d) How are macrocyclic ligands synthesized in the absence of any templates ? Discuss properly.

e) What are the main challenges in designing of hosts for anions ? How can a host for cation be changed to a host for anion ? Give suitable example.

4. a) What do you mean by "Naked Cluster" ? 1×5

b) Determine the structure and number of capping group in $[Os_8(CO)_{22}]^{2-}$ and $[Os_3(CO)_{12}]$

c) Establish a relation between a closo and the corresponding *nido* structures.

d) Determine the structural type of the clusters H $H_2Ru_6(CO)_{18}$

e) Determine the number of metal-metal bonds in M e

5. a) Calculate the *styx* number and draw the VB structure of the followings ***(any two)*** :

B_3H_7, B_4H_{10} $B_3H_8^-$, and $B_6H_6^{2-}$ 3

b) Predict the structural type with the aid of Wade's rule ***(any two)*** :

i) $[3-Me-2CB_5H_8]$,

ii) $[B_{11}SH_{10}Ph]$, $B_6H_{10}(PMe_3)_2$ and

iii) $[C_2B_4H_6(GaMe)]$ 2

c) Discuss briefly the syntheses of metal carbonyl clusters. 3

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M. Sc. Chemistry Examination, 2017

(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) Explain the factors that affect the growth of nanostructures. Give some examples of common stabilizers. What are the roles of stabilizer during synthesis of nanoparticles ?

b) What are the differences between thermotropic and lyotropic liquid crystals ? Smectic state is more solid like than nematic : Explain.

c) Define nanocomposite material. How many types of nanocomposite materials are found ? Why are polymer nanocomposites unique ?

d) What are the differences in measurement of particle size by TEM and SEM ? How is the surface of a nanoparticle characterized by AFM technique ?

e) Explain the synthesis process of AgCl nanoparticles using microemulsion technique.

2. a) The radial distribution function $\omega(r)$ of end to end distance 'r' for an isolated flexible polymer chain is given by $\omega(r) = 4\pi\left[\beta/\sqrt{\pi}\right]^3 r^2 \exp(-\beta^2 r^2)$, where $\beta = \left[3/2nl^2\right]^{1/2}$ in which *n* is the number of links of length *l* forming the chain. Find the most probable and root mean square and mean value of *r* in terms of n and *l*.

5

Or

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 ?

b) Show that the number average molar mass is given by $M_n = \frac{M_1}{(1-p)}$, where symbols have their usual meanings.

3

c) Relative viscosities of solution of a sample of a compound in toluene were determined with an Ostwald viscometer at 25°C.

$c/10^{-2}$ g cm^{-3}	0·249	0·499
η/η_o	1·355	1·782

Find viscosity average molar mass. Given Mark Houwink parameters : $k = 3\cdot7\times10^{-2}$ and a = 0·62. Other terms have their usual significances.

Or

Write a short note on Donnan membrane equilibrium.

d) Describe the method of 'vapour pressure osmometry' for the determination of molecular weight of a polymer.

2

UNIT - 3092

3. Answer ***any three*** questions : 4×3

a) Define hydrogen bond. Write down the criteria for hydrogen bond.

b) Make brief explanatory note on pre-organisation and complementarity.

c) The logarithms of the K^+ binding constants (M^{-1}. MeOH 25 °C) for three hosts are shown below. Explain this large variation.