

D 31064

(Pages : 2)

Name

Reg. No.....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2012

(CCSS)

Chemistry

CH3 B05—PHYSICAL CHEMISTRY—I

Maximum : 30 Weightage

Time : Three Hours

Section A

*Answer all questions.  
Each bunch carries a weightage of 1.*

Fill in the blanks :

1. For an ideal gas  $C_{p,m} - \text{---} =$
2. The efficiency of a Carnot cycle is given by  $\eta =$
3.  $P_c$  in terms of van der Waals constants is
4. Surface tension            with rise in temperature.

State whether True or False

5. Electrons and alpha particles are examples for fermions.
6. The boiling point of water increases with increase of atmospheric pressure.
7. Heat, internal energy, free energy are state functions of the thermodynamic system.
8. Below the Boyle temperature gases behave ideally.

Answer in a word or sentence :

9. How is entropy and thermodynamic probability related ?
10. Write down the Gibbs-Duhem equation.
11. State Le Chatelier principle.
12. Define vapour pressure.

(12 x ¼ = 3 weightage)

Section B

*Answer all questions.  
Each question carries a weightage of 1.*

13. Differentiate between average and most probable velocity.
14. The viscosity of a gas is independent of pressure. Explain.
15. What is compressibility factor ?
16. What is optical exaltation ?
17. State the third law of thermodynamics.

Turn over

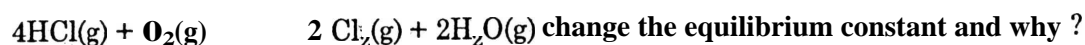
18. What do you mean by chemical potential ?
19. Calculate the entropy change when 1 mole of  $H_2$  is mixed with 1 mole of He, both gases being at the same temperature and pressure.
20. What is meant by residual entropy ?
21. Explain Joule-Thomson effect.

(9 x 1 = 9 Weightage)

### Section C

*Answer any five questions.  
Each question carries a weightage of 2.*

22. What is parachor ? How is it used in structure elucidation ?
23. How will you experimentally determine the critical constants of a gas ?
24. Explain the criteria for spontaneity of a reaction on the basis of changes in entropy and free energy.
25. Derive the Gibbs-Helmholtz equation.
26. Calculate the change in freezing point of ice when the pressure is increased by 1 atmosphere. Molar volumes of water and ice are  $18.0 \text{ cm}^3$  and  $19.6 \text{ cm}^3$  and the enthalpy of fusion for ice is  $6008 \text{ J}$  ( $1 \text{ J} = 9.87 \times 10^{-3} \text{ dm}^3 \text{ atm}$ ).
27. Using partition function write expressions for molar heat capacity  $C_v$ , entropy, pressure and enthalpy.
28. Will the addition of  $Cl_2(g)$  to the reaction mixture



(5 x 2 = 10 weightage)

### Section D

*Answer any two questions.  
Each question carries a weightage of 4.*

29. Why do real gases deviate from ideal behaviour ? Derive the van der Waals equation for  $n$  moles of a gas.
30. Derive the Clausius-Clapeyron equation. Explain any two applications.
31. How is equilibrium constant related to the standard free energy change of the reaction ? Derive the relations between  $K_p$ ,  $K_c$  and  $K_x$ .

(2 x 4 = 8 weightage)