

**M.Sc. Part-II (Sem–VI) Examination,
CHEMISTRY
Physical Chemistry (MPCT 401)**

Thermodynamic and Molecular Modelling

Day & Date : -----

Time : -----

Total Marks : 60

Instructions: 1) *Question No. 1 is compulsory.*
2) *Attempt any four questions from questions numbers 2 to 7*
3) *Figures to the right indicate full mark.*

Q.1) Answer the following Questions:

- 1) Define Canonical ensemble.
- 2) State Ergodic hypothesis.
- 3) What is Legendre transformation?
- 4) Define electro-osmosis.
- 5) What is Euler,s Reciprocal.
- 6) What is Dielectric equation of state.
- 7) What is pfaff differential equation?
- 8) In statistical thermodynamics, spin factor used for electron is.....
- 9) Write a Fermi energy temperature equation.
- 10) Define Microcanonical ensemble.
- 11) State Dulong-petite law.
- 12) Define Critical temperature.
- 13) State Ergodic hypothesis.
- 14) Write a any two thermodynamic potentials.
- 15) Define electro-osmosis.
- 16) What is Euler,s Reciprocal.
- 17) What is Dielectric equation of state.
- 18) State Maxwell Boltzman distribution law.
- 19) Define electro-osmosis.
- 20) What is Dielectric equation?
- 21) Give law of conservation of mass in closed and open system.

- 22) Write a Fermi energy temperature equation.
- 23) Write down the equation Boltzman point.
- 24) Give law of conservation of mass in closed and open system
- 25) State partition function.
- 26) Define Fermi levels.
- 27) Define Ensemble.
- 28) State second law of thermodynamic.
- 29) Define Maxima and Minima
- 30) Define Clausius inequality.

Q.2) Answer the following Questions:

[6]

- 1) Write in brief on heat capacity of monoatomic solids. Show that Debye heat capacity at low temperature is proportional to cube of absolute temperature.
- 2) Derive an expression for Saxens Relation.
- 3) Obtain equations for entropy production in couple chemical reaction.
- 4) State the principal of microscopic reversibility. Discuss in detail thermoelectric effect in the framework of Onsager's theory.
- 5) Derive an expression for total differential.
- 6) Write down second law of thermodynamics and mathematical consequences of second law.
- 7) Explain the use Bose-Einstein statistics to explain thermodynamic properties of boson gas.
- 8) What is legendre transformation? Discuss the application of Legendre transformation.
- 9) What is difference between exact and inexact differentials?
- 10) Explain concept of conservation of mass and energy for open systems obtain the expression for entropy production for chemical reactions.

- 11) Explain the Fermi energy and levels .
- 12) Write in brief on molecular mechanics. Explain various potentials used in force field developments.
- 13) Explain the use Bose-Einstein statistics to explain thermodynamic properties of boson gas.
- 14) What is Legendre transformation? Discuss the application of Legendre transformation.

- 15) Write in brief on heat capacity of monoatomic solids. Show that Debye heat capacity at low temperature is proportional to cube of absolute temperature.
- 16) Explain how to obtain absolute entropies for Debye solids.

- 17) Explain the Fermi energy and levels .
- 18) Write in brief on molecular mechanics. Explain various potentials used in force field developments.
- 19) Derivation of thermodynamic identities.
- 20) Explain in detail Free energy concept
- 21) Write a Characteristic temperature Debye T^3 law
- 22) Explain in detail Harmonic oscillator model.
- 23) Write in brief Kihara potential.
- 24) Explain in detail Lennard-Jones type and truncated -Jones potentials.
- 25) Explain in details microscopic and macroscopic properties.
- 26) Explain in details bonded and non bonded interactions.
- 27) Write a thermodynamic cycles for free energy calculations.
- 28) Derive thermodynamic equations of motion.
- 29) Explain in details Rate and affinities.
- 30) Explain in details protein-ligand binding free energy.

Q.3) Answer the following Questions:

- 1) Short note on Maxima and Minima.
- 2) Explain Ensemble and types of ensembles.
- 3) Short note on Exact Inexact differentials.
- 4) Explain Caratheodary's Principle.
- 5) Explain Cut-off methods in molecular dynamic simulation.
- 6) Discuss the Utility of Bose-Einstein statistics to estimate thermodynamic properties of boson gas.
- 7) short note on Condensation of helium.
- 8) short note on Thermoelectric effects.
- 9) short note on Verlet and leaf-frong algorithms.
- 10) Explain Caratheodory's theorem.
- 11) Explain Satisfical ensemble and their significance.
- 12) Explain Cut-off methods in MD-Simulation.
- 13) Short note on Entropy production in Coupled chemical reaction.
- 14) Short note on Condensation of helium.
- 15) Short note on Einstein model of heat capacity.
- 16) Explain clausius and kelvin principle.
- 17) Short note on Thermoelectric effect .
- 18) Short note on Morse potential.
- 19) Explain clausius and kelvin principle.
- 20) Short note on Thermoelectric effect.
- 21) Short note on Morse potential.

- 22) Short note on Condensation of helium.
- 23) Explain Entropy production closed and open system.
- 24) Explain Verlet and leaf-frong algorithms.
- 25) Explain Maxima and Minima.
- 26) Explain Ensemble and types of ensembles.

- 27) Derive Exact Inexact differentials.

- 28) Write a short note on electromotive force.

- 29) write a short note on electro-osmosis.
- 30) Explain in detail chemical and electrochemical affinities.
- 31) Explain in detail entropy production in closed and open system.
- 32) Explain in detail steepest descent method.
- 33) Write a short note on equilibration dynamics.
- 34) Explain in detail replica exchange method.
- 35) Explain in detail conjugate gradient method.
- 36) Write a note on Leap-frog algorithm.
- 37) Write a note on parameterization.
- 38) Explain in details implicit and explicit.
- 39) Explain in detail exchange method.
- 40) Write a short on thermoelectric effect.
- 41) Write a short note on law of increasing .
- 42) Explain in detail non adiabatic process.
- 43) Explain in detail Beemans algorithms.
- 44) Explain in properties of boson gas.
- 45) Explain in force field development.

M.Sc. Part-II (Semester-IV) Physical Chemistry
Chemical kinetics (MPCT402)
Subject Code: 91408

Q.1) Answer the following questions.

[2 Marks]

1. Define term flash photolysis?
2. Write down the Eyring equation.
3. What is a photocatalyst?
4. Which types of compounds are not fitted in Hammett plot?
5. What are fast reactions?
6. Write down the Grunwald-Winstein equation.
7. Which unit of time is selected for fast reactions?
8. What is heterogeneous catalysis?
9. Give the examples of chemical reaction on surfaces.
10. Write down equation of equilibrium constant.
11. What is photocatalysis?
12. What is the Hammett equation?
13. What is Collision frequency?
14. Define term collision number.
15. What is an activated complex in a reaction?
16. Why are some reactions very fast?
17. Why some reaction is fast and other slow?
18. Who proposed transition theory?
19. What is unimolecular surface reaction with example?
20. What is meant by surface reaction?
21. What is surface adsorption in chemistry?
22. What is bimolecular surface reaction with example?

23. What is difference between physical adsorption and chemical adsorption?
24. What is micellar catalysis?
25. What micelles mean?
26. What are the applications of Hammett equation?
27. What is Taft equation with example?
28. What is substituent constant (σ)?
29. What is Taft steric factor?
30. What is the limitation of Hammett equation?
31. What are the 4 factors of collision theory?

Q.2) Answer the following questions

[6 Marks]

1. Describe in detail the NMR relaxation method.
2. Write down short note on fast reactions.
3. Derive and explain the Hammett equation in details.
4. Explain flash photolysis method in details.
5. Write a note on Hydrogen ion dependence of reaction rates
6. Explain in brief relation between partition function and activated complex.
7. Derive an expression of thermodynamics of transition state theory.
8. Write short note on heterogeneously catalyzed oxidation reactions?
9. Explain in brief of reduction of silver bromide.
10. Describe in brief calculation of k and K values.
11. Write a short note on photocatalysis.
12. Write down activated complex theory in details.
13. Write down the expression of unimolecular reaction.
14. Write down equilibrium constant in details.
15. Explain collision theory in details.
16. Write short note on heterogeneously catalysed reduction reactions.
17. Explain in details of interpretation of hydrogen ion effect with suitable

example.

18. What is the difference between activated complex theory and collision theory?
19. What are the 4 factors of collision theory? Explain any one of them in details.
- 20.) Explain pseudo-phase ion exchange models with suitable example.
21. Write down the expression of bimolecular surface reaction.
22. Write a short note on Hammett plot with respect to linear free energy relationship.
23. Write a short note on micellar catalysis.
24. Write a short note on pressure jump method.
25. Explain relaxation techniques in details.
26. Write a short note on determination of active reactant species from kinetic data.
27. Explain in details of partition function and activated complex.
28. Describe in details of Menger-Portonoy with suitable examples.
29. Explain kinetics and mechanism of Trace metal ion catalysis with suitable examples.
30. Describe in details of solvent effects on rate of reactions.

Q.3) Answer the following questions

[4 marks]

1. Write a short note on the equilibrium constant and the rate constant.
2. Write down applications of photocatalysis in details.
3. Explain molecular beam method in details.
4. Explain transition state theory in details.
5. What is photocatysis? Write down two applications of photocatalysis.
6. Write a short note on temperature jump method.

7. Explain in details of rate constant.
8. Write a short note on chemical reaction on surfaces.
9. Write a formation and decay of activated complex in details.
10. What is absolute reaction rate theory? Explain it with suitable examples in details?
11. For a reversible reaction, the rate constants for the forward and backward reactions are 2.38×10^{-4} and 8.15×10^{-5} respectively. Calculate the equilibrium constant (K_{eq}) for the reaction.
12. Explain the Grunwald -Weinstein equation in details.
13. Derive Yukawa-Tsuna equation in details.
14. The reaction time for the fast reaction $A \rightleftharpoons B$ is $10 \mu s$ and the equilibrium constant is 1.0×10^{-3} . Calculate the rate constants for the forward (k_1) and reverse reactions (k_{-1}).
15. Describe neat labelled diagram of temperature jump method in details.
16. Prove the $\tau = 1 / (k_b + k_f)$.
17. Describe the physical significance of σ (sigma).
18. Write a short note Yukawa-Tsuna equation in details.
19. Write is ρ (rho)? Explain in details of it.
20. Derive and explain Eyring equation.
21. What is photocatalysis? Write down the reaction mechanism of photocatalysis.
22. Explain the Taft equation in details.
23. Write a short note on effect of photocatalysis reaction.
24. Write down physical significance of ρ (rho).
25. Derive transition state theory in details.
26. Write a short note on reaction mechanism of photocatalysis.

27. The rate constant of forward and backward reactions for certain hypothetical reaction are 1.1×10^{-2} and 1.5×10^{-3} respectively. Calculate the equilibrium constant of the reaction.
28. What are the basic assumptions of transition state theory?
29. What is the limitation of Hammett equation?
30. What does the Hammett equation represent?
31. What does the slope of a Hammett plot mean?
32. What does a negative/positive rho value mean?
33. What is adsorption theory of heterogeneous catalysis?
34. What is heterogeneous catalysis explain with one chemical reaction?
35. What is adsorption theory?
36. What is chemisorption explain with an example?
37. What are the characteristics of chemisorption?
38. What is the purpose of photocatalysis?
39. What are the advantages of photocatalysis?
40. Where are photocatalysts used?
41. What are the advantages of photocatalysis over other existing methods?
42. Draw a schematic diagram of pressure jump method and explain it in details.
43. Draw a schematic diagram of temperature jump method and explain it in details.
44. Draw a schematic diagram of flash photolysis method and explain it in details.
45. Draw a schematic diagram of molecular beam methods and explain it in details.

M.Sc.-II (Semester-IV) Question Bank
PHYSICAL CHEMISTRY
Molecular Structure-II (MPCT-403)

Q.1) Answer the following questions:

[2M]

- 1) Express the total polarizability of a molecule in terms of distortion and orientation polarization.
- 2) What is the value of Debye unit in terms of coulomb meter? Write the units of ϵ_0 .
- 3) Write the formula of tetramethyl silane. And how many equivalent protons are present in it?
- 4) Why alcohol is not a suitable solvent for ESR studies?
- 5) Mention the main factor on which chemical shift in Mossbauer spectroscopy depends? Why?
- 6) Which two factors independent of the applied field ?
- 7) Which of the following nuclei do not exhibit NMR spectrum? $C^{13}, O^{16}, N^{15}, F^{19}$ Why?
- 8) Predict the number of lines in an ESR spectrum an electron interacting with ^{14}N nucleus
- 9) How many equivalent protons present in benzene anion and predict the number of ESR signals.
- 10) What is spin of ^{14}N and ^{13}C ?
- 11) According to Curie-Weiss law susceptibility varies _____ with _____
- 12) The ^{13}C NMR is much simpler to interpret than proton NMR? Why?
- 13) Orientation polarization is observed in both polar and non-polar molecules. True or False. Give reason or if false then correct this statement.

- 14) Write the expression for magnetic susceptibility according to Curie law.
- 15) Predict ESR spectrum of F_2H
- 16) _____ and _____ do not exhibit Mossbauer effect because of recoil energy loss.
- 17) Why water is not a suitable solvent for ESR studies?
- 18) Give the Clausius-Mossotti equation used to calculate dipole moment of non-polar gas molecules?
- 19) Define Magnetic nuclei.
- 20) Define Non-magnetic nuclei.
- 21) Define coupling constant.
- 22) What is peak area integration.
- 23) What is precessional motion?
- 24) What is Paramagnetism?
- 25) What is meant by polarizability of a molecule?
- 26) Give the types of polarizability.
- 27) Write any two magnetic properties of molecule.
- 28) What is the electric properties of molecule.
- 29) What is precessional frequency?
- 30) What is shielding effect?

Q.2) Answer the following questions:

[6M]

- 1) Derive an expression for the interaction between two dipoles separated by a distance r and $\theta = 0$
- 2) Explain the shielding and deshielding effects in ethyne and benzene molecules due to field –induced electronic circulation of – electrons.
- 3) Describe the components of ESR spectrophotometer with a schematic diagram.
- 4) With suitable example explain the shielding and deshielding effects on

resonance energy of a proton

- 5) For the compound 1-bromopropane, $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-Br}$, Find the number of equivalent protons, number of signals in a low and high resolution NMR spectrum. Comment on the result.
- 6) Describe how ESR spectrum help to study of free radicals, unstable paramagnetic substances and kinetics of electron transfer reactions.
- 7) Derive Debye equation for molar polarization of a molecule.
- 8) Derive van-Vleck general equation for magnetic susceptibility.
- 9) Describe how the ESR spectrum help to study of free radicals, unstable paramagnetic substances and kinetics of electron transfer reactions.
- 10) Explain the interaction between nuclear spin and magnetic field . Show how it leads to NMR spectroscopy?
- 11) An electron in an atom revolves in an orbit of radius r which in presence of a magnetic field undergo precession of radius r_1 . Derive an expression for atomic susceptibility of an atom containing the electron.
- 12) Describe the components of an ESR spectrophotometer with a Schematic diagram.
- 13) Derive Clausius –Mossotti equation for molar polarization of a molecule.
- 14) Describe the instrumentation and procedure for obtaining an NMR spectra with neat diagram.
- 15) Calculate the polarizability and polarizability volume of water molecule at 20°C . If at this temperature the refractive index of water is 1.3330 for a light of wave length 589 nm. Molar mass M for water $= 18.015 \text{ gmol}^{-1}$. $\epsilon_0 = 8.8542 \times 10^{-12} \text{ J}^{-1} \text{ C}^2 \text{ m}^{-1}$.
- 16) Sample and reference nuclei experience magnetic fields B_s and B_{ref}

respectively at an applied field strength of B_0 . If σ_s and σ_{ref} are the respective shielding constants. Derive a relation between chemical shift and B_s and B_{ref} .

- 17) Describe the working of a Mossbauer spectrometer with a neat sketch.
- 18) What is coupling constant? Explain with suitable diagram effect of coupling between two neighboring nuclei on the splitting pattern of their NMR signals.
- 19) Write a note on Mc-Connel relation.
- 20) Draw the ESR spectra of an unpaired electron, hydrogen atom, methyl radical.
- 21) Discuss ESR spectra of transition metal complexes.
- 22) Explain NMR of Paramagnetic compounds.
- 23) Explain NMR of Diamagnetic compounds.
- 24) Explain double resonance with example.
- 25) Explain use of chemical shift reagents.
- 26) Explain the term NOE.
- 27) Give any four applications of NMR.
- 28) Explain the splitting of methylene peak of ethanol.
- 29) Write a note on Nuclear Overhauser Effect.
- 30) With suitable examples give applications of ESR.

Q.3) Answer the following questions:

[4M]

- 1) Explain electric properties of molecules with types of polarizations.
- 2) The half life of first excited state of ^{57}Fe is 1.5×10^{-7} s. Calculate its line width.
- 3) Explain with suitable example the calculation of number of equivalent protons from NMR spectra.
- 4) What are the important informations provided by an ESR spectrum?

Explain with examples.

- 5) Write a note on ^{13}C -NMR spectroscopy.
- 6) Explain the use of Pascal Constants for calculation of magnetic susceptibility
- 7) If molar polarization of $\text{NH}_3(\text{g})$ obeys the equation $P_m = a + b/T$.
Where the constants a and b have the values 5.6 and $12,000 \text{ cm}^3\text{mol}^{-1}$ respectively, What is the relative permittivity of ammonia gas at S.T.P.?
- 8) Write a note on types of magnetic substances.
- 9) An NMR instrument operates at 300MHz . Find the value of strength of magnetic field. ($h = 6.625 \times 10^{-34} \text{ Js}$, $g_N = 5.585$ and $\beta_N = 5.05 \times 10^{-27} \text{ J}^{-1}\text{T}$)
- 10) Write a note on Lennard-Jones potential.
- 11) What is isomer shift in Mossbauer spectroscopy? Explain with examples.
- 12) Explain the use of Pascal constants for calculation of magnetic susceptibility.
- 13) A free electron is placed in a magnetic field strength 1.3T .
Calculate the resonance frequency, if $g = 2.0023$.
- 14) Write a note on factors affecting chemical shift.
- 15) Explain the nature of ESR spectrum. Obtained for CH_3 radical.
- 16) What is magnetic susceptibility? Explain types of magnetic substances.
- 17) Write a note on ^{13}C NMR spectroscopy.
- 18) With suitable example explain the shielding and deshielding effects on resonance energy of a proton?
- 19) Write a note on Relaxation times in NMR.
- 20) Write a note on Quadrupole splitting in Mossbauer spectroscopy.
- 21) Verify Curie-Weiss law.

- 22) Write Applications of ESR.
- 23) Write a note on Pascal constants.
- 24) Write a brief note on Mossbauer sources.
- 25) Explain with equation energy due to induced dipole –induced dipole interaction.
- 26) Explain in brief Lengevins Classical Theory of diamagnetism and paramagnetism.

- 27) Why are NMR spectra observed in the rf region and the ESR spectra in the microwave region?
- 28) Discuss the use of the lanthanide shift reagents in NMR.
- 29) Write a note on Nuclear Quadrupole Resonance spectroscopy.
- 30) Predict the ESR spectrum of the hypothetical NH radical.
- 31) Predict the ESR spectra of benzene anion radical.
- 32) Explain the difference between ESR and EPR.
- 33) How NMR used in studying hindered rotation in molecules?
- 34) Explain spin-spin coupling.
- 35) Write a note on Chemical shift.
- 36) Explain with examples of equivalent and non- equivalent protons.
- 37) Name the scale used in NMR .How are they related?
- 38) Why is TMS selected as the internal standard reference in NMR.
- 39) What causes chemical shifts in NMR spectroscopy?
- 40) Write a note on Magnetic nuclei.
- 41) Write a note on shielding –deshielding.
- 42) What is precessional motion? Explain briefly.
- 43) In 2-chloropropane which are the most shielded and de-shielded protons? Explain Why?

44) Name the scales used in NMR .How are they related?

45) Give the applications of Mossbaur spectroscopy.

M.Sc. Part-II (Semester-IV)
Physical Chemistry
Physicochemical Techniques (MPCT404)
Subject Code: 91410

Q.1) Answer the following questions. [2 Marks]

1. What is mean by X-ray diffraction?
2. What is luminescence? Give the suitable example.
3. What is nuclear activation analysis (NAA)?
4. Which indicator is used in radiometric titration?
5. Write down full form and one application of SEM?
6. Who invented neutron activation analysis?
7. Write down Bragg's equation?
8. What is chemiluminescence? Give the suitable example.
9. What are full forms of TGA and DSC?
10. What are the techniques used for determination of molecular mass of chemical compounds.
11. Write down full form of ICP-MS.
12. Give the applications of nuclear activation analysis.
13. What is bioluminescence? Give the suitable example.
14. Write down any two properties of X-ray radiation.
15. What is the principle of XRF?
16. Write down any two application of XRF.
17. What is the principle of SEM?
18. What is the principle of STEM?
19. What are the 2 main types of electron microscopes?
20. What is principle of MS/MS?

21. What is electrochemiluminescence? Give the suitable example.
22. What is thermal analysis?
23. What are different types of thermal analysis?
24. Write down any two applications of thermal analysis.
25. What is X-ray radiology?
26. What is radiotherapy?
27. How many types of XRF? Give the name of XRF.
28. What is inductively coupled plasma emission spectrometry?
29. Write down the principle of inductively coupled plasma atomic emission spectroscopy.
30. What are the basic components of TGA?

Q. 2 Answer the following questions [6 Marks]

1. Explain Debye-Scherrer method for analysis of X-ray powder diffraction pattern of crystals in details.
2. What is luminescence? Write down short note on chemiluminescence?
3. What is X-ray diffraction? Explain X-ray diffraction phenomenon in details.
4. Describe the instrumentation of XPS in details.
5. Give the applications of X-rays.
6. Write a short note on concept of absorption edge.
7. Explain the concept of X-ray radiology in details.
8. What is radiotherapy? When it is used? Explain in details.
9. Describe the concept of radiotherapy in details.
10. Explain in details of strength and limitations of X-ray fluorescence (XRF).
11. Explain the basic instrumentation of neutron activation analysis (NAA).
12. What is TGA? Write down instrumentation of TGA.
13. Write down different steps involved in neutron activation analysis (NAA).

14. What are radiometric titrations? Write down instrumentation of radiometric titrations.
15. Write down theory and basic instrumentation of GC-MS.
16. What are the applications of XRF?
17. Explain in details of mechanism of X-ray fluorescence (XRF).
18. What are the advantages of XRF?
19. Write a short note on energy dispersive X-ray fluorescence (EDXRF)
20. Write a short note on wavelength dispersive X-ray fluorescence (WDXRF).
21. Write a note on neutron activation analysis (NAA).
22. Write down instrumentation of inductively coupled plasma atomic emission spectroscopy in details.
23. Write a short note on SEM.
24. Write the instrumentation of GC-MS in details.
25. Explain in details of X-ray emission.
26. What is ESCA? Explain the principal of ESCA.
27. What is the AES? Explain the principle of AES.
28. Write down types of chemiluminescence and explain any one of them in details.
29. What type of instrument is used for chemiluminescence and explain instrumentation of chemiluminescence in details.
30. Explain the basic components of mass spectroscopy.

Q.3 Answer the following questions [4 Marks]

1. Write a short note on STEM.
2. Write down short note on generation of X-rays.
3. Explain the X-ray diffraction diffractometer in details.
4. Write down principle of thermometric titration in details.
5. Explain in details of X-ray diffraction pattern with suitable example.

6. Write down short note on X-rays fluorescence.
7. Write down application of XRD in material science.
8. Explain in details of properties of X-rays.
9. Describe gas phase chemiluminescence in details.
10. Write down liquid phase chemiluminescence in details.
11. Explain the instrumentation of bioluminescence in details.
12. Write down any four differences between chemiluminescence and electrochemiluminescence.
13. Write down applications of XPS.
14. Write a short note on bioluminescence.
15. Write down basic principle and applications of neutron activation analysis (NAA).
16. Write down basic instrumentation of XPS.
17. Write down applications of GC-MS in details.
18. Write a short note on prompt radiation.
19. Write a short note electrochemiluminescence.
20. Explain in details of ionization sources used in mass spectroscopy.
21. Explain in details of analyzers used in mass spectroscopy.
22. Write a short note on MS/MS.
23. Write a short note pulse neutron activation analysis.
24. Write a short note radiochemical and instrumental neutron activation analysis procedures for the determination of low level trace elements in human livers
25. Explain limitations of neutron activation analysis (NAA).
26. Write down application of inductively coupled plasma atomic emission spectroscopy.
27. Write a short note of DTA.

28. Write down applications of neutron activation analysis (NAA).
29. Write a short note on DSC.
30. Write down principle and applications of radiometric titration.
31. Explain in details of DSC curve with suitable examples.
32. Write down principle and application of radiometric titration.
33. Write down in details of nuclear processes occurring when cobalt is irradiated with neutrons
34. Explain in details of DTA curve with suitable examples.
35. Explain in details of TGA curve with suitable examples.
36. Explain in details of instrumentation of TGA curve.
37. What are the factors affecting TGA curve?
38. What are the factors affecting DTA curve?
39. What are the basic components of TGA? Describe any one of them in details.
40. What are the limitations of TGA?
41. What are the two main techniques for thermal analysis? Explain any one of them in details.
42. What are the factors which affect the DSC results?
43. What are the uses of thermometric titration?
44. What are the main sources of error in a thermometric titration?
45. Write short note on thermometric titration?

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