



ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE  
FACULTY: BASIC & APPLIED SCIENCES  
DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES  
2016/2017 ACADEMIC SESSION: FIRST SEMESTER EXAMINATIONS

COURSE CODE: CHM 101

COURSE TITLE: GENERAL CHEMISTRY I

HOD's SIGNATURE

DURATION: 2 Hours

INSTRUCTIONS:

- ATTEMPT ANY TWO QUESTIONS.
- ENSURE YOUR MATRIC NUMBER IS WRITTEN CLEARLY ON YOUR ANSWER BOOKLET.
- BORROWING OF WRITING MATERIALS, ELECTRONIC CALCULATORS OR LENDING OF ANY SORT IS STRICTLY PROHIBITED

SECTION A

Question One

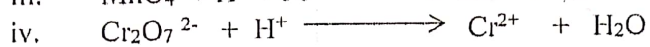
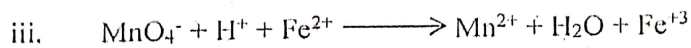
- 1a (i). Mention one physical property that can be used to ascertain the purity of solids? [1mark]
- (ii). Predict the effect of decrease in pressure on the position of equilibrium in the chemical reactions below



- (iii). Differentiate between homogeneous and heterogeneous equilibria. [2marks]
- b. Mention the five lines observed in the atomic emission spectrum of hydrogen and their corresponding regions on the electromagnetic spectrum. [5marks]
- c (i). Differentiate between Nucleon and Nuclide [1mark]
- ii. Predict the types of orbitals that define the electrons in the 2<sup>nd</sup> energy level, n=2 of an atom [1mark]
- iii. Explain why atomic radius increases down the group? [3marks]

Question 2

- 2a (i). Give a concise definition of an atomic spectrum. [1mark]
- ii. What is mass deficit? [1mark]
- iii. Mention the three types of molecular orbitals: [3marks]
- b. i. What is a Chemical Bond? [1mark]
- (ii). Indicate the number of bond pairs and lone pairs of electrons in H<sub>2</sub>O molecule [2 marks]
- (iii). Mention at least two components of electromagnetic radiation. [2marks]
- c. (i). Define the following:



D. A can of malt beer is bottled at 25°C under a CO<sub>2</sub> pp of 3.0 X 10<sup>-4</sup> atm. What is the concentration of CO<sub>2</sub> in the beer? [ Henry's constant for CO<sub>2</sub> in water at 25°C is 3.1 x 10<sup>-2</sup> mol / L. atm

E. Discuss the environmental effect of temperature on the solubility of dissolved oxygen on aquatic life.

### QUESTION TWO

A. State the factors that affect the rates of chemical reactions.

B.

i. Write an expression for the rate of reaction of  $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow \text{HI}(\text{g})$

ii. Derive the unit of rate constant K for a third order reaction.

iii. Calculate the average rate of J when the initial concentration is 0.750M and the concentration after 30 seconds is 0.250M

C. Determine the activation energy for the reaction  $\text{X} + \text{Y} \rightarrow \text{XY}$  at 298K given that the initial rate of reaction is 2.15 x 10<sup>-4</sup>MS<sup>-1</sup> and the concentrations of X is 0.03M and Y is 0.075M. The collision factor A is 9.1 x 10<sup>5</sup> S<sup>-1</sup>

### QUESTION THREE

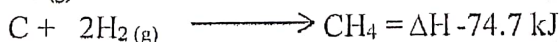
A.

i. Given the following,  $E_{\text{red}}^0 \text{Sn}^{4+} / \text{Sn}^{2+} = 0.15\text{V}$  and  $E_{\text{red}}^0 \text{Hg}^{2+} / \text{Hg}_2^{2+} = 0.90\text{V}$  at 298K. Determine the number of electrons transferred in the reaction and calculate the standard free energy and the equilibrium constant for the reaction. (Faraday constant = 96500 C/M, R = 8.314J/K/mol)

ii. Write balanced chemical equations to show the cathodic and anodic processes of rusting of iron.

iii. Explain why zinc and magnesium are suitable metals for galvanization of iron.

B. Given the following data,



Calculate the heat of formation of methane from its atoms

C. State the differences between a galvanic (voltaic) cell and an electrolytic cell.