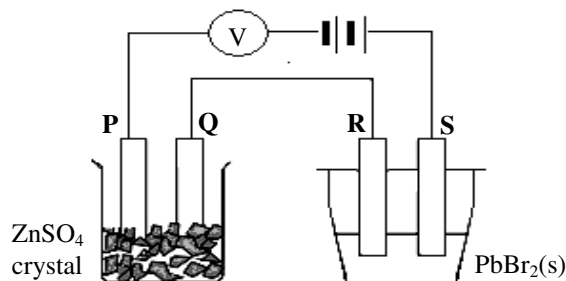
END OF SECTION A

Answers written in the margins will not be marked.

SECTION B

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

10. The following experiment shows the electrolysis of lead(II) bromide. **P** and **Q** are zinc electrodes while **R** and **S** are carbon electrodes.



- (a) Explain why there is no current flowing in the above circuit. (1 mark)
- (b) Some water is added to the beaker containing zinc(II) sulphate crystal.
- (i) State and explain the expected observations at electrodes
- (I) **P** and
- (II) **Q**.
- (ii) Suggest a chemical method to confirm the results in (i). (6 marks)
- (c) State and explain one safety precaution of conducting the experiment. (2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

A large rectangular area containing 28 horizontal lines, intended for writing answers. The lines are evenly spaced and extend across the width of the page.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

11. Consider five unlabelled substances of the following:

hexane, hex-1-ene, butan-1-ol, butanoic acid solution, ethyl ethanoate

- (a) Suggest a physical property that all the above substances are in common. (1 mark)
- (b) Suggest a chemical property that all the above substances are in common. (1 mark)
- (c) Propose a chemical method, with an expected observation and a chemical equation, to distinguish hex-1-ene from the other samples. (2 marks)
- (d) Propose a chemical method, with an expected observation and a chemical equation, to distinguish butan-1-ol from the other samples. (2 marks)
- (e) After the identification in (c) and (d), suggest how you would further identify the remaining unlabelled samples. (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

12. The following lists three acid solutions (1), (2) and (3):

	Acids	Molarity
(1)	ethanoic acid	1 M
(2)	sulphuric acid	2 M
(3)	hydrochloric acid	3 M

- (a) Arrange the above acids in decreasing order of pH value. Explain your ordering. (2 marks)
- (b) Suppose the above three acids are treated with the same amount of sodium hydroxide solution with a thermometer. Which of the above would give the greatest temperature rise ? Show your reasoning. (2 marks)
- (c) Suggest a physical method to distinguish between (2) and (3). Explain your answer. (2 marks)
- (d) In a titration experiment, 25.0 cm³ of vinegar required 22.3 cm³ of 1.0 M sodium hydroxide solution to attain the end-point. Calculate the molarity of ethanoic acid in the vinegar sample. (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.


Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Lined writing area for student responses.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Go on to the next page 

Page Total

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 Write an essay to compare and contrast addition polymerization and condensation polymerization. Illustrate your answers with appropriate examples.

(9 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

GROUP 族

PERIODIC TABLE 週期表

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

atomic number 原子序

relative atomic mass 相對原子質量