Name……..Adm no……Index No……...

School…….Class……date……Sign……..

231/1

CHEMISTRY THEORY

PAPER 1

TIME:2 HOURS.

SULIMO EXAMINATIONS

JUNE/JULY 2025.

1.Name another apparatus that is used for heating in the laboratory, Apart from bunsen burner (1 mark)

✓ Candle ✓ Electric heater
✓ Portable

b) Explain why non luminous flame is preferred for heating in the laboratory. (2 marks)

✓ Hotter

2.What is an electrode (1mark)

A rod which allows electric current to pass during electrolysis

b) What particles are responsible for the electrical conductivity in the following substances

i) Magnesium metal (1mark)

✓ Delocalised electrons

ii)Molten magnesium chloride (1 mark)

✓ Mobile ions

3. What is a ~~proton~~? ~~Electron~~ ~~Nut~~ Neutron. NO (1 mark)

Sub-atomic particle which is ~~negatively~~ charged.

b) An element Q has two isotopes Q1 and Q2 with atomic number 16. Use the information in the table below to answer the questions that follow.

Isotope	Number of neutrons	Percentage abundance
Q1	16	75
Q2	17	25

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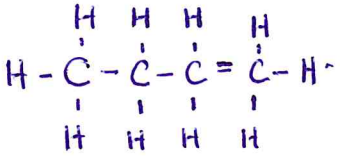
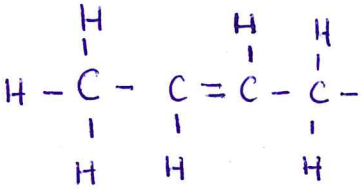
i)Calculate the Relative Atomic Mass of element Q (2 marks)

$\left[\frac{(16+16)\times 75}{100}\right] + \left[\frac{(16+17)\times 25}{100}\right]$

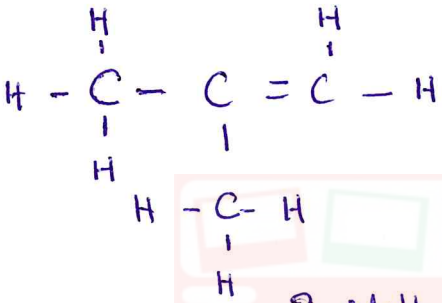
4.An organic compound with the formulae C_4H_8.Draw and name all the possible isomers of the compound. (3marks)



But-1-ene



But-2-ene



2-Methylprop-1-ene

D

5) describe how a dry sample of lead II chloride can be obtained from a mixture of iron fillings and silver chloride. and Lead(II) Chloride (3 marks)

✓½ 1- Put Spread the mixture on a flat surface
✓½ 2- Pass a magnet over, slowly, Iron will be attracted
✓½ 3- Add mix to a beaker and add warm/hot water
✓½ 4- Stir to dissolve Lead II chloride
✓½ 5- Filter out Silver chloride
✓½ 6- Allow solution to cool.
✓½ 7- Filter and dry between filter paper

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

Rate of diffusion of a gas is inversly proportional to the square root of its density at constant temperature and pressure.

b) The rate of diffusion of Sulphur (IV) oxide gas through a porous material is $40cm^3$/second. Calculate the rate of diffusion of carbon IV oxide gas through same porous material at constant temperature and pressure.

(S=32, O=16, C=12) (2 marks)

$\frac{R_{SO_2}}{R_{CO_2}} = \sqrt{\frac{MM_{CO_2}}{MM_{SO_2}}} = 48.24\ cm^3/sec$

$\frac{40}{x} = \sqrt{\frac{44}{64}}$

RFM

$SO_2 = 32+32 = 64$

$CO_2 = 12+32 = 44$ ½

7. Two colourless solutions are suspected to be hydrochloric acid and ethanoic acid. To distinguish the two solutions, universal indictor is preferred to phenolphalein indicator. Explain (1 mark)

Universal Indicator gives/shows the strength/PH.

8)a(i) Describe how simple acid base indicator can be prepared from flower petals. (2 marks)

½ ✓ Crush the petals in a motor using a pestle.

½ ✓ Add ethanol/acetone and continue crushing.

½ ✓ Filter the solution

½ ✓ Solution give different colour in acid and basic medium

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9)) The formulae of a hydrated salt is $CuSO_4.xH_2O$. Given the salt contains 24.5% of copper, determine the value of x. (Cu=63.5, O=16, S=32, H=1,) (3 marks)

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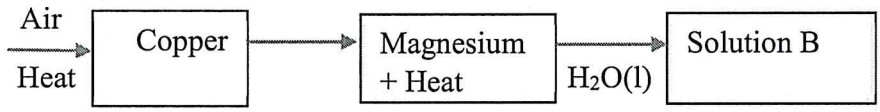
10.Draw a well labelled diagram that can be used to prepare and collect a sample of hydrogen gas in the laboratory. (3 marks)

11.Use the flow diagram shown to answer the questions that follow.



a)(i) State and explain the observation made in the chamber containing copper metal. (2 marks)

Brown solid changes to black; oxidation

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2

ii)Write a balanced chemical equation for the formation of solution B. (1mark)

$Mg_3N_2(s) + 6H_2O(l) \rightarrow 3Mg(OH)_2(aq) + 2NH_3(g)$

12. The table below shows three water samples collected from difference sources. Soap solution was added to 1000cm^3 of water samples. The observations were made over a period of 24 hours.

Water sample hard water (1000cm^3)	Volume of soap needed to lather before treatment	Volume of soap needed to lather after treatment	Effect on fabric after treatment
Sample I	25cm^3	14cm^3	Stains
Sample II	5cm^3	5cm^3	Does not stain
Sample III	25cm^3	25cm^3	Stains

(i)Which water sample is likely to be rain water? (1 mark)

II

ii) Which chemical was used to treat water in sample I? Explain (2 marks)

Calcium hydroxide. Reintroduces Ca^{2+} that formed scum and stains the fabric.

iii) Water in sample III was boiled, what type of hardness was present in this sample? Explain. (2 marks)

Permanent - Not removed by boiling.

13.Concentrated sulphuric (VI) acid is a common drying agent.

a (i)Use an equation to show why it cannot be used to dry ammonia gas. (1mark)

$2NH_3(g) + H_2SO_4(l) \longrightarrow (NH_4)_2SO_4(aq)$

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ii) The product formed in **13a(i)** is used as a Nitrogenous fertilizer. Calculate the percentage of Nitrogen in the product. (N=14, S=32,0=16, H=1). (2 marks)

$\frac{28}{132} \times 100 = 21.21\%$

14. Starting with $50cm^3$ of 2M sulphuric (VI) acid, describe how a sample of sodium sulphate can be prepared. (3 marks)

- ✓ In a beaker containing $50cm^3$ of 2.0M H_2SO_4
- ✓ Add $100cm^3$ of 2M NaOH
- ✓ Heat to saturation
- ✓ Cool
- ✓ Dry between Filter paper

$H_2SO_4 : 2NaOH$

$1 : 2$

$\frac{50cm^3 \times 2}{1000}$

$0.1mls : 0.2$

$\frac{0.2 \times 1000}{2} = 100cm^3$

15. The following pairs of compounds were reacted together and the maximum temperature rise recorded for each reaction.

I. $50cm^3$ of 2M ammonia solution and $50\ cm^3$ of 2M ethanoic acid.

II. $50\ cm^3$ of 2M sodium hydroxide and $50\ cm^3$ of 2M hydrochloric acid. ✓

III. $50\ cm^3$ of 2M sodium hydroxide and $50\ cm^3$ of 2M ethanoic acid.

(a) State the pair which showed:

i) The highest temperature rise. ✓ II (1mark)

ii) The lowest temperature rise. I (1mark)

(b) Explain your answers above. (1mark)

II – Fully Ionises

I – Partial Ionise – some heat energy is used to Ionise it fully

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16.The table below gives the atomic number of elements W,X,Y and Z.

Element	W	X	Y	Z
Atomic number	14	17 ✓	16	19

a) Name the type of bond that exist in the compound formed when X and Z react. (1mark)

Ionic

b) Select the element representing the strongest reducing agent. Give a reason. (2 marks)

Z - loose electrons

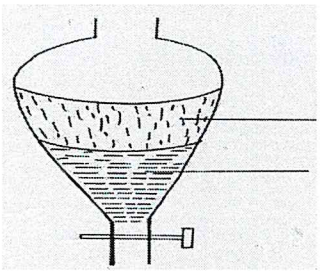
17. During preparation of soap, a fatty acid is hydrolyzed by sodium hydroxide. What is the name of this process? (1 mark)

Saponification.

ii) Describe the cleaning action of soap? (3 marks)

✓ Soap lowers surface tension of water ✓
✓ Non polar of soap dissolves in dirt/oil
✓ Polar end of soap dissolves in water.
✓ Agitation dislodges / lifts dirt from fabric
✓ Rinsing washes away dirt.

18. A mixture of hexane and water was shaken and left to separate out as shown in the diagram.



A
B

a) Identify liquids A and B

i)**A**..Hexane..... (1mark) (ii) **B**..Water..... (1 mark)

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ii)Apart from density, state **one** other property that makes it possible to separate them using the set-up above? (1mark)

Solubility | Immiscibility | Miscibility.

19. Explain the following concepts in respect to aluminum extraction: -

a(i)Why cryolite is added to Aluminum Oxide. (1 mark)

Lower M.P

ii) Why graphite anode is replaced from time to time. (1 mark)

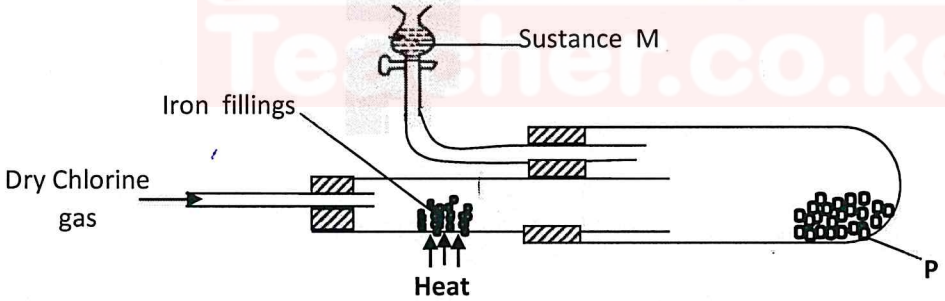
Reacts with O_2

iii) Give one environmental effect associated with extraction of Aluminum. (1 mark)

✓ Land degradation / derilliction ✓

✓ CO_2 - Can cause global warming

20.) In an experiment, dry chlorine gas was reacted with Iron fillings as shown in the diagram below



i)Write a chemical equation for the formation of substance P (1 mark)

$2Fe_{(s)} + 3Cl_{2(g)} \rightarrow 2FeCl_{3(s)}$

(iii) List two possible identities of substance M. (1 mark)

✓ Anhydrous Calcium chloride

✓ Anhydrous Calcium Oxide

✓ Sodalime.

06

O R
I I
L G

21) Consider the equation below

$Zn_{(s)}/Zn^{2+}_{(aq)}$ // $Pb^{2+}_{(aq)}/Pb_{(s)}$ $E^{\theta} = +1.80V$

Given that the e.m.f of the half-cell that gained electron is -1. 30V. Calculate the e.m.f of the half-cell that lost electrons. (2 marks)

emf = E^{θ} Reducing - E^{θ} oxida

1.80 =

b) Give one application of electrolysis. (1mark)

✓ Purification of Metals

✓ Extraction of Metals.

22. Rubber is obtained from latex tree as a soft liquid. Its hardened by a process called vulcanization. Briefly explain how rubber is vulcanized. (2 marks)

✓ Heat Mix of Rubber and Sulphur

✓ Cool to harden

b) State two properties of vulcanized rubber. (1 mark)

- Hard
- Increase tensile strength.
-

23. Many ionic, metallic and covalent compounds are crystalline. The regular structure of crystals is due to the regular packing of the particles within the crystal. What is the name given to this regularly repeating arrangement? (1 mark)

Lattice

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b) Explain the difference in melting point of chlorine and bromine and both are held by weak forces of attraction. (2 marks)

Br_2 higher ✓ Larger Molecular Mass, stronger Intermolecular force

24. In an experiment to study the properties of carbon, a small amount of charcoal is placed in a boiling tube. 5.0cm3 of concentrated Nitric (v) acid is added. The mixture is then heated.

a(i) state the observation made. (1mark)

Brown fumes

ii) write a balanced chemical equation that took place in the boiling tube. (1mark)

$C_{(s)} + HNO_3 \rightarrow CO_2 + NO_2 + H_2O$

iii) What property of carbon is shown in this reaction? (1mark)

Reducing

25. What volume of 0.1M sodium hydroxide will be needed to neutralize 30cm3 of 0.1M sulphuric VI acid? (3 marks)

$2NaOH_{aq} + H_2SO_{4\,aq} \rightarrow Na_2SO_{4\,aq} + 2H_2O_{(l)}$ ✓

$\left(\frac{30 \times 0.1}{1000}\right) = 0.003$ mole

$0.003 \times 2 = 0.006$ mole

0.1 mole — 1000

$0.006 \times \frac{1000 \times 0.006}{0.1} = 60\,cm^3$

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26. Apart from colour and density, chlorine has a characteristic pungent chocking smell, the following equation shows the reaction that occurs when domestic water is treated with chlorine.

$Cl_2(g) + H_2O(l) \rightleftharpoons HCl(aq) + HOCl(aq)$

With reference to the above equation.

i) Explain why treated water still has the smell of chlorine. (1 mark)

In reverse reaction, Cl_2 is suspended in air.

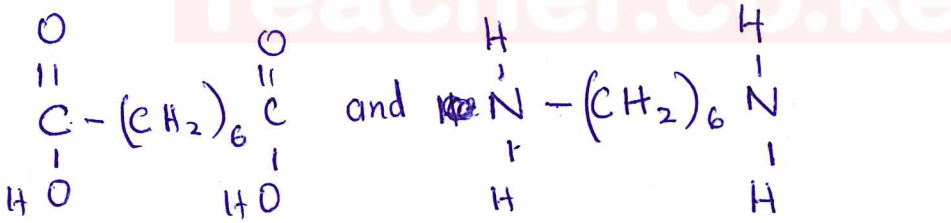
ii) State and explain how the smell can be removed. (2 marks)

Addition of NaOH; OH^- reacts with H^+ from HCl and HOCl; equilibrium shifts to right.

27. A synthetic polymer has the structure below.

$$\left[C-(CH_2)_6-C(=O)-NH-(CH_2)_6-NH \right]$$

i) Draw and name the structures of the two monomers. (2 marks)



hexan-1,6-dioc acid

hexan-1,6-diamine

ii) Give one use of the polymer. (1 mark)

✓ Arrow Carner bag

✓ Umbrella.

✓

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