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 $J.K^{-1}.Mol^{-1}$, 0.0821 $Latm.K^{-1}mol^{-1}$
Avogadro constant, N_A = 6.023 X 10^{23} Mol^{-1}
Boltzmann constant, **K** = 1.381 X 10^{-23} $J.K^{-1}$

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) $\_\ Ba(OH)_{2\,(aq)} + \_\ H_2SO_{4(aq)} \rightarrow \_\ H_2O_{(l)} + \_\ BaSO_4(s)$
ii) $\_\ CH_{4\,(g)} + \_\ H_2O_{(l)} \rightarrow \_\ CO_{2\,(g)} + \_\ H_2(g)$.

B): State the Le Chartelier'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;

$Na_{(s)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_{2(g)}\ \Delta H_{298} = -57.0\ KJMol^{-1}$.

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: $SO_2 + O_2 \leftrightarrow SO_3$

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; $NO_{(g)} + O_{2(g)} \rightarrow NO_{2(g)}$.

i) Balance the above reaction. **(2 mks).**

ii) If the rate of reaction due to $O_{2(g)}$ is 'x', what would be the corresponding reaction rates due to $NO_{2\ (g)}$?. **(3 mks)**