M.Sc. Final (Chemistry) Examinations,
December 2017

(Directorate of Distance Education)

Paper: DPB – 540: DECHEM-2.04: Physical Chemistry – VIII

Time: 3 hrs] *[Max. Marks: 75/85*

Note: *1)* ***Scheme 75 Marks*** *– Answer* ***Part – A*** *(any* ***TEN*** *subdivisions).*
Any ***TWO*** *questions from* ***Part – B*** *and* ***THREE*** *questions from* ***Part – C****.*

2) ***Scheme 85 Marks*** *– Answer* ***Part – A*** *(any* ***TEN*** *subdivisions).*
Any ***TWO*** *questions from* ***Part – B*** *and* ***THREE*** *questions from* ***Part – C***
and ***ONE*** *question from* ***Part – D****.*

PART – A

1. ***Answer any TEN subdivision*** 10 x 2 = 20 Marks

   a) Write basic principle involved in thermogravimetric analysis.
   b) Differentiate between DTA and DSC.
   c) Define trans effect.
   d) Define effective nuclear charge.
   e) Calculate Binding energy for Iron atom whose mass is 55.934932u $\left({}^{50}Fe\right)$ and mass of proton is 1.007825, neutron is 1.008665.
   f) Define the term chemical dosimeters? Give an example.
   g) Which of the following condition in a reaction is spontaneous? Why?
      $\Delta H = +ve; \quad \Delta S = +ve$
      $\Delta H = +ve; \quad \Delta S = -ve$
   h) What are the limitations of first law of thermodynamics?
   i) What are isotactic polymers? Give example.
   j) Account on number average molar mass.
   k) How do you explain overtones in Raman Spectroscopy?
   l) Write the significance of relative intensities of rotation spectral lines.
   m) Comment on band shapes for alolehyde and ketone group in IR spectra.
   n) Write the relationship between IR and Raman Spectroscopy.
   o) What are the advantages of FTIR?

PART – B

Answer any TWO questions: 2 x 8 = 16

2. a) Write the factors affecting DSC.

   b) What are Inert and Labile complexes? Explain with example. (4 + 4 = 08)

Contd.....2

3. a) Give a comparative account of liquid drop and shell models of nucleus for explaining the nuclear stability.
   b) What are magic numbers? Mention their importance. (6 + 2 = 08)

4. a) Account on Radiolysis of water.
   b) How third law of thermodynamics is usefull in the determination of absolute entropy? (4 + 4 = 08)

PART – C

Answer any THREE questions: 3 x 13 = 39

5. a) Obtain an expression for the entropy change for an ideal gas.
   b) How do you determine molecular weight of polymer by sedimentation velocity method?
   c) Obtain Vibration – Rotation spectra of a polyatomic molecule by taking suitable example. (5 + 4 + 4 = 13)

6. a) How do you apply IR spectra for Organo transistion metal complexes?
   b) What are the effects of co-ordination and symmetry of donar molecules?
   c) Differentiate between number average and weight average molecular weights. (4 + 4 + 5 = 13)

7. a) Entropy is a measure of spontaneity. Comment on this.
   b) Calculate the half life period of an radio isotope whose disintegration constant is 1.237×10^{-4} years.
   c) Write base hydrolysis of $Cr(III)$ complexes. (4 + 5 + 4 = 13)

8. a) Explain types of recording thermobalances.
   b) Write a note on Packing fraction and Binding energy.
   c) Explain the mechanism radiation dosimeter. (4 + 4 + 5 = 13)

9. a) Define force constant and anharmonic constant.
   b) Discuss the basic principle of Raman spectroscopy.
   c) How inductive effect and hydrogen bonding influence on IR spectra. (4 + 4 + 5 = 13)

PART – D

Answer any ONE question:

10. a) Explain ceric sulphate dosimeter.
    b) What are the mechanisms involved in hydrogen bomb? Explain. (5 + 5 = 10)

11. a) Which type of reaction takes place in octahedral $CO(III)$ complexes? Explain.
    b) Explain theory and instrumentation of differential scanning calorimetry. (5 + 5 = 10)

* * * * * * *