

KABARAK



UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE CERTIFICATE OF PRE-UNIVERSITY CHEMISTRY

COURSE CODE: PCHEM 011

**COURSE TITLE: BASIC PHYSICAL AND INORGANIC
CHEMISTRY**

STREAM: SEMESTER ONE

DAY: WEDNESDAY

TIME: 2.00 – 4.00 P.M.

DATE: 23/03/2011

INSTRUCTIONS:

➤ *Attempt all questions*

PLEASE TURN OVER

QUESTION ONE (17.5 marks)

- a. Define the following terms
- i. Atomic number
 - ii. Isotopes
 - iii. Mass number (3marks)
- b. Distinguish between a chemical and physical change and give an example in each case. (4marks)
- c. Explain Dalton's theory on the laws of chemical reactions. (4.5marks)
- d. (i) Explain what homogeneous and heterogeneous mixture is. Give examples of each. (3 marks)
- (ii) Explain how the following mixtures can be separated to pure compounds
Sugar solution, Mixture of Methanol/water and a mixture ink of different colours. (3 marks)

QUESTION TWO (17.5 marks)

- a. Given the following mass-spectrometric data, calculate, the atomic mass of silver.

| Isotope | Mass(amu) | % abundance |
|-------------------|-----------|-------------|
| ^{107}Ag | 106.906 | 51.84 |
| ^{109}Ag | 108.905 | 48.16 |

(2marks)

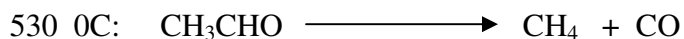
- b. Adipic acid is used in the manufacture of nylon. The composition of this acid is 49.3% C, 6.9%H, and 43.8% O by mass. What is its molecular formula given that it has a molecular weight of 146 amu? (4marks)
- c. A flask contains a solution with unknown amount of HCl. This solution is titrated with 0.101M NaOH. It takes 3.35ml NaOH to complete the reaction with this HCl. What is the mass of the HCl acid? (5.5 marks)
- d. Methanol can easily burn in air. If 112g of methanol is used up in a combustion process, how many moles of H_2O are produced? (6marks)

QUESTION THREE (17.5 marks)

- a. Define the following terms
- Ionic radii
 - Electronegativity
 - Electron Affinity (3 marks)
- b. Explain the variation of atomic radii of elements within a period in the periodic table. (3marks)
- c. Give the electronic configuration of the following elements; B, Mg, Ne and P. (Z values: B = 5, Mg = 12, Ne = 10, P = 15) (4marks)
- d. Explain how the following bonds are formed, give example in each case.
- Hydrogen bond
 - Dipole-dipole bonds (4marks)
- e. Explain how (i) ionic bond (ii) Delocalized bond (ii) polar bond are formed (3.5 marks)

QUESTION FOUR (17.5)

4. (a) (i) Give the factors that affect rate of reaction? (2 marks)
- (ii) Explain how temperature and a catalyst affect the rate of reaction.(2 marks)
- (b) The following data were collected for the reaction below at a temperature of

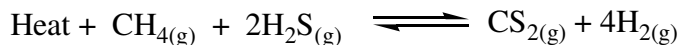


| [CH ₃ CHO] (mol/l) | Time (s). |
|-------------------------------|-----------|
| 0.200 | 0 |
| 0.153 | 20 |
| 0.124 | 40 |
| 0.104 | 60 |
| 0.090 | 80 |
| 0.079 | 100 |
| 0.070 | 120 |
| 0.063 | 140 |
| 0.058 | 160 |
| 0.053 | 180 |
| 0.049 | 200 |

Plot a graph of concentration versus time and determine the rate of CH₃CHO at 60 seconds and at 140 seconds. (4 marks)

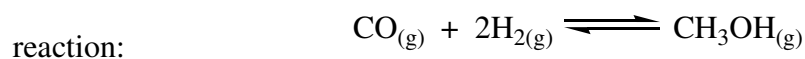
(c) (i) State Le Chatelier's principle in your words. (1 mark)

(ii) How will the equilibrium of the following reaction be affected by addition of H₂ gas and the removal of CS₂ gas respectively? (2 marks)



(iii) Explain how temperature affects the chemical equilibrium of reaction system at equilibrium. (2 marks)

(iii) At 773 °C, a mixture of CO gas, H₂ gas, and CH₃OH gas was allowed to come to equilibrium. The following equilibrium concentrations were then measured: [CO] = 0.105 M, [H₂] = 0.250 M, [CH₃OH] = 0.0050 M. Calculate K_c for the



(4.5 Marks)