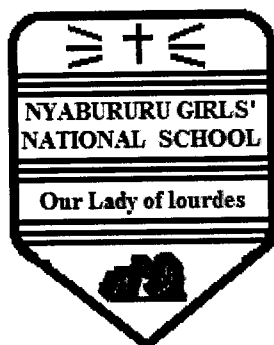


Name.....

Stream.....C/no.....

Admission no.....

Index no.....



Sign.....

Date.....

Invigilator.....

Date returned.....

Date revised.....

233/ 1

Chemistry Theory

September series

Time 2 Hours

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.
- Mathematical tables and silent electronic calculators **may be used**.
- All working **must be** clearly shown where necessary.
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing

For Examiner's Use Only

Questions	Maximum Score	Candidate's Score
1 – 30	80	

This paper consists of 10 printed pages. Candidates should check to ascertain that all the pages are printed as indicated and that no questions are missing.

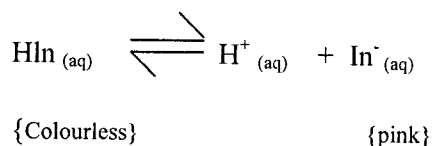
1. Give two reasons why a luminous flame is not used for heating purposes {2mks}

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2. In an experiment it was found that 40.0cm³ of 0.2M sodium hydroxide solution just neutralized 0.2g of a dibasic acid Q. Calculate the relative molecular mass of acid Q {2mks}

.....

3. The following equation shows a system in equilibrium



Explain the observation made when a few drops of sodium hydroxide solution are added {2mks}

.....

4. The table below gives some properties of three substances I, J and K. Study it and answer the questions that follow

Substance	Melting point °C	Solubility in water	Electrical conductivity	
			Solid	Molten
I	1063	Insoluble	Conducts	Conducts
J	113	Insoluble	Doesn't	Does not conduct
K	402	Sparingly soluble	Doesn't	Conducts and is decomposed

a) Suggest the type of structure in

(i) I..... (ii) K..... {1mk}

b) Explain why molten K is decomposed by current but I is not decomposed. {1mk}

.....

5. Calculate the oxidation number of nitrogen in the following species.

NO₂ {1mk}

NO₃⁻ {1mk}

.....

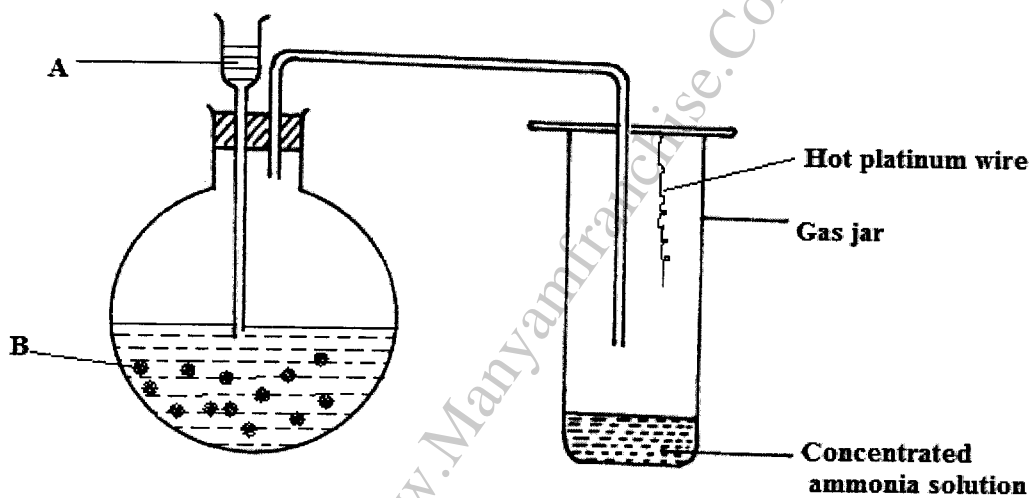


{1mk}

6. Draw structures of three main isomers having formula C₅H₁₂ and give their respective IUPAC names. {3mks}

7. On completion combustion in oxygen a gaseous hydrocarbon x gave 1.32g of carbon (IV) oxide and 0.54g of water. Calculate the empirical formula of x (C=12.0, H=1, O=16.0) {3mks}

8. The apparatus below was set up to show the catalytic oxidation of ammonia.



Name substances labeled A and B

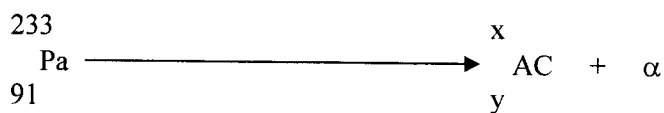
{1mk}

A..... B.....

(a) State and explain two observations made in jar .

{2mks}

9. The following is a nuclear equation



a) Calculate the value of x and y

Conc. Ammonia solution

{1mk}

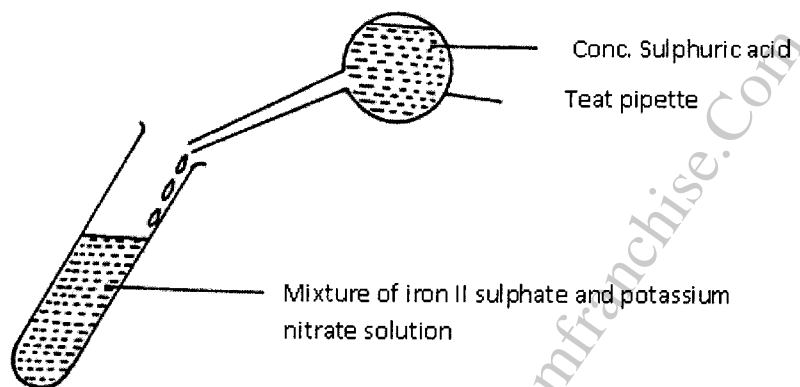
b) State two differences between a nuclear reaction and a chemical reaction. {2mks}

.....
.....
.....

10. Describe how you would prepare a dry sample of lead II chloride starting with lead II carbonate. {3mks}

.....
.....
.....
.....

11. Concentrated sulphuric acid is slowly added to a mixture of freshly prepared solution of iron II sulphate and potassium nitrate as below.



(i) State the observation made. {1mk}

.....
.....

(ii) Identify the complex salt formed. {1mk}

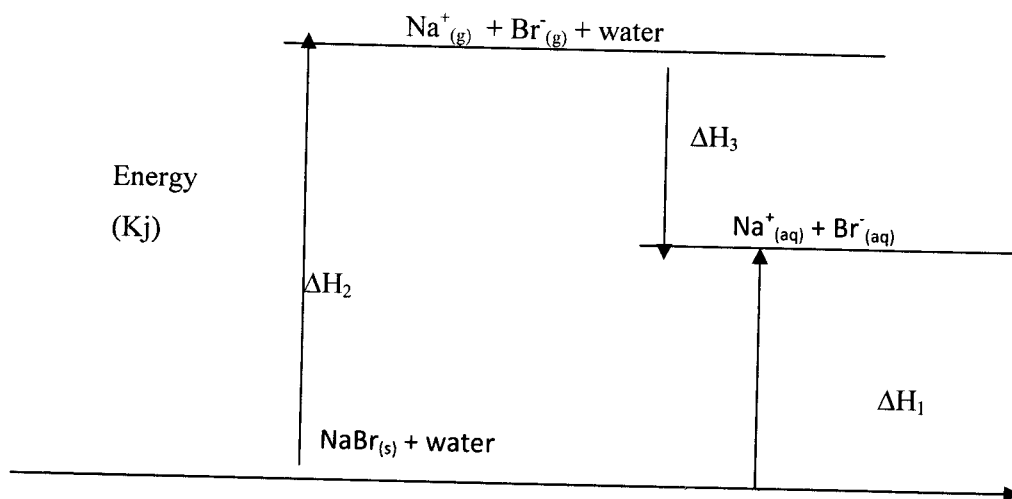
12. In an experiment to determine the relative formula mass of gas P, the time taken for equal volumes of oxygen and gas P under identical conditions of temperature and pressure was measured and the results were shown in the table below. (O=16.0) {2mks}

Use the data to calculate the relative formula mass of gas P

Gas	Oxygen	P
Time in seconds	20.3	30.3

.....
.....
.....

13. Study the energy level diagram below and answer the questions that follow.



Name the energy changes labeled

- ΔH_1 {1mk}
- b) ΔH_3 {1mk}

Given the following energy values

$$\Delta H_1 = +2\text{KJ mol}^{-1}$$

$$\Delta H_3 = -741\text{Kj mol}^{-1}$$

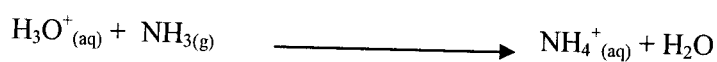
Calculate the value of ΔH_2

{1mk}

14. a) Distinguish between a strong acid and a concentrated acid.

{1mk}

b) Giving a reason in each case, identify an acid and a base in the equation.



Acid {1/2 mk}

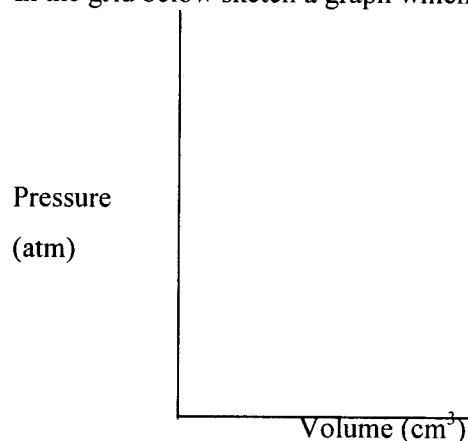
Reason {1/2 mk}

Base {1/2 mk}

Reason {1/2 mk}

15. When excess dilute hydrochloric acid was added to sodium sulphite 960cm³ of sulphur IV oxide gas was produced. Calculate the mass of sodium sulphite reacted (Moles Gas volume at r.t.p = 24.0dm³, Na=23, S=32, O=16) {3mks}
-
-
-

16. In the grid below sketch a graph which represents Boyles law. {1mks}

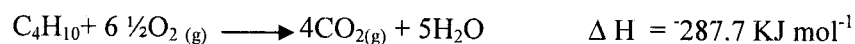


17. Given a mixture of sulphur, calcium carbonate and potassium dichromate (VI) describe how you would obtain a pure sample of each. {3mks}
-
-
-
-

18. Study and complete the table below (3mks)

Particle	Mass number	No. of protons	No. of Neutrons	No. of electrons
S ²⁻	32	16	-	-
Li ⁺	-	3	4	-
Cl ⁻	37	-	-	18

19. Use the information to answer the questions that follow.



a) Define the term molar enthalpy of combustion of a compound {1mk}

b) Calculate the molar enthalpy of formation of butane C_4H_{10} from its elements in their normal states at standard temperature and pressure. {2mks}

20. When calcium carbonate was added to a solution of dry hydrogen chloride in methyl benzene there was no observable reaction explain. {3mks}

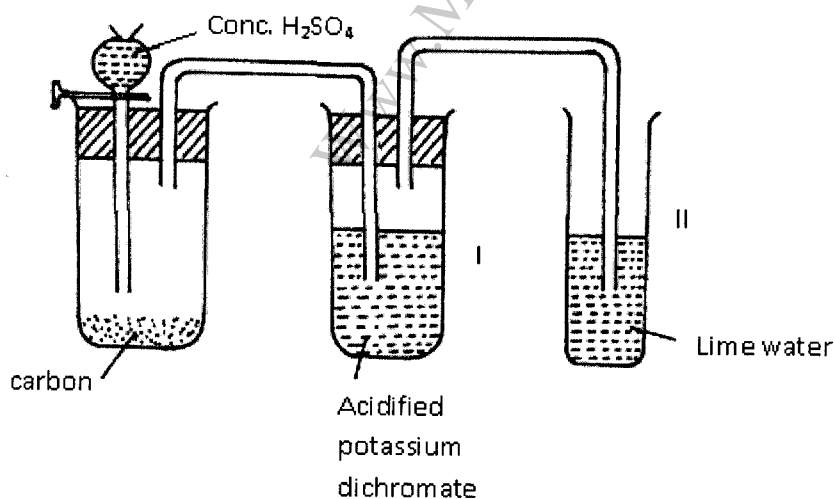
21. The chief ore of aluminium is bauxite which mainly contains $Al_2O_3 \cdot 2H_2O$. The ore is initially purified before aluminium is extracted electrolytically.

a) Identify the main impurities associated with this ore. {1mk}

b) Sodium hydroxide solution is used in the purification process. State its role. {1mk}

c) Give an equation for the reaction that forms Aluminium Oxide (Alumina) from aluminium hydroxide. {1mk}

22. Concentrated sulphuric acid is added to powdered carbon as shown below



a) What is observed in tube I

Observation

{ $\frac{1}{2}$ mk}

Explain

{2mks}

b) What is the role of concentrated sulphuric acid in this reaction?

{½ mk}

23. The following elements belong to the same group of the periodic table. (letters do not represent the actual symbols)

Element	Atomic radius nm	Ionic radius nm	First ionization Energy KJ mol ⁻¹
A	0.136	0.065	736
B	0.089	0.031	900
C	0.174	0.099	590

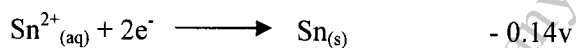
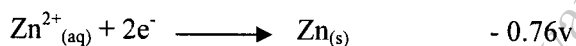
(i) Are the elements metals or non metals? Explain

{1mk}

(ii) Which of the elements is the most reactive explain.

{1mk}

24. Below are standard reduction potentials of 3 electrodes.



Explain using electrode potentials why an iron can coated with tin will rust when scratched. But one coated with zinc will not rust when scratched.

{3mks}

25. a) Draw a clearly labeled diagram of a set up you would use to plate an iron spoon with silver metal.

{2mks}

b) State one other application of electrolysis. {1mk}

.....

26. Using dots and crosses to represent electrons, show bonding in.

a) Carbon II oxide {1 ½ mks}

b) Calcium oxide {1 ½ mks}

27. a) What is observed when hydrogen sulphide gas is bubbled into lead II nitrate solution? {1mk}

.....

b) Write an ionic equation for the reaction. {1mk}

.....

28. The table below shows the solubility of potassium nitrate and potassium chlorate at various temperatures

Salt	Solubility at various temperatgure	
	50°C	20°C
Potassium nitrate	86g	31g
Potassium chlorate	18g	8g

A mixture of salts contains 20g of potassium nitrate and 18g of potassium chlorate in 100g of water at 50°C.

a) State the method which may be used to separate the mixture. {1mk}

.....

b) If the mixture were cooled from 50 – 20°C state and explain what would be observed. {3mks}

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