

Name Index No.

233/1

Candidates signature

CHEMISTRY

Paper 1 (Theory)

Date

July 2017

Time : 2 Hours

FORM 4 END OF TERM 2 EXAM

CHEMISTRY

Paper 1

July 2017

Time : 2 Hours

INSTRUCTIONS TO CANDIDATES

- * Write your name and index number in the spaces provided.
- * Sign and write the date of examination in the spaces provided.
- * Answer **ALL** questions in the spaces provided in the question paper.
- * Mathematical tables and silent calculators may be used.
- * All working must be clearly shown where necessary.
- * Use English when answering the questions.
- * Candidates should check the question paper to ascertain that all pages are printed.

For Examiner's Use Only

Question	Maximum score	Candidate's Score
1 - 29	80	

1. Solutions can be classified as acids, bases or neutral. The table below shows solutions and their pH values.

Solution	PH values
K	1.5
L	7.0
M	14.0

- a) Select any pair that would react to form a solution of pH 7. (1 mark)

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- b) Identify two solutions that would react with aluminium hydroxide. Explain. (2 marks)

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2. 9.12g of a gaseous compound contain 8g of silicon while the rest is hydrogen. Determine the empirical formula of the compound. (H = 1, Si = 28) (3 marks)

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3. A fixed mass of a gas occupies 105cm^3 at -14°C and 650mmHg . At what temperature will it have a volume of 15cm^3 if pressure is adjusted to 690mmHg ? (3 marks)

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4. Using dots (•) and crosses (x) to represent electrons, show the bonding in fluorine molecule. (Atomic numbers; F = 9) (1 mark)

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5. Starting with copper metal, describe how to prepare solid copper (II) carbonate. (3 marks)

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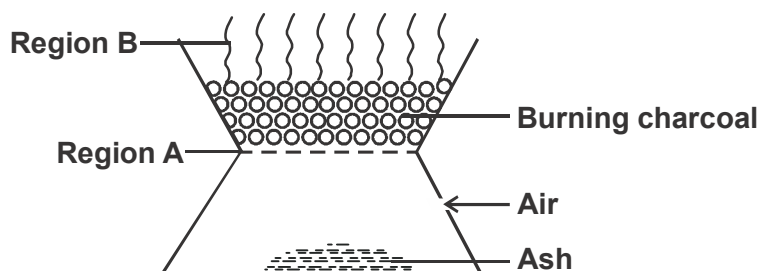
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6. The diagram below shows a 'jiko' when in use. Study it and answer the questions that follow.



- a) Identify the gas formed at region B. (1 mark)

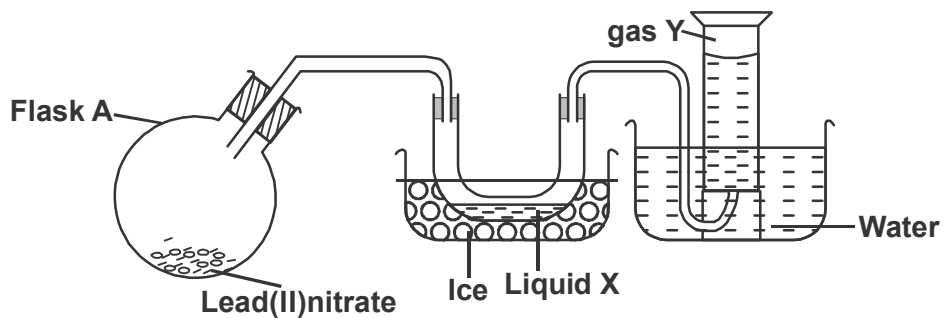
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- b) State and explain the observation made at region B. (2 marks)

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7. A student set up the experiment to study the effect of heat on lead (II) nitrate.



- i) Identify liquid X. (1 mark)

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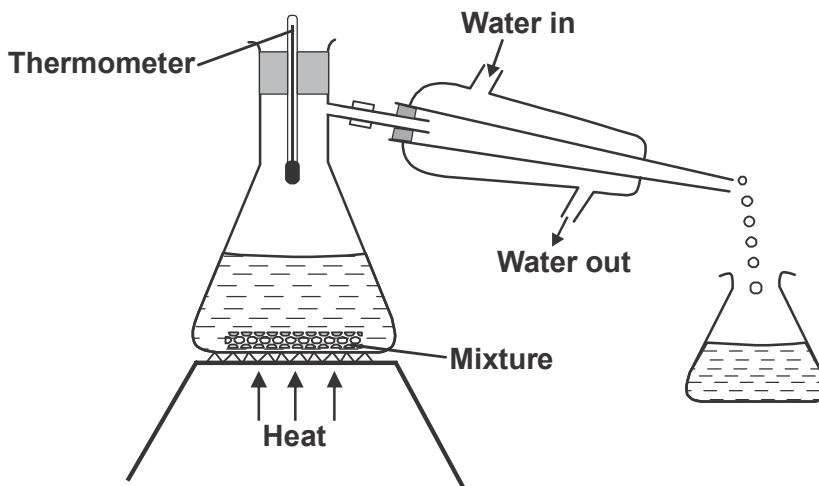
- ii) Describe the test for gas Y. (1 mark)

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- iii) Write a balanced chemical equation for the reaction in flask A. (1 mark)

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8. The set-up represented below can be used to separate ethanol from its mixture with water.



a) Identify an error in the set-up. (1 mark)

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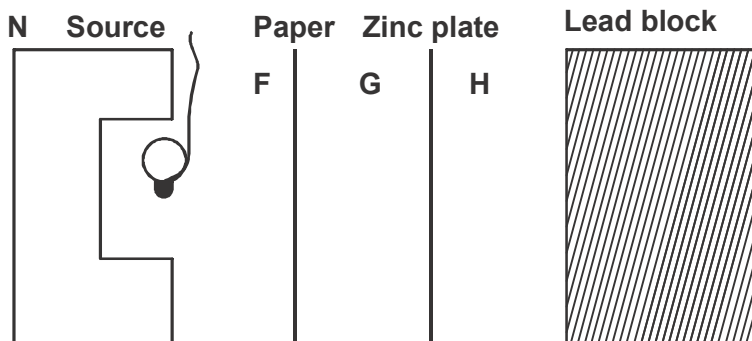
b) Name this method of separation. (1 mark)

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c) What properties make it possible to separate ethanol from water by this method ? (1 mark)

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9. The arrangement below was used to compare the penetrating power of emissions in a radioactive decay.



a) Name the radiation that can be detected at F, G, H. (3 marks)

F

G

H

b) Name the material N and state its use. (1 mark)

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c) The half-life of ${}_{92}^{238}\text{U}$ is 4500 years. The isotope decays by alpha emission. Write a nuclear equation for its decay to form Thorium (Th). (1 mark)

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10. a) What is meant by solubility ?

(1 mark)

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b) In an experiment to determine the solubility of solid X in water at 30°C the following results were obtained:

- Mass of evaporating dish = 26.2g
- Mass of evaporating dish + saturated solution = 42.4g
- Mass of evaporating dish + dry solid X = 30.4g

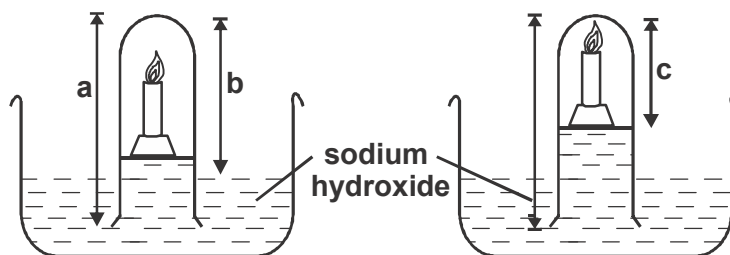
Using the information, determine the solubility of solid X at 30°C in g/100g water. (2 marks)

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11. A Form one student set-up the following apparatus to investigate the percentage of oxygen in air.



a) i) Why is sodium hydroxide preferred to water in the above experiment ? (1 mark)

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ii) Write an expression to show how the percentage of oxygen can be calculated. (1 mark)

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iii) Given that the value of a = 10cm, b = 8cm and c = 6.4cm, calculate the percentage active part of air used. (2 marks)

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12. 30cm³ of 0.5M hydrochloric acid was used to neutralize 25cm³ of sodium hydroxide solution. Determine the concentration of sodium hydroxide in grams per litre. (3 marks)
(H = 1, O = 16, Na = 23)

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13. The table below gives some information about the physical properties of four substances which are represented by letters L, M, N and K.

Substance	Melting point	Heat of vaporisation	Electrical conductivity	
			Solid	Molten
L	High	High	Poor	Poor
M	High	High	Good	Good
N	High	High	Poor	Good
K	Low	Low	Poor	Poor

Select with reasons an element which is likely to be :

- i) Copper metal (1 mark)

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- ii) Silicon (IV) oxide (1 mark)

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- iii) Potassium iodide (1 mark)

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14. Write balanced chemical equations for reactions between chlorine and : (2 marks)

- i) concentrated sodium hydroxide

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- ii) dilute sodium hydroxide

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15. a) Hydrogen sulphide gas is bubbled through bromine water.

- i) Give two observations made. (1 mark)

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- ii) Write an equation for the reaction that takes place. (1 mark)

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b) State the test for hydrogen sulphide gas. (1 mark)

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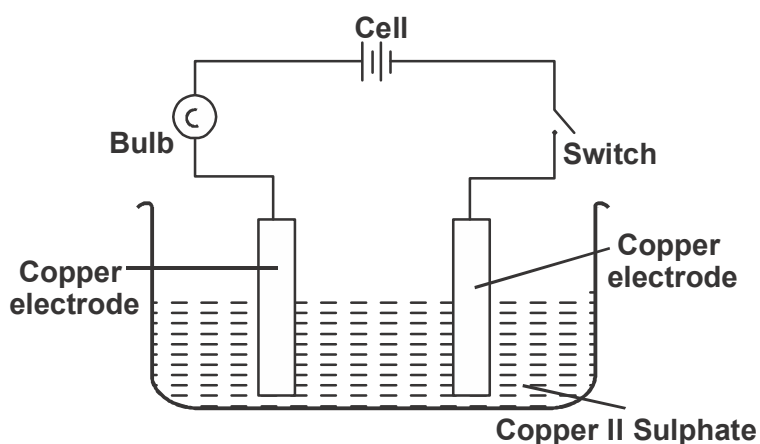
16. a) State Gay-Lussac's law of combining volumes. (1 mark)

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b) When 100cm^3 of a gaseous hydrocarbon (C_xH_y) burns in 300cm^3 of oxygen, 200cm^3 of carbon (IV) oxide and 200cm^3 of steam are formed. Deduce the formula of the hydrocarbon. (2 marks)

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17. Study the set up below for electrolysis of copper (II) sulphate using copper electrodes.



a) Write ionic equations for reactions that took place at :

I. Anode (1 mark)

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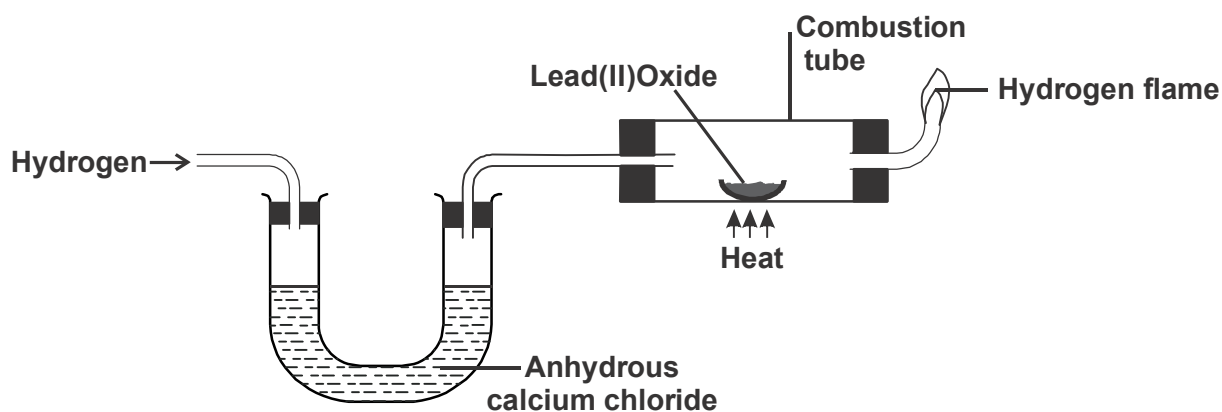
II. Cathode (1 mark)

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b) State and explain the observations made on the electrolyte. (1 mark)

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18. Study the diagram below and answer the questions that follows.



i) Write an equation for the reaction that takes place in the combustion tube. (1 mark)

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ii) What property of hydrogen makes this reaction possible? (1 mark)

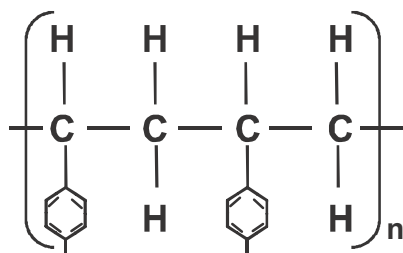
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iii) What would you expect to happen if sodium oxide (Na_2O) was used instead of lead (II) oxide? Explain. (1 mark)

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19. The formula given below represents a portion of a polymer.



a) Give the name of the polymer. (1 mark)

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b) State one disadvantage of continued use of this polymer. (1 mark)

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20. 16g of ethanol (C₂H₅OH) were completely burnt in air. The heat evolved caused the temperature of 600cm³ of water to change from 20°C to 85°C. Calculate the molar enthalpy of combustion of ethanol. (H = 1, C = 12, O = 16). Specific heat capacity of water = 4.2KJK⁻¹K⁻¹). (3 marks)

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21. A mixture contains ammonium chloride, silver chloride and lead (II) chloride. Describe how each of the substance can be obtained from the mixture. (3 marks)

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22. Two elements A and B have electronic configurations 2.8.3 and 2.6 respectively. (1 mark)
- a) To which group and period does element B belong ?

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- b) If the two react, what is the formula of the compound they form ? (1 mark)

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23. The table below represents elements P, Q, R and S. Study it and answer the questions that follow. (The letters are not the actual symbols of the elements)

Element	Atomic number	Atomic radius (nm)	Ionic radius (nm)
P	13	0.121	0.061
Q	14	0.101	0.043
R	17	0.099	0.181
S	18	0.023	-

- a) Explain why the atomic radius of element P is greater than that of element R. (1 mark)

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- b) Explain why the atomic radius of element R is less than its ionic radius. (1 mark)

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c) Using dots (•) and crosses (x) show bonding in the compound formed between elements Q and R. (1 mark)

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24. A piece of burning magnesium ribbon was placed in a gas jar full of nitrogen gas. The product Q formed was then reacted with water.

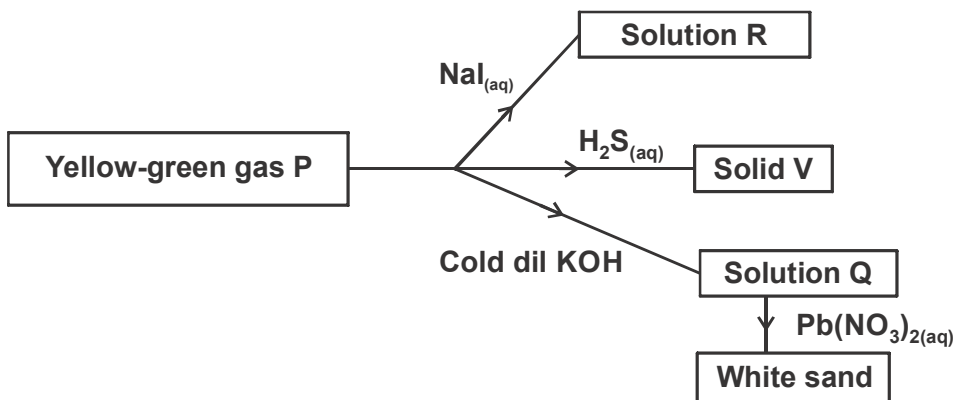
a) Write the chemical formula for the product Q. (1 mark)

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b) Write the equation for the reaction between product Q and water. (1 mark)

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25. Study the flow chart below and answer the questions that follow.



Identify :

i) Solid V (1 mark)

ii) Solution R (1 mark)

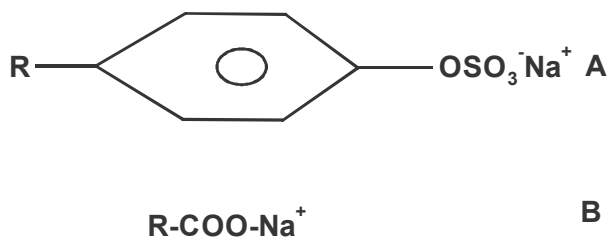
iii) Solution Q (1 mark)

26. a) Define hard water. (1 mark)

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b) The structure below represents two cleansing agents.



Which of the above cleansing agent would be suitable for washing in hard water ? Give a reason. (2 marks)

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27. Hydrogen iodide is a product formed when hydrogen reacts with iodine according to the equations.



Explain how the following would affect the yield of hydrogen iodide.

a) Increase the temperature. (1 mark)

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b) A decrease in pressure of the system. (1 mark)

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c) State the Le Chatelier's principle. (1 mark)

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28. An element X has a relative atomic mass of 88. When a current of 0.5 ampere was passed through a fused chloride of X for 32 minutes 10 seconds, 0.44g of X was deposited.

i) Determine the charge of element X. (1 Faraday = 96500C) (3 marks)

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ii) Write the formula of the hydroxide of X. (1 mark)

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29. The basic raw material for extraction of aluminium is bauxite.

a) Name the method that is used to extract aluminium from bauxite. (1 mark)

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b) Cryolite is used in the extraction of aluminium from bauxite. State its role. (1 mark)

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c) Aluminium is a reactive metal yet utensils made of aluminium do not corrode easily. Explain this observation. (1 mark)

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