

233/1 -

CHEMISTRY
(THEORY)
Nov. 2018 - 2 hours

- Paper 1

Name Index Number

Candidate's Signature Date

Instructions to candidates

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- Answer **ALL** the questions in the spaces provided in the question paper.
- KNEC mathematical tables and silent non-programmable electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.
- This paper consists of 16 printed pages.**
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- Candidates should answer the questions in English.



For Examiner's Use Only

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	26	27	28	Grand Total

1. (a) Define a soluble base. (1 mark)

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(b) Aqueous solutions of 2M ethanoic acid and 2M nitric(V) acid were tested for electrical conductivity. Which solution is a better conductor of electricity? Explain. (2 marks)

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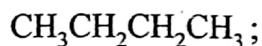
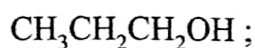
2. (a) Explain why it is not advisable to prepare a sample of carbon(IV) oxide using barium carbonate and dilute sulphuric(VI) acid. (2 marks)

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(b) State a method that can be used to collect dry carbon(IV) oxide gas. Give a reason. (1 mark)

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3. The following are formulae of organic compounds. Use the formulae to answer the questions that follow:



- (a) Select:

- (i) **two** compounds which when reacted together produce a sweet smelling compound. (1 mark)

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- (ii) **an** unsaturated hydrocarbon. (1 mark)

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- (b) Name the compound selected in (a) (ii). (1 mark)

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4. One of the allotropes of sulphur is rhombic sulphur.

- (a) Name the other allotrope of sulphur. (1 mark)

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- (b) Draw a diagram to show the shape of the allotrope named in (a) above. (1 mark)

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(c) Write an equation for the reaction between concentrated sulphuric(VI) acid and sulphur (1 mark)

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5. Describe an experiment to show that group one elements react with cold water to form alkaline solutions. (3 marks)

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6. (a) State Graham's law of diffusion: (1 mark)

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(b) Explain why a balloon filled with helium gas deflates faster than a balloon of the same size filled with argon gas. (2 marks)

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7. 30.0 cm³ of aqueous sodium hydroxide containing 8.0 g per litre of sodium hydroxide were completely neutralised by 0.294 g of a dibasic acid. Determine the relative formula mass of the dibasic acid. (Na = 23.0 ; O = 16.0 ; H = 1.0) (3 marks)

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8. Study the flow chart in **Figure 1** and answer the questions that follow.

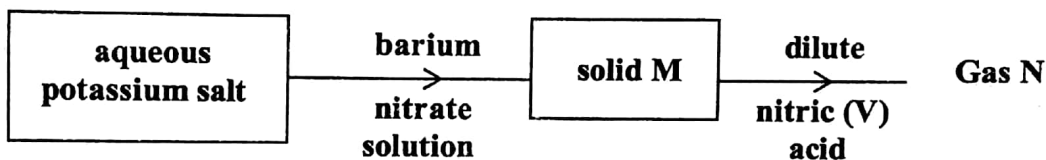


Figure 1

Gas N forms a white suspension with aqueous calcium hydroxide.

- (a) Name the anion present in the potassium salt. (1 mark)
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- (b) Write an ionic equation for the formation of solid M. (1 mark)
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- (c) Give one use of gas N. (1 mark)
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9. An experiment was carried out to determine the presence of substances P, Q, R and S in mixture T. The results obtained are shown in Figure 2.

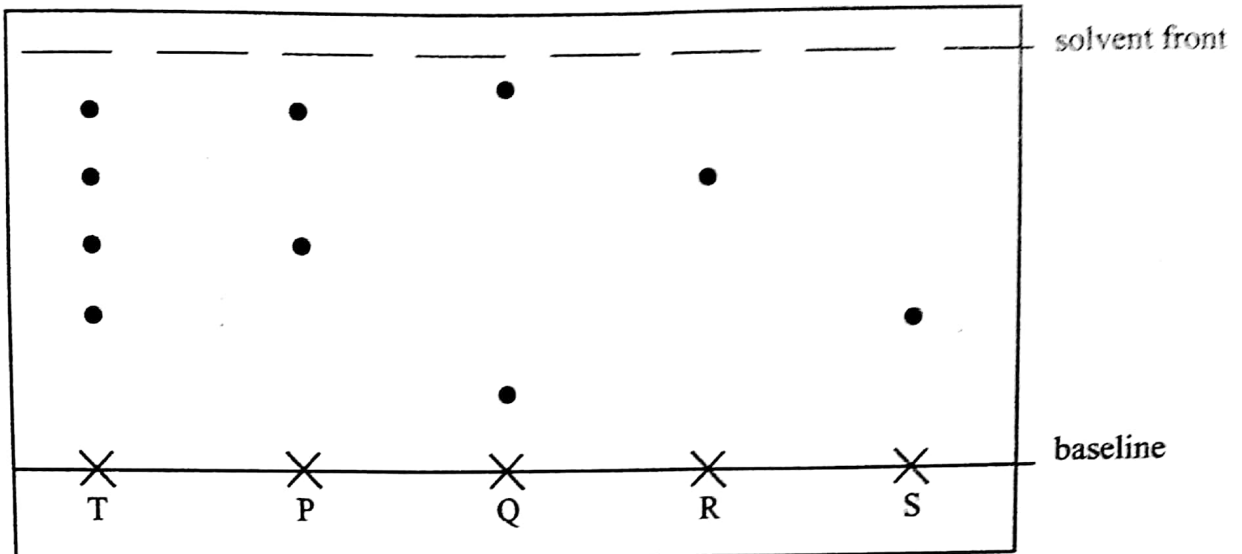


Figure 2

- (a) Name the method of separation illustrated in Figure 2. (1 mark)

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- (b) Select:

- (i) one substance which contains a component **not** present in T. (1 mark)

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- (ii) a substance which is least soluble in the solvent used. (1 mark)

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10. Using iron filings, describe an experiment that can be conducted to show that oxygen is present in air. (3 marks)

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11. (a) Element U has atomic number 12 while element V has atomic number 16. How do the melting points of their oxides compare? Explain. (3 marks)

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12. When ethene gas is compressed at a high temperature, a solid is formed.

(a) Give the name of the solid.

(1 mark)

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(b) Explain why it is **not** advisable to allow the solid to accumulate in the environment.

(2 marks)

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13. In the Haber process, nitrogen reacts with hydrogen according to the following equation.



(a) What would be the effect of adding a catalyst on the position of the equilibrium?

(1 mark)

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(b) Explain why it is **not** advisable to use temperatures higher than 773 K in the Haber process.

(2 marks)

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14. Figure 3 shows a set-up used by a student to prepare dry chlorine gas in the laboratory.

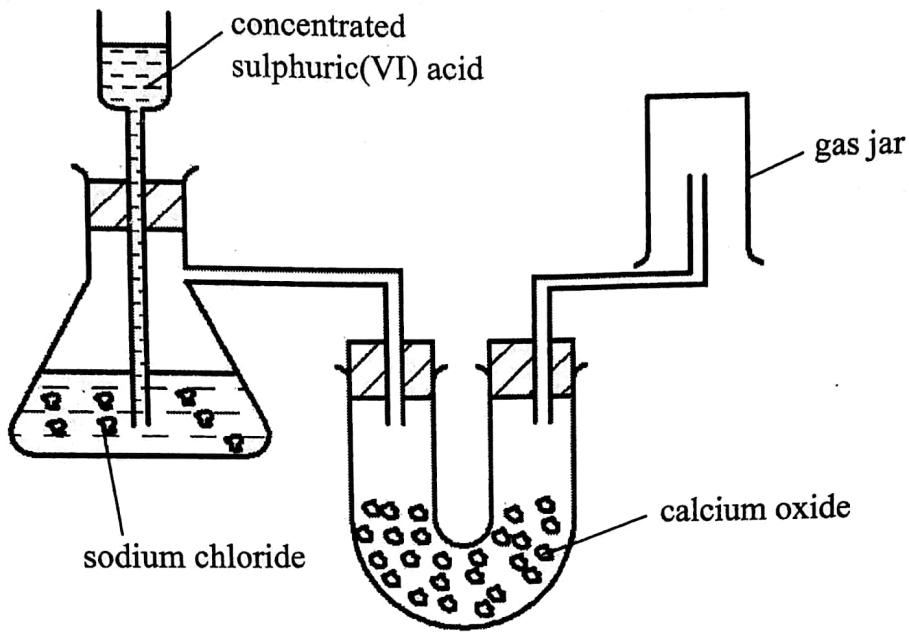


Figure 3

Identify **three** mistakes in the set-up, and give a reason for each. (3 marks)

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15. You are provided with solid potassium hydrogen carbonate. Describe how a solid sample of potassium nitrate can be prepared. (3 marks)

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16. Metal X and Y have standard electrode potentials of -0.13 V and -0.76 V respectively. The metals were connected to form a cell as shown in **Figure 4**.

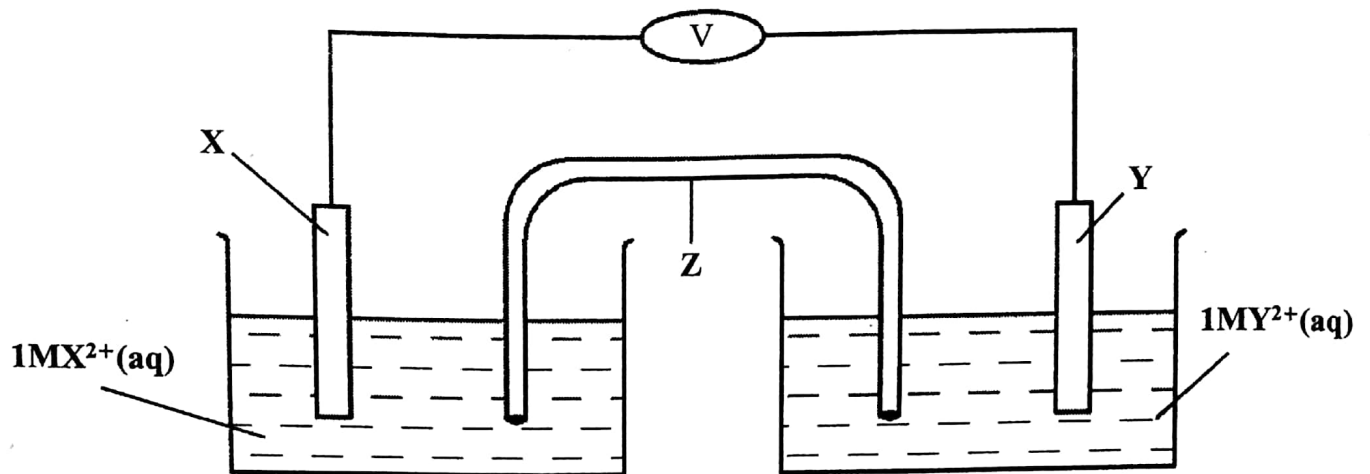


Figure 4

- (a) Name the part labelled Z. (1 mark)

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- (b) State **one** function of the part labelled Z. (1 mark)

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- (c) Calculate the e.m.f. of the cell. (1 mark)

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17. **Figure 5** represents a grid that is part of the periodic table. Study it and answer the questions that follow. The letters are not the actual symbols of the elements.

	A				B			
				C				
	E							

Figure 5

(a) Write the electron arrangement of element C. (1 mark)

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(b) On the grid provided, show with a tick (✓) the position of element D whose atomic number is 18. (1 mark)

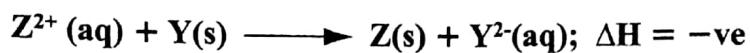
(c) Element E is more reactive than A. Explain. (1 mark)

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18. (a) Define molar heat of displacement. (1 mark)

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- (b) The following ionic equation represents the reaction between metal Y and an aqueous solution of Z^{2+} .



Draw an energy level diagram to represent the reaction. (2 marks)

19. (a) Give the symbols of the two charged particles emitted by a radioactive isotope. (1 mark)

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- (b) An isotope $^{210}_{82}\text{Pb}$ disintegrates by emitting two beta particles. Determine the mass number and atomic number of the resulting nuclide.

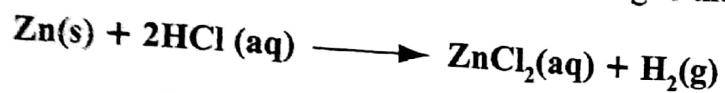
mass number: (1 mark)

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atomic number: (1 mark)

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20. (a) Zinc reacts with hydrochloric acid according to the following equation.



Identify the reducing agent. Give a reason for the answer.

(2 marks)

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- (b) Iron sheets are dipped in molten zinc to prevent rusting. Name this process. (1 mark)

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21. Study the set-up in Figure 6 and answer the questions that follow.

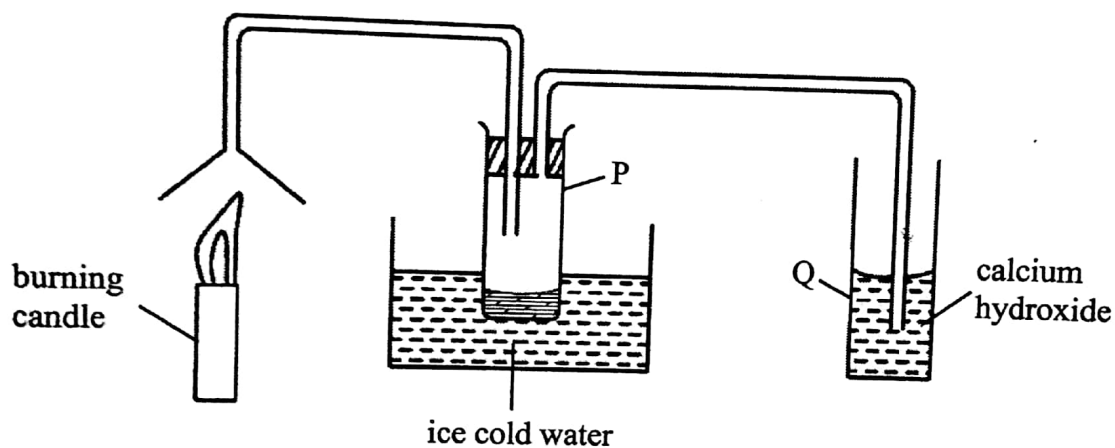


Figure 6

- (a) Name the substance that was collected in tube P. (1 mark)
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- (b) Write an equation for the reaction which occurs in tube Q in the first few minutes of the experiment. (1 mark)
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- (c) Give a suitable conclusion for the experiment in the set-up. (1 mark)
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22. You are provided with the following: thermometer, boiling tube, beaker, Bunsen burner, pure substance X whose boiling point is about 80°C, water and any other apparatus that may be required. Draw a labelled diagram of the set-up that can be used to determine the melting point of X. (3 marks)

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23. Explain why it is important to put off a non-luminous flame immediately after use. (2 marks)

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24. (a) Name two ores of iron. (1 mark)

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(b) Describe how the amount of iron in a sample of iron(III) oxide can be determined. (2 marks)

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25. Explain why a solution of sodium chloride conducts electricity while that of sugar does not. (2 marks)

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26. Explain why commercial indicators are preferred to flower extracts as acid-base indicators. (2 marks)

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27. $(\text{NH}_4)_2\text{HPO}_4$ is a fertiliser used by farmers to boost their crop production.
(a) Calculate the mass of phosphorus in a 20 kg packet of $(\text{NH}_4)_2\text{HPO}_4$.
(N = 14.0; H = 1.0; P = 31.0; O = 16.0) (2 marks)

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(b) State **one** advantage of this fertilizer, $(\text{NH}_4)_2\text{HPO}_4$, over urea $(\text{CO}(\text{NH}_2)_2)$. (1 mark)

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28. Distinguish between empirical and molecular formula of a compound. (2 marks)

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