

KENYA CERTIFICATE OF BASIC EDUCATION

SENIOR SCHOOL ASSESSMENT

AUGUST ASSIGNMENT 2026

GRADE 10 – CHEMISTRY

Time: 2 Hours



LEARNER'S DETAILS

Name: _____ . School: _____ .

Assessment Number: _____ . Date: _____ .

School Code: _____ . Signature: _____ .

INSTRUCTIONS TO CANDIDATES

1. Write your name in the spaces provided above.
2. Write the name of your school and your stream in the spaces provided.
3. Write your admission number and the date of the assessment in the spaces provided.
4. This paper consists of two sections: A and B.
5. Answer all questions in section A and section B.
6. Answer the questions in English.
7. All answers MUST be written in the spaces provided in the paper.
8. Do NOT remove any page from this question paper.

FOR OFFICIAL USE ONLY

SECTION	SECTION A	SECTION B	% SCORE	EE1	EE2	ME1	ME2	AE1	AE2	BE1	BE2
SCORE RANGE	30 MARKS	50 MARKS		90-100	75-89	58-74	41-57	31-40	21-30	11-20	1-10
POINTS				8 POINTS	7 POINTS	6 POINTS	5 POINTS	4 POINTS	3 POINTS	2 POINTS	1 POINT
LEARNER'S TOTAL SCORE											

SECTION A (30 MARKS)

Answer ALL questions in this section.

1. Three learners are observing samples of Group II elements (Magnesium and Calcium) placed in beakers of water.

Kibet: "The Calcium is reacting much faster than the Magnesium."

Maina: "I can see bubbles of a colorless gas forming on the surface of both metals."

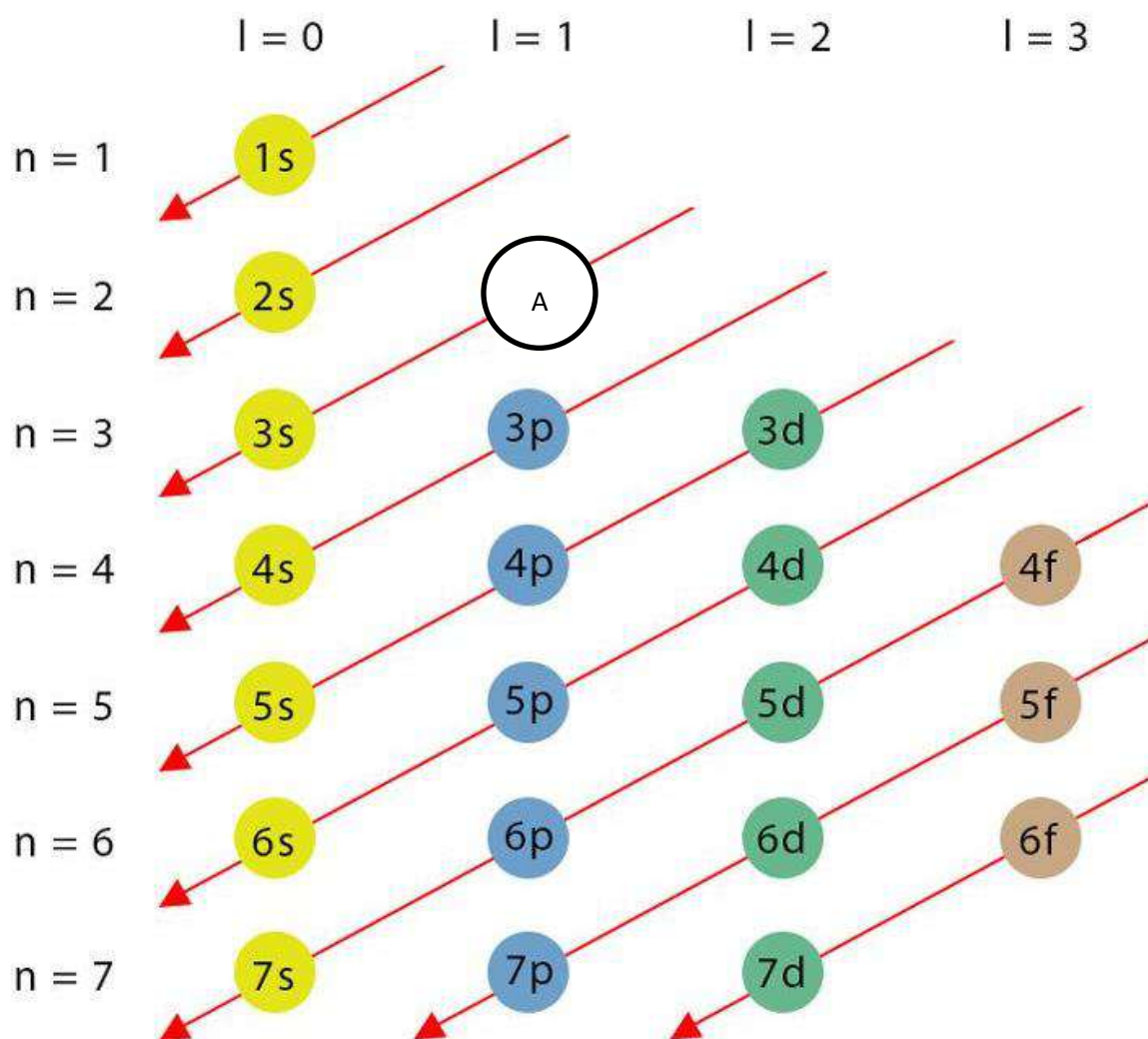
Ochieng: "When I add phenolphthalein indicator, the water turns pink."

(a) **Identify** the colorless gas mentioned by Maina. _____ (1 Mark)

(b) **Name** the product formed that causes the water to turn pink in Ochieng's observation. (1 Mark)

(c) **Explain** why Kibet observed a faster reaction with Calcium than with Magnesium. (2 Marks)

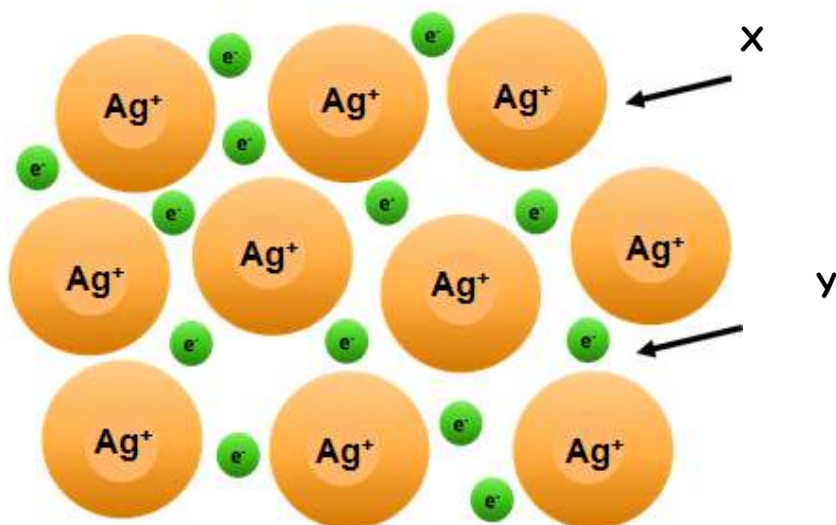
2. Study the diagram below showing the filling order of electrons in sub-orbitals.



(a) **Identify** the sub-orbital labeled A. (1 Mark)

(b) **Write** the full electronic configuration for an atom with atomic number 16 using **s and p notation**. (2 Marks)

3. Look at the illustration below representing the structure of Silver metal.



(a) **Name** the parts labeled X (the positive centers) and Y (the moving particles). (2 Marks)

X: _____

Y: _____

(b) **Select** one property of Aluminium that makes it suitable for making overhead electric cables. (1 Mark)

4. Amina from **Mama Ngina Girls** is performing a "Mystery Salt" identification test. She is given four containers. (a) **Match** the salt to its solubility category in water: (4 Marks)

Salt Name	Solubility Category
i) Potassium Nitrate	A. Insoluble
ii) Barium Sulphate	B. Soluble
iii) Silver Chloride	C. Insoluble
iv) Sodium Carbonate	D. Soluble

5. (a) **Identify** the color of the Universal Indicator in a solution of pH 12. (1 Mark)

(b) Write **True or False** in the following statement: Ethanoic acid is a strong acid because it fully dissociates in water. [] (1 Mark)

6. (a) **Define** "Relative Atomic Mass" (R.A.M). (2 Marks)

(b) **Calculate** the R.A.M of an element with two isotopes: Isotope A (mass 35, abundance 75%) and Isotope B (mass 37, abundance 25%). (2 Marks)

SECTION B (50 MARKS)

(Answer ALL questions in this section)

7. At Kapsabet Boys High School, a group of learners is preparing Copper (II) Sulphate crystals by reacting Copper (II) Oxide with dilute Sulphuric (VI) acid.

(a) **Identify** the type of reaction taking place. (1 Mark)

(b) **Explain** why the Copper (II) Oxide is added in excess to the acid. (2 Marks)

(c) **Describe** the purpose of the "filtration" step in this process. (1 Mark)

(d) **Outline** the remaining steps needed to obtain pure crystals from the resulting solution. (2 Marks)

- i.

- ii.

- iii.

- iv.

(e) **State** the color of the Copper (II) Sulphate crystals formed. (1 Mark)

8. Study the trend in melting points for Period 3 elements (Na, Mg, Al, Si, P, S, Cl, Ar) shown in the graph below.

(a) **Name** the element with the highest melting point in Period 3. (1 Mark)

(b) **Explain** why Silicon has a much higher melting point than Phosphorus. (2 Marks)

(c) **Describe** the trend in atomic radius from Sodium to Argon and **give a reason** for this trend. (2 Marks)

(d) **Distinguish** between *Ionization Energy* and *Electron Affinity*. (2 Marks)

9. (a) **Draw** a dot and cross diagram to show the bonding in a Hydroxonium ion (H_3O^+). (2 Marks)

(b) **Identify** which bond in H_3O^+ is a *Dative Covalent bond* and **explain** how it is formed. (2 Marks)

(c) **Compare** the electrical conductivity of molten Sodium Chloride and liquid Carbon Tetrachloride. Give a reason. (2 Marks)

10. A student at **Lenana School** is cleaning rusted iron gates using a commercial "Rust Remover" which contains phosphoric acid.

(a) **Mention** two safety precautions the student should take when handling the rust remover. (2 Marks)

- i. _____
- ii. _____

(b) **Describe** how Chemistry has helped in the "Entertainment Industry" and "Sports Industry." (2 Marks)

- i. _____
- ii. _____
- iii. _____
- iv. _____

(c) **Examine** three effects of drug and substance abuse on a learner's health. (3 Marks)

- i. _____
- ii. _____
- iii. _____

(d) **Outline** the role of Chemistry in the manufacturing of inorganic fertilizers to boost Kenyan agriculture. (4 Marks)

- i. _____
- ii. _____
- iii. _____

11. *Define the following terms. (2 Marks)*

a) **Cation**

b) **Anion**

12. State one application of Chemistry in each of the following fields. (3 Marks)

a) Agriculture

b) Clothing Industry

c) Medicine

13. Describe the contributions of the following scientists to the development of Atomic Theory. (3 Marks)

a) John Dalton

b) J. J. Thomson

c) Ernest Rutherford

14. Lithium has two isotopes with mass numbers 6 and 7 respectively. If the Relative Atomic Mass (R.A.M.) of lithium is 6.94, calculate the percentage abundance of each isotope. (3 Marks)

15. An element P has two isotopes with relative abundances of 65% and 35%. If the mass numbers of the isotopes are X and 31 respectively, determine the value of X given that the Relative Atomic Mass (R.A.M.) of P is 30. (3 Marks)

16. Write the electron arrangement of the alkali metals using the s and p notation. (3 Marks)

a) Lithium

b) Sodium

c) Potassium

17. Explain how electron spin contributes to the stability of an atom. (2 Marks)

18. Briefly explain the contribution of the following scientists to the development of the Periodic Table. (2 Marks)

a) Dmitri Mendeleev

b) Henry Moseley

19. Using dots (·) and crosses (×) to represent electrons, illustrate how the following atoms form ions. (3 Marks)

a) Aluminium

b) Oxygen

c) Fluorine

20. Derive the chemical formulae for the following compounds. (3 Marks)

a) Aluminium chloride

b) Ammonium sulphate

c) Magnesium nitride

d) Silicon (IV) oxide

e) Sulphur (IV) oxide

f) Nitrogen (II) oxide

21. Write and balance the chemical equations for the following reactions. (4 Marks)

a) Iron + Sulphur $\rightarrow$ Iron(II) sulphide

b) Sodium hydroxide + Nitric(V) acid $\rightarrow$ Sodium nitrate + Water

22. Balance the following chemical equations. (12 Marks)

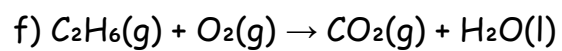
a) $\text{Mg(s)} + \text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$

b) $\text{Na(s)} + \text{H}_2\text{O(l)} \rightarrow \text{NaOH(aq)} + \text{H}_2\text{(g)}$

c) $\text{NaOH(aq)} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{Na}_2\text{SO}_4\text{(aq)} + \text{H}_2\text{O(l)}$

d) $\text{CuCO}_3\text{(s)} + \text{HNO}_3\text{(aq)} \rightarrow \text{Cu(NO}_3)_2\text{(aq)} + \text{CO}_2\text{(g)} + \text{H}_2\text{O(l)}$

e) $\text{H}_2\text{S(g)} + \text{O}_2\text{(g)} \rightarrow \text{SO}_2\text{(g)} + \text{H}_2\text{O(l)}$



MARKING SCHEME

1. (a) Hydrogen.

(b) Metal hydroxide/Alkaline solution.

(c) Calcium is further down the group, outer electrons are further from nucleus/less attracted, easier to lose.

2. (a) 2p orbital.

(b) $1s^2 2s^2 2p^6 3s^2 3p^4$.

3. (a) X: Metal Cations; Y: Delocalized electrons.

(b) Good electrical conductivity / Ductility.

4. i-B, ii-A, iii-C, iv-D.

5. (a) Purple/Violet.

(b) False (weak acid/partial dissociation).

6. (a) Average mass of one atom of an element compared to 1/12th the mass of Carbon-12.

(b) 35.5.

7. (a) Neutralization.

(b) To ensure all acid is used up.

(c) Remove unreacted Copper (II) Oxide.

(d) Evaporate to saturation, cool for crystals, filter/dry.

8. (a) Silicon.

(b) Si has giant atomic structure with strong covalent bonds; P has simple molecular structure with weak Van der Waals forces.

9. (b) One bond where both electrons are donated by one atom (Oxygen).

(c) NaCl conducts (mobile ions); CCl_4 does not (molecules).

10. (a) Wear gloves, use in ventilated area.

(c) Addiction, organ damage, mental health issues.

(d) Synthesis of ammonia/nitrates for plant nutrients.

11. Define the following terms. (2 Marks)

a) Cation

A positively charged ion formed when an atom loses one or more electrons.

b) Anion

A negatively charged ion formed when an atom gains one or more electrons.

12. State one application of Chemistry in each of the following fields. (3 Marks)

a) Agriculture

Manufacture of fertilizers to improve crop production.

b) Clothing Industry

Production of synthetic fibres such as nylon and polyester.

c) Medicine

Manufacture of drugs and medicines used to treat diseases.

13. Describe the contributions of the following scientists to the development of Atomic Theory. (3 Marks)

a) John Dalton

Proposed that matter is made up of tiny indivisible particles called atoms.

b) J. J. Thomson

Discovered the electron and proposed the plum pudding model of the atom.

c) Ernest Rutherford

Discovered the atomic nucleus through the gold foil experiment and proposed the nuclear model of the atom.

14. Lithium has two isotopes with mass numbers 6 and 7 respectively. If the R.A.M. of lithium is 6.94, calculate the percentage abundance of each isotope. (3 Marks)

Let the percentage abundance of Lithium-6 = $x\%$

Percentage abundance of Lithium-7 = $(100 - x)\%$

$$\frac{6x + 7(100 - x)}{100} = 6.94 \quad 6x + 700 - 7x = 694 \quad -x = -6 \quad x = 6$$

Lithium-6 = 6%

Lithium-7 = 94%

15. An element P has two isotopes with relative abundances of 65% and 35%. If the mass numbers are X and 31 respectively and the R.A.M. is 30. (3 Marks)

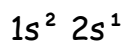
$$\frac{65X + 35(31)}{100} = 30 \quad 65X + 1085 = 3000 \quad 65X = 1915 \quad X = 29.46$$

Mass number must be a whole number.

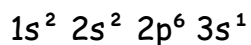
$$X = 29$$

16. Write the electron arrangement of the alkali metals using the s and p notation. (3 Marks)

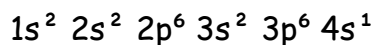
a) Lithium (Z = 3)



b) Sodium (Z = 11)



c) Potassium (Z = 19)



17. Explain how electron spin contributes to the stability of an atom. (2 Marks)

Electrons in the same orbital must have opposite spins. Opposite spins reduce electron repulsion and allow two electrons to occupy the same orbital, making the atom more stable.

18. Briefly explain the contribution of the following scientists to the development of the Periodic Table. (2 Marks)

a) Dmitri Mendeleev

Arranged elements according to increasing atomic mass and left gaps for undiscovered elements.

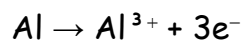
b) Henry Moseley

Arranged elements according to increasing atomic number, leading to the modern periodic table.

19. Using dots (·) and crosses (×) to represent electrons, illustrate how the following atoms form ions. (3 Marks)

a) Aluminium

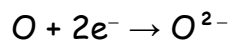
Electronic arrangement: 2,8,3



Al^{3+} : 2,8

b) Oxygen

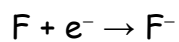
Electronic arrangement: 2,6



O^{2-} : 2,8

c) Fluorine

Electronic arrangement: 2,7



F^{-} : 2,8

20. Derive the chemical formulae for the following compounds. (3 Marks)

a) Aluminium chloride $\rightarrow \text{AlCl}_3$

b) Ammonium sulphate $\rightarrow (\text{NH}_4)_2\text{SO}_4$

c) Magnesium nitride $\rightarrow \text{Mg}_3\text{N}_2$

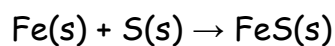
d) Silicon (IV) oxide $\rightarrow \text{SiO}_2$

e) Sulphur (IV) oxide $\rightarrow \text{SO}_2$

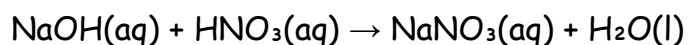
f) Nitrogen (II) oxide $\rightarrow \text{NO}$

21. Write and balance the chemical equations for the following reactions. (4 Marks)

a) Iron + Sulphur $\rightarrow$ Iron(II) sulphide

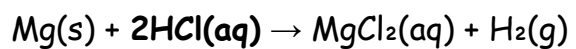


b) Sodium hydroxide + Nitric(V) acid $\rightarrow$ Sodium nitrate + Water

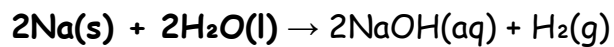


22. Balance the following chemical equations. (12 Marks)

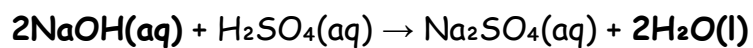
a)



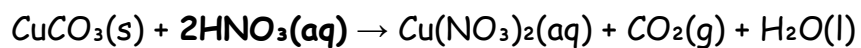
b)



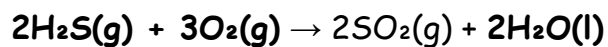
c)



d)



e)



f)

