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F.Y. B.Sc.

CHEMISTRY - I

Physical and Inorganic Chemistry

(Paper - I) (2008 Pattern) (Theory) (41310)

Time :3 Hours]   *[Max. Marks :80*

Instructions to the candidates:-

   1)   *All questions are compulsory.*

   2)   *Draw neat diagrams wherever necessary.*

   3)   *Use of logtables and calculator is allowed.*

   4)   *Figures to the right indicate full marks.*

Q1) Attempt the following questions :   **[16]**

   a)   Define pOH and calculate pOH of 0.002 N NaOH solution.

   b)   State the units of viscosity and surface tension.

   c)   What is autocatalysis? Give one example of it.

   d)   Define entropy. Give its physical significance.

   e)   State any two assumptions of Bohr's theory.

   f)   What is atomic orbital overlap? Give factors affecting it.

   g)   Calculate the molarity of 250 ml. solution of NaOH containing 5 gm. of NaOH. (At.Wts. Na = 23, O = 16, H = 1)

   h)   P - nitrophenol is more soluble than O - nitrophenol. Why?

Q2) a)   Attempt any <u>four</u> of the following   **[8]**

      i)   Calculate the value of x in the equation $10^x = 33.48$.

      ii)   Find the value of $(0.0057)^3$ using log - table.

      iii)   What is the slope and intercept if the equation of line is $5x + \frac{1}{2} y - 11 = 0$.

      iv)   What is the equation of line which makes an intercept 5 and perpendicular to the line $y = 2x + 3$.

      v)   If $y = (x^5 + 8)^3$, find $\frac{dy}{dx}$.

vi) Calculate $\frac{dy}{dx}$, if $y = x^{\frac{1}{2}}$.

vii) $\int_{2}^{8} \frac{x^3}{2} \, dx = ?$

viii) Integrate w.r.t. $x \int (x^2 + 3)^2 \, dx$.

b) Define surface tension. Give it's units. How it is determined by capillary method? **[4]**

c) Attempt any one of the following **[4]**

   i) Calculate the entropy change in a reversible isothermal process at 30° C, when 3 moles of a gas changes it's volume from 20 liters to 10 liters.

   ii) A liquid of density 0.956 g/cm³ is observed to rise 11.5 mm in a tube of radius of 0.5 mm. Calculate surface tension of liquid.

Q3) a) Attempt any three of the following : **[12]**

   i) Give at least four properties of cathode rays.

   ii) Discuss the importance of carnot cycle.

   iii) What is compressibility factor? Discuss the variation of it with pressure of gas.

   iv) What is enzyme catalysis? Explain its characteristics.

b) Attempt any one of the following : **[4]**

   i) What are the drawback's of Ruther ford's atomic model?

   ii) Calculate the velocity and kinetic energy of an electron, revolving in the first orbit of hydrogen atom. (Given : radius (r) = 0.529×10^{-8} cm; $m_e = 9.11 \times 10^{-28}$ g. h = 6.626×10^{-27} ergs).

Q4) a) Attempt any three of the following **[12]**

   i) What is electrophoresis? Give it's applications.

   ii) State and explain Aufbau principle.

   iii) Explain Acid - Base catalysis with suitable example.

   iv) Give the properties and applications of emulsions.

   v) Give the significance of Azimuthal quantum number and magnetic quantum number.

b) Attempt <u>any one</u> of the following. **[4]**

    i) State the postulates of Heitler - London theory.

    ii) What is hybridization? Explain the formation of C – H bond in CH_4 molecule.

Q5) a) Attempt <u>any two</u> of the following : **[6]**

    i) Mention various isotopes of hydrogen. How is heavy hydrogen prepared?

    ii) Explain the bonding and shape of BeF_2 molecule.

    iii) 10 ml of the solution of NaOH containing 2 gm of NaOH per liter is neutralised by 20 ml of a solution of H_2SO_4 and 25 ml of HCl solution separately. Calculate strength of acids in g/lit.

b) Attempt <u>any two</u> of the following. **[10]**

    i) What is atomic orbital overlap? What are the different types of overlap between s and p orbitals give one example of each.

    ii) Explain the bonding and shape of NH_3 and ICl_2^- on the basis of VSEPR theory.

    iii) How will you prepare 0.25 N, 500 ml HCl solution from concentrated HCl solution whose specific gravity is 1.18 and contains 35% HCl by weight?

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