

UMMUL QURA HIGH SCHOOL
AROWONA BUS-STOP, AMULOKO-AKANRAN ROAD, IBADAN.
2020/2021 MOCK EXAMINATION

SUBJECT: Chemistry
CLASS: SS 3

DURATION : 3:00hrs
INSTRUCTION: Attempt section A and B

SECTION A: OBJECTIVES

1. The bond formed between H_2O and H^+ to form the hydroxonium ion H_3O^+ is
 - A. Dative
 - B. Covalent
 - C. Electrovalent
 - D. Ionic
2. Which of the following *apparatus* can be used to measure a specific volume of a liquid accurately?
 - A. Beaker
 - B. Conical flask
 - C. Measuring cylinder
 - D. Pipette
3. The energy which accompanies the addition of an electron to an isolated gaseous atom is
 - A. Atomization
 - B. Electronegativity
 - C. Electron affinity
 - D. Ionization
4. The refreshing characteristic taste of fizzy drinks is due to the presence of
 - A. Carbon (IV) oxide
 - B. Glucose
 - C. Hydrogen
 - D. Sodium citrate
5. Chlorine water is used as a bleaching agent because it is
 - A. An acidic solution
 - B. An alkaline solution
 - C. An oxidizing agent
 - D. A reducing agent
6. Which of the following substances is a *non-electrolyte*?
 - A. H_2SO_4
 - B. CH_3COOH
 - C. $\text{C}_6\text{H}_{12}\text{O}_6$
 - D. NH_4Cl
7. The oxidation number of *sulphur* is +4 in
 - A. $\text{Na}_2\text{S}_2\text{O}_3$
 - B. H_2SO_3
 - C. H_2SO_4
 - D. SO_3
8. Consider the following reaction equation:
$$\text{C}_2\text{H}_4(\text{g}) + 3\text{O}_{2(\text{g})} \longrightarrow 2\text{CO}_{2(\text{g})} + 2\text{H}_2\text{O}(\text{l})$$
The volume of oxygen at *s. t. p* that will be required to burn **14g** of ethane is
 - { $\text{C}_2\text{H}_4 = 28$; Molar volume of gas at *s. t. p* = 22.4 dm^3 }
 - A. 67.2 dm^3
 - B. 33.6 dm^3
 - C. 11.2 dm^3
 - D. 3.73 dm^3
9. Which of the following metals is common to both brass and bronze?
 - A. Aluminium
 - B. Copper
 - C. Lead
 - D. Iron
10. The relative molar mass of $(\text{NH}_4)_2 \cdot \text{FeSO}_4 \cdot 6\text{H}_2\text{O}$ is

{ Fe = 56.0, S = 32.0, O = 16, N = 14.0, H = 1.0 }

- A. 392
- B. 374
- C. 312
- D. 286

11. Alkali metals

- A. from covalent bonds with the halogens
- B. have their meeting points decrease down the group
- C. from oxides when reacted with water
- D. have their reactivities decrease down the group

12. if the atomic number of an element M is 20 and that of nitrogen is 7, the type of bond between M and N is

- A. metallic
- B. dative
- C. ionic
- D. covalent

13. The formula of the compound formed by M and N is

- A. M_2N_5
- B. M_2N
- C. MN_2
- D. M_3N

14. What is the concentration of a solution containing 1.40g of potassium hydroxide per 250cm^3 ?
{ $\text{KOH} = 56\text{gmol}^{-1}$ }

- A. 0.025 mol dm^{-3}
- B. 0.050 mol dm^{-3}
- C. 0.100 mol dm^{-3}
- D. 0.224 mol dm^{-3}

15. The concentration of a solution containing 6.0g of **NaOH** in 250cm^3 of solution is { molar mass of NaOH = 40gmol^{-1} }

- A. $0.0375\text{ mol dm}^{-3}$
- B. $0.0400\text{ mol dm}^{-3}$
- C. $0.1500\text{ mol dm}^{-3}$
- D. $0.6000\text{ mol dm}^{-3}$

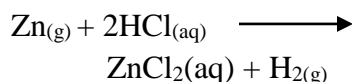
16. The following table shows the melting points of substances P, Q, R and S.

Substances	P	Q	R	S
Melting Point ($^{\circ}\text{C}$)	100	20	0	-4

Which of the substances would still be solid at room temperature?

- A. P
- B. Q
- C. R
- D. S

17. Consider the reaction represented by the following equation:



The $\text{H}_{2(\text{g})}$ produced can be increased by

- A. Using dilute HCl
- B. Using zinc powder instead of zinc granules
- C. Cooling the container of the reacting mixture
- D. Using zinc alloy instead of zinc

18. Equal volumes of all gases at the same temperature and pressure contains the same number of molecules in an expression of:

- A. Charles' law
- B. Boyle's law
- C. Avogadro's law
- D. Gay Lussac's law

19. The *main* ore of aluminium is

- A. bautite
- B. haematite
- C. siderite

- D. magnetite
20. Which of the following acid-base titrations is phenolphthalein **not** suitable to determine the end-point?

A. HCl against NaOH
B. H₂SO₄ against KOH
C. CH₃COOH against NH_{3(aq)}
D. CH₃COOH against NaOH_(aq)

21. Which of the following salts when heated produces a solid oxide and Carbon(IV)oxide only?

A. Na₂CO₃
B. CaCO₃
C. Ag₂CO₃
D. (NH₄)₂CO₃

22. What is the **IUPAC** name of the following compound?



A. 3 methyl – 2 – chlorobutane
B. 3 chloro – 3 – methylbutane
C. 2 methyl – 3 – chlorobutane
D. 2 chloro – 3 – methylbutane

23. The separation techniques which depends mainly on the **solubilities** of solutes at different temperatures is

A. Sublimation
B. Distillation
C. Evaporation
D. Crystallization

24. The reaction between **alkane** and **halogens** is by

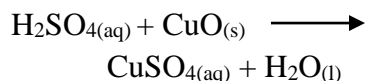
A. Addition
B. Reduction
C. Polymerization
D. Substitution

25. If 100cm³ of a saturated solution of **CuSO₄** at 120°C gives 40g of a salt on evaporation, calculate its solubility.

{ molar mass of CuSO₄ = 160.0 }

A. 0.25 moldm⁻³
B. 0.40 moldm⁻³
C. 2.50 moldm⁻³
D. 4.00 moldm⁻³

26. Consider the reaction represented by the following equation:



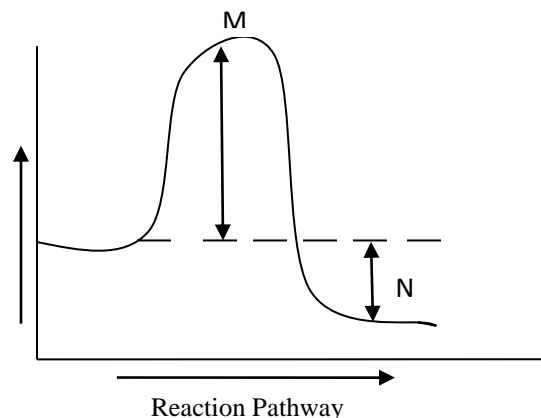
The rate of reaction will not be affected by

A. Concentration of H₂SO₄
B. Particle size of CuO
C. Temperature of the reacting mixture
D. Pressure at which the reaction is taking place

27. The **electrolyte** used in car battery is

A. Ammonium chloride
B. Dilute tetraoxosulphate (VI) acid
C. Dilute trioxonitrate (V) acid
D. Ethanoic acid

28. Consider the following diagram:



What does M and N represent respectively?

A. Activated complex and activation energy
B. Activation energy and heat of reaction

- C. Activation complex and heat of reaction
D. Heat of reaction and activation energy
29. Consider the reaction represented by the following equation:

$$2\text{H}_2\text{S} + \text{SO}_2 \longrightarrow 2\text{H}_2\text{O} + 3\text{S}$$
 SO_2 is acting as
 A. Dehydrating agent
 B. Reducing agent
 C. Precipitating agent
 D. Oxidizing agent
30. What is the volume of oxygen at *s.t.p* would be evolved when 9650C OF electricity is passed through dilute tetraoxosulphate (VI) acid?
 { $1\text{F} = 96500\text{Cmol}^{-1}$, molar volume of a gas at *s.t.p* = 22.4dm^3 }
 A. 0.56dm^3
 B. 1.12dm^3
 C. 2.24dm^3
 D. 22.4dm^3
31. The electron configuration of carbon atom in its exact state is [6C]
 A. $1s^2 2s^2 2p_x^1 2p_y^1$
 B. $1s^2 2s^2 2p_x^2 2p_y^0$
 C. $1s^2 2s^2 2p_x^1 2p_y^1 2p_z^1$
 D. $1s^2 2s^1 2p_x^1 2p_y^1 2p_z^1$
32. Which of the following elements exhibits the same chemical properties as the atom ${}^{35}_{17}\text{X}$? An element with
 A. Atomic number 17
 B. Atomic number 18
 C. Mass number 35
 D. Mass number 52
33. Which of the following elements is diatomic?
 A. Iron
 B. Neon
 C. Oxygen
 D. Sodium
34. Which of the following statements about chlorine and iodine at room temperature is correct?
 A. Chlorine is a gas and iodine is a solid
 B. Chlorine is liquid and iodine is a gas
 C. Chlorine and iodine are gases
 D. Chlorine is solid and iodine is liquid
35. If *X* is a group III element, its oxide would be represented as
 A. X_3O_2
 B. X_3O
 C. X_2O_3
 D. XO_3
36. Which of the following species correctly represents an ion of *M* with 13 protons and 10 electrons?
 A. ${}_{10}\text{M}^{3+}$
 B. ${}_{10}\text{M}^{3-}$
 C. ${}_{13}\text{M}^{3+}$
 D. ${}_{13}\text{M}^{3-}$
37. The bonds in crystalline ammonium chloride are
 A. Covalent and dative
 B. Ionic and covalent
 C. Ionic, covalent and dative
 D. Ionic, covalent and hydrogen bond
38. Consider the neutralization reaction represented

$$\text{Na}_2\text{CO}_3 + 2\text{HNO}_3 \rightarrow 2\text{NaNO}_3 + \text{H}_2\text{O} + \text{CO}_2$$
 The stoichiometric ratio of acid to base is
 A. 2 : 2
 B. 2 : 1
 C. 1 : 2
 D. 1 : 1

39. A solution of sodium trioxocarbonate(IV) contains 10.6g in 250cm³ solution. Calculate the concentration of the solution.
[**$Na_2CO_3 = 106.0$**]
A. 0.4mol dm⁻³
B. 1.0mol dm⁻³
C. 10.6mol dm⁻³
D. 25.0mol dm⁻³
40. What is the volume occupied by 2moles of ammonia at s.t.p?
A. 44.8dm³
B. 22.4dm³
C. 11.2dm³
D. 5.6dm³
41. A given volume of oxygen diffused through a porous partition in 8 seconds. How long would it take the same volume of carbon(IV)oxide to diffuse under the same condition?
[**$C = 12.0, O = 16.0$**]
A. 5.8seconds
B. 6.8 seconds
C. 9.4 seconds
D. 11.0 seconds
42. The minimum amount of energy required for effective collisions between reacting particles is known as
A. Activation energy
B. Bond energy
C. Kinetic energy
D. Potential energy
43. The following substances are normal salts except?
A. **$Al(NO_3)_3$**
B. **$FeSO_4$**
C. **$Mg(OH)NO_3$**
D. **$NaCl$**
44. Which of the following chlorides is insoluble in water?
A. **$AgCl$**
B. **KCl**
C. **NH_4Cl**
D. **$ZnCl_2$**
45. Consider the equilibrium reaction represented by the following equation:
 $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)} \Delta H = -395.7kJmol^{-1}$ Which of the following statements about the equilibrium system is correct?
A. Addition of catalyst changes the equilibrium position
B. Decrease in pressure increases the yield of **SO_3**
C. Decrease in pressure increases the equilibrium concentration of **O_2**
D. Increase in temperature favours the forward reaction
46. the quantity of electricity required to discharge 1 mole of univalent ion is
A. 9,600C
B. 48,250C
C. 96,500C
D. 193,000C
47. An organic compound contains 40.0% carbon, 6.7% hydrogen, and 53.3% oxygen. What is the empirical formula of the compound? [**$O = 16.0, C = 12.0, H = 1.0$**]
A. **C_2HO**
B. **CHO**
C. **CH_2O**
D. **CHO_2**
48. Consider the reaction represented by the equation:
 $2H_2SO_{4(aq)} + C_{(s)} \rightarrow 2H_2O_{(l)} + 2SO_{2(g)} + CO_{2(g)}$
 H_2SO_4 is acting as
A. A catalyst
B. An oxidizing agent
C. A reducing agent
D. A sulphonating agent

49. Which of the following oxides of nitrogen has oxidation number of +1?

- A. NO_3
- B. N_2O
- C. N_2O_3
- D. NO

50. Which of the following is not a property of trioxonitrat(V) salts?

- A. Positive reaction to the brown ring test
- B. Ability to dissolve in cold water
- C. Decomposition on being strongly heated
- D. Evolution of gas with concentrated H_2SO_4 and copper turnings

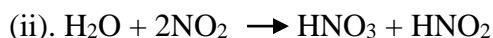
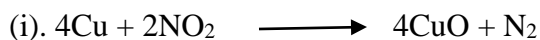
SECTION B: THEORY PART

Instruction: Answer *Four* questions; number *One (1)* is compulsory and any other *three*

1a(i). What is an *acid-base* indicator?

(ii). Give *one* example of an acid-base indicator

1(b). State the *property* exhibited by *nitrogen(IV)oxide* in each of the following equations:



1(c)i. Define enthalpy of combustion

(ii). State *why* the enthalpy of combustion is always negative.

1(d)i. Distinguish *between* a primary cell and a secondary cell.

(ii). Give an example of each of the cells stated in *1(d)(i)*.

1(e). Define the term *efflorescence*?

1(f). Calculate the amount of *hydrochloricacid* in 40.0 cm³ of 0.40 moldm⁻³ dilute HCl.

1(g). Name *two* substances which can be used as electrodes during the electrolysis of acidified water.

1(h). List *two* uses of copper

1(i). State Le chatelier's principle

1(j). State *two* allotropes of sulphur

2(a)i. I. State the periodic law

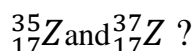
II. What is meant by the term periodic property of elements?

(ii). List **three** properties of an element which show periodicity

(iii). Explain **briefly** how each of the properties listed in 2(a)(ii) varies across the period.

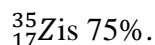
2(b). Define relative atomic mass

2(c)i. What phenomenon is exhibited by an element Z which exist as



(ii). What accounts for the difference in the mass numbers of the element Z?

(iii) Calculate the relative atomic mass of Z if the percentage abundance of



2(d)i. State the method used for collecting each of the following gases:

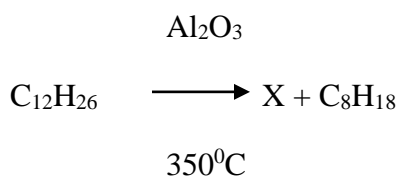
I. CO₂;

II. HCl;

III. H₂

(ii). Give a reason for your answer stated in 2(d)(i) I and 2(d)(i) II.

3(a). Consider the following reaction equation:



(i). What type of reaction is represented by the equation?

(ii). Write the molecular formula of X

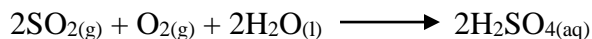
(iii). Draw the structure of two isomers of X

(iv). Name the isomers drawn in **3(a)(iii)**

(v). Write a balanced equation for the reaction between X and hydrogen

3(b). Describe **one** test for fats.

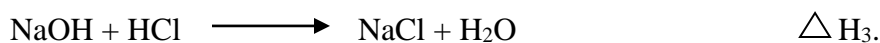
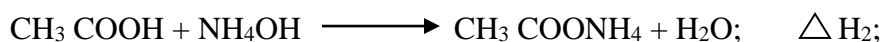
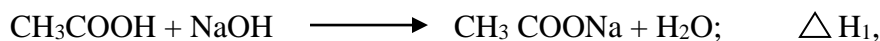
3(c). Sulphur(IV)oxide is converted to tetraoxosulphate(VI)acid according to the following equation:



If 1.5 moles of oxygen reacts with sulphur (IV) oxide, calculate the mass of tetraoxosulphate (IV) acid produced.

{ H = 1.0; O = 16.0; S = 32.0 }

3(d) Consider the following neutralization reactions:



- (i) Arrange the enthalpy changes for the reactions in order of increasing magnitude
- (ii) Explain briefly your order in **3(d)(i)**.

3(e). Consider the following substances.

$\text{Cu}_{(s)}$, $\text{BeCl}_{2(s)}$, $\text{NaH}_{(s)}$, $\text{HF}_{(l)}$ and $\text{CCl}_{4(l)}$.

State the substance(s) which:

- (i) Can conduct electricity
- (ii) Is/are soluble in water.

4(a)(i). State **two** ores of each of the following metals:

- I. Aluminium;
- II. Iron

(ii). Write chemical equations to show the reactions which occur in the blast furnace during the extraction of iron.

4(b)(i) List **three** factors that could affect the discharge of ions during electrolysis.

(ii). Which of the following pairs of ions would be preferentially discharged in each case:

- I. Fe^{2+} and Sn^{2+}
- II. H^+ and Cu^{2+}

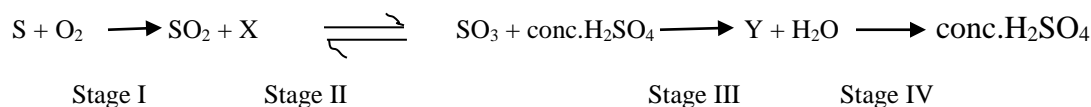
(iii). Give one reason for your answer in each case in **4(b)(ii)**.

4(c). how can oxygen be tested for in the laboratory?

4(d). Calculate the volume of oxygen liberated at the anode during the electrolysis of $\text{CuSO}_{4(\text{aq})}$, when 1.60 g of copper is deposited at the cathode.

{ Cu = 63.5; Molar volume = 22.4 dm^3 ; 1 faraday = 1 mole of electrons }

5(a). Consider the following flow chart for the manufacture of tetraoxosulphate (VI) acid.



(i). Name the process represented by the chart

(ii). Identify reactant X and product Y

(iii). What are the operating temperature and pressure at stage II?

(iv). Mention the stage that requires a catalyst

(v). State the catalyst used

(vi). Give the reason why the SO_3 Produced in stage II is not dissolved directly in water to form the acid.

5(b)(i). List **two** properties of gases that determine their methods of collection in the laboratory.

(ii). State the **method** of collection of each of the following gases:

- I. CO_2 ;
- II. NH_3 .

5(c)(i). Name the components of the following alloys:

- I. steel ;
- II. bronze.

(ii). State the reason why graphite:

- I. Conducts electricity;
- II. Is used as a lubricant

5(d)(i). Name **two** components of air that can dissolve in water.

(ii). Give **one** biological importance of each of the gases named in 5(d)(i).

(iii). Describe a **chemical** test for water.

(iv). Give **two** ions that cause hardness in water.

6(a). Name **one** compound **each** that is responsible for:

- (i) Temporary hardness of water
- (ii) Permanent hardness of water

6(b)i. State **one** method each of removing hardness in **a(i)** and **a(ii)**.

ii. Give **two** advantages and **two** disadvantages of hard water

6(c)i. Define polymerization

(ii). When 5.2g of impure calcium trioxocarbonate (IV) reacted with excess hydrochloric acid, 0.05 moles of carbon(IV)oxide was formed. **Calculate** the percentage purity of the calcium trioxocarbonate (IV) used.

{ $\text{CaCO}_3 = 100$ }.

(iii). Name **three** types of coal

(iv). Give the **purest** form of charcoal

6(d)i. Draw a **labeled diagram** for the laboratory preparation of a dry sample of chlorine

(ii). Give **one** chemical test for chlorine

(iii). Give **three** physical properties of chlorine.

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2020/2021 MOCK EXAMINATION

SUBJECT: Practical Chemistry

DURATION : 2hours

CLASS: SS 3

INSTRUCTION: Answer all questions

QUESTION 1

All burette readings (initial and final) as well as the size of the pipette must be recorded, but no experimental procedure is required. All calculations must be done in your answer booklet.

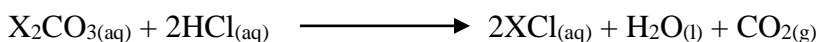
A is 3.65g of **HCl** in 500cm³ of solution

B is 10.60g X₂CO₃ per dm³ solution

(a). Titrate A against 20cm³ or 25cm³ of B using methyl orange as an indicator. Repeat the titration three more times and record your results in a table.

(b). Calculate the average volume of A used.

The equation for the reaction is :



[H = 1, Cl = 35.5, Na = 23, C = 12, O = 16]

[1 mole of a gas at s.t.p = 22.4dm³]

(c). From the result and information provided, calculate the:

i. Concentration of **A** in moldm⁻³

ii. Concentration of **B** in moldm⁻³

iii. The molar mass of **B** in g mol⁻¹

iv. Relative atomic mass of **X** in X₂CO₂

v. Volume of carbon (IV) oxide that will be released at *s.t.p*

QUESTION 2

2. All observations and inferences must be recorded immediately they are made in a table. identify gas(es) given off.

You are provided with salt sample **C**. Carry out the following tests on it.

a(i). Add about 5cm^3 of distilled water and shake thoroughly. Divide the solution into three portions.

(ii) To the first portion, add **NaOH** solution in drops and then in excess.

(ii). To the first portion, add **K₃Fe(CN)₆** solution.

b(i). To the third portion, add **AgNO₃** solution

(ii). To the result obtained in **b(i)**, add dilute **HNO₃** solution in drops until in excess.

(iii). To the result obtained in **b(ii)**, add **NH₃** solution in excess.

QUESTION 3

3a(i). Mention the most *suitable* method that is used to separate insoluble solids from liquids

(ii). A solid substance **U** when strongly heated decomposes to give a white solid **V** and carbon(IV)oxide. When water is added to **V**, **W** is produced.

W can be used for test for carbon (IV) oxide.

Identify **U**, **V** and **W**.

(b). State the indicator suitable for the titration of:

i. dilute **HNO₃** and **NaOH**

ii. dilute **H₂SO₄** and **NH₃(aq)**

iii. dilute **CH₃COOH** and **KOH**

(c). State what will be observed when **BaCl₂** solution is added to a solution of **Na₂CO₃**, followed by addition of dilute **HCl** in excess.

(d). What is that drying agent particularly suitable for ammonia in the laboratory?.