

M.Sc. Examination 2017
Semester-IV
Chemistry
Course: CH-1020
(Optional : Inorganic Chemistry)

Time: Three Hours

Full Marks: 40

Questions are of equal value or as indicated in the margin.

Answer *any four* questions.

1. a) State the principles of "Green Chemistry". 5
b) Write notes on 'catalytic converter' and $\text{Pb}(\text{C}_2\text{H}_5)_4$. 5
2. a) "Depending upon the symmetry and point group the Raman spectroscopic pattern of chemical constituent changes" - Justify the statement. 2.5
b) Illustrate the energy related to anti-Stoke's radiation. 2.5
c) Discuss about Infrared and Raman spectroscopic output of CO_2 molecule. 2.5
d) Explain 'inversion doubling' of AB_3 type molecule with proper example. 2.5
3. a) What is Samarium Barbier reaction? 2.5
b) Write briefly about actinide carbonyls. 2.5
c) What is CO insertion reaction of actinide complex? 2.5
d) $\text{Cp}_2\text{LnR}(\text{THF}) + \text{CO} \rightarrow ?$ 2.5
(Here, Cp = Cyclopentadienyl ring, Ln = Lanthanide, R $\neq$ Methyl, THF = Tetrahydrofuran)
4. a) How do you estimate BOD and COD of any water sample? 2.5
b) Write a short note on green house gases. 2.5
c) State the photochemical mechanism of PAN formation. 2.5
d) " Sm^{2+} ion in solution is a good reducing agent whereas an aqueous solution of Ce^{4+} is a good oxidizing agent" – Justify the statement. 2.5
5. a) Illustrate the biochemical pathways of Arsenic toxicity. 2.5
b) Comment on the magnetic moment of Gd^{3+} . 2.5
c) Write a short note on tunneling conduction. 2.5
d) Briefly describe the photolithography technique. 2.5

OR

How does melting point vary with with particle size? Clearly justify your answer. 2.5

6. Answer *any five*: 5x2
 - a) Derive the relation between molar surface energy and particle diameter.
 - b) Give the microscopic explanation of Ostwald ripening.
 - c) What is Langmuir-Blodgett film? Describe the fabrication of Langmuir-Blodgett film.
 - d) If you want to reliably store data on Fe nanoparticles at room temperature what should be the minimum particle size?
(Given: anisotropy constant: $2 \times 10^5 \text{ J/m}^3$; natural life time, $\tau_0 = 10^{-9} \text{ s}$; τ : recording industry norm (40 yrs), $k_B = 1.38 \times 10^{-23} \text{ J/K}$)
 - e) Show that ballistic conduction is independent of material or geometry of the nanowire.
 - f) Surface plasmon resonance is only important for metal nanoparticles, but not for bulk metal: Explain why?