

[ 4 ]

4. What do you mean by unmediated and multimediated self-assembly?
5. a) Write the IUPAC nomenclature of  $[B_2H_7]^-$ . 1×4  
b) Determine the structure and number of capping group in  $[Os_8(CO)_{22}]^{2-}$ .  
c) Determine the structure of the 6,9- $Me_2B_{10}H_{12}$  with the aid of Wade's rule.  
d) What are naked clusters ?
6. a) Calculate the *styx* number and draw the VB structure of the following (*any two*): 3  
 $B_3H_8^-$ ,  $B_3H_{10}$ ,  $B_4H_8^+$  and  $B_6H_6^{2-}$   
b) Predict the structural type with the aid of Wade's rule : 3  
 $[CPB_{10}H_{11}]$ ,  $[\{Co(\eta^5-C_5H_5)\}_2C_2B_8H_{10}]$  and  $[Ru_6(CO)_{18}]^{2-}$   
c) Determine the number of metal-metal bonds in the following clusters and give a schematic representation of  $\delta$  bond: 2  
 $[Ir(CO)(py)Cl(OAc)]_2$ ,  $[Re_2Cl_4(PMe_3)_4]$  and  $[Co_4(CO)_{12}]$

Ex/M.Sc/CH/3/U-3091/12/2019

**M. Sc. CHEMISTRY EXAMINATION, 2019**

( 3rd Semester )

**ADVANCED GENERAL CHEMISTRY - I**

**PAPER - IX**

Time : Two hours

Full Marks : 50

( 25 marks for each unit )

Use a separate answerscript for each unit.

**UNIT - 3091**

1. Answer any three questions . 4×3
- a) Why does the activity of a material change when its size is changed from bulk to nano-dimension ? Explain anomalous melting point for nanosized particles with example.
- b) What are the differences between thermotropic and lyotropic liquid crystals ? Smectic state is more solid like than nematic : Explain.
- c) What is polymer nanocomposite ? What makes polymer nanocomposites unique ?
- d) What are the difference in the measurement of particle size by TEM and SEM ? How is the surface of a nanoparticle characterized by AFM techniques ?

[ Turn over

[ 2 ]

2. a) How does Flory-Huggins theory take into account of difference in size between solvent and polymer molecules in the derivation of entropy of mixing ? What are the limitations of Flory Huggins theory? 5+1
- b) What is Donnan membrane potential ? For a macromolecule with net positive charge of 8, at a concentration of 1mM dialysed against 0.1M NaCl, calculate the ratio of  $\text{Cl}^-$  ions in side-I (with macromolecule) and side-1 (without macromolecule). Also calculate Donnan membrane potential at 300K. 4

Or

A Sample of serum albumine gives the following experimental results at 27°C. Density of solvent 1.00g.  $\text{ml}^{-1}$ ; sedimentation coefficient  $7.12 \times 10^{-13}$  s; diffusion coefficient  $4.0 \times 10^{-11} \text{m}^2 \text{s}^{-1}$ ; specific volume of solute  $0.718 \text{mLg}^{-1}$ . Calculate the molar mass of the serum albumine.

- c) The radial distribution function  $\omega(r)$  of end to end distance 'r' for an isolated flexible polymer chain is given by

$$\omega(r) = 4\pi \left[ \frac{\beta}{\sqrt{\pi}} \right]^3 r^2 \exp(-\beta^2 r^2), \text{ where } \beta = \left[ \frac{3}{2nl^2} \right]^{\frac{1}{2}} \text{ in which}$$

n is the the number of links of length l forming the chain. Find most probable end to end distance ( $r_{\text{mp}}$ ). 3

Or

[ 3 ]

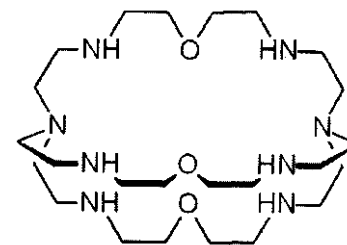
Show that the number average molar mass is given by

$$\bar{M}_n = \frac{M_1}{(1-p)}, \text{ where } M_1 = \text{mass of each monomeric unit}$$

and p = probability of linkage formation. 3

### UNIT - 3092

3. Answer any three questions. 4×3=12
- a) Define hydrogen bond. Write down some characteristics of hydrogen bond.
- b) Discuss about entropic considerations in designing anion binding host. Which of the anions among  $\text{F}^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$  and  $\text{N}_3^-$  show highest binding constant for the macrobicyclic host (given below)? Explain.



- c) How are crown ethers synthesized ? How do crown ethers differ from podands in metal ions binding ?
- d) Why is high dilution method favored for the synthesis of macrocyclic compounds ? Describe synthesis of a cryptand using high dilution method.

[ Turn over