QUAID-I-AZAM UNIVERSITY

ISLAMABAD

B.Sc. Annual Examinations--2013
(PART-I)

Roll No: _____

SUBJECT: **Chemistry** PAPER: **A** (Physical Chemistry)

Time Allowed: **3 Hours** **June 12, 2013** Max Marks: **60**

Section-I

Note: Attempt any FOUR questions from Section-I. Question No.1 is compulsory. All questions carry equal marks.

Q. No.1

(a) Covert the following equation to an equation of a straight line: **(3)**

$$d(\ln k)/dT = \Delta H^0/RT^2$$

(b) How will you determine the rate constant of second order reaction by plotting a straight line graph from

$$1/(1 - x) = kt + 1/a$$ **(3)**

(c) Find the value of dy/dx when $y = (x^2 + 5)\sqrt[3]{x^2 + 1}$ **(3)**

(d) The equation for one mole ideal gas is V = RT/P. Find the value of dV in terms of dP and dT. **(3)**

Q. No.2

(a) Derive the Gibbs-Heltmholtz equation in the form ; $((\partial(\Delta G)/T)/\partial T)_p = -\Delta H/T^2$ **(6+2)**
Write two main applications of Gibbs-Heltmholtz equation.

(b) Prove that $TP^{(1/\gamma)-1}$ = constant **(4)**

Q. No.3

(a) Develop the following relationship between mean free path and viscosity of gases:

$$\lambda = 3\eta/d(\sqrt{8R\cdot T/\pi M})$$

Also explain the effect of temperature on the viscosity of gases. **(6+2)**

(b) The viscosity of H_2 at 273K is 6.41×10^{-6} $kg\cdot m^{-1}\cdot s^{-1}$. Calculate the mean free path of H_2 at S.T.P. **(4)**

Q. No.4

(a) Explain the following terms with examples: **(6)**

i. Diamagnetism
ii. Paramagnetism
iii. Ferromagnetism

(b) How magnetic susceptibility is measured by Gouys' balance? **(6)**

Q. No.5

(a) Discuss the quantitative effects of temperature and inert gas addition to a system at equilibrium. **(4+4)**

(b) Differentiate between equilibrium state and equilibrium constant. Name the factors on which these depend. **(2+2)**

Q. No.6

(a) What do you mean by energy of activation? What is the source of energy of activation in the system? Do you think that the change of temperature affects the energy of activation? **(2+2+2)**

(b) The rate of a reaction triples when the temperature changes from 20 ^oC to 50 ^oC. Calculate the energy of activation. **(6)**

Section-II

Q. No.7 Attempt any six parts. (2x6=12)

i. Why do we always report heat capacities of solids at constant volume rather than at constant pressure?

ii. What are the Bravis lattices?

iii. How will you justify that parachor of a liquid is an additive and constitutive property?

iv. Why is the efficiency of heat engine always less than unity?

v. Comment on the statement: "the most probable velocity of gases corresponds to the peak of Maxwell's curve".

vi. Why hydrogen and helium do not obey the Joule-Thomson effect?

vii. Deduce the units of K_c and K_p for ammonia synthesis?

viii. How is the degree of dissociation of PCI_5 related to external pressure of the system?

ix. What is the physical significance of probability factor in the collision theory of reaction rates?

x. Why does the order of reaction changes by changing the pressure of gaseous unimolecular reaction?