ISESE

CHEMISTRY MARKING GUIDE

FORM ONE AND FORM THREE SERIES EXAMINATION
ISESE TIME TABLE
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ALL SUBJECTS	DATE
SERIES - 01	03rd August 2026
SERIES - 02	10th August 2026
SERIES – 03	17th August 2026
SERIES - 04	24th August 2026
SERIES – 05	31st August 2026

NB# SERIES No.06 – No.10 (SEPTEMBER – OCTOBER)
WE ALSO HAVE EXAMINATION SERIES FOR FORM TWO, FORM FOUR , FORM FIVE AND FORM SIX

SECTION A (16 Marks)

Answer **ALL** questions in this section

Question 1: Multiple Choice (10 Marks)

(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
A	B	D	A	D	A	D	D	D	C

(1 mark @ = 10 marks)

Question 2: Matching items (6 Marks)

List A	(i)	(ii)	(iii)	(iv)	(v)	(vi)
List B	E	F	D	A	B	C

(1 mark @ = 06 marks)

SECTION B (54 marks)

Answer **all** questions in this section.

Question 3

(a) Colours of oxides

Oxide	Colour when hot	Colour when cold
Copper Oxide	Black	Black
Zinc Oxide	Yellow	White
Magnesium Oxide	White	White

(1 mark @ = 06 marks)

(b) Reaction with Lead Carbonate

- **Description:** Effervescence occurs, and a colourless gas (carbon dioxide) is evolved. The solid lead carbonate dissolves to form a solution **(2 marks)**.
- Chemical equation

  $PbCO_3(s) + 2HCl(aq) \rightarrow PbCl_2(aq) + CO_2(g) + H_2O(l)$ **(1 mark)**

Question 4

(a) Species and movement

- **Species:** Ag^+ ions and NO_3^- ions **(1 mark)**
- **Direction:** Ag^+ ions move towards the cathode; NO_3^- ions move towards the anode **(1 mark).**

(b) Electrode equations

- **Cathode:** $Ag^+(aq) + e^- \rightarrow Ag(s)$ **(1 mark)**
- **Anode:** $4OH^-(aq) \rightarrow O_2(g) + 4e^- + 2H2O(l)$ **(1 mark)**

(c) Change with silver anode

- The reaction at the anode would change **(1 mark).**
- The silver anode would dissolve: $Ag(s) \rightarrow Ag^+(aq) + e^-$ **(2 marks).**
- The concentration of Ag^+ ions in the solution would remain constant **(2 marks).**

Question 5

Given elements T (Z=12) and Q (Z=17)

(a) Electronic configuration of Q : 2:8:7 **(1 mark)**

(b) Valency of T is 2 **(1 mark)**

(c) Chemical Formula is TQ_2 **(1 mark)**

(d) Type of bond and Reason

- Type: Ionic bond **(1 mark).**
- Reason: Formed between a metal (T) which loses electrons and a non-metal (Q) which gains electrons **(1 mark).**

(e) Group and Period

- Element T (Mg): Group 2, Period 3 **(1 mark).**
- Element Q (Cl): Group 17, Period 3 **(1 mark).**

(f) Two properties of the compound

(i) High melting and boiling point.

(ii) Conducts electricity in molten or aqueous state but not in solid state.
(iii) Soluble in water
(iv) Crystalline solid at room temperature
(Mark any two properties 1 mark@ = 2marks)

Question 6

(a) Three examples of amphoteric hydroxides
- Zinc hydroxide, $Zn(OH)_2$ **(1 mark)**
- Aluminium hydroxide, $Al(OH)_3$ **(1 mark)**
- Lead(II) hydroxide, $Pb(OH)_2$ **(1 mark)**

(b) Equations

With Dilute HNO_3:

$Zn(OH)_2(s) + 2HNO_3(aq) \rightarrow Zn(NO_3)_2(aq) + 2H_2O(l)$ **(2 Marks)**

With excess NaOH:

$Zn(OH)_2(s) + 2NaOH(aq) \rightarrow Na_2ZnO_2(aq) + 2H_2O(l)$ **(2 Marks)**

(c) Reaction type and ionic equation

(i) Type: Precipitation reaction / Double decomposition **(1 mark).**

(ii) Net ionic equation:

$Fe^{3+}(aq) + 3OH^-(aq) \rightarrow Fe(OH)_3(s)$ **(1 Mark)**

Question 7

(a) **Boiling forms precipitate:** Temporary hardness is caused by calcium hydrogencarbonate. On boiling, it decomposes to form insoluble calcium carbonate, which appears as a white precipitate **(2 marks)**

$Ca(HCO_3)_2(aq) \xrightarrow{Boiling} CaCO_3(s) + CO_2(g) + H_2O(l)$ **(1 marks)**

(b) **Scum after boiling:** Boiling only removes temporary hardness. If permanent hardness is present, the Ca^{2+} or Mg^{2+} ions will still react with soap (sodium stearate) to form an insoluble scum (calcium stearate) **(2 marks)**

(c) **Sodium carbonate softens water:** Sodium carbonate (washing soda) adds carbonate ions (CO_3^{2-}) which precipitate out the Ca^{2+} and Mg^{2+} ions as their insoluble carbonates, removing both temporary and permanent hardness **(2 marks)**

(d) Economic importance

- **Negative:** Wastes soap, causes scaling in pipes and boilers which reduces efficiency and can lead to blockages.
- **Positive:** The scale layer can protect pipes from corrosion; calcium ions in drinking water are beneficial for bone development.

(Mark any two economic importances 1mark@ = 2 marks)

Question 8

(a) Three common impurities

- Sand / Silica (SiO_2) **(1 mark)**
- Clay / Earthy materials **(1 mark)**
- Limestone / Other rocky materials **(1 mark)**

(b) Reason for removal

- To obtain a purer metal. **(1 mark)**
- To prevent impurities from interfering with the reduction process, which could make it less efficient or more expensive. **(1 mark)**

(c) **Monitoring reaction rate**

(i) **Volume of gas:** Measure the volume of CO_2 gas produced over time. It increases as the reaction proceeds.

(ii) **Mass of the reaction mixture:** The total mass of the flask + contents will decrease over time as CO_2 gas escapes.

(iii) **Pressure:** If the reaction is in a closed container, the pressure will increase due to the production of CO_2 gas.

(iv) **Change in pH/Acidity:** The pH of the solution will increase (acidity decreases) as HCl is consumed.

(v) **Temperature:** The temperature may change if the reaction is exothermic/endothermic, which can be monitored.

(Mark any four factors 1mark@ = 4 marks)

SECTION C (30 marks)

Answer **ONLY two** questions

Question 9 (15 Marks)

The concept explained is **neutralization:**

Neutralization reaction has many applications in daily life. Some of them are explained below;

- **Treating insect stings and bites**: Acidic stings from insects like bees or nettles can be neutralized with baking soda. Alkaline stings, such as from wasps, are neutralized with acidic substances like vinegar. This treatment relieves pain and itching caused by the sting.
- **Relieving indigestion**: Indigestion is often caused by excess stomach acid. It can be treated by taking antacids, which contain bases like sodium or magnesium bicarbonate. These substances neutralize the excess acid, providing relief from discomfort.
- **Soil treatment**: Crops require specific soil pH levels for optimal growth. Excess soil acidity is treated by adding bases like lime. Conversely, alkaline soil is treated by adding acidic materials such as sulfur to lower the pH.
- **Treating factory wastes**: Factory liquid waste often contains harmful acids. This is treated by adding bases like calcium hydroxide to neutralize the acidity. This process prevents environmental damage to land and water bodies.
- **Manufacture of fertilizers**: Ammonium fertilizers are produced through neutralization reactions. For example, ammonia reacts with nitric acid to form ammonium nitrate. Similarly, it reacts with sulfuric acid to produce ammonium sulfate.
- **Neutralizing accidental chemical spills**: Chemical spills in labs are dangerous and must be contained. Acidic spills are neutralized by adding a base like sodium hydroxide. Alkaline spills are neutralized by adding an acid to make the area safe.
- **Preventing formation of acidic rain**: Acid rain forms when rainwater reacts with industrial acidic gases. To prevent this, air pollution devices with bases are fitted in chimneys. These devices neutralize the acidic compounds before they are released into the atmosphere.

- **To treat tooth decay or cavities**: Acidic foods can produce acids that damage tooth enamel. Using toothpaste, which is basic, helps to neutralize these acids. Brushing with toothpaste therefore helps to prevent cavities and tooth decay.
- **To Prevent coagulation of latex**: In the rubber industry, latex can coagulate due to bacterial acid. Ammonia solution is added to the latex to neutralize this lactic acid. This process prevents the latex from coagulating too early.

MARKS ALLOCATION:
Introduction: **1.5marks**
Any six applications: **2 marks @ = 12 marks**
Conclusion: **1.5marks**

Question 10 (15 Marks)

Important factors you would consider when choosing the most suitable alternative fuel

- **Energy value (calorific value);** this is the amount of energy released by a fuel during its combustion. A good fuel should have **high energy value**. Energy value is determined by the amount of energy produced per unit mass of the fuel.
- **Velocity of combustion;** this refers to the rate at which a fuel burns.
  A good fuel should burn **with a moderate velocity** for a continuous supply of heat. It should not burn too fast or too slowly.
- **Ignition point;** this is the temperature to which the fuel must be heated before it starts burning. A good fuel should have **an average ignition point**. Low ignition point is risk due to fire hazards while high ignition point makes it difficult to start a fire. Fuel with high ignition point is safe to transport and store
- **Non-combustible material content;** these are materials left in form of ashes after burning a fuel. A good fuel should have **low or no contents** of non-combustible material. High content of non-combustible materials lowers the heat value of the fuel.
- **Poisonous products of combustion;** A good fuel should **not give off poisonous gases** during combustion and also it should **give off very little or no smoke.**
  In general, the combustion of a good fuel should **not produce** harmful substances like soot and toxic substances.
- **Pyrometric burning effect;** this is the highest temperature that can be reached by the burning fuel. A good fuel should have **high Pyrometric** burning effect. Gaseous fuels have the highest pyrometric burning effect.
- **Availability;** A good fuel should be readily available in large quantities.

- **Affordability**; A good fuel should be cheap and affordable to most people.
- **Ease to transport and store;** a good fuel should be easy and safe to transport, handle and store.
- **Effect in the environment;** a good fuel should not pollute the environment during its production, storage and use. Example Fossil fuels which produce carbon monoxide on burning are major contributor to **environmental pollution.**

MARKS ALLOCATION:
Introduction: **1.5marks**
Any six factors: **2 marks @ = 12 marks**
Conclusion: **1.5marks**

Question 10 (15 Marks)
Salts have a lot of uses in our daily lives. Some of them are explained below:

- **Control soil pH;** soils that are too acidic or alkaline are not suitable for crop production. Calcium carbonate is usually added when soil is acidic to neutralize the acidity and calcium sulphate (gypsum) is usually added when soil is alkaline to neutralize the alkalinity condition.
- **Used as antacid;** some salts are used to relieve heartburn and acid build-up in the stomach. Some common antacids are magnesium sulphate, magnesium hydrogen carbonate, and sodium hydrogen.
- **Used as inorganic fertilizer;** some salts are added in the soil as fertilizers to increase fertility. Examples of those salts are ammonium sulphate, ammonium nitrate, potassium nitrate and calcium phosphate.
- **Alleviation of health disorders**; various salts are used to alleviate problems that are associated with different health conditions. These salts include chlorides, phosphates and sulphates of sodium, potassium and calcium.
- **Production of pesticides**; some of the salts are used as pesticides to kill or control pests such as insects, rodents, weeds and fungi. For example, copper (II) sulphate, iron (II) sulphate and sodium chlorate (V) are used as pesticides for control of fungi in crops.
- **Softening of hard water;** salts such as sodium carbonate can be used to soften hard water.
- **Preservation of food;** sodium chloride or common salt due to its property of absorbing water from substances can be used in food preservation since when added to moist food it absorbs the moisture and leave the food dry.
- **Used as drying agents;** some salts are hygroscopic; hence they can be used as drying agents in different chemical processes, such salts include sodium

chloride, anhydrous calcium chloride and copper (II) sulphate. For example, anhydrous calcium chloride is used as drying agent of different gases except ammonia.

- **Improve taste of food;** salts such as sodium chloride is added in food to improve the taste of the food.
- **Used in fire extinguishers;** sodium hydrogen carbonate is used as a chemical composition of dry chemical fire extinguisher which is used to put off class A, B, C and E fires.
- **Used in construction**; salts such as calcium carbonate plays an important role as a construction and building material or as an ingredient in cement.
- **Used in manufacture of dry batteries**; some salts such as ammonium chloride are used as electrolyte in manufacture of dry batteries.
- **Used in water treatment plants;** in urban water treatment plants salts are used. For example, aluminium sulphate and copper sulphate is added in water to clump together fine solid particles that are allowed to settle at the bottom of the tank.

  MARKS ALLOCATION:

  Introduction: **1.5marks**

  Any six uses of salts: **2 marks @ = 12 marks**

  Conclusion: **1.5marks**