



MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2012/2013

FIRST YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN PUBLIC HEALTH WITH INFORMATION TECHNOLOGY (CITY CAMPUS)

SCH 101: BASIC PHYSICAL CHEMISTRY

Date: 1st August, 2013

Time: 11.00 a.m. – 1.00 p.m.

INSTRUCTIONS :

1. Write your University Registration Number on every Answer Booklet you use.
2. Do not write your name on any paper you use
3. The time allowed for this paper is TWO (2) hours.
4. The Questions are set out in TWO (2) Sections, A and B.
5. Read very carefully the additional instructions preceding each section.

Important data:

Molar gas constant; $R = 8.314 \text{ J.K}^{-1}.\text{Mol}^{-1}$, $0.0821 \text{ Latm.K}^{-1}\text{mol}^{-1}$
Avogadro constant, $N_A = 6.023 \times 10^{23} \text{ Mol}^{-1}$
Boltzmann constant, $K = 1.381 \times 10^{-23} \text{ J.K}^{-1}$

Instructions

1. Attempt five (5) questions ONLY.
2. Question One (1) is compulsory.

Question 1: (Compulsory - 10 mks)

- A) Define the following: (10 mks)
- i) Atomic mass units (a.m.u).
 - ii) A dynamic chemical equilibrium
 - iii) Reaction stoichiometry
 - iv) A base according to "lewis definition":
 - v) Heterogeneous Equilibrium
 - vi) Isochoric reaction
 - vii) An ideal solution
 - viii) Equation of state
 - ix) Rate law
 - x) Stoichiometric coefficient

Question 2:

- A) Balance the following equations: (6 mks)
- i) $_ \text{Ba(OH)}_2 (\text{aq}) + _ \text{H}_2\text{SO}_4 (\text{aq}) \rightarrow _ \text{H}_2\text{O} (\text{l}) + _ \text{BaSO}_4 (\text{s})$
 - ii) $_ \text{CH}_4 (\text{g}) + _ \text{H}_2\text{O} (\text{l}) \rightarrow _ \text{CO}_2 (\text{g}) + _ \text{H}_2 (\text{g})$.

B): State the Le Chatelier's Principle (2 mks)

C): Assume ideal behavior and derive an expression relating K_c (equilibrium constant due to concentration) and K_p (that due to pressure) for a given reaction.

(7 mks)

Question 3:

A): Define the following:

(6 mks)

- i) Colligative properties
- ii) Vapour pressure of a liquid
- iii) Van't Hoff factor in colligative properties equations

B) Explain where in medicine are the following applied/used:

(9 mks)

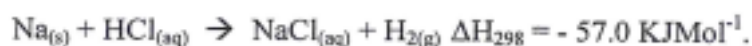
- i) Pressure of a medium
- ii) Physical identification of gases/compounds
- iii) Polarity of solvents

Question 4:

A) State 4 factors that would hasten a chemical reaction.

(4mks)

B) Consider the process given below;



- i) How can the above reaction be speeded up? (4 mks)
- ii) Show the equilibrium constant expression for the equation. (3 mks)
- iii) Explain what happens to the equilibrium values when the system is (a) warmed up and (b) when the reaction vessel is capped/closed? (4 mks)

Question 5:

Consider the following reaction: $\text{SO}_2 + \text{O}_2 \leftrightarrow \text{SO}_3$

When 2.0 Mol of SO_2 and 1.0 Mol of O_2 were placed in a 2 Lit. Container at 25 °C, only 1.80 Mol of SO_3 was detected at equilibrium.

- a) Show the stoichiometric coefficients for the above reaction. (4 mks).
- b) Express the Equilibrium constant equation for the reaction. (4 mks).
- c) Calculate the Equilibrium constant. (7 mks).

Question 6:

- a) State the fundamental postulates for an Ideal gas. (4 mks).
- b) What are the main distinctions between the four known states of matter?
(6 mks).
- c) Consider the reaction; $\text{NO}_{(g)} + \text{O}_{2(g)} \rightarrow \text{NO}_{2(g)}$.
- i) Balance the above reaction. (2 mks).
- ii) If the rate of reaction due to $\text{O}_{2(g)}$ is 'x', what would be the corresponding reaction rates due to $\text{NO}_{2(g)}$? (3 mks)