

UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

**FIRST YEAR EXAMINATION FOR THE DEGREES OF
BACHELOR OF SCIENCE (GENERAL), BACHELOR OF
EDUCATION (SCIENCE), BACHELOR OF SCIENCE
(BMED) AND BIOCHEM**

CHEM 111: INORGANIC CHEMISTRY

STREAMS: *BED(Sc)), BSc(Gen) Biomed, Biochem*

TIME: *2 HRS*

DAY: *FRIDAY [14.30 – 16.30 P.M]*

DATE: *06/02/2026*

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

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Answer ALL the Questions**QUESTION ONE (30 MARKS)**

a) Define the following terms. **(3 Marks)**

- i, Bond Length
- ii, Electronegativity.
- iii, Molar mass

b) A concentrated solution of HNO_3 contains 68% HNO_3 (w/w) and has a density of 1.51g/cm^3

- i, Calculate the Molarity of this solution. **(4 Marks)**
- ii, What volume of HNO_3 is required to make 500 ml of 0.5M HNO_3 solution? **(2 Marks)**
- iii, How many moles of HNO_3 are contained in 27cm^3 of 0.5M HNO_3 solution? **(2 Marks)**

(Atomic masses H=1, N= 14, O=16)

c) Write the electronic configuration of the following **(4 Marks)**

- i, Fe^{2+}
- ii, Al
- iii, Cl^-
- iv, Cu

(Atomic Numbers are Fe = 26, Al = 13, Cl= 17, Cu= 29)

d) A complex compound of K, Mo and cyanide (CN) showed % composition by mass as K= 25.51%, Mo= 31.54%, CN=42.95%.

- i) Calculate the empirical formula. **(6 Marks)**
- ii) Calculate the molecular formula (molecular mass is 304.1). **(3 Marks)**

(RAM are; K=39.1, Mo= 95.9, C=12, N=14.)

e) Draw the s and p orbitals. (4 Marks)

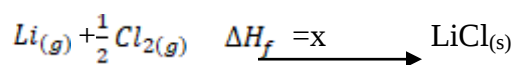
f) Name the **FOUR** isotopes of Carbon atom. (2 Marks)**QUESTION TWO (20 MARKS)**a) State the **FIVE** postulates of atomic theory. (5 Marks)

b) i. Draw the born-Haber cycle for the formation of one mole of solid LiCl. (3 Marks)

ii. Name the enthalpy change for each step. (2.5 Marks)

iii. Use the following data to calculate the enthalpy of formation ΔH_f of LiCl. (1.5 Marks)

Process	ΔH /Kjmol ⁻¹
$\text{Li}_{(s)} \rightarrow \text{Li}_{(g)}$	190
$\text{Li}_{(g)} \rightarrow \text{Li}_{(g)}^+$	590
$\frac{1}{2}\text{Cl}_{2(g)} \rightarrow \text{Cl}_{(g)}$	120
$\text{Cl}_{(g)} \rightarrow \text{Cl}_{(g)}^-$	-360
$\text{Li}_{(g)}^+ + \text{Cl}_{(g)}^- \rightarrow \text{LiCl}_{(s)}$	-760



c, Write the Lewis structure of the following. (4½ Marks)

i, F₂ii, NH₃iii, SO₂

(Atomic Numbers, F=9, N=7, H=1, S=16, O=8)

d) Given the principle Quantum Number (n) is 5, calculate.

i. Angular Momentum Quantum Number (l).

(1 Mark)

ii. Magnetic Quantum Number (m_l).

(2½ Marks)

QUESTION THREE (20 MARKS)

a) Describe briefly the following trends or observation in the periodic table

i. The variation of atomic size across the period.

(2 Marks)

ii. Why the 1st Electron Affinity of Sulphur is negative while the 2nd Electron Affinity is positive.

(2 Marks)

iii. The first ionization energy of Al is less than for Mg.

(2 Marks)

b) Calculate the wavelength of the light given off in the Balmer series when $n_i = 3$ and

$$R = 109676/\text{cm. Use } R(1/n_f^2 - 1/n_i^2) = 1/\lambda$$

(3 Marks)

c) Calculate the percent by weight of each element present in Na_2SO_4 .

(5 Marks)

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

d) i. Show how you would prepare 1000ppm of Mg^{2+} from MgCl_2 salt.

(2.5 Marks)

ii. From the above stock solution, show how you would prepare 100ml of 500ppm MgCl_2 solution.

(2.5 Marks)

(Atomic masses, Mg=24, Cl=35.5)

e) State Fajan's rule and give one Example.

(1 Mark)