Topic: Photochemistry

Questions for 1 Marks

1. Give one example photochemical equilibrium reaction?
2. Give mathematical equation Lamberts- Beer's law.
3. Give the reactions involved in the decomposition of HI.
4. State Lambert-Beer's law.
5. ISC and IC represent nonradiative transitions in Jablonski diagram. True/False

Questions for 2 Marks

1. State Lambert's law.
2. State Beer's law.
3. What are thermal reactions?
4. What is meant by photosensitizer?
5. What is fluorescence?

Questions for 4 Marks

1. What are radiative transitions? Give examples.
2. State first and second law of photochemistry.
3. Draw Jablonski diagram depicting various processes occurring in excited state.
4. Write a note on fluorescence phenomenon.
5. What is phosphorescence? Explain with examples.
6. Distinguish between thermal and dark reactions.

Questions for 5 Marks

1. Give a brief account on photosensitized reactions.
2. State and explain Einstein's law of photochemical equivalence.
3. Discuss in detail, "Jablonski diagram."
4. What is quantum yield? Give the causes of high and low quantum yield of photochemical reactions.

5. What is the chemiluinescence? Explain the phenomenon with suitable example.
6. Define Grotthus-Draper law and Lambert law of photochemistry.

Questions for 6 Marks

1. What are photosensitized reaction ? Explain with the suitable example.
2. Write note on "Photodimerisation of Anthracene".
3. What is the Chemiluminescence? Explain the phenomenon with suitable examples.
4. What is quantum yield? A substance absorbs 2×10^{6} quanta of radiation per second and 0.002 moles of it react in 20 minutes. Calculate quantum yield of this reaction. ($N = 6.023\times10^{23}$).

Questions for 8 Marks

1. State and explain Einstein law of photochemical equivalence. When substance irradiated with light at 5000 A° wavelength, 1×10^{-4} moles of it decomposed how many photons are absorbed during the reaction if its quantum efficiency is 10 Given $N = 6.023\times10^{23}$.
2. What is photochemical equilibrium? Explain with respect to photodimerization of anthracene.
3. What are photochemical reactions? Calculate the energy associated with i) one quantum and ii) one Einstein. Given that the wavelength of radiation is 7500A°. ($N = 6.024\times10^{23}$, $h = 6.62\times10^{-27}$ erg. sec, $C = 3\times10^{10}$ cm/sec, 1 cal = 4.184×10^{7} ergs)
4. State and explain the law of photochemical equivalence. What are the reasons for high and low quantum yield? Explain with suitable examples.
5. Explain with example: a) photosensitized reactions and b) chemiluminescence.

Question Bank

Selected Topics in Polymers

A. Questions for four marks (20 questions) (4 marks each)

1. Draw a diagram showing cholesteric and smectic phase.
2. What are the basic requirements for the polymers to show conductivity?
3. Explain why PET is used in beverage bottles?
4. Differentiate between micro-filtration and ultra-filtration. Give its applications.
5. How are polymer blends and composites different? Explain.
6. Give the synthesis of bisphenol A.
7. What is nitrile rubber? Give its synthesis.
8. What is incineration? Enlist its advantages.
9. How will you differentiate the terms lyotropic and thermotropic?
10. Write a note on nematic phase.
11. What are blowing agents? Give two examples of any two blowing agents.
12. What is vulcanization? Write a note on sulfur vulcanization.
13. What is vulcanization? Can it be done without sulfur? Explain.
14. Give various plastic recycling codes and names of corresponding polymers.
15. Give the synthesis of sulfonated polystyrene. Give its one important use.
16. Explain the curing reaction of epoxy resin.
17. Explain how does flame retardant additive work in polymers.
18. Explain the term 'leaching' with reference to membrane polymers.
19. Explain the synthesis of diglycidyl ether of bisphenol-A. How much is the epoxide equivalent of DGEBA with two epoxy groups per molecule (mol. wt. 340)?
20. What is reverse osmosis? Give its application.
21. Give any two modification reactions for cellulose. Draw the structure of hydroxyethyl cellulose.
22. What are UV stabilizers? How do they work? Give two examples of UV stabilizers.
23. Why polymer supported catalysts are preferred? Explain with one example.

B. Questions for 08 marks (50 questions) (8 marks each)

1. Discuss the methods for the synthesis of conducting polymers.
2. Explain how will you synthesize cellulose triacetate.
3. Explain various polymer recycling processes. Discuss the tertiary recycling process and give an example for the same.
4. What is chlorinated polythene? Explain its synthesis and properties.
5. What are block copolymers? Give the synthesis of anyone diblock copolymer.
6. What are conducting polymers? Explain doping process. Give examples of different types of dopants.
7. What is hydrogel? Explain its preparation with suitable example.
8. Write a note on polymers in pharmaceutical applications. Give an example of polymer in control drug release application.

9. Give the synthesis and applications of polyurethane multiblock copolymer from hydroxyl terminated PBT.
10. What are polymer adhesives? Enlist the criteria for a polymer to behave as an adhesive. Give two examples.
11. What are LCPs? What is the basic requirement for a polymer to show LC properties? give
two examples of building blocks for LC polymers.
12. Differentiate between polymer blends and alloys. Give commercial applications of the same.
13. Write a note on plastic sorting from waste. Enlist the challenges involved.
14. Explain non-sulphur vulcanization of rubber in detail.
15. Write a note on various ways by which a polymer can be made conductive.
16. Write a note on the preparation and applications of cellulose ethers.
17. What are polyblends? Explain the methods used to prepare the same.
18. Explain any two modifying reactions for polystyrene with suitable reactions.
19. Enlist various cellulose derivatives. Give the details of synthesis of anyone derivative.
20. What are antioxidants? Give two examples and explain the working mechanism of antioxidants in polymers.
21. What are stabilizers? Explain how do they work. Give suitable examples.
22. What are polymer Nanocomposites?Explain the preparation of polymer nanocomposites.
23. Write a note on radiation crosslinking reactions with suitable examples.
24. What is click polymerization? Explain with one example.
25. What are polymer membranes? Explain the role of polymer membranes in fuel cells.
26. What are lubricants? Explain the working of lubricants when it is utilized during processing.
27.What are composites? Discuss various types of reinforcing agents used in polymer composites.
28. Explain how traditional composites are different from bio-composites.
29. Write a note on polymers in lithography. Emphasize on its use.
30. What are polymer reactions? Explain how polymer reactions are important with suitable example showing their applications.
31. Write a note on epoxidation of natural rubber. Explain how properties alter after the oxidation of rubber.
32. Comment on the alteration in properties and hence applications of natural rubber after hydrogenation.
33. Explain the chlorination of polyethylene. Comment on its properties.
34. What changes do you expect in the properties of grafted polyethylene due the reaction of polythene grafting?
35. Explain the cross-linking agents used in the modification of polystyrene. give the uses of cross-linked PS.
36. How does hydrogenation of polystyrene alter the structure, properties and applications of polystyrene.
37. Write a note on depolymerization to obtain monomers during polymer recycling. Give

suitable examples.
38. What is down cycling? Explain polymer reprocessing giving an example.
39. What are micro-plastics? Write a note on polymer industries and its impact on environment.
40. What is latex? Explain the process of collection of latex and conversion into raw rubber.
41. Write a note on determination of cross-linking density of polymer by any method.
42. What is EPDM?Explain the preparation of EPDM.Comment on the composition of EPDM.
43. Compare the characteristic features of SBR, nitrile, butyl and EPDM rubber.
44. What is neoprene? Draw the structure and elaborate on properties of neoprene.
45. Write a note on compounding of rubber. Explain anyone equipment that is used in the compounding of rubber.
46. Write a note on various equipment used in the manufacture of master batch of rubber through compounding.
47. What is carbon black? What are the different sources of carbon black preparation? Explain
the properties contributed by carbon black in rubber.
48. What are accelerators? Give three examples of accelerators that are used in the manufacture
of rubber.
49. Write a note on various types of additives used in rubber and explain their role.
50. Explain the importance of antistatic additives use in rubber. Give its application areas.

Question Bank

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
M. Sc. (Part-II) (Semester-IV) Examination
Physical Chemistry
(Paper HCT 4.1): Statistical Mechanics (CBCS)

Q.2. Answer the following. - (4 marks each)

1) Discuss conservation of energy in an open system
2) 5 quanta of energy shared among 5hormonic oscillators. Estimate the possible configurations and total number of microstates associated with this system
3) Illustrate the concept of Legendre transformations with suitable examples.
4) What is microstate? Estimate the number of possible microstates for an atom having non-equivalent configuration ns^1p^1.
5) For an ideal gas PV = nRT, show that 1/T is an integrating factor for dw= PdV.
6) Derive Saxen's relations.
7) Derive the expressions for the change in entropy during the various physical transformations.
8) Explain the concept of electron gas in metals.
9) Write on basic assumptions of Debye theory of heat capacity of solids.
10) Write on exact and inexact differentials
11) Explain Caratheodory's principle.
12) Write a note on electrokinetic effects.
13) What is microstates and configurations? Explain with example
14) Write on configurations and predominant configurations.
15) Derive the expression for Boltzmann-Planck equation.
16) Define Ensemble. Explain canonical ensemble.
17) Establish the relationship between thermodynamic probability and entropy.
18) What is entropy? Give the entropy change expression for physical transformations.
19) Compare the quantum statistics: Bose-Einstein, Fermi-Dirac and Maxwell-Boltzmann
20) Define Ensemble. Explain micro canonical ensemble.

Q.3. Answer the following. (8+8)

1) Derive Sackur-Tetrode equation. Using that equation calculate S_{trans} of Xenon gas at 300 K and 1 atm pressure (Given- Mass of Ar is 131.3 g/mol).
2) Explain how third law of thermodynamics helps in calculation of absolute entropy of gasous substance
3) If H= f(T,P) and dH is an exact differential then prove that $(dH/dP)_T = V - T(dV/dT)_P$.
   [Given: dq = dH – VdPand 1/T is an integrating factor]
4) Mention different electrokinetic effects. Explain them.
5) Show that $Q_{trans} = (2 \pi m k T)^{3/2}/h^3.RT/P$. Write down the equation for S_{trans}.
6) Explain Einstein's theory for heat capacity of solids.
7) What is ortho and para hydrogen? Write on equilibrium proportions of ortho and para hydrogen.
8) Discuss the concept of electronic partition function.
9) Discuss conservation of energy in an open and closed system
10) Describe the entropy production due to heat flow.

Q.4. Answer the following. **(8 marks each)**

1) Derive the values of α and β involved in classical Maxwell-Boltzmann distribution law.
2) Describe Onsager's theory of microscopic reversibility.
3) Derive the expression for vibrational partition function.
Calculate vibrational characteristic temperature for N_2 gas at 2750 K. [Given v = 3300 cm^{-1}]
4) For Cu, θ_E is -125^{0}C. Calculate heat capacity of Cu using Einstein's heat capacity model at 1000 K and 1500 K.
5) Derive the expression for Fermi-Dirac statistics.
6)Derive the expression for Bose-Einstein statistics.
7) Discuss the concept of nuclear partition function.
8) Discuss conservation of mass in an open and closed system
9) Write on various phenomenalogical laws.
10) Derive the expression for rotational partition function.

Q.5. Answer the following. **(8 marks each)**

1) Give basic assumptions of Debye theory. Derive the expression for Debye specific heat theory for solids.
2) Establish the relation between partition function Q_{trans} and the thermodynamic properties like S and E.
3) 5 quanta of energy shared among 10 hormonic oscillators. Estimate the possible configurations and total number of microstates associated with this system
4) Discuss the concept of reciprocity relations and Onsager theorem.
5) Derive vibrational partition function.
Evaluate vibrational partition function for O_2 molecule at 525 ^{o}C. (Given- fundamental vibrational frequency = 1.32 x 10^{14} Hz)
6) Derive an expression for Sackur-Tetrode equation for translational entropy.
7) Describe the entropy production in chemical reactions.
8) Write on nuclear spin effects and symmetry numbers.
9) Derive the expression for entropy change for mixing of gases.
10) Illustrate exact and inexact differentials with suitable examples.

Q.6. Answer the following. **(8 marks each)**

1) Derive the expression for translational entropy.
2) Derive an expression for rotational partition function.
The rotational constant for HCl is 8.24 cm^{-1}. Calculate rotational partition function for HCl at 300 K. (σ = 1)
3) Define ensemble. Discuss in detail canonical and grand canonical ensembles.
4) Show that $Q_{trans} = (2\ \pi\ m\ k\ T)^{3/2}/h^3.V$. Write down the equation for S_{trans}.
5) Define ensemble. Discuss in detail canonical and microcanonical ensembles.
6) Estimate the rotational partition function, Q_{rot}, for O-H radical at 25^{o}C.
(Given r_{O-H} = 97pm).
7) Establish the relation between partition function $Q_{rotational}$ and the thermodynamic properties like S and E.
8) Calculate vibrational characteristic temperature of Nitrogen gas molecule and also vibrational partition function. (Given vibrational frequency = 2350 $cm^{-1,}$ T= 25^{0}C)
9) Calculate Qrot for N_2 molecule Given N-N bond length = 110 pm)
10) Derive the expression for entropy change for an isothermal reversible process.

Q.7. Answer the following. **(8 marks each)**

1) What is entropy? Derive the expressions for the change in entropy during the various physical transformations.

2) If E= f(T,V) and dE is an exact differential then prove that $(dE/dV)_T = T(dP/dT)_V - P$.
[Given: dq = dE + PdV and 1/T is an integrating factor]

3) Derive the expression for the Maxwell-Boltzmann distribution law. Write the significance of the term β.

4) Discuss in brief Einstein's theory for heat capacity of solid.

5) Discuss entropy production due to heat flow.

6) Illustrate Onsager's theory of microscopic reversibility

7) Derive the expression for entropy change for an isobaric process.

8) Discuss in detail various laws of thermodynamics.

9) Explain the concept of electron gas in metals

10) What is integrating factor? Prove that 1/T is an integrating factor for dq = nCvdT+PdV.

M. Sc. II, Sem. – IV Industrial Chemistry

Paper: HCT-402Pollution Monitoring and Control

Question Bank

For 4 marks

Unit I: Regulatory aspects and Removal of phenolic residues.

A) Give an account on Air (Prevention and Control of Pollution) Act 1981.
B) Give an account on Water (Prevention and Control of Pollution) Act 1974.
C) Write in short MINAS for sugar industries and distilleries.
D) Write in short MINAS for synthetic fiber industries and distilleries.
E) Write in short MINAS for sugar industries and synthetic fiber industries.
F) Write in short MINAS for distilleries and oil refineries.
G) Write in short MINAS for sugar industries and oil refineries.
H) Write in short MINAS for distilleries and synthetic fiber industries.
I) Write the Indian Standards IS-2490, IS-3360, IS-3307 and IS-2296.
J) Explain detail with necessary diagram the ion exchange method for phenol removal.
K) Explain detail with necessary diagram the steam gas stripping method for phenol removal.
L) Explain detail with necessary diagram the solvent extraction method for phenol removal.
M) Explain detail with necessary diagram the oxidation method for phenol removal.
N) Explain detail with necessary diagram the biological method for phenol removal.
O) Mention the sources of phenolic residues in the environment.

Unit II: Waste water treatment and Air pollution and its measurements.

A) Describe the sedimentation process for waste water treatment.
B) Describe the flocculation process for waste water treatment.
C) Describe the trickling filter process for waste water treatment.
D) Describe the activated sludge process for waste water treatment.
E) Describe the oxidation pond process for waste water treatment.
F) Describe the ion exchange process for waste water treatment.
G) Describe the oxidation pond process for waste water treatment.
H) Describe the reverse osmosis process for waste water treatment.

I) Discuss how CO and $NO_x$are analyzed in the air sample?

J) Explain the advanced waste water treatment methods for removal of nitrogen.

K) Explain the advanced waste water treatment methods for removal of phosphorus.

L) What are particulate matter? How they affects air quality and how they are harmful to human?

M) Discuss how $SO_2$and H_2S are analyzed in the air sample?

N) Discuss how CO and $H_2S$are analyzed in the air sample?

Unit III: Removal of heavy toxic metals and Polymer recycling.

A) Give an account on reduction process of chromium removal.

B) Give an account on precipitation method of chromium removal.

C) Give an account on ion exchange process of chromium removal.

D) Give an account on reverse osmosis method of chromium removal.

E) Give an account on lime coagulation process of chromium removal.

F) Give an account on absorption scheme of chromium removal.

G) Give an account on ion exchange process of mercury removal.

H) What is mean by heavy toxic metal? Describe their toxic effect on human.

I) What is polymer recycling? How commercial polymers are recycled?

J) What is melt processing? How it is helpful for pollution control?

K) Explain how chromium and mercury are poisonous to the environment.

Unit IV: Soil pollution and analysis, Water pollution and analysis.

A) Explain soil pollution and its sources.

B) Explain water pollution and its sources.

C) Define soil pollution and explain its pollutants.

D) Describe in short the analysis of moisture and total nitrogen of soil.

E) Describe in short the analysis of moisture and phosphorus of soil.

F) Describe in short the analysis of moisture and manganese of soil.

G) Describe in short the analysis of moisture and sulfur of soil.

H) Describe in short the analysis of sulfur and phosphorus of soil.

I) Describe in short the analysis of moisture and pH of soil.

J) Describe in short the analysis of pH and phosphorus of soil.

K) Describe in short the analysis of pH and sulfur of soil.

L) Describe in short the analysis of pH and total nitrogen of soil.

M) Describe in short the analysis of total acidity and basicity of water.

N) Describe in short the analysis of dissolved oxygen and chloride of water.

O) Describe in short the analysis of chloride and fluoride of water.

P) Describe in short the analysis of chloride and suspended solids of water.

For 8 marks

Unit I: Regulatory aspects and Removal of phenolic residues.

A) Discussthe Air (Prevention and Control of Pollution) Act 1981, its implication and application in industrial pollution control in India.

B) ExplaintheWater (Prevention and Control of Pollution) Act 1974, its implication and application in industrial pollution control.

C) Describe in detail with necessary figures the solvent extractionand biological methods for removal of phenolic residues.

D) Explain detail with necessary diagrams the ion exchange and steam gas stripping methods for treatment of phenolic residues.

E) Describe in detail with necessary diagrams the oxidation and solvent extraction methods for removal of phenolic residues.

F) Discuss the sources of phenolic residues in the environment and give an account of any two methods for removal of it.

G) What are phenolic residues in the environment? Mention their toxic effects on human and discuss themethods that are used for elimination of phenolic residues.

H) Discuss in detail the minimum national standards (MINAS) for sugar industries,distilleries, synthetic fiber industries and oil refineries.

I) How phenolic compounds are toxic to the human? Discuss any two methods for removal of phenolic compounds.

J) Describe in detail with necessary figures the solvent extractionand ion exchangemethods for removal of phenolic residues.

Unit II: Waste water treatment and Air pollution and its measurements.

A) Explainin detail any two tertiary treatment methods for waste water treatment with diagrams.
B) Discuss the nature of gaseous and liquid industrial effluents? Discuss how CO, SO_2, NO_x and H_2S are analyzed in the air sample?
C) Explainin detailany two primary treatment methods for waste water treatment with diagrams.
D) Discuss in detailany two secondary treatment methods for waste water treatment with diagrams.
E) Explainthe advancedwaste water treatment methods for removal of nitrogen and phosphorus.
F) Explainin detail sedimentation and trickling filter treatment methods for waste water treatment with diagrams.
G) Explainin detail flocculation and activated sludge processes for waste water treatment with diagrams.
H) Explainin detail ion exchange and electrolysis processes for waste water treatment with diagrams.
I) Explainin detail ion exchange and reverse osmosis methods for waste water treatment with diagrams.
J) Explainin detail oxidation pond and sedimentation processes for waste water treatment with diagrams.

Unit III: Removal of heavy toxic metals and Polymer recycling.

A) Describe in detail elimination of chromium by reduction and reverse osmosis method.
B) Explain in detail removal of chromium by precipitation and reverse osmosis method.
C) Describein detail removal of chromium by lime coagulation and ion exchange method.
D) Explainin detail eliminationof chromium by lime coagulation and absorption method.
E) Describein detail eliminationof chromium by reduction and precipitation method.
F) Explain in detail eliminationof chromium by ion exchange and precipitation method.
G) Explain in detail removal of mercury from gaseous and liquid streams.
H) Explain how mercury is toxic to the human and discuss in detail any two methods of mercury removal.

I) What are the sources of hexavalent chromium in the water? Explain any two methods of chromium removal.

J) What is mean by heavy toxic metals? Discuss the toxicity of chromium and mercury to the human and also give an account on chromium removal by precipitation method.

Unit IV: Soil pollution and analysis, Water pollution and analysis.

A) What is soil pollution? Explain analysis of soil for the factors like moisture content, pH andphosphorus.

B) Define soil pollution and discuss sources of soil pollution. Explain how the total nitrogen and phosphorus of soil are analyzed.

C) Define water pollution and describethe analysis of water for the factors such as chloride, fluoride and cyanide content.

D) Explain in detail soil pollution and pollutants.Describe the analysis of soil for the factors like total nitrogen, manganeseand phosphorus.

E) Discuss in detail the soil pollution and its sources. Explain how the moisture, total nitrogen and sulfur of the soil are analyzed.

F) Explain water pollution and describethe analysis of water for the factors like chloride, total alkalinity and dissolved oxygen.

G) Discuss about water pollution and describethe analysis of water for the factors liketotal acidity, total alkalinity and dissolved oxygen.

H) Describe soil and water pollution. Explain the analysis of soil for pH and moisture content.

I) What is soil and water pollution? Explain the analysis of water for dissolved oxygen and chloride content.

J) What is soil and water pollution? Explain the analysis of water for suspended solids and chloride content.

Advanced Organic Chemistry-II

M.Sc-II, Sem- IV

Organic Chemistry

Q. Answer the following

1. How to protect carbonyl functional group?

2. Explain mechanism of addition of IPC_2BH?

3. Explain various protecting groups for alkenes?

4. Discuss synthesis, mechanism and uses of Allyl boranes?

5. Discuss protecting groups for diols?

6. Explain preparation methods of organoboranes?

7. Give an account of the selective protection of $–NH_2$ group in peptide synthesis.

8. Write note on Wacker oxidation?

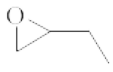
9. Discuss acetals/ketals as a protecting groups for alcohol?

10. Discuss Pausan Khand reaction?

11. Define Heck coupling and explain its mechanism?

12. Explain role of $Co_2(CO)_8$ in carbonylation reaction?

13. Write synthons for following target molecules?



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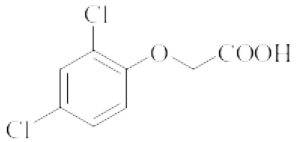

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14. Explain role of organoboranes in organic synthesis?

15. Define the following terms.

    a) Disconnection

    b) Functional group interconversion.

16. Explain various reactions given by Ferrocene?

17. Explain the following terms

    a) Synthon

b) Synthetic equivalent

18. With the help of suitable examples, explain disconnection approach.

19. Why transitional metals complexes having wide range of synthetic utility?

20. Explain the role of functional group transformation in organic synthesis with suitable example?

Q. Answer the following

1. Which are the protecting groups for amines?

2. Explain role of Ipc_2BH and $IpcBH_2$ in organic synthesis?

3. Explain principle of protection of alcohol functional group with suitable examples?

4. Explain stereoselectivity in hydroboration reaction?

5. Explain protecting and deprotecting groups for carboxylic acid?

6. Discuss the principle of protection of carbonyl group, and describe the use of cyclic acetal/ketals as protecting groups for carbonyl compounds?

7. What is organoboranes? explain regioselectivity in hydroboration reactions?

8. What is a protecting group? What are its salient features?

9. Comment on the use of silylating reagents for selective protection of functional groups in organic synthesis.

10. What are the requirements for a protecting group? Explain with suitable examples?

11. Explain synthetic utility of silicon complexes?

12. Which are the protecting groups used for alkynes?

13. Describe the use of the following as protecting groups in organic synthesis:

    a) TBDMS

    b) Fmoc

    c) THP

14. Discuss role of organoboranes in synthesis of EE, EZ, ZZ dienes.

15. Explain the importance of protecting groups in organic synthesis?

16. Illustrate the methods for the protection and deprotection of a carbonyl group in basic and acidic medium.

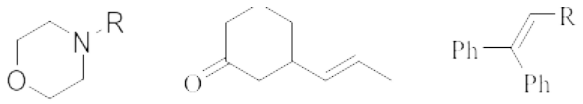
17. What is the role of organoboranes in synthesis of primary, secondary and tertiary alcohol?

18. Define hydroboration? Explain the role of hydroboration in chiral synthesis?

19. Explain role of manganese complexes in formylation reaction?

20. Discuss sonogashira coupling reaction and explain its role in organic synthesis?

21. Using disconnection approach, design the synthesis of the following molecules?



22. Explain properties of organoborane reagents?

23. Explain role of cobalt complexes in organic synthesis?

24. Explain catalytic cycle of Hiyama coupling reaction with suitable examples?

25. With help of Diels-Alder reaction explain two group C-C disconnection.

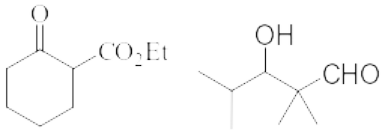
26. Explain synthetic utility of Suzuki coupling reaction?

27. Explain in detail allylic activation?

28. Discuss the guidelines used for suitable disconnections.

29. Discuss two-group C-X disconnections with suitable examples.

30. Suggest synthesis for the following compounds, using disconnection approach?



31. With the help of suitable examples, discuss one-group C-C disconnection.

32. Discuss Stille coupling reaction with its mechanism?

33. Discuss synthetic utility of Henry and Nef reactions?

34. Discuss reactions given by Fe-cyclopentadiene complex?

35. Explain Pd catalysed coupling reactions with mechanism?

36. Explain synthetic utility of Collman's reagent?

37. What is chemoselectivity? Dicuss the methods for solving the chemoselectivity problem in organic synthesis.

38. Discuss the factors governing the cyclisation reactions.

39. Discuss amine synthesis applying the disconnection approach.

40. Explain one-group C-X disconnection in ether?

41. Explain the term regioselectivity with suitable examples?

42. What is umpolung? Give examples of organic syntheses employing various umpolung reagents.

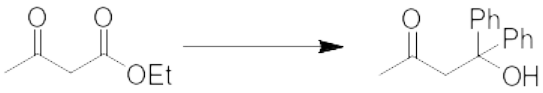
43. Discuss the various steps involving in coupling reaction?

44. Explain following terms with suitable examples?

    a) Stereoselectivity

    b) Enantioselectivity

45. Using a suitable protecting group, how would you bring about the following conversion via Grignard reaction?



46. Explain N-aryl and N-alkyl bond formation reactions?

47. Illustrate the methods for the deprotection of alcohol group in acidic medium?

48. Give four examples of organoboranes and explain its selectivity?

49. Explain following terms with suitable examples?

    a) Isomarization

    b) Transmetalation

50. Give a brief account of the methods to control chemoselectivity and regioselectivity problems in carbonyl condensations?

Question Bank

M.Sc.-II Semester-IV (Medicinal Chemistry)

Paper Name:- Pharmaceutical Dosage Forms (HCT-4.1)

04 Mark Questions

1) Write the classification of control release system.
2) Write the advantages of controlled release over conventional release system.
3) Write a short note on Oral controlled release system.
4) Write down the factors to be considered while designing of modified-release formulation.
5) Write down the pharmacopoeial requirements for parenteral with respect to sterility, excipients, containers, endotoxins and pyrogens.
6) Why there is need for dosage form design and give their reasons?
7) Write about dissolution testing in preformulation study.
8) Write the mechanism of drug degradation.
9) Define and give example of following ingredients.
    a) Aerosol propellant b) Plasticizer
    c) Tonicity agent d) Alkalinizing agent.
10) Write about sweetening agents used in pharmaceuticals.
11) Write a note on local routes of drug administration.
12) Write any four systemic routes of drug administration.
13) Write a note on important parenteral routes of drug administration.
14) What are the importance of dosage forms?
15) Describe briefly film coating of tablets.
16) Write a note on classification of suspensions.
17) Write the comparison between flocculated and Non-flocculated suspensions.
18) Write a note on stability of suspension.
19) What are the advantages of emulsion?
20) What are the advantages and disadvantages of parenteral preparations?

08 Mark Questions

1) Explain in detail various systems covered under continuous release system.
2) Write in detail In situ forming drug delivery systems (ISFD).
3) Explain in detail extended release oral drug delivery system.
4) Explain in detail delayed release oral drug delivery system.
5) Write down the pharmacopoeial requirements for parenteral with respect to particulates and injections.
6) Write down the excipients used in parenteral.
7) Explain in detail the formulation principles used in transdermal and topical preparations.
8) Write down the common formulation types of transdermal and topical formulations.
9) Write down the factors to be considered during formulating ophthalmic preparations.
10) Explain in detail topical, liquid and topical, semisolid ophthalmic preparations.
11) Explain in detail preformulation study.
12) Write in detail kinetics and shelf life of drug products.
13) Explain about enhancing stability of drug products.
14) Write about stability testing of pharmaceutical components and finished pharmaceutical products.
15) Explain about flavoring of pharmaceuticals.
16) Write about coloring of pharmaceuticals.
17) Write in detail about preservatives and preservative selection in pharmaceuticals.
18) Explain in detail about general preservative considerations and their mode of action.
19) Define “solid dosage forms”. How will you classify solid dosage forms? Write in brief about dentifrices and effervescent granules.
20) Write in detail about “Monophasic liquid dosage form”.
21) What are ‘emulsions’? State the different types of emulsions and also how will you distinguish them?
22) What are ‘Suspensions’? State the different types of suspensions.
23) What are ‘Ointments’? Classify different ointment bases used in the preparation of ointments. Describe briefly each base.
24) Write in detail the types of tablets.
25) What are quality standards and compendial requirements for tablets?
26) Why in vitro dissolution testing of solid dosage forms is important, explain in detail?

27) Write in detail about Wet granulation method used for the production of compressed tablets.

28) Explain Dry granulation method used for the production of compressed tablets.

29) Write in detail the formulation of suspension.

30) Write the classification of emulsion.

31) Explain the emulsifying agents used in formulation of emulsion and write the classification of emulsifying agents.

32) Describe in detail formulation of parenteral preparations.

33) Write the important characteristics required for ophthalmic preparation.

34) Write any two ophthalmic products.

35) What are the various evaluation test employed for ophthalmic preparations?

36) Write in detail about formulation and design of metered-dose inhalers.

37) Write in detail about formulation and design of dry-powder inhalers.

38) Write in detail about Bulk powders and Divided powders.

39) Explain in detail ingredients used in preparation of semisolids.

40) Describe in detail about propellants used in pharmaceutical aerosols.

Question Bank -2022

School of Chemical Sciences
Sumer 2022; CBCS pattern; Faculty: Science & Technology
M. Sc. Part II Semester IV examination; Polymer chemistry specialization
Course code: POLY CH 404
Course Title: Processing Technology and Polymer Properties (SCT 4.4)

Q . 01 to 20 Questions: Answer the following (4 mark each)

1. Write note on acid value with example.
2. Explain HDT in detail
3. Discus in short hardness and optical properties
4. Discus in detail water absorption
5. Explain in detail Softening point
6. Describe the dielectric strength and dielectric loss factor
7. Explain the refractive index
8. Discus the testing procedure for tire and adhesive
9. Describe the testing procedure for tubes and containers
10. Explain the % elongation at brake
11. Explain in brief General Features of single screw extrusion
12. Explain in brief Analysis of flow in Extrude
13. Explain in brief general features of twin-screw extruder
14. Describe in brief pultrusion
15. What is the blow molding with diagram
16. Discus the Compressive strength
17. Discus the rotational molding process with neat diagram
18. Describe the rheological state equation
19. Explain the dynamic mechanical behavior
20. Explain the stress-relaxation

Q . 01 to 50 Questions: Answer the following (8 mark each)

1. Explain in detail HDT and MFI with neat diagram
2. Explain in detail Izod impact test with neat diagram
3. Describe the glow haze and yellowness index neat diagram
4. Explain the volume restivity and breakdown voltage.
5. Describe in detail testing of films and pipes
6. Describe in detail ultimate polymer properties and structure relationship elastomer, fiber and plastic
7. Discus the testing of adhesive and laminate
8. Discus in detail stress strain curve in detail
9. Discus in short Tensile strength, tear strength, flexural strength
10. Explain in detail Maxwell and Voight model

11. Explain in detail Boltzmann's superposition principle
12. Explain the different testing procedures for products
13. Describe the identification of polymers by heating and burning tests
14. Describe the identification of elements and functional groups
15. Describe the moisture content and ash content
16. Describe the melting point and bulk-density
17. Explain the transmittance and photoelastic properties
18. Explain the Electrical properties of polymers
19. Explain the sample preparation procedures for dielectric constant
20. Describe the Processing thermoplastics material
21. Discus in detail calendaring with well labeled diagram
22. Discus the difference between compression molding and transfer molding
23. Draw neat labeled diagram and explain in detail twin-screw extruder
24. Explain the general features of single screw extrusion
25. Draw neat labeled diagram and explain in detail thermo forming
26. Explain the mechanism of flow and Analysis of flow in Extruder
27. Explain the blow moulding and casting
28. Draw neat labeled diagram and explain in detail Rotational moulding
29. Explain the calendering and it's analysis
30. Explain the structural foaming and pultrusion
31. Draw neat labeled diagram and explain in detail sandwitch moulding
32. Explain the preparation of material for moulding
33. Draw neat labeled diagram and explain in detail compression moulding
34. Draw neat labeled diagram and explain in detail transfer moulding
35. Explain the Effect of processing and micro structural changes
36. Discus in detail injection molding with well labeled diagram
37. Difference between injection molding and thermoforming
38. Explain the Processing of fibres and fabrics
39. Discus the spinning and post-spinning Processes
40. Describe the Gel Spinning, Phase Separation Spinning
41. Explain the application of rheological aspects in polymer processing
42. Describe the ideal fluid and Non Newtonian fluid with example
43. Explain the mechanical spectra, and explain factor affecting on it
44. Describe stress strain curve in detail
45. Discus the flow properties of viscoelastic polymers
46. Write the difference between ideal Newtonian and Non Newtonian fluid
47. Describe the factors affecting on mechanical spectra
48. Discus the generalized Maxwell model
49. Explain the general behaviors of polymer melts
50. Explain the role of additive in polymer processing with example

M. Sc. Part - II (Sem.-IV), CBCS pattern
PHYSICAL CHEMISTRY (w. e. f. Nov. 2021)
(Molecular Structure- II) HCT 4.3
QUESTION BANK

Time: 3Hours Total Marks: 80

Q.2. Answer the following. 16 (4X4)

1) Why a substance is a paramagnetic or diamagnetic?
2) Factors affecting the 'g' value in ESR.
3) Nuclear overhauser effect.
4) Explain the Lennard-Jones potential.
5) Pascal constants.
6) Limitations of Debye theory.
7) Write note on Exchange phenomena.
8) Zero field splitting in ESR.
9) Write note on Lennard-Jones potential.
10) Write note on Van Vleck general equation of magnetic susceptibility.
11) Spin –spin relaxation.in NMR spectroscopy.
12) Doppler effect in Mössbauer.
13) Kramer's degeneracy
14) Double resonance technique
15) Curie Temperature
16) Limitations of Langevin's theory
17) Larmor frequency
18) Dipole moment and ionic character
19) Chemical Shift
20) Doppler broadening in Mossbauer spectroscopy.

Q.3. Answer the following. (10+6 OR 8+8)

1) Discuss determination of dipole moment from dielectric measurements in pure liquids and in solutions.
2) Describe the experiment and instrumentation setup in NMR spectrometer.
3) Describe polarizability of molecules by Clausius-Mossotti equation.
4) Discuss in detail the principles of NMR spectroscopy.
5) Discuss factors affecting chemical shift in NMR.
6) Define diploe moment. Discuss vapour- temperature method for the determination of dipole Moment.
7) Derive an equation for intensity of total magnetization using Langevin's theory of paramagnetism
8) Calculate the molar susceptibility of pyridine by using Pascal constants.
(Given: atomic susceptibilities per g atom of C, H and ring N are -6.0×10^{-6}, -2.93×0^{-6} and -4.61×10^{-6} respectively)
9) In NMR spectroscopy for a nucleus with I = 1, obtain expression for allowed energy levels and frequency of transition in presence of magnetic field.
10) Predict the ESR spectrum of the following radicals
i) *(CF_2H), ii) *($^{13}CF_2H$), iii) Naphthalene $C_{10}H_8^-$

Q.4. Answer the following. (10+6 OR 8+8)

1) Discuss in detail the principle of Mossbauer spectroscopy.

2) Explain the terms magnetic permeability and magnetic susceptibility.
3) Discuss applications to coordination complexes and complex ions of transition metals as a Ferro and ferri magnetism.
4) Explain Isotropic and anisotropic hyperfine coupling constants in ESR.
5) Discuss in detail the Gouy method of determining magnetic susceptibility.
6) Discuss the various components of ESR spectrometer with schematic diagram.
Calculate the "g" value of $CH^{\bullet}_3$ radical which absorb at 0.329 T in spectrometer operating at frequency 9230 MHz. ($\beta = 9.273 \times 10^{-24}\ JT^{-1}$, $h = 6.626 \times 10^{-34}$ Js)
7) Define paramagnetic susceptibility. How is it determined experimentally?
8) Give the number of NMR signals and their splitting of the following compounds
i) propionic acid ii) Acetaldehyde iii) Acetic acid.
9) Explain with the help of chemical shift concept in NMR why -OH proton requires low field and =CH proton requires high field for methanol.
10) What is isomer shift in Mossbauer spectroscopy? Explain with examples.

Q.5. Answer the following. (10+6 OR 8+8)

1) Distinction between polar and non-polar molecules. Describe the Clausius –Mossotti equation of molar polarization.
2) Define the term coupling constant in NMR. Discuss the factors influencing the coupling constant.
3) What is dipole moment? Discuss applications of dipole moment measurement in the study of structure of compounds.
4) What are the advantages of TMS as internal standard reference in NMR study?
A compound show PMR peak at 240 HZ downfield from TMS peak operating at 60 MHz. What is value of τ?
5) What is polar and non-polar molecules? Derive Clausius –Mossotti equation of molar polarization.
6) Distinguish between ^{1}H and ^{13}C NMR spectroscopy
7) Define paramagnetic susceptibility. How is it determined experimentally?
8) Applying Crystal field theory, derive the expression for molar magnetic susceptibility in case of transition metal ion complexes.
9) Discuss Refraction method of dipole moment determination.
10) Discuss the parameters required for evaluating Mossbauer Spectra.

Q.6. Answer the following. (10+6 OR 8+8)

1) Describe Langevin's classical theory of diamagnetism and paramagnetism.
2) The half-life of the first excited state of Fe^{57} is 1.58×10^{-7} s. What is the line width of resonance? ($h = 6.626 \times 10^{34}$ Js, $\pi = 3.141$)
3) Discuss- i) Atomic and ionic susceptibility. ii) Curie- Weiss law.
4) Discuss the applications of Mossbauer spectroscopy of iron compounds with suitable examples.
5) Discuss the basic principles of ESR spectroscopy.
6) Derive an expression for molar susceptibility using Langevin's theory of diamagnetism.
7) What is relaxation timee? Distinguish between spin lattice and spin - spin relaxations.
8) Explain the Ebert's method of determining dipole moment
9) Explain with suitable example the calculation of number of equivalent protons from NMR spectra.
10) Calculate the recoil velocity of ^{119}Sn Mossbauer nucleus if the emitted y - ray has the frequency 5.76×10^{18} Hz ($N = 6.023 \times 10^{23}$), $h = 6.626 \times 10^{-34}$ Js, $C = 3.0 \times 10^{8}\ ms^{-1}$, Mass of $^{119}Sn \times 10^{-3}$ kg / $6.023 \times 10^{23} = 19.767 \times 10^{-26}$ kg).

Q.7. Answer the following. (10+6 OR 8+8)

1) Define chemical shift. Describe the factors affecting the chemical shift in NMR.
2) Discuss applications of ESR spectroscopy.

Calculate the frequency for an unpaired electron in a magnetic field of strength 0.35 T. (g=2, h= 6.626×10^{-34} Js)

3) Write note on- i) Fourier Transform and ii) double resonance in NMR.

4) Describe how the ESR spectrum helps to study kinetics of electron transfer reactions.

5) Describe interaction between spin and a magnetic field in NMR spectroscopy

6) Describe the working of a Mossbauer spectrometer with a neat sketch.
If the energy of emitted γ-rays from the first excited state of Fe^{57} nucleus is 14.4 keV. Calculate its recoil energy (N = 6.023×10^{23}, 1keV = 1.6×10^{-19} J, c= 3×10^{8} ms^{-1})

7) Derive Curie-Weiss law and explain how Curie point can be determined.

8) At 27 °C, a coordinate compound (mol. Wt. 220 g mol^{-1}) has density equal to 3.20 gem^{-3}. If it contains three unpaired electrons, calculate the molar magnetic susceptibility and the magnetic susceptibility.

9) What are the advantages of using tetramethylsilane as a standard for NMR spectroscopy? An NMR instruments operates a 300 MHz. Find the value of strength of magnetic field. (h = 6.625×10^{-34} JS. g_N = 5.585 and βN = 5.05×10^{-27} JT^{-1}).

10) Describe the double resonance phenomena in ESR spectroscopy.

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Question Bank

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M. Sc. (Part-II) (Semester-IV) Examination- March/April 2022

Physical Chemistry

(Paper HCT 4.2): Chemical Kinetics (CBCS)

Q.2. Answer the following. - (4 marks each)

1. In an acid catalysed reaction differentiate between protolytic and prototropic mechanism.
2. Write a general mechanism of an enzyme catalysed reaction and obtain an expression for Michaelis-Menten constant.
3. The $t_{1/2}$ of reaction halved as the initial concentration of the reactant is doubled. Estimate the order of the reaction.
4. For the first order reaction, the activation energy is 105 kJ mol^{-1}. Calculate the entropy of activation for this reaction.
5. For a consecutive reaction

$$A \xrightarrow{k_1} B \xrightarrow{k_2} C$$

The values of k_1 and k_2 are 45 and 15 h^{-1} respectively calculate the time required for the concentration of B to reach maximum.

6. For the hydrolysis of sulfamic acid k= 1.16×10^{-3} moles $lit^{-1}s^{-1}$ at 100^0C, while Ea = 30.5 kcal/mole. From these data find $\Delta G^{\neq}$, $\Delta H^{\neq}$ and $\Delta S^{\neq}$. .
7. Explain the effect of temperature on enzyme catalysis.
8. Write on pH dependence of rate constants of catalysed reactions.
9. Write a note on steady state approximation.
10. Explain the assumptions of conventional transition state theory.
11. What are acidity functions? Explain their significance.
12. What is Lineweaver-Burk plot? What information can be obtained from the plot?
13. What is an autocatalyzed reaction? Explain its kinetics with a suitable example.
14. Discuss weakness of the collision theory of reaction rates.
15. Calculate the entropy and Gibbs free energy of activation for the second order decomposition

of NO_2 at 500K. (Given: Ea = 111 kJ/mole and A = $2x10^9$ moles/lit/sec)..

16. Comment on branched chain reactions.

17. Write on general characteristics of catalytic reactions.

18. The gaseous decomposition of ozone takes place as $2O_3 \rightarrow 3O_2$

the rate is $-d[O_3]/dt = k [O_3]^2/[O_2]$ prove that the proposed mechanism is correct

$O_3 = O_2 + O$ fast eqillibrium

$O + O_3 \rightarrow 2O_2$ slow.

19. Explain graphically how catalyst provides alternative path for the reaction.

20. Illustrate the effect of temperature on the rate of the chemical reactions.

Q.3. Answer the following. (8 marks each)

1. Using vibrational partition functions of reactants A and B obtain an expression for the rate constant.
2. Explain how the activation energy, enthalpy of activation and entropy of activation of a reaction are calculated.
3. Discuss in detail the kinetics of first-order opposed first-order equilibrium reaction.
4. Obtain an expression for the maximum concentration of an intermediate is a consecutive reaction.
5. Explain general aspects of chain reaction with a suitable example.
6. Define what is meant by a saddle point, reaction coordinate and explain the tunnelling effect.
7. Using Lindemann's unimolecular reaction mechanism derive a rate expression and explain its limiting cases.
8. Obtain an expression for the maximum concentration of an intermediate in a consecutive reaction.
9. A reactant M gives simultaneously the products N and O with rate constants k_n and k_o respectively. Derive an expression for the overall rate constant of the reaction.
10. For a consecutive reaction

$$A \xrightarrow{k_1} B \xrightarrow{k_2} C$$

The values of k_1 and k_2 are 1.62×10^5 and 5.4×10^4 sec^{-1} respectively. Calculate the time required for the concentration of B to reach maximum. .

Q.4. Answer the following. (8 marks each)

1. Derive a rate expression for the reaction between H_2 and Br_2.
2. Explain the weaknesses of collision theory with suitable examples.
3. Obtain an expression for the time at which the intermediate reaches its maximum concentration in a consecutive reaction.
4. Discuss in detail the kinetics of second-order opposed first order equilibrium reaction.
5. Give an account of the theory of absolute reaction rates.
6. Discuss the kinetics of consecutive reaction. $A \rightarrow B \rightarrow C$. Calculate the time when the concentration of B will be maximum and also find out that concentration.
7. Give the salient features of the collision theory and transition state theory.
8. Discuss critically the effect of temperature on the reaction rates with particular mention of the significance of activation energy.
9. Discuss in detail with suitable mechanism the kinetics of thermal decomposition of acetaldehyde.
10. Construct a potential energy surface. Explain saddle point, path and reaction coordinates.

Q.5. Answer the following. (8 marks each)

1. Using potential energy surface explain the reaction between H and H_2.
2. Explain in detail how activated complex theory helps in calculating $\Delta S^{\#}$ and $\Delta H^{\#}$.
3. Illustrate the rate expression for second order reaction with equal initial concentration of reactants. Express $t_{1/2}$ for a reaction.
4. Illustrate the kinetics of parallel reaction with suitable example.
5. Describe enzyme catalysed reaction
6. Construct a potential energy surface. Explain saddle point, path and reaction coordinates

7. Derive the rate constant expression for second order reaction with equal initial concentration of reactants. Mention half life time expression for it.

8. Describe Hinselwood unimolecular theory

9. Describe integration and graphical method for determination of order of a reaction

10. Describe with the help of potential energy surfaces simplest reaction like

$$D + H_2 \rightarrow DH + H$$

Q.6. Answer the following. (8 marks each)

1. Give the thermodynamic and partition function approach to transition state theory.
2. Using Lindemann theory, show that $k_{uni}=k_1k_2/k_{-1}+k_2/[A]$
3. With the help of energy profile discuss the activated complex formation in exothermic and endothermic reactions.

4. Show that for gaseous reaction $A+B\rightarrow(AB)\# \rightarrow$ Products, $E_a = \Delta H^{\#}+2RT$

5. Discuss kinetics of opposing reactions.

6. Draw potential energy contour diagram for linear XYZ system as a function of internuclear distances. Illustrate the diagram.
7. What are oscillatory reactions? Discuss in detail their mechanism.
8. Discuss kinetics of parallel reactions.
9. Integrate the rate expression for second order reaction with equal initial concentrations of the reactants. What is meant by half life time of a reaction?
10. Discuss kinetics of chain reactions.

Q.7. Answer the following. (8 marks each)

1. Illustrate the kinetics of parallel reaction with suitable example.

2. Discuss collision theory of bimolecular gas phase reaction.

3. Applying SST, discuss the kinetics of ozone decomposition reaction.

4. Discuss kinetics of branched chain reactions

5. Giving the coordinates required to describe the position of atoms in the reaction $D+H_2 \rightarrow DH+H$, plot potential energy surfaces.

6. Describe the counter map of the potential energy surface for the reaction $D+H_2 \rightarrow DH+H$

7. Show that for the reaction involving simple molecules, the collision theory and activated complex theory give identical results.

8. Integrate the rate expression for first order reaction. What is meant by half life time of a reaction?

9. Discuss kinetics of consecutive reactions.

10. Describe the molecular beam method for studying molecular reaction dynamics.

Question Bank

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

M. Sc. (Part-II) (Semester-IV) Examination- March/April 2022

Physical Chemistry

(Paper OET 4.1): Surface Chemistry (CBCS)

Q.2. Answer the following. - (4 marks each)

1) Show that for the spreading coefficient of liquid B on the surface of liquid A,

$S_{B/A} = \gamma_A - \gamma_B - \gamma_{AB}$ where γ_A, γ_B, and γ_{AB} are the surface tension of liquid A, liquid B and interfacial tension between liquid A and B.

2) Explain how critical micelle concentration can be determined using surface tension measurements.

3) Discuss spreading of benzene on the surface of water.

4) The ratio of vapour of droplet to that of water is 2.95 at 27^0C. The surface tension of water is 71×10^{-3} Nm^{-1}. Calculate the radius of the droplet.

5) Discuss maximum bubble pressure method of determination surface Tension of liquids.

6) Explain the terms cohesion and adhesion energy of the liquids in terms of the surface tension.

7) Derive the expression for Herkins-Jura Equation.

8) Describe Bartell method of determination of contact angle made by the liquid with the solid surface.

9) State and explain Trube's rule.

10) What is surface tension? Describe maximum bubble pressure method of determination of it.

10) Write a note on micelle and reverse micelle.

11) What is sintering? Illustrate sintering mechanism.

12) Describe contact angle hysteresis.

13) What do you mean by lubricant? Write on solid lubricants.

14) For CTAB the free energy of micellization is -7.8 kcal mol^{-1} at 298 K. The calorimetric heat of micellization is 2.2 kcal mol^{-1}. Calculate entropy change of micellization.

15) What are the factors that affects heat of adsorption?

16) Write a note on Tammann temperature and its importance

17) Write a note on selective wetting.

18) For a 0.2 M solution of an acid in water at 175^0C the rate at which the surface tension varies with concentration $\frac{-d\gamma}{dC}$ is -0.05 J $m^{-2}M^{-1}$. Determine the surface excess concentration.

19) Initial spreading coefficient of benzene water is positive while final spreading coefficient is negative. Why?

20) Explain with suitable example method of preparation of organic nanoparticles based micro-emulsion.

Q.3. Answer the following. (8 marks each)

1) Mention different types of emulsions. Describe conductivity and fluorescence method of identification of types of emulsion.

2) Derive Gibb's Adsorption equation with usual notation for dilute solution.

4) Derive Young and Laplace equation for vapor pressure at curved, plane and spherical interfaces.

5) Describe Langmuir-Blodget films

6) Discuss re-precipitation method of preparation of aqueous suspension of organic nanoparticles.

7) Describe Chemisorption phenomenon with suitable examples.

8) What are emulsions? Mention its types. Write on stabilization of emulsions.

9) Give an account of physical states of monomolecular insoluble films.

10) What is catalysis? Discuss heterogeneous catalysis.

Q.4. Answer the following. (8 marks each)

1) Write on Langmuir-Adam surface pressure balance.

2) What is surface tension? Describe drop weight method of determination of surface tension of liquids.

3) Deduce two dimensional ideal equations to describe physical states of monomolecular films of surfactant on liquid surfaces.

At 298 K and a surface pressure of 2 dynes per cm, lauric acid occupies an area of 2500 A^2 per molecule on a water surface. Assuming the film to be a two dimensional ideal gas, calculate the gas constant in ergs per degree per mole.

4) Give a brief comment on the factors affecting adsorption

5) Describe tilting plate method of determination of contact angle.

6) Discuss theory and energetic of micellization.

7) Mention different types of surfactants. Write on classification of surfactants.

8) What are the solid lubricants? Discuss the mechanisms of hydrodynamic and boundary lubrication.

9) Explain the concept of positive and negative adsorption with suitable examples.

10) Write on the role of micelle in solubilization of water insoluble organic materials.

Q.5. Answer the following. **(8 marks each)**

1) Describe 'Point B' method of determination surface area of an adsorbent.

The adsorption of nitrogen on silica studied at 77K by Point B method has given the volume of gas corresponding to Point B , reduced to standard condition of P=1 atm and T=273 K as 40 cc . Calculate surface area of silica if area of nitrogen molecule is 16.2 A^0

2) Why falling drop of liquid is spherical? Describe drop number method of determination of surface tension of liquid.

3) What is 'point B' method? Discuss determination surface area of the solids by using this method.

4) Derive Langmuir adsorption isotherm and explain its advantages and disadvantages.

5) Derive an equation for Langmuir adsorption isotherm. Discuss experimental verification this equation for the given system of adsorbate and adsorbent.

6) Derive an equation for the spreading coefficient for the spreading of liquid B on the surface of liquid A.

7) What causes the surface tension (γ) of a pure aqueous liquid to arise?

8) What do you mean by micellization. Discuss its energetics.

9) Describe drop number method of determination of surface tension of liquids

10) Define detergency. Explain various factors involved in detergent action.

Q.6. Answer the following. **(8 marks each)**

1) Derive the expression, $\Delta P = \frac{2\gamma}{r}$ using the concept of surface free energy change in droplet.

2) Discuss on molecular gaseous film using ideal gas equations.

3) Describe capillary rise method of determination of contact angle made by the liquid with the solid surface.

4) Discuss positive and negative adsorption.

5) Write in detail on Langmuir-Blodget films

6) Mention emulsion types and methods of identification of emulsion types.

7) Write on applications of micelles.

8) Explain the colloidal electrolytes and ionic micelle

9) Explain the terms pre-sintering and final sintering with proper examples.

10) Discuss the identification tests of types of emulsion in detail.

Q.7. Answer the following. **(8 marks each)**

1) What are nanoparticles? Describe the method for its preparations.

2) Write on cohesion and adhesion phenomena and their energy.

3) Discuss in brief the theory and energetic of micellization.

For sodium dedocyl sulphate the free energy of micellization is -15.7 kcal $mole^{-1}$ at 298 K. The calorimetric heat of micellization is 0.75 kcal $mole^{-1}$. Calculate entropy change of micellization.

4) Derive Gibb's adsorption equation with usual notations.

5) Give an account of volumetric method of measuring gas adsorption.

6) Derive Kelvin equation for the vapour pressure inside and outside the liquid.

7) Illustrate the gravimetric method of gas adsorption.

8) What are solid lubricants? Discuss the mechanism of hydrodynamic and boundary lubrication.

9) Write in detail on kinetics of chemisorptions.

10) What is contact angle? Describe Tilting plate method of determination of contact angle.

M.Sc. II (Semester-IV) (CBCS) Examination

Analytical Chemistry (Pharmaceutical Analysis) SCT 4.2

Question Bank

Q. 2 Answer the following (4 marks each)

1. **E**xplain in detail lubricant
2. Discuss injections with suitable example
3. Explain advantages of aerosol
4. How limit test of lead is carried out for pharmaceutical sample?
5. Explain procedure for determination of ash in ginger.
6. Discuss pills in details
7. Write a note on liquid dosage form
8. Explain the role of FDA in pharmaceutical industries
9. Write a note on capsule
10. Explain procedure for determination of trace water content in pharmaceutical product.
11. How will you differentiate between hard and soft capsule
12. Explain classification of ointment bases
13. How personal error can be controlled?
14. Explain how sulphated ash in aspirin is determined?
15. What is Karl-Fisher reagent? How it is prepared?
16. Explain how salicylic acid is used in mouth wash
17. What are advantages of aerosole?
18. What precautions should taken in manufacture of blood product
19. Write a note on pharmaceutical raw materials
20. Write a note on chemical instability of drug substances

Q. 3 Answer the following (6 marks each)

1. Discuss disintegration test in detail
2. Explain the reaction with container material.
3. Write a short note on visit to quality control.
4. What is contamination? Explain the factors which are responsible for contamination in pharmaceutical products

5. 0.314 gm benzocaine [$C_9H_{11}NO_2$] dissolved in mixture of 25 ml HCl and 50 ml distilled water. After cooling this solutionto 15°C titrate with 0.095 N $NaNO_2$ gave burette reading 12,2 ml. Calculate percentage of benzocaine in the given sample. [At. Wt.: C-12, H-1, O-16, N-14].
6. Explain labeling procedure in pharmaceutical drug synthesis
7. Discuss the terms pills and capsules
8. Explain in detail dissociation test.
9. 0.32 gm of paracetamol [$C_8H_9NO_2$] was dissolved in 30 ml 2 N H_2SO_4. This solution was titrated with 0.1 N cerric ammonium sulphate using ferroin sulphate indicator gave a burette reading 8.1 ml. Calculate the percentage of pracetamol. [At. Wt.: C-12, H-1, O-16, N-14].
10. What is tablet? Describe different types of tablet
11. Discuss in detail clinical study in development of new drug
12. Explain dissociation test in detail
13. What is ash value? Explain determination of sulphated ash value for given vegetable drug sample
14. What is atmospheric contamination? Discuss it's preventive measures.
15. What is Karl-Fisher reagent? How it is prepared and standardized?

Q. 4 Answer the following (8 marks each)

1. How physical changes occur in pharmaceutical products? Explain with example
2. What are general errors occur during packaging of pharmaceuticals
3. Discuss in detail about microbial contamination
4. Explain good manufacturing practices in packaging and labeling control
5. Discuss different phases of new drug approval and test in detail
6. What is Karl-Fisher? How it prepared and standardized?
7. Discuss in detail ophthalmic preparation in dosage form
8. Describe in detail chemical test for arsenic
9. Explain in detail about pharmaceutical raw materials
10. An ascorbic acid [$C_6H_8O_6$] sample, 0.3 gm was dissolved in 30 ml distilled water and diluted to 100 ml. 25 ml of diluted solution titrated with 0.1 N iodine solution using starch as an indicator. The titration reading was 17.5 ml. Determine the % of ascorbic acid in the given sample. [At. Wt.: C-12, H-1, O-16].
11. What is ash value? How sulphated ash is determined for vegetable drug sample?

12. What is Karl-Fisher? How it prepared and standardized?
13. What is ash value? How sulphated ash is determined for vegetable drug sample?
14. 0.59 gm sample containing calcium lactate [$C6H_{10}O6Ca5H2O$] was dissolved in 100 ml of water containing 2 ml of HCl. This solution was titrated with 0.05 M EDTA using muroxide naphtha indicator gave a burette reading 24.2 ml. Calculate the % of calcium lactate in given sample. [At. Wt.: C-12, H-1, O-16, Ca-20].
15. Explain general procedure for tablet manufacturing

Q. 5 Answer the following (10 marks each)

1. What is FDA? Discuss in detail how FDA control pharmaceutical and cosmetic Industries?
2. Discuss in detail container contamination of various pharmaceutical substances
3. Explain loss on drying and loss on ignition. How personal error is controlled?
4. How ointment bases are classified? Discuss uses of ointment and cream as dosage form
5. Discuss role of manitol in injection and role of salicylic acid in mouth wash
6. What is FDA? Discuss in detail how FDA control pharmaceutical and cosmetic industries?
7. Discuss in detail ophthalmic preparation in dosage form
8. What is contamination of pharmaceuticals? Discuss in detail about contamination due to process error
9. Explain in detail about atmospheric contamination and particulate contamination
10. Explain loss on drying and loss on ignition. How personal error is controlled?