

MUHANGA DISTRICT

CHEMISTRY THEORY

Date: 16/03/2026

Period: 8h30-11h30

**END OF TERM II EXAMINATION**

GRADE: SENIOR TWO(S2)

LEVEL: ORDINARY

DURATION: 3 HOURS

MARKS: /100

**INSTRUCTIONS**

- 1) This paper consists of Two sections:  
Section A: Attempt all questions  
Section B: Attempt any three questions
- 2) You do not need a periodic table
- 3) For multiple choice questions circle a letter corresponding to the correct answer.

**SECTION A: ATTEMPT ALL QUESTIONS (70Marks)**

1) Circle the correct answer in each of the following questions. **(7Marks)**

i) which of the following best defines an ion in chemistry?

- A) A molecule that consists of two or more atoms bonded together
- B) A neutral particle made up of protons and neutrons.
- C) A substance that speeds up a chemical reaction without being consumed.
- D) An atom or molecule that has gained or lost one or more electrons.

ii) which of the following is a characteristic of an ionic bond?

- A) Transfer of electrons from one atom to another.
- B) Sharing of electrons between atoms
- C) Overlapping of atomic orbitals.
- D) Formation between non-metal atoms only.

iii) which of the following elements is most likely to form metallic bond?

- A) Oxygen
- B) Chlorine
- C) Sodium
- D) Nitrogen

iv) which one of the following options defines a chemical bonding?

- A) The force of attraction that holds metal atoms together.
- B) The force of attraction that holds atoms together to form molecules, ions, crystals and other stable substances.
- C) The bond formed by means of electrons transfer from a non-metal to metal.
- D) The bond formed by means of sharing electrons between metal atoms.

v) Which of the following statements is true about covalent bond?

- A) They are stronger than ionic bonds.
- B) They result in the formation of charged particles.
- C) They involve the sharing of electrons between two non-metal atoms.
- D) They form between two metals by transferring electrons.

- vi) What does the term \*Malleability\* refer to for metals?
- A) The ability of metals to resist electricity
  - B) The ability of metals to resist corrosion.
  - C) The ability of metals to be hammered into thin sheets.
  - D) The ability of metals to be drawn into thin wires.
- vii) Which element has properties of both metals and non-metals?
- A) Carbon
  - B) Magnesium
  - C) Silicon
  - D) Potassium
- 2) i) Which of the following statement correctly defines solubility of a salt? **(5 Marks)**
- A) The ability of a salt to dissolve in water.
  - B) The amount of salt dissolved in water.
  - C) The amount of salt in grams that dissolves in 50 grams of water.
  - D) The amount of a salt in grams that dissolves in 100 grams of water at a given temperature to give a saturated water.
- ii) Which of the following salts is insoluble in water?
- A) Sodium chloride
  - B) Potassium nitrate
  - C) Ammonium sulphate
  - D) Barium sulphate
- iii) Which of the following methods is suitable for the preparation of an insoluble salt like Lead (II) Sulphate?
- A) Neutralization of an acid with a base.
  - B) Precipitation reaction between two soluble salts.
  - C) Direct reaction between metal and acid.
  - D) Evaporation of a salt solution.
- iv) Which of the following combinations will produce a salt and water only?
- A)  $\text{HCl} + \text{NaOH}$
  - B)  $\text{CuCO}_3 + \text{HCl}$
  - C)  $\text{Mg} + \text{HCl}$
  - D)  $\text{Na}_2\text{CO}_3 + \text{HCl}$

v) What gas is evolved when dilute hydrochloric acid reacts with carbonate salt?

- A) Oxygen
- B) Hydrogen
- C) Carbon dioxide
- D) Chlorine

3) Wastes must be effectively managed for environment conservation. **(4 Marks)**

i) Which of the following is the most preferred option in waste hierarchy?

- A) Disposal
- B) Prevention
- C) Minimization
- D) Reuse

ii) Which of the following wastes is a type of the E-Waste?

- A) Food scraps
- B) Clothing and textiles
- C) Electronic devices and components
- D) Constructions debris.

iii) In waste management, composting is mainly used for which type of waste?

- A) Plastic waste
- B) Glass waste
- C) Metal waste
- D) Organic waste

iv) What does the \*3RS\* in waste management stand for?

- A) Reduce, Reuse, Recycle
- B) Reclaim, Reduce, Refuse
- C) Reuse, Regenerate, Recycle
- D) Remove, Recycle, Reuse.

4) i) Which of the following is not a water pollutant? **(1Mark)**

- A) Sewage
- B) Table salt

- C) Industrial waste
- D) Phosphates

ii) Match each water pollutant in the left column with its corresponding definition in the right column of the table. **(4Marks)**

Water pollutants	Definition
1. Sewage	A. Eutrophication
2. Industrial wastes	B. Gases such as Sulphur dioxide
3. Aliem species	C. Consists of faeces, urine and laundry waste
4. Fertilizers' containing nitrates	D. Water hyacinth

5) i) What is the correct ionic equation for the reaction between Barium chloride and Sulphuric acid? **(1Mark)**

- A)  $\text{Ba Cl}_{2(\text{aq})} + \text{H}_2\text{SO}_{4(\text{aq})} \rightarrow \text{BaSO}_{4(\text{s})} + 2 \text{HCl}_{(\text{aq})}$
- B)  $\text{Ba}_{(\text{aq})} + 2\text{Cl}^{-}_{(\text{aq})} + \text{H}_2\text{SO}_{4(\text{aq})} \rightarrow \text{BaSO}_{4(\text{s})} + 2\text{HCl}_{(\text{aq})}$
- C)  $\text{Ba}^{2+}_{(\text{aq})} + \text{SO}_4^{2-}_{(\text{aq})} \rightarrow \text{BaSO}_{4(\text{s})}$
- D)  $\text{Ba}_{(\text{aq})} + \text{SO}_{4(\text{aq})} \rightarrow \text{BaSO}_{4(\text{s})}$

ii) Classify the following chemical reactions as either Combination, Single displacement, Combustion, Precipitation, Neutralization or Decomposition. **(6Marks)**

- A)  $\text{CH}_{4(\text{g})} + 2\text{O}_{2(\text{g})} \rightarrow \text{CO}_{2(\text{g})} + 2\text{H}_2\text{O}_{(\text{g})}$
- B)  $2\text{Mg}_{(\text{s})} + \text{O}_{2(\text{g})} \rightarrow 2\text{MgO}_{(\text{s})}$
- C)  $\text{CuSO}_{4(\text{aq})} + \text{Mg}_{(\text{s})} \rightarrow \text{MgSO}_{4(\text{aq})} + \text{Cu}_{(\text{s})}$
- D)  $\text{HCl}_{(\text{aq})} + \text{AgNO}_{3(\text{aq})} \rightarrow \text{AgCl}_{(\text{s})} + \text{HNO}_{3(\text{aq})}$
- E)  $\text{MgCO}_{3(\text{s})} \rightarrow \text{MgO}_{(\text{s})} + \text{CO}_{2(\text{g})}$
- F)  $\text{HCl}_{(\text{aq})} + \text{KOH}_{(\text{aq})} \rightarrow \text{KCl}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})}$

iii) Use the words given below to fill in the following sentences correctly.

**(absorb, endothermic, release, exothermic)** **(4Marks)**

Exothermic reactions.....heat to the surrounding whereas endothermic

Reactions.....heat from the surrounding.

If temperature rises during a reaction, it is.....reaction.

If the temperature drops during a reaction then it is .....

- 6) i) Match each danger of polluted water in the left column with its corresponding example of causal agent in the right column of the table. **(3Marks)**

Danger of polluted water	Causal agent
1. Eutrophication	A. Carbon dioxide(CO <sub>2</sub> )
2. Health hazards	B. Phosphates( PO <sub>4</sub> )
3. Acidification of water bodies	C. Bacteria

- ii) Classify the following substances as either biodegradable wastes or non-biodegradable wastes. **(2Marks)**

- A) Wastes of food from the kitchen
- B) Polythene papers

- 7) Classify the following compounds as either ionic compound, covalent compound or metal: **(3Marks)**

- A) CCl<sub>4</sub>
- B) Ca
- C) MgCl<sub>2</sub>

- 8) State whether each of the following statement is about the properties of elements in the periodic table is **True(T)** or **False(F)**. **(5Marks)**

- I) Both sodium (Na) and Sulphur (S) are in the same period. Na is a good conductor of electricity while Sulphur is a bad conductor.
- II) Carbon in the form of graphite is a bad conductor of electricity.
- III) Both Magnesium (Mg) and Chlorine (Cl) are in the same period. The melting point of Mg is lower than that of Cl.
- IV) Zinc metal reacts with dilute sulphuric acid to give zinc sulphate solution and hydrogen gas.
- V) Sodium reacts with oxygen to form sodium hydroxide

- 9) Match each term in the left column with its corresponding definition in the right column of the table. **(3 Marks)**

Term	Definition
i) Unsaturated solution	A) Is a solution that contains the maximum amount of solute at a given temperature
ii) super saturated solution	B) Is a solution that contains less solute than that it can dissolve at a given temperature
iii) saturated solution	C) Is a solution that contains more solute than it should hold.

10) Fill in the blank spaces of the following sentences with the correct provided terms:

**Sulfate, Iron ions , water, carbon dioxide , salt, copper ions. (5Marks)**

- i) When dilute hydrochloric acid is added to a carbonate,.....gas is released
- ii) Barium chloride is used to test for.....ions, which forms a white precipitate
- iii) A brown precipitate is formed when sodium hydroxide is added to a solution containing.....
- iv) In a neutralization reaction, an acid reacts with a base to form a .....and.....
- v) A blue precipitate is formed when sodium hydroxide is added a solution containing.....

11) i) How many moles are contained in 80g of NaOH? ( Na=23, O=16, H=1) (1Mark)

- A) 0.05moles
- B) 1.62moles
- C) 0.5moles
- D) 2moles

ii) Fill in the blank spaces of the following sentences with the provided terms:

**22.4 ; Avogadro's number ; 2 ;  $6,022 \times 10^{23}$ ; molar mass. (5Marks)**

- A) The number of particles in one mole of a substance is known as.....
- B) The mass of one mole of a substance in grams is called its.....
- C) One mole of any substance contains.....particles
- D) One mole of an ideal gas at standard temperature and pressure(STP) occupies a volume of .....litters
- E) 44.8l of CO<sub>2</sub> at STP contains .....moles

12) i) 5g of sugar was dissolved in 100ml of water to make a solution. Which of the two substances is: (2Marks)

- A) The solute?
- B) The solvent?

ii)The solubility of a solute at 30°C is 40. What amount of water is required to make a saturated solution of 80g of a solute? (3Marks)

13) Compare and justify the reactivity of the following pairs of elements. (6Marks)

- A) Sodium and Magnesium
- B) Fluorine and Chlorine

C) Sodium and potassium

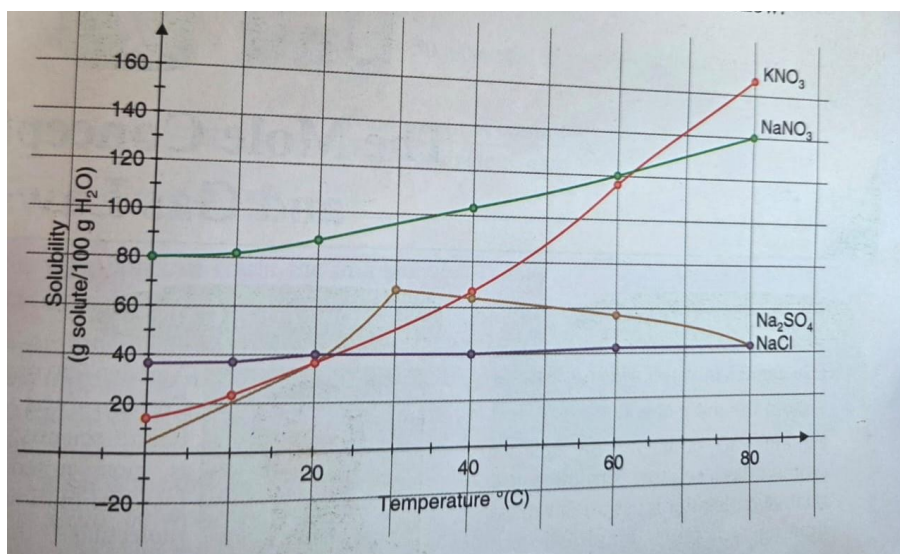
**SECTION B: ATTEMPT ANY THREE (3) QUESTIONS (30Marks)**

14) Describe a chemical test to distinguish between each of the pairs of the following ions.

In each case, state the reagent and expected observable change. **(10Marks)**

- A)  $\text{Fe}^{2+}_{(\text{aq})}$  and  $\text{Fe}^{3+}_{(\text{aq})}$
- B)  $\text{SO}_4^{2-}_{(\text{aq})}$  and  $\text{SO}_3^{2-}_{(\text{aq})}$
- C)  $\text{I}^{-}_{(\text{aq})}$  and  $\text{Cl}^{-}_{(\text{aq})}$
- D)  $\text{Ca}^{2+}_{(\text{aq})}$  and  $\text{Cu}^{2+}_{(\text{aq})}$

15) Look at the solubility graph below and answer the questions that follow. **(10Marks)**



i) How much sodium nitrate will dissolve at 60°C?

- A) 100grams
- B) 110grams
- C) 120grams
- D) 130grams

ii) Which solute is the most soluble at 80°C?

- A) Sodium chloride
- B) Sodium sulphate
- C) Sodium nitrate

D) Potassium nitrate

iii) which solute is the least soluble at 10°C?

- A) Potassium nitrate
- B) Sodium chloride
- C) Sodium Sulphate
- D) Sodium nitrate

iv) 140 grams of solute is dissolved at 80°C is true for

- A) Sodium nitrate
- B) Potassium nitrate
- C) Sodium sulphate
- D) Sodium chloride

v) Generally, the solubility of salts

- A) Decreases with increase of temperature
- B) Remains unchanged with decrease of temperature
- C) Increases with increase of temperature
- D) Decreases with decrease of temperature

iv) State whether each of the following statements is **True(T)** or **False(F)**

- A) The solubility of  $\text{KNO}_3$  is higher than the solubility of  $\text{NaCl}$  at 0°C
- B) The solubility of  $\text{NaNO}_3$  decreases with increases of temperature
- C) At 10°C, the solubility of  $\text{NaNO}_3$  is 80g/100g.
- D) At 40°C, the solubility of  $\text{NaCl}$  is lower than the solubility of  $\text{Na}_2\text{SO}_4$ .
- E) The solubility of  $\text{NaNO}_3$  is 110g/100g of  $\text{H}_2\text{O}$  at 60°C

16) Elements Z and L ( not actual chemical symbols) have atomic numbers of 12 and 16 respectively.

**(10Marks)**

- A) Give the electron arrangement (electronic configuration) of:
  - i) Element Z
  - ii) Element L
- B) Classify the elements Z and L as metal or non-metal
- C) State the type of bonding in:
  - i) Element Z
  - ii) Element L

- D) Predict the type of bonding in the compound formed when elements Z and L react.
- E) Give the formula of the compound of elements Z and L.
- F) Predict two physical properties of the compound of elements Z and L.

17) Fill in the blanks of the following equations, with the appropriate compound. **(10Marks)**

- A)  $\text{Na}_{(s)} + \text{O}_{2(g)} \rightarrow \dots\dots\dots$
- B)  $\text{Mg}_{(s)} + \text{HCl}_{(aq)} \rightarrow \dots\dots\dots + \text{H}_{2(g)}$
- C)  $\text{NaOH}_{(aq)} + \text{H}_2\text{SO}_{4(aq)} \rightarrow \dots\dots\dots + \text{H}_2\text{O}_{(l)}$
- D)  $\text{CaCO}_{3(s)} + \text{HCl}_{(aq)} \rightarrow \dots\dots\dots + \text{CO}_{2(g)} + \dots\dots\dots$
- E)  $\text{CaO}_{(s)} + \text{SO}_{3(g)} \rightarrow \dots\dots\dots$
- F)  $\text{ZnO}_{(s)} + \text{HCl}_{(aq)} \rightarrow \dots\dots\dots + \text{H}_2\text{O}_{(l)}$
- G)  $\text{NaHCO}_{3(s)} + \text{HCl}_{(aq)} \rightarrow \dots\dots\dots + \dots\dots\dots + \text{CO}_{2(g)}$
- H)  $\text{Na}_{(s)} + \text{H}_2\text{O}_{(l)} \rightarrow \dots\dots\dots + \text{H}_{2(g)}$

18) A) Calculate the percentage by mass of sodium (Na) in  $\text{Na}_2\text{SO}_4$

( Na= 23, S= 32, O=16)

**(3Marks)**

B) A compound contains 40% Carbon, 6.67% hydrogen and 53.33% oxygen.

Determine its empirical formula and hence, its molecular formula given that its relative molecular mass is 180.

**(7Marks)**

( C=12, H=1, O=16)

**END.**