AD-142

April-2019

M.Sc., Sem.-II

409 : Chemistry

(Physical Chemistry)

Time : 2:30 Hours]   **[Max. Marks : 70**

1. (A) (i) Define partition function. Discuss rotational partition function for symmetrical diatomic molecule.   **7**

      (ii) Write a note on Maxwell-Boltzmann distribution law.   **7**

OR

      (i) What is thermal de Broglie wavelength? Calculate the translational partition function for hydrogen atom at 3000K confined to move in a box of volume of $2.494 \times 10^5 cm^3$. ($N_A = 6.022 \times 10^{23} mol^{-1}$, $h = 6.626 \times 10^{-34}$ J.s and $k = 1.38 \times 10^{-23} J.K^{-1}$).

      (ii) Derive an equation for vibrational partition function at very high temperature.

  (B) Answer in **one** or **two** lines : (any **four** out of **six**)   **4**

      (i) What is zero point energy ?

      (ii) Define degeneracy.

      (iii) Why partition function is dimensionless ?

      (iv) What is thermodynamic probability ?

      (v) What is the value of nuclear partition function for ortho molecules ?

      (vi) Define permutation.

2. (A) (i) Write a note on liquid drop model of atomic nucleus.   **7**

      (ii) Discuss applications of radioisotopes as tracers in detail.   **7**

OR

      (i) Write a note on fermi gas model of atomic nucleus.

      (ii) Explain spallation and evaporation in nuclear reactions. Calculate nuclear radius in centimeter for ^{235}U. ($r_0 = 1.3 \times 10^{-15}$ m)

  (B) Answer in **one** or **two** lines : (any **four** out of **six**)   **4**

      (i) Who developed independent particle model ?

      (ii) Define radioactivity.

      (iii) What is fusion process in nuclear reactions ?

      (iv) What is the unit of reaction cross section ?

      (v) Write the magic numbers.

      (vi) The number of neutrons in $^{32}S^{-2}$ ion is.

3. (A) (i) Write a short note on osmotic pressure measurement method to determine number average molecular weight. Calculate number average molecular weight and weight average molecular weight for equal numbers of molecules with $M_1 = 10,000$ and $M_2 = 1,00,000$ are mixed. 7

(ii) Discuss the kinetics of acid catalyzed polycondensation. 7

OR

(i) Discuss the criteria of polymer dissolution process in detail.

(ii) Discuss the mechanism and kinetics of free radical chain polymerization.

(B) Answer in **one** or **two** lines : (any **three** out of **five**) 3

(i) What is viscosity ?

(ii) Define kinetic chain length.

(iii) Define polycondensation.

(iv) What is the functionality of glycerine ?

(v) What is osmosis ?

4. (A) (i) How will you determine dissociation constant of dibasic acid by potentiometric method ? 7

(ii) Discuss the origin and characteristics of various currents produced in polarography. 7

OR

(i) How will you determine dissociation constant of monobasic acid by conductometry ?

(ii) What is electrical double layer ? Write a note on polarization and hydrogen overvoltage.

(B) Answer in **one** or **two** lines : (any **three** out of **five**) 3

(i) What is the unit of conductivity ?

(ii) What is limiting current ?

(iii) Define polarization.

(iv) What is degree of dissociation ?

(v) What is half wave potential ?

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