

D 14111

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Name.....

Reg. No.....

**THIRD SEMESTER B.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION
NOVEMBER 2016**

Chemistry

CH 3B 05—PHYSICAL CHEMISTRY—I

Time : Three Hours

Maximum : 30 Weightage

Section A

*Answer all questions.
Each question carries $\frac{1}{4}$ weight.*

Fill in the blanks :

1. The average speed of a certain gas at 27°C is 400 m s^{-1} . The temperature at which the speed will be 800 m s^{-1} is _____
2. _____ microstates are associated with the tossing of 3 coins.
3. In an adiabatic process _____ is zero.
4. _____ statistics deals with distinguishable particles.

State whether true or false :

5. Coefficient of gas viscosity is directly proportional to square root of temperature in absolute scale.
6. Use of thermometers for temperature measurement is based on the Zeroth law of thermodynamics.
7. Equilibrium constant is independent of temperature.
8. Pressure has no effect on the boiling point of water.

Answer in a word or sentence :

9. Define surface tension.
10. What is the effect of pressure on viscosity of a gas ?
11. State van der Waals equation for n moles of a gas.
12. When is the parachor of a liquid equal to its molar volume ?

($12 \times \frac{1}{4} = 3$ weightage)

Section B

*Answer all questions.
Each question carries 1 weight.*

13. State the virial equation of state.
14. What is molar refraction ?
15. Give two examples each for state function and path function.

Turn over

16. Write down the expression for work in an isothermal reversible expansion of an ideal gas.
17. State Clausius-Clapeyron equation.
18. What is optical exaltation ?
19. State Nernst heat theorem.
20. Is it possible for a reaction with a negative entropy change to be spontaneous ? Explain.
21. Predict the effect of increase of pressure and temperature on the following equilibrium.

$$\text{N}_2 (\text{g}) + 3\text{H}_2 (\text{g}) \rightleftharpoons 2\text{NH}_3 (\text{g}); \Delta\text{H} = -92.3 \text{ KJ mol}^{-1}.$$

(9 × 1 = 9 weightage)

Section C

*Answer any five questions.
Each question carries 2 weight.*

22. Describe the limiting density method for molecular mass determination.
23. Draw the Maxwell distribution curve of molecular velocities and mark the most probable, average and rms velocities.
24. Calculate viscosity of a gas having an average velocity 1260 m s^{-1} at 300 K and 1 atm pressure if the mean free path is 10^{-7} m .
25. Calculate the translational partition function of benzene (molar mass 78 g mol^{-1}) in a volume of 1 m^3 at 298 K.
26. Derive the Gibbs-Helmholtz equation.
27. Derive the expression for the entropy of mixing of two non-reacting gases.
28. The equilibrium constant for a reaction is 0.86 at 40°C and 0.35 at 60°C . Calculate ΔH°

(5 × 2 = 10 weightage)

Section D

*Answer any two questions.
Each question carries 4 weight.*

29. (a) Explain the kinetic molecular theory of gases.
(b) Derive the kinetic gas equation.
30. (a) What are Maxwell relations ?
(b) Derive Gibbs-Duhem equation.
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 × 4 = 8 weightage)