



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI – ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2025_2 EXAMINATIONS

COURSE CODE: CHM 303

COURSE TITLE: INORGANIC CHEMISTRY III

COURSE UNIT: 3

INSTRUCTION: Answer question one (1) and any other three questions

Time: 3 hours

1. (a). (i). Explain why hydrogen can be placed in Group 1 or 17 of the Periodic Table. – **3 Marks**
(ii). Using balanced equations, write **TWO (2)** reactions of hydrogen. – **4 Marks**
(b). Differentiate between nuclear fission and nuclear fusion. – **3 Marks**
(c). (i) Using suitable examples, differentiate between a ligand and a complex – **3 Marks**
(ii) Mention **ONE (1)** coordination compound in nature and state its importance – **2 Marks**
(d). (i) Highlight any **THREE (3)** general properties of transition elements. – **3 Marks**
(ii). Identify any **TWO (2)** models that can be used to describe the electronic structure of d-metal complexes– **2 Marks**

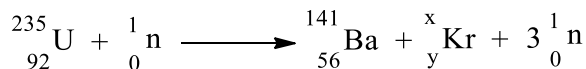
MARKS

- (e). (i). Describe the liquation method of purification of metals. – **3 Marks**
(ii). Name any **TWO (2)** metals that can be separated by Liquation. – **2 Marks**.

2. (a). (i) State **THREE (3)** compounds of boron. – **3 Marks**
(ii). Predict the product from the hydroboration of $(\text{CH}_3)_2\text{C}=\text{CH}_2$ – **2 Marks**
(b). (i) Using suitable equation, what is the product of the complete combustion of phosphorus – **3 Marks**
(ii) State **TWO (2)** uses of compounds of phosphorus. – **2 Marks**
(c). (i) Why is Pyrex glass suitable for making heat-resistance laboratory glassware? – **2 Marks**
(ii). Classify the following carbides: Na_2C_2 , SiC , and Fe_3C – **3 Marks**

3. (a) (i) Why does oxygen more readily stabilize high oxidation states of most elements than fluorine – **2 Marks**
(ii). Discuss any **TWO (2)** uses of compounds of Sulphur – **3 Marks**.
(b). (i) Mention **TWO (2)** oxohalides of fluorine. – **2 Marks**
(iii) Arrange the following in order of increasing stability: BrO_4^- , ClO_4^- , IO_4^- – **3 Marks**
(c). (i). Briefly discuss any **ONE (1)** reaction of the noble gases – **2 Marks**
(ii). Give **ONE (1)** example each of compounds of Xe in the +2, +4 and +6 oxidation states. – **3 Marks**

4. (a). (i). Mention **FOUR (4)** devices used for detection of radiation. – **2 Marks**
(ii). Balance the equation below and classify it as either nuclear fission or nuclear fusion.



– **4 Marks**

- (b). If 1.20×10^5 atoms of a radioactive nuclide decayed such that only 1.50×10^4 remained after 81 days. The half-life of the radioactive nuclide is? – **4 Marks**
(c). The atomic mass of ${}^{19}_9\text{F}$ is 18.9984 μ , if the individual masses of the proton, neutron and electron are 1.007277 μ , 1.008655 μ and 0.0005486 μ respectively, calculate its binding energy: (i) Per mole and (ii). Per atom – **5 Marks**

5. (a) Highlight **FIVE (5)** successes of the crystal field theory. – **5 Marks**
(b). Differentiate between the Valence Bond and Molecular Orbital Theories – **5 Marks**
(c). Briefly describe the froth floatation process in metallurgy. – **5 Marks**
6. (a) Using suitable examples, what geometries/structure(s) are complexes with coordination number 4 likely to have? – **5 Marks**
(b). Name the following complexes: (i). $[\text{Rh}(\text{CO})_2\text{I}_2]^-$ and (ii). $[\text{CoCl}_2(\text{en})_2]^+$ – **5 Marks**
(c). Write the formulas of the following complexes: (i). diaquadichloridoplatinum(II) and (ii) diamminetetra(thiocyanato- κS)chromate(III) – **5 Marks**