THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2011

(C.C.S.S.)

Chemistry—Core Course

CH 3B 05—PHYSICAL CHEMISTRY—I

Time : Three Hours   Maximum Weightage : 30

Section A

I. Answer *all* twelve questions :

1 The unit for van der Waals constant "b" is :

    (a) Atmosphere.   (b) Joules.

    (c) Litre/mole.   (d) Mole/litre.

2 A liquid rises in a capillary tube. It is due to :

    (a) Surface tension.   (b) Osmosis.

    (c) Effusion.   (d) Viscosity.

3 Identify the state function among the following :

    (a) q.   (b) $q - w$.

    (c) q/w.   (d) $q + w$.

4 Which of the following are fermions ?

    (a) Electron.   (b) Proton.

    (c) $^2H_1$.   (d) He_2.

5 k_1 and k_2 are the velocity constants of forward and backward reactions. The equilibrium constant of the reaction is :

    (a) $k_1 \times k_2$.   (b) $k_1 - k_2$.

    (c) k_1/k_2.   (d) k_2/k_1.

6 The haphazard motion of gas molecule is called ———

7 Internal energy is a ——— property.

8 Rheochore is defined as ———

9 Vant Hoff equation is given by ———

10 The number of eigen states corresponding to a particular energy E_1 is called ———

11 Write down Gibbs Helmholtz equation.

12 What is an adiabatic process ?

(12 x ¼ = 3 weightage)

Turn over

Section B

II. Short Answer. Answer *all* nine questions :

13 Define the term collision diameter.

14 What do you mean by optical exaltation ?

15 What is chemical potential ?

16 What do you know about the term "probability" ?

17 State Le Chatelier's principle.

18 Calculate the mean square speed of an oxygen molecule at 288 K in S.I. units.

19 Define critical temperature.

20 Assuming hydrogen gas behaves ideally, calculate the work done by 16 g. of hydrogen in expanding isothermally and reversibly from a volume of 1 litre to 10 litres at 27° C.

21 Define efficiency of a heat engine.

x 1 = 9 weightage)

Section C

III. Short Paragraph. Answer any *five* questions :

22 Derive Maxwell Boltzmann distribution law.

23 What is parachor ? Can we use it for structural elucidation ?

24 Show that maximum work can be obtained by reversible process.

25 What is meant by partition function ? Derive an equation for internal energy in terms of partition function.

26 Derive thermodynamically the law of chemical equilibrium.

27 How is the molecular weight of a gas determined by limiting density method ?

28 Discuss the variation of free energy with temperature and pressure.

(5 x 2 = 10 weightage)

Section D

IV, Essay Question. Answer any *two* questions :

29 Derive Clapeyron Clausius equation of liquid vapour equilibrium. What are its applications ?

30 Discuss pressure volume isotherms of CO_2 and also continuity of states.

31 (a) What is meant by heterogeneous equilibrium ?

(b) How is the temperature dependence of the equilibrium constant (K_p) of a reaction related to its MI° ? What is this equation called ?

(2 x 4 = 8 weightage)