

TRINITY COLLEGE NABBINGO
S.3 END OF TERM II 2019
CHEMISTRY EXAMINATION PAPER 2
DURATION: 2 HOURS

GUIDE.

SECTION A - 50
B - 30

80

INSTRUCTIONS:

- Attempt all questions in section A and B.
- Answers to section A should be put in the spaces provided.
- Each question in section B should be answered on a fresh page.

SECTION A (50 MARKS)

1. (a) A new iron knife was left in a banana plantation for two weeks.

(01mark)

(i) State what was observed on the knife after two weeks.

A brown coating on the knife ✓

(ii) Name the process that occurred on the knife after the two weeks.

(01mark)

Rusting. ✓

(b) (i) State two conditions that favoured the above process.

(01mark)

- Presence of oxygen ✓

- Presence of moisture ✓

(ii) Outline two ways of preventing the above process.

(01mak)

- Oiling ✓

- Use of stainless steel knife ✓

(c) State one advantage and one disadvantage of the process in (a) (i) above.

Advantage

(½ mark)

Improves soil fertility by adding Iron to the soil.

Disadvantage

(½ mark)

Wears out machines; May cause friction in machines; Makes cutting machine blunt.

2. The atomic numbers of elements X, Y and Z are 11, 15 and 17 respectively;

(½ each)

(a) Write the electronic configuration of;

X 2:8:1

Y 2:8:5

Z 2:8:7

(b) State the period in the periodic table to which each of the three elements belongs. (½ mark)

Period 3

(c) Element Z can react with both X and Y to form solid products Q and R respectively;

(i) Identify which one of the products would have a lower melting point? (01 mark)

R

(ii) Give a reason for your answer (01 mark)

R is a covalent compound whereas Q is ionic hence R has a lower melting point.

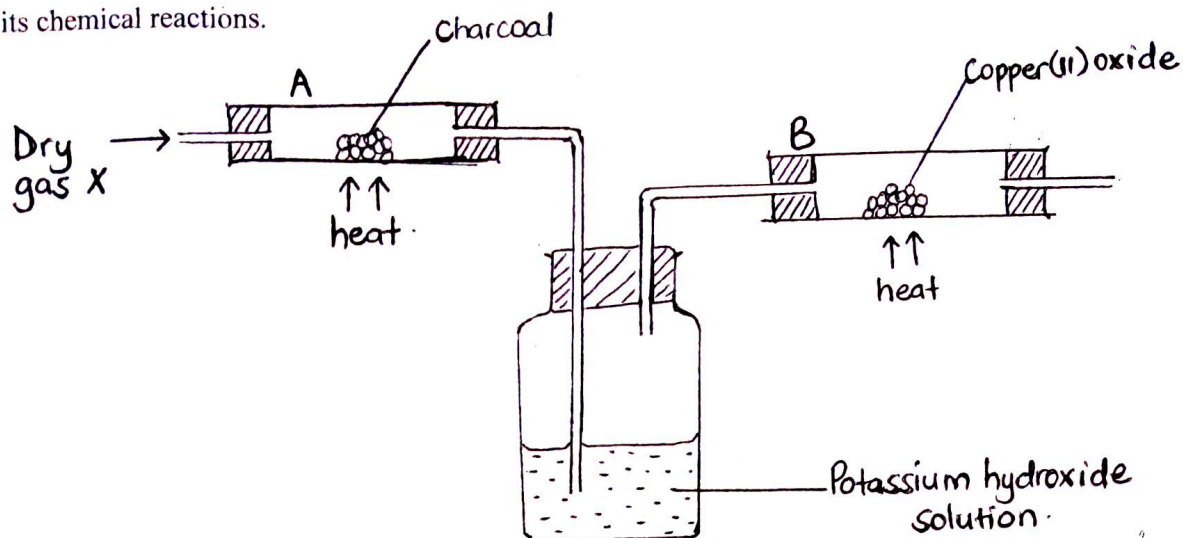
(d) Write the formula of the compound formed between Z and Y. (01 mark)

$Z^+ Y^3$

Z_3Y

or YZ_3

3. The figure below is a set-up of an apparatus used to prepare carbon monoxide and investigate its chemical reactions.



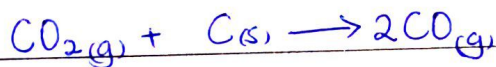
(a) Name gas x.

(½ mark)

Carbon dioxide ✓

(b) Write an equation for the reaction that took place in tube A

(1 ½ marks.)

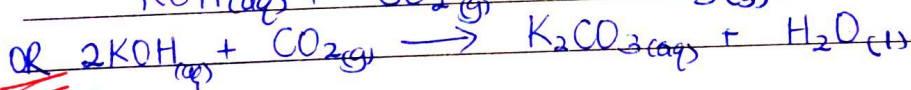
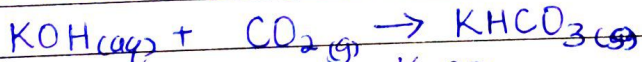


(c) State ;

(i) the purpose of potassium hydroxide solution and write an equation to support your answer.

(02marks)

To absorb the unreacted / excess carbon dioxide. ✓



(01mark)

(ii) What was observed in tube B.

The black solid turned to brown. ✓

4. (a) (i) Name the reagents commonly used to prepare ammonia in the laboratory. (01mark)

- Calcium hydroxide. ✓

- Ammonium chloride. ✓

(ii) Why is ammonia not dried using concentrated sulphuric acid?

(01mark)

Because it reacts with it to form ammonium sulphate. ✓

(b) State;

(i) the condition(s) necessary for the reagents in (a) to produce ammonia gas. (01mark)

Presence of heat. ✓

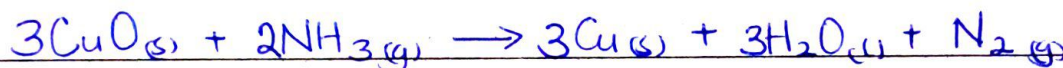
(ii) the substance used to dry ammonia gas.

(½ mark)

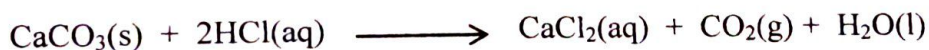
Calcium oxide. ✓

(c) Write a well balanced equation for the reaction between ammonia and copper (ii) oxide.

(1 ½ marks)



5. Carbon dioxide can best be prepared by reacting calcium carbonate with dilute hydrochloric acid. The reaction proceeds according to the following equation;



(a) Explain why sulphuric acid is not normally used instead of hydrochloric acid. (02marks)

Sulphuric acid reacts with calcium carbonate to form calcium sulphate which is sparingly soluble and so forms a coating on the calcium carbonate hence stopping the reaction. ✓ ✓

(b) Calculate the mass of calcium carbonate that would liberate 250cm^3 of carbon dioxide at room temperature ($\text{Ca} = 40, \text{C} = 12; \text{O} = 16$, 1 mole of gas occupies 24dm^3 at room temperature). (03marks)

R.F.M of CaCO_3
 $= 40 + 12 + (16 \times 3)$
 $= 100$

1 mole of Calcium carbonate forms 1 mole of Carbon dioxide.
~~100 g of Calcium carbonate form 24000cm^3 of Carbon dioxide~~
 24000cm^3 of CO_2 is produced by 100 g of Calcium carbonate
 1cm^3 of " " " $\left(\frac{100}{24000}\right)$ g of Calcium carbonate
 250cm^3 of CO_2 is produced by $\left(\frac{100 \times 250}{24000}\right)$ g of Calcium carbonate
 $= 1.042\text{g}$ of Calcium carbonate

6. An oxide of a metal Z contains 50% Z.

(a) Calculate the empirical formula of the metal oxide ($\text{Z} = 30; \text{O} = 16$). (03marks)

Elements	Z	O	Percentage of O = $100 - 50 = 50\%$
Percentage composition	50	50	
No of moles	$\frac{50}{30}$	$\frac{50}{16}$	
	$= 1.6667$	3.125	
Divide by the smallest	$\frac{1.6667}{1.6667}$	$\frac{3.125}{1.6667}$	
	1	2	
Simplest ratio	1	2	
Simplest formula	ZO_2		

(b) If the relative density of Z is 54; find the molecular formula of Z. (02marks)

$\text{R.M.M} = \text{RD} \times 2 = 54 \times 2 = 108$ $(\text{ZO}_2)_n = \underline{\underline{\text{Z}_2\text{O}_4}}$
 $(\text{ZO}_2)_n = 108$
 $(30 + 32)n = 108$
 $62n = 108$
 $n = \frac{108}{62} \approx 1.74$
 $n = 2$

7. State how the following mixtures of substances can be separated and state the principle behind the method used. (01 mark@)

Mixture	Method of separation	Principle
(a) Chlorophyll pigments	Chromatography	Diff. in rates of movement over stationary phase. OR: Diff. in solubility of pigments in a given solvent.
(b) Ammonium chloride and potassium sulphate	Sublimation	Ammonium chloride sublimates.
(c) Water and ethanol	Fractional distillation	Different but close boiling points.
(d) Sand and water	Filtration	Sand is insoluble in water.
(e) Coconut oil and water	Use of a separating funnel	oil and water are immiscible.

8. A mixture containing zinc nitrate and zinc carbonate was shaken with excess water and filtered.

(a) Identify the residue.

(01mark)

Zinc carbonate.

(b) The dry residue was heated strongly.

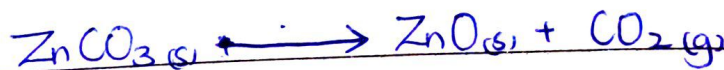
(01mark)

(i) State what was observed.

White solid decomposed to a yellow residue when hot, turns white on cooling.

(ii) Write equation for the reaction that took place.

(1 ½ marks)



(c) Ammonia solution was added to the filtrate dropwise till in excess. State what was observed.

(1 ½ marks)

A white precipitate soluble in excess to form a colourless solution.

(01mark)

9. (a) (i) What is meant by water pollution?

Definition
is relative

Is the contamination of water by adding undesirable substances to it.

(01mark)

(ii) State two substances that can cause water pollution.

- Sewage
- Oil from ship wreched tankers.
- Detergents
- Hot water from industries.

(01marks)

(iii) Give two ways how you can tell water is polluted.

- Change in the colour of water.
- The water becomes smelly.
- It is usually tasty - (has a taste)

(02marks)

(b) State the role of each of the following in water treatment process.

(i) Addition of potassium aluminium sulphate (ALUM)

Collects suspended particles into clumps that can sink to the bottom of the plant.

(ii) Sand and gravel

To trap tiny suspended particles as away of filtration.

(iii) Chlorine

Disinfectant.

(iv) Sodium carbonate.

- * Soften the water.
- * pH balancing.

10. Dry chlorine gas can be prepared from manganese(IV) oxide and substance X. The gas is passed through wash bottles containing water and concentrated sulphuric acid respectively and finally collected by method Z.

(a) (i) Identify substance X and method Z.

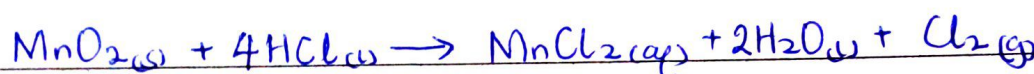
(01mark)

X Concentrated hydrochloric acid.

Z Downward delivery.

(ii) Write equation for the reaction leading to the formation of chlorine gas.

(1 ½ marks)



(iii) State the conditions(s) for the reaction above

(01mark)

- Heat.

Concentrated acid.

(b) State the role of passing chlorine gas in wash bottle containing.

(i) Water

(½ mark)

To absorb the hydrogen chloride (acid) fumes.

(ii) Concentrated sulphuric acid.

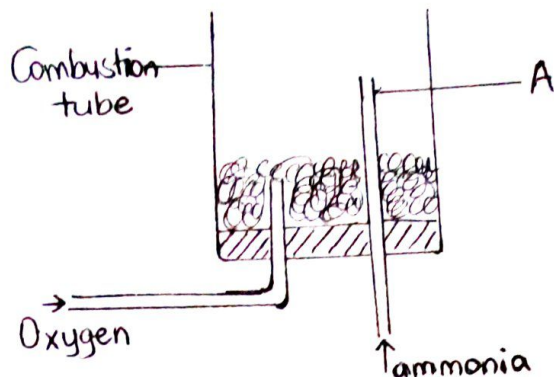
(01mark)

To dry the gas.

SECTION B (ATTEMPT ALL QUESTIONS IN THIS SECTION)

11. (a) With the aid of a labeled diagram describe how a dry sample of ammonia is prepared in the laboratory. (07marks)

(b) Study the diagram below and attempt the questions that follow.



- State what is observed when the ammonia is ignited at tube A. (01mark)
 - Write an equation for the reaction that took place in b(i) above. (1 ½ marks)
 - What is the role of the glass wool? (01mark)
- (c) Using equations only describe how nitric acid is manufactured from ammonia. (4 ½ marks)

12. Part of the periodic table is shown below. The letters are not the usual symbols for the elements.

I								VIII
	II		III	IV	V	VI	VII	
							T	
P	Q				S		U	
							V	W

- (a) (i) Which one of the elements T, U and V react most vigorously with Q? Give a reason for your answer. (1 ½ marks)
- (ii) Which is the most reactive metal? (½ mark)
- (iii) Write the formula of the compound formed between Q and S. (01mark)
- (iv) Give three characteristics of the compound formed between S and U. (03marks)
- (v) Which elements represented in the table can react as reducing agents? (01mark)
- (b) In a titration experiment carried out by Jomu a senior 3G student at TCP college; 25.0cm³ of 0.2M potassium hydroxide solution required exactly 24.60cm³ of a dibasic acid, H₂Y using phenolphthalein indicator to attain an end point.
- (i) What name is given to the above reaction between acid and potassium hydroxide solution. (1mark)
- (ii) Write equation for the reaction that took place. (1 ½ marks)
- (iii) Calculate the number of moles of potassium hydroxide that reacted. (1 ½ marks)
- (iv) Find the moles of acid that reacted. (02marks)
- (v) Calculate the concentration of the acid in moles per litres. (02marks)

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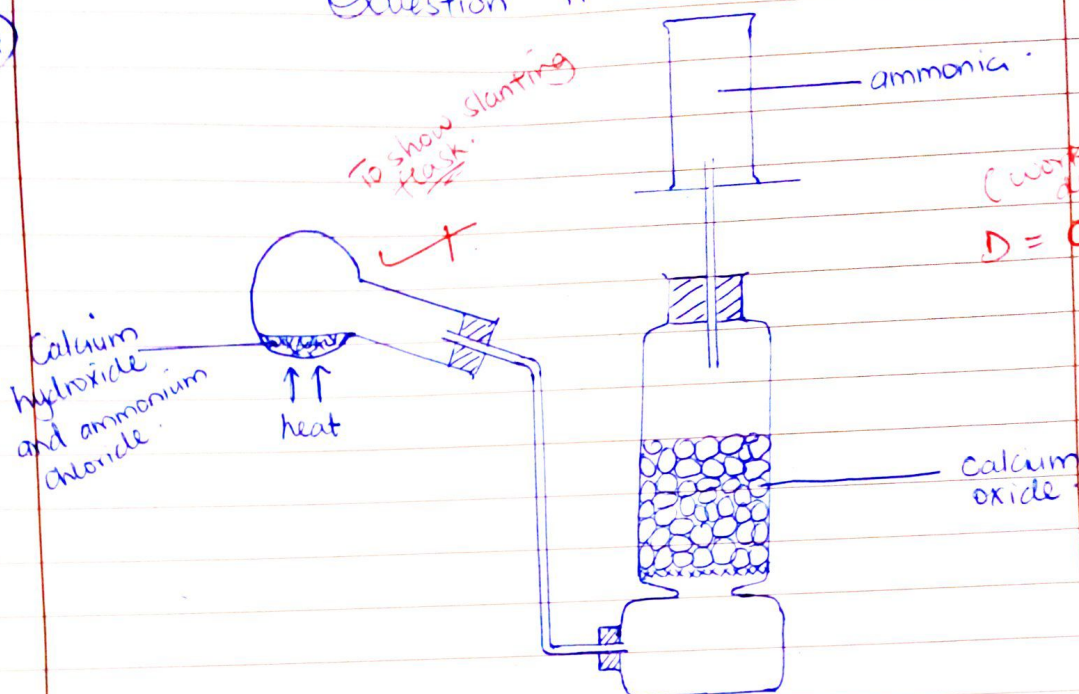
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Question 11.

a)



Calcium hydroxide and ammonium chloride are thoroughly ground and mixed then put in a round bottomed flask and the apparatus arranged as shown above.

The mixture is heated and ammonia gas is evolved.



The gas is direct using set

The gas is delivered into an ammonia tower containing calcium oxide to dry the gas and the dry gas is collected by upward delivery since it is less dense than air.

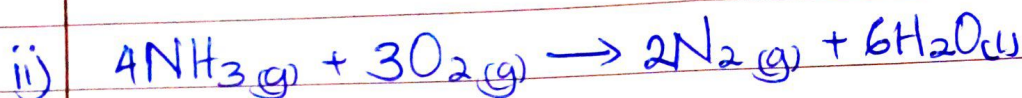
b) i) It burns with a pale yellowish-green flame to form nitrogen and water vapour.

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1½

iii) To ensure that oxygen is evenly spread throughout the combustion tube. ✓

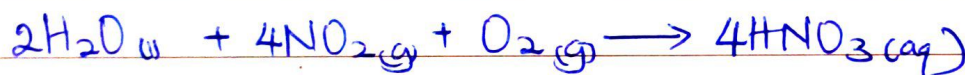
c) ~~labor~~ Manufacture of nitric acid.



1½



1½



1½

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Question 12.
a) T; among halogens, reactivity decreases down the group hence T which is on top is most reactive.

1 1/2

ii) P

1/2

iii) ~~Q₂S₃~~

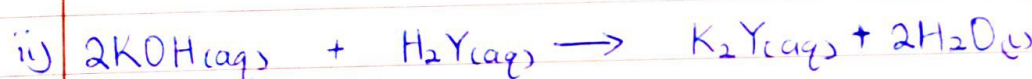
Q₃S₂

01

iv) - The compound has a low melting and boiling point.
- It is insoluble in water but soluble in non-polar solvents.
- It is a poor conductor of heat and electricity.

v) P and Q

b) Neutralisation.



1 1/2

iii) 1000 cm³ of potassium hydroxide solution contain 0.2 moles
1 cm³ of potassium hydroxide solution contain $\left(\frac{0.2}{1000}\right)$ moles

1 1/2

25.0 cm³ of potassium hydroxide solution contain $\left(\frac{0.2}{1000} \times 25\right)$ moles
= 0.005 moles.

iv) moles of acid that reacted.

2 moles of KOH react with 1 mole of H₂Y.
1 mole of KOH reacts with $\left(\frac{1}{2}\right)$ moles of H₂Y.
0.005 moles of KOH react with $\left(\frac{1}{2} \times 0.005\right)$ moles of H₂Y.
= 0.0025 moles of H₂Y.

2



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v) 24.60 cm^3 of H_2Y contain 0.0025 moles

1 cm^3 of H_2Y contains $\left(\frac{0.0025}{24.60}\right) \text{ moles}$

1000 cm^3 of H_2Y contain $\left(\frac{0.0025 \times 1000}{24.60}\right) \text{ moles}$

$= 0.102 \text{ M}$

$= \underline{0.102 \text{ moles per litre.}}$

(2)