

Name Index Number.....

School..... Stream

Candidate's Signature..... Date.....

233/2

CHEMISTRY

Paper 2

(THEORY)

September, 2021

2 hours

BURAMU 2 JOINT EXAM, TERM ONE, 2021

CHEMISTRY PAPER 2

Instructions to Candidates

- a) Write your name, index number, school and stream in the space provided above.
- b) Sign and write the date of the exam in the spaces provided above.
- c) Answer **all** questions in the spaces provided in the question paper.
- d) All working **must** be shown clearly where necessary.
- e) KNEC Mathematical tables and silent electronic calculators may be used
- f) Answer the questions in English.

For Examiner's use only

Question	Maximum Score	Candidate's Score
1	12	
2	14	
3	10	
4	10	
5	10	
6	14	
7	10	
Total Score	80	

1. The grid below shows part of the periodic table. Use it to answer the questions that follow. The letters are not actual symbols of the elements.

								P
K				S		T		
			R				N	Q
L								

- i. What is the name given to the elements that lie within the shaded region? [1mk]

- ii. Compare the atomic radius of: [2mks]
 I. K to that of L

 II. R to that of N

- iii. The stable ion of an element M is M^{2+} . If the electron configuration of this ion is 2.8, place M on the grid above. [1mk]
- iv. In which chemical family does M belong? [1mk]

- v. Explain why the melting point of N is higher than that of Q. [2mk]

- vi. Using dots (•) and crosses (x) to represent electrons, draw a diagram to illustrate the bonding in the compound formed between K and T. [2mks]

vii. The chloride of R was dissolved in water and a blue litmus paper dropped in the resulting solution. State and explain the observation made. [2mks]

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viii. Give one use of element P. [1mk]

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2. a) A hydrocarbon **D** has an empirical formula CH_2 and a molecular mass of 56.

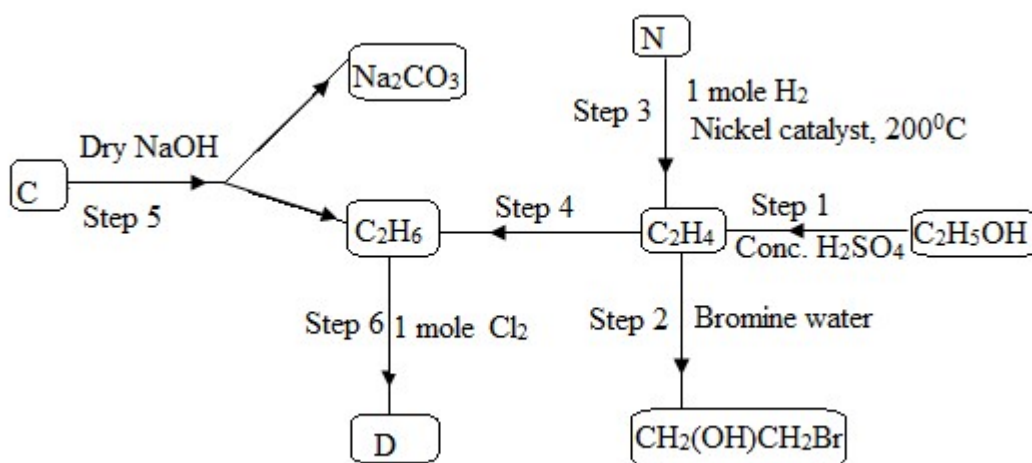
i. Determine the molecular formula of the hydrocarbon. [2mks]

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ii. Draw and name two possible structures of the hydrocarbon. [4mks]

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b) Study the flow chart below and answer the questions that follow.



i. Name substance:
 I. C [2mks]

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II. N

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ii. Draw the open structural formula of D. [1mk]

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iii. What is the role of concentrated sulphuric (VI) acid in step 1? [1mk]

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iv. Name the reagents that can be used to prepare N in the laboratory. [1mk]

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v. State the observation made in step 2. [1mk]

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vi. How was the sodium hydroxide (NaOH) in step 5 kept dry? [1mk]

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vii. Under what condition would the reaction in step 6 **NOT** take place? [1mk]

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3. a) At 25^oC, 50g of potassium nitrate were added to 100g of water to make a saturated solution. What is meant by a saturated solution? [1mk]

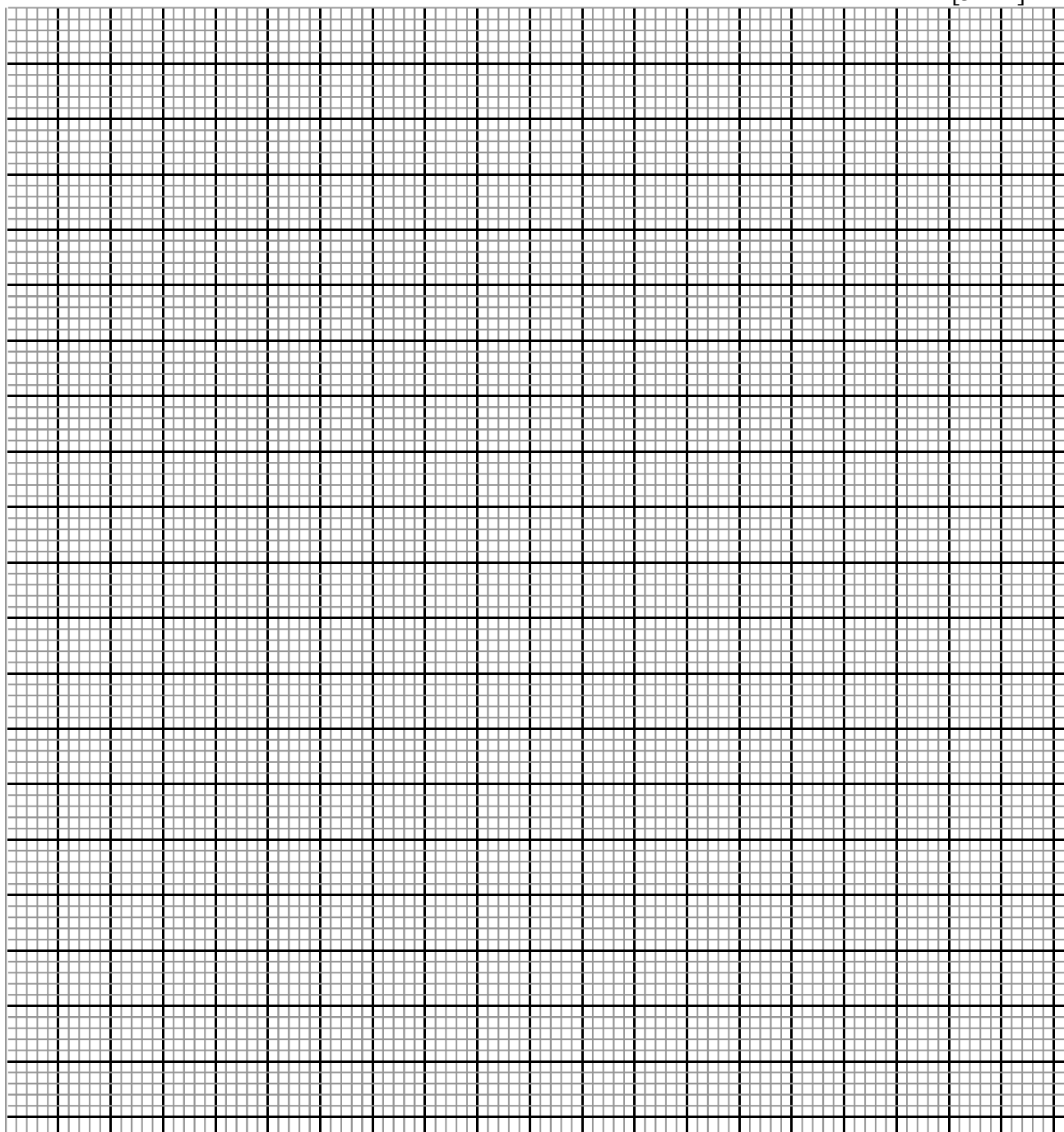
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b) the table below gives the solubilities of potassium nitrate at different temperatures.

Temperature ($^{\circ}\text{C}$)	12	20	28	36	44	52
Solubility g/100g of water	22	31	42	55	70	90

i. Plot a graph of the solubility of potassium nitrate (vertical axis) against temperature.

[3mks]



- ii. Using the graph:
- I. Determine the solubility of potassium nitrate at 15⁰C. [1mk]
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- II. Determine the mass of potassium nitrate that remained undissolved given that 80g of potassium nitrate were added to 100 cm³ of water and warmed to 40⁰C. (density of water is 1g/cm³) [2mks]
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- iii. Determine the molar concentration of potassium nitrate at 15⁰C. (K=39.0, N=14.0, O=16.0). [3mks]
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4. a) Hydrogen chloride gas is commercially obtained from the reaction between hydrogen and chlorine gas. State the sources of hydrogen and chlorine gas in this process. [2mks]
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- b) Explain why small amounts of hydrogen gas are burnt in excess chlorine during commercial preparation of hydrogen chloride gas. [1mk]
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- c) Write an equation for the reaction between chlorine and hydrogen gas. [1mk]
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- d) hydrogen chloride gas reacts with lead (II) ions in solution according to the equation:
- $$2\text{HCl}_{(g)} + \text{Pb}^{2+}_{(aq)} \rightarrow \text{PbCl}_{2(s)} + 2\text{H}^{+}_{(aq)}$$
- 2.4 litres of hydrogen were carefully bubbled through 50 cm³ of 1.2 M solution of lead (II) ions at room temperature.

i. Name a suitable salt that was used to prepare lead (II) ions. [1mk]

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ii. Calculate:

I. The number of moles of lead (II) ions that reacted. [2mks]

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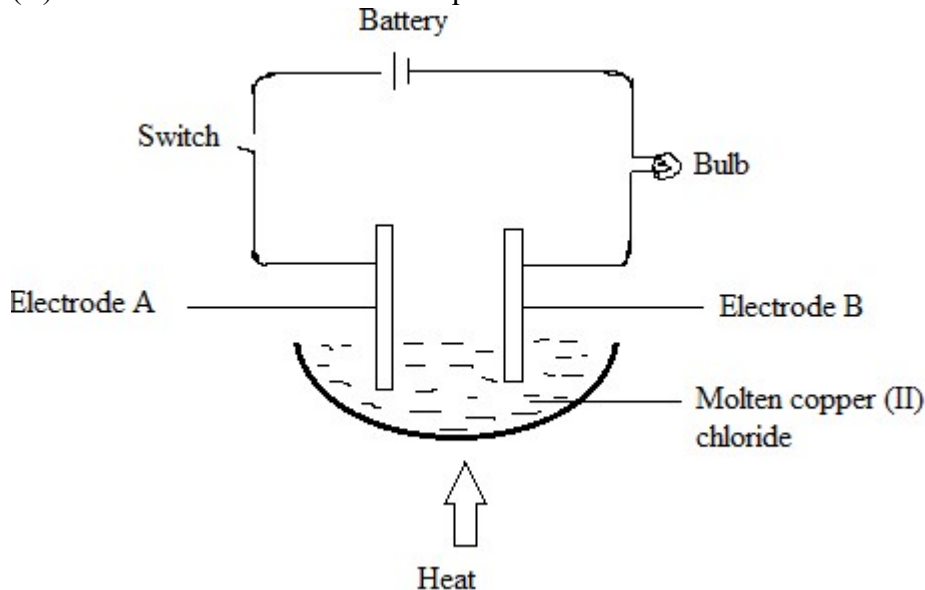
II. The mass in grams of lead (II) chloride formed. [2mks]
(one mole of a gas occupies 24 dm³ at r.t.p, Cl = 35.5, Pb =207)

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iii. State one use of hydrogen chloride. [1mk]

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5. The set-up below was used to investigate the effect of an electric current on molten copper (II) chloride. Use it to answer the questions that follow.



- i. Identify the anode and cathode. [2mk]

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- ii. State three observations that were made in the above set-up when the switch was closed. [3mks]

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- iii. Write an equation for the reaction that occurred at electrode A. [1mk]

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iv. What would happen if the source of heat was withdrawn in the above set-up? Explain. [2mks]

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v. Give two application of electrolysis. [2mks]

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6.

i. Sulphur exhibits allotropy. What is meant by the term allotropy? [1mk]

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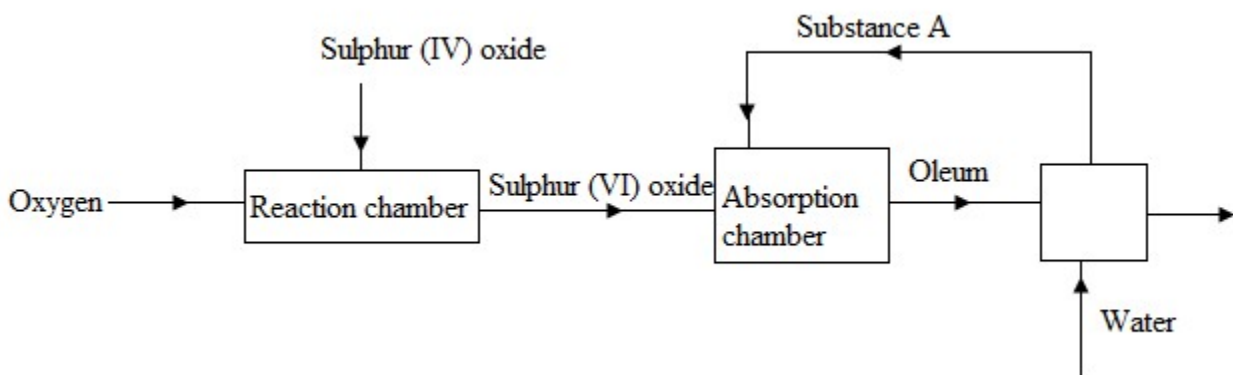
ii. Name one non-crystalline allotrope of Sulphur. [1mk]

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iii. Extraction of Sulphur is done by the Frasch process. State the role of superheated water in the Frasch process. [1mk]

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- iv. The flow chart below shows some of the processes involved in the large-scale production of sulphuric (VI) acid. Use it to answer the questions that follow.



- I. Describe how oxygen is obtained from air on large scale. [3mks]

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- II. Name substance A. [1mk]

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- III. Write an equation for the reaction that takes place in the absorption chamber. [1mk]

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- IV. Give two reasons why vanadium (V) oxide is commonly used as a catalyst in the above process. [2mks]

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- v. A form three student carried out the following tests using different concentrations of sulphuric (VI) acid.

Test 1

Copper turnings were added to 5 cm³ of 18M sulphuric (VI) acid in a boiling tube and the mixture warmed.

Test 2

Copper turnings were added to 5 cm³ of 0.1M sulphuric (VI) acid in a boiling tube and the mixture warmed.

State and explain the observations made in each test.

Test 1

Observation [1mk]

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Explanation [1mk]

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Test 2

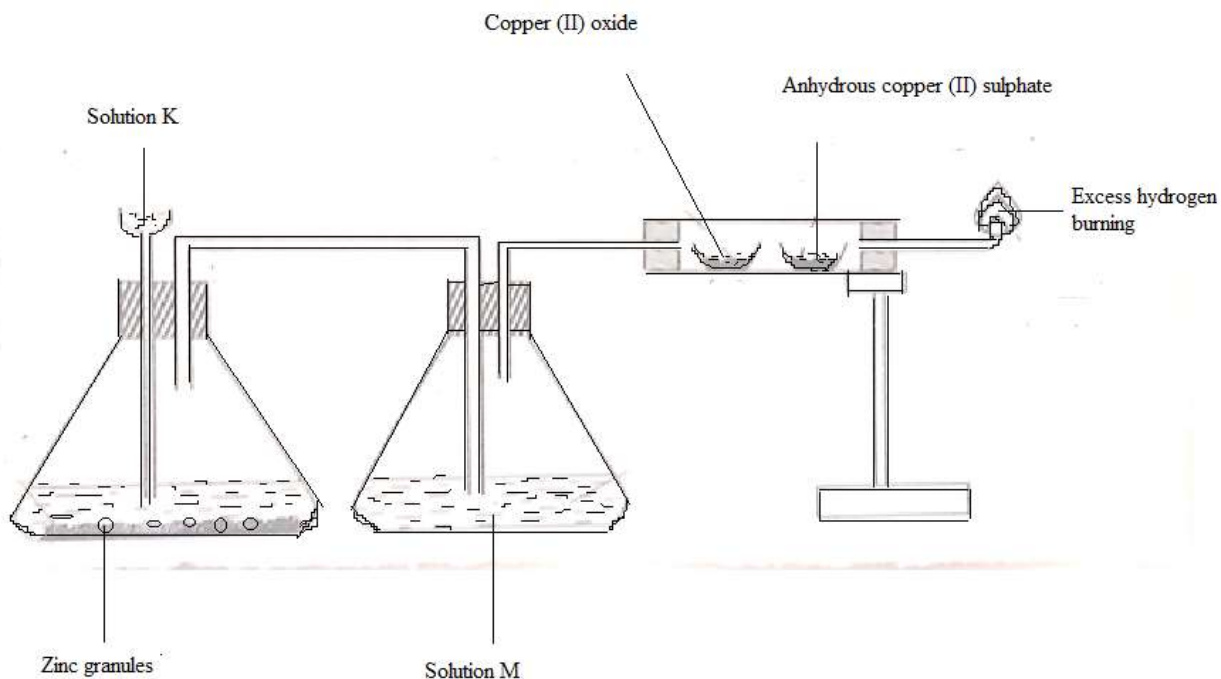
Observation [1mk]

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Explanation [1mk]

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7. The set-up below was used to prepare hydrogen and investigate one of its properties. Study it and answer the questions that follow.



a. Identify:

i. Solution K [1mk]

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ii. Solution M [1mk]

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b. State two properties of solution M that make it suitable to perform the role it does in the above set-up. [2mks]

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c. Write an equation for the reaction that occurs in the conical flask. [1mk]

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d. What would be observed in the combustion tube at the end of the experiment? [2mks]

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e. What type of reaction is undergone by hydrogen in the above set-up? Explain. [2mks]

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f. Other than industrial manufacture of hydrochloric acid, give any other industrial use of hydrogen. [1mk]

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