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Reg. No. : .....

Name : .....

Fifth Semester B.Sc. Degree Examination, November 2016
First Degree Programme Under CBCSS
CHEMISTRY
Core Course V
CH 1541 : Physical Chemistry – I
(2013 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions. Answer in **one** word to maximum of **2** sentences. **Each** question carries **1** mark.

1. Define collision number.
2. Define Boyle temperature.
3. What is anisotropy ?
4. What are colligative properties ?
5. What are isotonic solutions ?
6. Write the Poiseuille's equation and explain the terms.
7. Define enthalpy of formation of a compound.
8. State the zeroth law of thermodynamics.
9. What is meant by efficiency of an engine ?
10. What is the criteria for spontaneity and equilibrium in terms of entropy of system and surrounding ?

(10×1=10 Marks)

P.T.O.

SECTION – B

Short answer type (**Not** to exceed **one** paragraph). Answer **any eight** questions. **Each** question carries **2** marks.

11. Calculate RMS velocity of hydrogen gas at 0° C.

12. Calculate the Miller indices of crystal planes which pass through the crystal axes at (2a, 3b, c).

13. Calculate the normality and molarity of an aqueous solution containing 15.5 g of anhydrous sodium carbonate in 2 litres.

14. Maximum work is obtained from a reversible process – substantiate.

15. State and explain Hess's law.

16. What is the significance of Helmholtz free energy ?

17. Distinguish between proper and improper rotation.

18. How will you classify a gas based on its compressibility factor ?

19. The diffraction of a crystal with X-rays of wavelength 2.9×10^{-10} m gives a first order diffraction at 27° 8′ . What is the distance between the lattice planes ?

20. Calculate the osmotic pressure of a 0.1 M aqueous solution of an organic solute at 17° C-R = 0.0821 L atm K^{-1} mol^{-1}.

21. Explain why the heat of neutralisation of a strong acid by a strong base is a constant.

22. Identify the symmetry elements of NH_3^- . **(8×2=16 Marks)**

SECTION – C

Answer **any six** questions. **Each** question carries **4** marks.

23. Define critical temperature of a gas and explain how it can be determined.

24. Describe the rotating crystal method of determining the interplanar spacing for the different kinds of planes.

25. Density determination of copper yields a value of 8.539×10^3 Kg m^{-3}. The edge length of the fcc unit cell of copper is found to be 3.3 Å from X-ray diffraction studies. Calculate the Avagadro number from the above data. [Cu = 63.54 g mol^{-1}].

26. One mole of an ideal gas at 27° C expands adiabatically against a constant external pressure of 1 atm from a volume of 10 dm^3 to 20 dm^3. Calculate

    i) q

    ii) w

    iii) Δu and

    iv) ΔH. Assume that $C_v = \frac{3}{2} R$.

27. Derive the Gibbs Helmholtz equation.

28. Explain the different elements of symmetry.

29. Addition of 0.643 g of a compound to 50 ml of benzene (d = 0.879 g/ml) lowers the freezing point from 5.51° to 5.03° C. If K_f of benzene is 5.12 K kg mol^{-1}, calculate the molar mass of the compound.

30. Derive the Kirchoff's equation.

31. Give the group multiplication table for C_{2v} point group. **(6×4=24 Marks)**

SECTION – D

Answer **any two** questions. **Each** question carries **15** marks.

32. Why do real gases deviate from ideal behaviour ? How did Van-der-Waal account for the deviations ?

33. What are liquid crystals ? Explain the different types of liquid crystals with examples. What are their applications ?

34. Give an account of the stoichiometric and non-stoichiometric defects of crystals.

35. a) How do abnormal molecular masses arise ?

    b) How will you determine viscosity of a liquid using Ostwald's viscometer ?

(2×15=30 Marks)