OLOKODA MOBINAT A.

OLABISI ONABANJO UNIVERSITY

DEPARTMENT OF CHEMICAL SCIENCES

AGO-IWOYE, OGUN STATE, NIGERIA

TITLE OF EXAMINATION: B.Sc Pure Chemistry/Industrial Chemistry/ Chemistry Education

SESSION: 2012/2013

SEMESTER: Harmattan

COURSE CODE: CHM 201

Number of Units: 3

COURSE TITLE: Inorganic Chemistry I

INSTRUCTION: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

TIME ALLOWED: 2.5 HOURS

1(a) Consider the series of molecules N_2^{2+}, N_2^{+}, N_2^{-} and N_2^{2-} (i) Draw the molecular orbital energy level diagram (ii) write the electronic configuration for each of them and (iii) arrange them in the order of increasing stability.

1(b) (i) Predict the trends in the boiling points of the following hydrides– NH_3, PH_3, AsH_3, and SbH_3. (bii) Explain any anomaly expected in (bi) above.

1(c) With relevant equations, explain the following heterogeneous catalytic processes (i) SO_2 oxidation and (ii) The water gas reaction

2(a) What is meant by the term conjugate acid and conjugate base. (bi) What are the conjugate bases of the acids: HF, HSO_4^-, and NH_4^+. (bii) What are the conjugate acids of the bases: HSO_4^- and NH_2^- (c) Distinguish between soft bases and hard bases(state at least three differences).

(d) All the so called strong acids familiar to the chemist appear to have exactly equal strength in aqueous solution.True or false?. Give reason for your choice.

3 By defining oxidation and reduction in terms of electron transfer, state clearly in each of the following reactions: $Ce^{4+} + Fe^{2+} \rightleftarrows Ce^{3+} + Fe^{3+}$ ----------(i)

$2Mg + O_2 \rightarrow 2MgO$ ----------(ii)

(ai) an oxidizing agent, (aii) a reducing agent. (aiii) Substances which change in oxidation number and (aiv) The number(s)of electron(s) given up or taken on by those elements which change in oxidation numbers. (bi) Explain clearly the term half+equation

(bii) Write the half+equation for this reaction: $Ce^{4+} + Fe^{2+} \leftrightarrow Ce^{3+} + Fe^{3+}$ (c) Mention two methods for extraction of metals from its ore by reduction process. (d) What is galvanization? give two important reasons why iron needs to be galvanized.

4(a) For each of the following molecules: Li_2, Ne_2 and CO (i) Write the electronic configuration (ii) Draw the molecular orbital diagram and determine whether the molecule is stable or not

(b) Justify the roles of metals in the following biological functions (i) Myoglobin (ii) Peroxidases and catalases (iii) Zinc and copper enzymes

(c) Explain the functionality of the Siderophores and Transferrins and justify the roles of Iron in the two biological systems