SH CHE—11

5th Semester Examination, 2021

Time : 3 hours

Full Marks : 60

Answer any **one** Group as per your Syllabus

Answer from **all** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

GROUP – A

(MODEL SYLLABUS)

(ORGANIC CHEMISTRY - IV)

SECTION – A

1. Answer *all* questions : 1×8

   (*a*) Hypsochromic shift is also called _____ shift.

(*b*) Which is the colour enhancing group between chromophore and auxochrome ?

(*c*) Due to hydrogen bonding what happens to wave number of IR absorption ?

(*d*) Which inductive effect raises the wave number of IR absorption ?

(*e*) Shielding shifts the NMR signal _____ field.

(*f*) How many NMR signals are obtained for $CH_3-CH_2-\underset{\underset{OH}{|}}{CH}-CH_3$?

(*g*) Name one aldopentose.

(*h*) What is the emperical formula of cellulose ?

SECTION – B

2. Answer any *eight* of the following : $1\frac{1}{2}\times 8$

(*a*) Arrange the following electronic transitions in order of increasing energy :

$n \rightarrow \pi^*, \pi \rightarrow \pi^*, \sigma \rightarrow \sigma^*, n \rightarrow \sigma^*$.

(*Continued*)

(*b*) State Lambert-Beer's law.

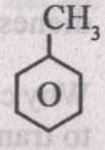
(*c*) What are chromophores ? Give examples.

(*d*) What are symmetric and asymmetric stretching vibrations ?

(*e*) Arrange the following in increasing order of their IR spectra wave numbers.

Formaldehyde, Acetaldehyde and Acetone

(*f*) Predict the number of NMR signals of following :

$(CH_3)CH-OH$, $(CH_3)_3C-NH_2$, 

(*g*) Indicate multiplicity of different NMR peaks of $CH_3-CH(Br)-COOH$.

(*h*) Name the factors that affect chemical shift of NMR spectral peaks.

(*Turn Over*)

(*i*) Draw Haworth's projection formula for α-D(t) Glucopyranose.

(*j*) Give one example each for the following :

reducing sugar, non-reducing sugar and non-sugar.

SECTION – C

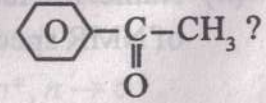
3. Answer any *eight* of the following : 2×8

(*a*) Why aniline shows hypsochromic shift in acid solution ?

(*b*) What are homoannular and heteroannular dienes ?

(*c*) Why cis-stilbene has lower λ_{max} as compared to trans-stilbene ?

(*d*) Explain different types of bending vibrations ?

(*e*) Why $CH_3-\overset{\overset{O}{\|}}{C}-CH=CH_2$ has higher IR spectral wave number than  ?

(*f*) How intermolecular and intramolecular Hydrogen bonding can be distinguished from IR spectra of compounds ?

(*g*) Why TMS is used as reference standard in NMR spectra analysis ?

(*h*) What is significance of Coupling constant in NMR spectra ?

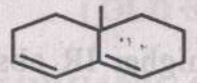
(*i*) Explain Killiani-Fischer synthesis in carbohydrate interconversions.

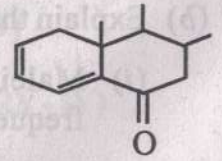
(*j*) Draw the structure of maltose. What are its hydrolysis products ?

SECTION – D

Answer **all** questions : 6×4

4. (*a*) Calculate λ_{max} for the following : 3 + 3

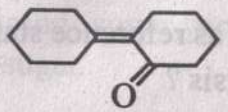
(*i*) 

(*ii*) 

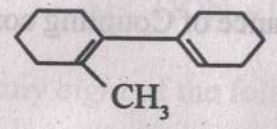
Or

(*b*) Calculate λ_{max} for the following : 3 + 3

(*i*)



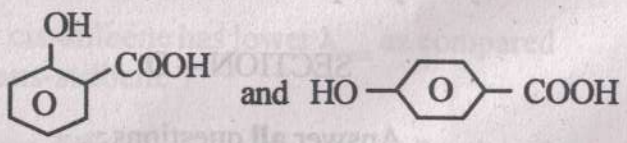
(*ii*)



5. (*a*) How can you distinguish between the following pairs by IR spectra ? 3 + 3

(*i*) CH_3COCH_3 and CH_3CH_2OH

(*ii*)



Or

(*b*) Explain the following : 3 + 3

(*i*) Maleic acid has higher IR absorption frequency than fumaric acid.

(*ii*) Finger print region in IR spectra is most important.

6. (*a*) Write a note on spin-spin coupling in NMR spectra of compounds. 6

Or

(*b*) Discuss about NMR spectra of 1, 3-dichloro-propane. 6

7. (*a*) Write a note on mutarotation. 6

Or

(*b*) Explain : 3 + 3

(*i*) Ruff's degradation

(*ii*) Epimers and anomers.

GROUP – B

(OLD SYLLABUS)

(ORGANIC CHEMISTRY - IV)

SECTION – A

1. Answer *all* questions : 2×6

(*a*) Write the structural formula of pyrimidine and purine.

(*b*) Distinguish between coenzymes and cofactors.

(*c*) What is isoelectric point ? Explain.

(*d*) What is rancidity of oils and fats ?

(*e*) Define catabolism and anabolism.

(*f*) Mention two important medicinal uses of curcumin.

SECTION – B

Answer **all** questions as directed : 12×4

2. (*a*) Give one method of synthesis each for adenine and guanine. 3 + 3

(*b*) Define and give one example each for competitive, uncompetitive and non-competitive enzymes. 2 + 2 + 2

Or

(*c*) (*i*) Write the three components of a nucleotide. 3

(*ii*) Give one method of synthesis of Thymine. 3

(*d*) Give mechanism of enzyme action taking trypsin as example. 6

3. (*a*) Explain following methods of synthesis of α-amino acids. 3 + 3

(*i*) Strecker synthesis

(*ii*) Gabriel synthesis

(*b*) Explain why α-aminoacids possess low values for pka and pkb. 3 + 3

SH CHE – 12

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GROUP – A

(MODEL SYLLABUS)

(PHYSICAL CHEMISTRY-V)

SECTION – A

1. Answer *all* questions : 1×8

(*a*) The + and – signs of lobes of orbitals represent _____ of the wave function.

(*b*) Which theorem is expectation-value postulate of quantum mechanics ?

(*c*) If $\int_{-\infty}^{+\infty} \psi\psi^* dx = 1$, the wave function is _____ .

(*d*) Between s–s covalent bond and p–p covalent bond, which is stronger ?

(*e*) Which of the following does not show microwave spectra ?

$HCl, H_2O, CO_2, CO.$

(*f*) The number of vibrational degrees of freedom for a linear molecule having "*n*" number of atoms is _____ .

(*g*) Between singlet and corresponding triplet states which is lower in energy ?

(*h*) Between fluorescence and phosphorescence which involves transition between two states of different multiplicity ?

SECTION – B

2. Answer any *eight* of the following : $1\frac{1}{2} \times 8$

(*a*) What is a free particle ?

(*b*) Define zero point energy.

(*c*) Name three types of operators used in quantum mechanics.

(*d*) Define resonance. What is resonance energy ?

(*e*) Write different canonical structures of Carbon monoxide.

(*f*) Write the shapes of resulting BMOS for following overlaps of a.os S–S , S–P and P–P.

(*g*) Name three rules which are obeyed for filling electrons in MOs.

(*h*) What do you understand by Raman Scattering ?

(*i*) State and explain Grotthus-Draper law of photochemical activation.

(*j*) What is photosensitisation ? Give an example of this.

SECTION – C

3. Answer any *eight* of the following : 2×8

(*a*) What is quantization of energy ?

(*b*) What is the degeneracy of nth energy state ?

(*c*) Write Schrödinger equation in spherical polar coordinates for one electron system.

(*d*) Distinguish between BMO &ABMO.

(*e*) Draw MO diagram of LiH molecule and calculate bond order.

(*f*) What are localised and non-localised molecular orbitals ? Give examples.

(*g*) What is Born-Oppenheimer approximation ?

(*h*) Explain spin-forbidden and symmetry forbidden transitions.

(*i*) What is chemiluminescence ? Give two examples.

(*j*) Explain internal and external quenching.

SECTION – D

Answer **all** questions : 6×4

4. (*a*) Apply Schrödinger equation to particle in one-dimensional box. 6

Or

(*b*) Discuss rigid rotator model of rotation of diatomic molecules. 6

5. (*a*) Compare LCAO–MOT and VBT. 6

Or

(*b*) Explain MO energy levels of linear and angular geometrics of AH_2 type molecule on the basis of qualitative MOT. 6

6. (*a*) Write notes on P, Q and R branches. 2 + 2 + 2

Or

(*b*) Write notes on effect of isotopic substitution on rotational spectrum of diatomic molecule. 6

7. (*a*) Explain role of mutual exclusion and compare the intensities of stokes and anti stokes lines. 3 + 3

Or

(*b*) Write notes on : 3 + 3

(*i*) Photochemical equilibrium

(*ii*) Causes for low and high quantum yield.

GROUP – B

(OLD SYLLABUS)

(PHYSICAL CHEMISTRY-V)

SECTION – A

1. Answer *all* questions : 2 × 6

(*a*) Write Schrödinger equation for one electron system in spherical polar coordinates.

(*b*) How is Hamiltonian operator $\hat{H}$ is related to Laplacian operator ∇^2 ?

(*c*) What is the principle of LCAO ?

(*d*) What do you mean by hot bands ?

(*e*) Give an example of predissociation ?

(*f*) State Grotthus-Draper law of photochemical activation and Stark-Einstein's law of photochemical equivalence.

SECTION – B

Answer **all** questions : 12 × 4

2. (*a*) Write the postulates of quantum mechanics. 6

(*b*) Write notes on : 3 + 3

(*i*) Zero point energy

(*ii*) Heisenberg's uncertainty principle.

SD CHE –01

5th Semester Examination, 2021

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GROUP – A

(MODEL SYLLABUS)

(POLYMER CHEMISTRY)

SECTION – A

1. Answer *all* the following questions : 1×8

   (*a*) What is IUPAC system name of the polymer $(-CH_2-CH_2-CH_2-CH_2-CH_2-)$?

(*b*) A polymer having random arrangement of pendant groups on each side of the chain is called _____ polymer.

(*c*) The number of reactive sites of a monomer is called its _____ .

(*d*) The ratio of $\overline{M}w/\overline{M}n$ of Polymers has been named as _____ .

(*e*) For symmetrical polymers $T_m =$ _____ T_g.

(*f*) The viscoelastic properties of the polymers at all temperatures are explained by an equation called _____ equation.

(*g*) The monomer for Teflon is _____ .

(*h*) The polymer formed from chloroprene monomer is called _____ .

SECTION – B

2. Answer any *eight* of the following : $1\frac{1}{2} \times 8$

(*a*) Name three types of copolymers according to distribution of structural units.

(*b*) Name three types of polymers basing upon tacticity.

(*c*) Give composition of Ziegler-Natta catalyst.

(*d*) Give definition of glass trasition temperature and name two factors which affect it.

(*e*) Write full forms of the abbreviations DSC, DTA and TGA relevant to polymers.

(*f*) Name any three methods used for the determination of molecular weights of polymers.

(*g*) How is Nylon 66 prepared ?

(*h*) Name one use for each PVA, Teflon and polyethylene.

(*i*) Name any three conducting polymers.

(*j*) Name any three types of polymerisation techniques in liquid phase.

SECTION – C

3. Answer any *eight* of the following : 2×8

(*a*) What are addition and condensation polymers ? Give one example for each.

(*b*) Distinguish between thermo setting and thermo plastic polymers.

(*c*) Explain the relationship between degree of polymerisation and extent of reaction.

(*d*) What do you understand by $\overline{M}z$? What is the relation between $\overline{M}n$, $\overline{M}w$ and $\overline{M}z$?

(*e*) What are Buna-N and Buna-S rubbers ?

(*f*) Explain how the structure of polymer affects the crystalline melting point.

(*g*) Distinguish between inhibition of polymerisation and retardation of polymerisation.

(*h*) What is living polymerisation ?

(*i*) What are biodegradable polymers ? Give two examples of such polymers.

(*j*) How is PVC polymer prepared ? Write two uses of it.

SECTION – D

Answer **all** questions of the following : 6×4

4. (*a*) Discuss classification of polymers on various basis. 6

Or

(*b*) What are bifunctional and poly-functional system monomers ? Give examples of each type. 3 + 3

5. (*a*) Discuss mechanism and kinetics of copolymerisation. 3 + 3

Or

(*b*) Discuss mechanism and kinetics of cationic polymerisation. 3 + 3

6. (*a*) Discuss viscometry method of determination of molecular weight of polymers. 6

Or

(*b*) Discuss Osmometry method determination of molecular weight of polymers. 6

7. (*a*) How phenol-formaldehyde resins are prepared ? Distinguish between bakelite and novolac. 4 + 2

Or

(*b*) Write method of preparation and uses of : 3 + 3

(*i*) Polystyrene

(*ii*) Polyvinyl acetate.

GROUP – B

(OLD SYLLABUS)

(POLYMER CHEMISTRY)

SECTION – A

1. Answer any *six* of the following : 2 × 6

(*a*) What do you understand by Functionality of a monomer ? Find the functionality of Phenol.

(*b*) Name the following polymers by IUPAC system.

(*i*) $(-\underset{\underset{OH}{|}}{CH}-CH_2-)_n$ (*ii*) $(-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2-)_n$

(*c*) Show termination of radical chain growth polymerisation by any one method.

(*d*) Mention names of any two polymerisation techniques.

(*e*) What are four types of molecular weights of polymer ?

(*f*) What is WLF equation ?

(*g*) Which theory discusses thermodynamics of polymer solution ?

(*h*) How is Nylon 66 prepared ?

SECTION – B

Answer **all** questions : 12×4

2. (*a*) Give classification of polymers on different basis. 6

(*b*) Give classification of polymerisation processes. 6

Or

(*c*) Explain the relationship between functionality extent of reaction and degree of polymerisation. 6

(*d*) Define bifunctional and poly functional monomers. Give examples of bi, tri and tetrafunctional systems. 6

3. (*a*) Discuss mechanism and Kinetics of step grow polymerisation. $6 + 6$

Or

(*b*) Explain crystalline melting point and degree of crystallinity of polymers. Which factors affect crystalline melting point ? What is DSC and what is its significance ? $4 + 4 + 4$

(*Continued*)

4. (*a*) Discuss the osmometric method of determination of molecular weight of polymers. 12

Or

(*b*) Write notes on : $6 + 6$

(*i*) PDI

(*ii*) Glass transition Temperature and factors that affect it.

5. (*a*) Explain criteria for polymer solubility and solubility parameter. 8

(*b*) Write the preparation of poly (Vinyl Chloride) and mention its important uses. $2 + 2$

Or

(*c*) Give the preparation and uses of (*i*) Bakelite (*ii*) Teflon. $4 + 4$

(*d*) Give two examples of conducting polymers and mention the important uses of each. $2 + 2$

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Or

(*b*) (*i*) Write a note on proliferation of solvent-less reactions. 6

(*ii*) What is sustainable development ? How can it be realised through green chemistry ? 6

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GROUP – A

(MODEL SYLLABUS)

(GREEN CHEMISTRY)

PART – I

1. Answer *all* questions : 1×8

(*a*) Name one ionic liquid which is used as green solvent.

(*b*) The ratio of mass of desired useful product to the total mass of all reactants is called _____.

(*c*) Name the gas which caused Bhopal Gas Tragedy.

(*d*) Give one property of immobilized solvent.

(*e*) Which is superior between catalytic reagents and stoichiometric reagent ?

(*f*) Ultrasound assisted reactions may otherwise be called _____ reactions.

(*g*) Name one marine antifoulant.

(*h*) Which method replaces strecker synthesis for synthesis of disodium iminodiacetate ?

PART – II

2. Answer any *eight* of the following : $1\frac{1}{2} \times 8$

(*a*) What is green chemistry ?

(*b*) What are the needs of green chemistry ?

(*c*) What are supercritical fluids ? Give two examples.

(*d*) What is versatile photocatalyst ? Why TiO_2 is used as such a catalyst ?

(*e*) Write full forms for PEG, PLA and PTC.

(*f*) What is rightfit pigment ? Give one example.

(*g*) What are biodiesels ? Give one example.

(*h*) What do you understand by asymmetric catalysis ?

(*i*) How can PLA be obtained from corn ?

(*j*) Which green solvent is used for cleaning and dry cleaning of garments and why ?

PART – III

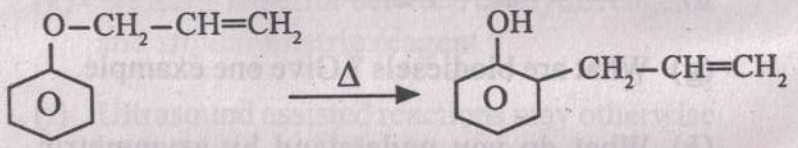
3. Answer any *eight* of the following : 2×8

(*a*) What are the goals of green chemistry ?

(*b*) Name the obstacles in the pursuit of the goals of green chemistry.

(*c*) Give reasons why PEG is used as a green solvent.

(*d*) Calculate % atom economy of following reaction :



(*e*) Draw the phase diagram for super critical state of carbon dioxide.

(*f*) What are the important properties of environmental friendly antifoulant ?

(*g*) Explain advantages of solventless processes.

(*h*) Give one example each for microwave assisted reaction in water and organic solvent.

(*i*) How can you prevent hazardous of toxic products by use of green methods ?

(*j*) Give an example where green synthesis method mitigates the fossil fuel problems in real world.

PART – IV

Answer **all** questions : 6×4

4. (*a*) Write the twelve principles of Green Chemistry. 6

Or

(*b*) Enlist the advantages of ionic liquids and immobilized solvents. 3 + 3

5. (*a*) What is ISD ? What are its important subdivisions ? 2 + 4

Or

(*b*) How is green synthesis of adipic acid from glucose is carried out by use of E. Coli bacteria as biocatalyst ? 6

6. (*a*) Explain following microwave assisted reactions. 3 + 3

(*i*) Hofmann elimination in water

(*ii*) Diels-Alder reaction in organic solvent

Or

(*b*) Explain the following : 3 + 3

(*i*) Green synthesis of catechol

(*ii*) Ultrasound assisted Simons-Smith reaction.

7. (*a*) Write a note on Cradle to Cradle carpetting. 6

Or

(*b*) Discuss "Green Chemistry in sustainable development". 6

GROUP – B

(OLD SYLLABUS)

(GREEN CHEMISTRY)

PART – I

1. Answer *all* the following questions : 3×4

(*a*) What is atom economy ? Illustrate it taking one rearrangement reaction as an example.

(*b*) Explain why catalytic reagents are superior to stoichiometric reagents.

(*c*) Explain how Monsanto process is used as alternative to Strecker synthesis for disodium iminodiacetate.

(*d*) What is Cradle to Cradle Carpeting ?

PART – II

Answer **all** the following questions : 12×4

2. (*a*) Write short notes on the following : 2×6

(*i*) Super critical Carbon dioxide

(*ii*) Immobilized solvent.

Or

(*b*) Write twelve principles of Green Chemistry with examples. 12

3. (*a*) Explain the following : 2×6

(*i*) Catalysis and green chemistry

(*ii*) Inherent Safer Design.

Or

(*b*) Answer the following : 2×6

(*i*) What is Bhopal Gas Tragedy ? Suggest a greener alternative for synthesis of MIC.

(*ii*) What are the alternative sources of energy for carrying out green reactions ? Give examples for each source.

4. (*a*) Explain the following : 3×4

(*i*) Microwave assisted Hofmann elimination reaction in water.

(*ii*) Microwave assisted Diels-Alder reaction in organic solvent.

(*iii*) Microwave assisted decarboxylation reaction in organic solvent.

(*iv*) Ultrasound assisted Simmons-Smith reaction.

Or

(*b*) (*i*) Give green synthesis of catechol. 3

(*ii*) Give green synthesis of adipic acid. 3

(*iii*) Explain how supercritical carbon dioxide replaces ozone depleting and smog forming solvents for precision cleaning and dry cleaning of garments. 6

5. (*a*) (*i*) Write an efficient green synthesis of polylactic acid from corn. 6

(*ii*) What is combinatorial green chemistry ? Explain its usefulness. 6

SH CHE—11

2020

(5th Semester)

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(ORGANIC CHEMISTRY - IV)

SECTION – A

1. Answer *all* the following questions : 2 × 6

   (*a*) What are nucleosides and nucleotides ?

   (*b*) Write the structures of adenine and guanine.

   (*c*) How does coenzyme differ from enzyme ?

(*d*) What is Zwitterion ?

(*e*) Calculate saponification value of a sample of fat if 2.25 gram of it requires 440 gram of KOH for complete saponification.

(*f*) Name one antacid and mention its function.

SECTION – B

Answer **all** the following questions : 12 × 4

2. (*a*) Give one method of synthesis for each of the following : 3 + 3

(*i*) Uracil

(*ii*) Cytosine.

(*b*) Name the sugars present in DNA and RNA and draw their structures. 3 + 3

Or

(*c*) Which factors affect enzyme action ? 2

(*d*) Explain specificity of enzyme action. 4

(*Continued*)

(*e*) Distinguish between competitive, uncompetitive and non-competitive enzyme inhibition. 6

3. (*a*) How can you synthesise α-amino acids by following methods : 3 + 3

(*i*) Azlactone synthesis

(*ii*) Amination of α-haloacids.

(*b*) Write a note on electrophoresis of amino-acids. 6

Or

(*c*) Illustrate polypeptide synthesis by following methods : 6 + 6

(*i*) Use of N-protecting group

(*ii*) Use of C-protecting group.

4. (*a*) Write the names and formula of any three fatty acids commonly present in oils and fats. 2 + 2 + 2

(*Turn Over*)

(*b*) How can you distinguish between oils and fats ? 2

(*c*) Define acid value and iodine value of oils and fats. 2 + 2

Or

(*d*) Differentiate between catabolism and anabolism. 2 + 2

(*e*) Discuss briefly catabolic pathways of protein. 6

(*f*) What is calorific value of food ? 2

5. (*a*) Give synthesis of the following pharmaceuticals (one method for each) : 4 + 4

(*i*) Paracetamol

(*ii*) Ibuprofen.

(*b*) Write the structures and medicinal uses of Vitamin-C and Ranitidine. 2 + 2

(*Continued*)

Or

(*c*) What are antibiotics ? Give one method of synthesis of chloramphenicol. 1 + 5

(*d*) What are antimalarials ? Give one method of synthesis of chloroquine. 1 + 5

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(*b*) What is quantum yield ? Give reasons for high and low quantum yield. 2 + 2 + 2

Or

(*c*) State and explain Lambert-Beer's law. 8

(*d*) Write a note on photochemical equilibrium. 4

2020

(5th Semester)

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(PHYSICAL CHEMISTRY - V)

SECTION – A

1. Answer *all* the following questions : 2×6

(*a*) What is zero point energy ?

(*b*) What is quantization of energy levels ?

(*c*) What do you understand by Born -Oppenheimer approximation ?

(*d*) Give two examples of photosensitised reactions.

(*e*) How are bonding m.o. differs from anti-bonding m.o. ?

(*f*) Explain Chemiluminescence.

SECTION – B

Answer **all** the following questions : 12×4

2. (*a*) Discuss Schrödinger equation for the particle one dimensional box. 8

(*b*) Write a note on degeneracy. 4

Or

(*c*) Discuss qualitative treatment of Simple Harmonic Oscillator. 8

(*d*) What are average and most probable distances of electron from nucleus ? $2 + 2$

3. (*a*) Discuss LCAO-MO treatment of H_2^+ ion. 6

(*b*) Discuss qualitative description of LCAO-MO treatment of H-F molecule. 6

Or

(*c*) Draw M.O. diagram of O_2 molecule and calculate its bond order. $5 + 1$

(*d*) Give LCAO-MO treatment of LiH molecule. 6

4. (*a*) Explain Stokes and anti-Stokes lines. $3 + 3$

(*b*) Write a note on rule of mutual exclusion. 6

Or

(*c*) Write short notes on following : $4 + 6 + 2$

(*i*) Selection rules for rotational spectra

(*ii*) P, Q, R branches

(*iii*) Morse potential.

5. (*a*) Explain Franck-Condon principle of electronic transitions. 6

5. (*a*) Discuss the entropy, enthalpy and free energy changes of mixing of polymer solutions. 8

(*b*) Explain the synthesis of Nylon 66. 4

Or

(*c*) Write notes preparation and uses of (*i*) Bakelite and (*ii*) Silicone Polymers. 6 + 6

2020

(5th Semester)

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(POLYMER CHEMISTRY)

SECTION–A

1. Answer any *six* questions : 2 × 6

(*a*) What is degree of polymerisation ? What is the relationship between degree of polymerisation, mol. weight of monomer and molecular weight of polymer ?

(*b*) Give classification of polymers on the basis of heat treatment and mechanism of polymerisation.

(*c*) Define number average mol. weight and weight average mol. weight of polymers.

(*d*) Name the factors that affect crystalline melting point.

(*e*) What are upper and lower critical solution temperatures ?

(*f*) Give two examples of conducting polymers.

(*g*) What is Teflon ? Write the formula of its monomer.

(*h*) What is functionlity of a monomer ? Give one example of a bifunctional monomer.

SECTION–B

Answer **all** questions : 12 × 4

2. (*a*) Explain the bonding in polymers. 6

(*b*) Write a note on Texture of polymers. 6

Or

(*c*) Explain the criteria for synthetic polymer formation. 6

(*d*) Discuss the extent of reaction and degree of polymerisation. 6

3. (*a*) Discuss the mechanism and kinetics of copolymerisation. 8

(*b*) Write a note on Ziegler-Natta Catalyst. 4

Or

(*c*) Write a note on morphology of crystalline polymers. 6

(*d*) Write a note on crystalline melting point and degree of crysallinity. 6

4. (*a*) Explain the determination of molecular weight of polymers by viscometry method. 8

(*b*) Explain significance of PDI. 4

Or

(*c*) Explain Free Volume theory of Glass Transition. 6

(*d*) Write a note on WLF equation. 6

(*ii*) What is antifoulant ? Mention its properties. 3

5. (*a*) What are rightfit pigments ? Give their characteristics. 2 + 4

(*b*) Explain enzymatic inter esterification for production of no transfats and oils. 6

Or

(*c*) Write a note on usefulness of biomimetic reagents. 6

(*d*) Explain cocrystal controlled solid-state synthesis (C^3S^3). 6

SD CHE –02

2020

(5th Semester)

Time : 3 hours

Full Marks : 60

Answer from **both** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(GREEN CHEMISTRY)

SECTION – A

1. Answer *all* the following questions : 3 × 4

(*a*) Write the limitations of green chemistry.

(*b*) Explain why catalytic reagents are superior to stoichiometric reagents in green chemistry.

(*c*) What is Disodium iminodiacetate ? What is its use ?

(*Turn Over*)

(*d*) Explain cradle to cradle carpeting.

SECTION – B

Answer **all** questions : 12×4

2. (*a*) Explain twelve principles of green chemistry with examples. 12

Or

(*b*) What are the obstacles in the pursuit of the goals of green chemistry ? 6

(*c*) Write a note on super critical carbon-dioxide. 6

3. (*a*) Explain the principle of ISD. 6

(*b*) Write note on the uses of heterogeneous and homogeneous catalysts in green synthesis. 6

Or

(*c*) Write a brief account of developments of

analytical techniques to prevent generation of hazardous substances. 8

(*d*) Write a note on Flixiborough accident. 4

4. (*a*) Explain Green synthesis of following : 3 + 3

(*i*) Adipic acid

(*ii*) Catechol.

(*b*) Explain following microwave assisted reactions in water : 3 + 3

(*i*) Oxidation of toluene

(*ii*) Conversion of methyl benzoate to benzoic acid.

Or

(*c*) Explain following microwave assisted reactions in organic solvents : 3 + 3

(*i*) Diels-Alder reaction

(*ii*) Decarboxylation.

(*d*) (*i*) Explain ultrasound assisted Simmon -Smith reaction. 3

5. (*a*) Elucidate the structure of chloramphenicol. Write one method of its synthesis and its therapeutic uses. 6 + 4 + 2

Or

(*b*) (*i*) Describe the structure, synthesis and therapeutic uses of chloroquine. 8

(*ii*) Write the medicinal values of curcumin (haldi) and azadirachtin (neem). 2 + 2

2019

(5th Semester)

Time : $2\frac{1}{2}$ hours

Full Marks : 60

Answer from **both** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(ORGANIC CHEMISTRY - IV)

SECTION – A

1. Answer *all* questions of the following : 2 × 6

(*a*) Write the name and structure of sugar units present in RNA and DNA.

(*b*) What is substrate specificity of enzyme ?

(*c*) What are essential and non-essential amino-acids ? Give one example of each.

(*d*) What are the differences between oils and fats ?

(*e*) Why ATP is called energy currency of cell ?

(*f*) Write the medicinal values of Ranitidine. What class of drugs does it belong ?

SECTION – B

Answer **all** questions : 12 × 4

2. (*a*) (*i*) Mention the characteristics of the active sites of an enzyme. 6

(*ii*) Discuss the mechanism of Enzyme Action taking Trypsin as example. 6

Or

(*b*) (*i*) Give one method of preparation of each : 2 × 4

Adenine, Guanine, Uracil and Cytosine.

(*ii*) What are nucleotides ? How are they different from nucleosides ? 2 + 2

3. (*a*) Discuss the synthesis of amino-acid by Strecker's method and Gabriel's method. How does an amino-acid react with Ninhydrin and Sanger's reagent ? 3 × 4

Or

(*b*) (*i*) Explain zwitterion structure of amino-acid. What is the effect of pH on the structure of amino-acid ? 3 + 3

(*ii*) Give a brief account on isoelectric point. Discuss its role in separation and purification of different amino-acids. 3 + 3

4. (*a*) (*i*) Write a note on hydrogenation of oils. What do you mean by "hardening of oils" ? 4 + 2

(*ii*) What is rancidity ? Explain oxidative and hydrolytic rancidification. 2 + 4

Or

(*b*) Discuss the interrelation in the metabolic pathways of protein, fat and carbohydrate. 12

Or

(*b*) (*i*) Discuss the law of photochemical equivalence. Explain the quantum yield for the decomposition of HI by UV-light. 8

(*ii*) Explain photosensitizers and photo-inhibitors. 4

SH CHE–12

2019

(5th Semester)

Time : $2\frac{1}{2}$ hours

Full Marks : 60

Answer from **both** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(PHYSICAL CHEMISTRY)

SECTION – A

1. Answer *all* questions : 2 × 6

(*a*) What are orthogonal and orthonormal wave functions ?

(*b*) State Heisenberg Uncertainty principle.

(*c*) Find the bond order of N_2^{2+} ion.

(*d*) Explain forbidden transitions.

(*e*) What do you mean by singlet and triplet states ?

(*f*) Explain the physical significance of absorption coefficients.

SECTION – B

Answer **all** questions : 12 × 4

2. (*a*) Discuss Schrödinger's wave equation for Hydrogen atom. Write their separate differential form of equations. 7 + 5

Or

(*b*) Write short notes on : 4 × 3

(*i*) Postulates of quantum mechanics

(*ii*) Commutation Rule

(*iii*) Simple Harmonic oscillator.

3. (*a*) Give a detailed description of qualitative molecular orbital theory and its application to AH_2-type molecule. 12

Or

(*b*) Give a detailed account of localised and non-localised molecular orbitals treatment to Be H_2 and H_2O. 12

4. (*a*) Discuss the basic principle of Raman spectroscopy. What is the effect of temperature on Raman lines ? 12

Or

(*b*) (*i*) Discuss the basic principle of vibrational spectroscopy. 8

(*ii*) State and explain selection rules. 4

5. (*a*) Discuss the phenomenon of Fluorescence and phosphorescence. 12

Or

Write notes on (Referring to preparation structure and properties) :

(*i*) PVC

(*ii*) Polyurethanes.

2019

(5th Semester)

Time : $2\frac{1}{2}$ hours

Full Marks : 60

Answer from **both** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(POLYMER CHEMISTRY)

SECTION – A

1. Answer any *six* questions : 2 × 6

(*a*) Differentiate between homopolymer and copolymer with suitable examples.

(*b*) Define glass transition temperature. Name two factors affecting it.

(*c*) What are elastomers ? Give two examples.

(*d*) Define specific viscosity and reduced viscosity.

(*e*) What is CED ?

(*f*) What is condensation polymerisation ? Give two examples.

(*g*) Write down the structure of monomers of poly butadiene and poly isoprene.

(*h*) Write down two applications polyacrylamide.

SECTION – B

Answer **all** questions as directed : 12 × 4

2. Discuss classification of polymers depending upon (*i*) polymerisation mechanism (*ii*) Interparticle forces and (*iii*) Source or origin. How do polymers differ from macromolecule.

Or

Discuss the following terms :

(*a*) Degree of polymerisation

(*b*) Monomers and repeating units

(*c*) Copolymers and types of copolymers.

3. Discuss kinetics and mechanism of Free radical addition polymerisation.

Or

Discuss mechanism of co-ordination and anionic polymerisation.

4. Discuss determination of molecular mass of polymers by osmotic pressure method.

Or

Define number average molecular mass and weight average molecular mass and poly-dispersity index. Discuss the significance of PDI and molecular weight of polymers.

5. Discuss one method of preparation structure and three important properties of any two condensation polymers.

2019

(5th Semester)

Time : $2\frac{1}{2}$ hours

Full Marks : 60

Answer from **both** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(GREEN CHEMISTRY)

SECTION – A

1. Answer the following : 3 × 4

(*a*) Explain atom economy in elimination reaction.

(*b*) What are green solvents ? Give two examples.

(*c*) What is heterogeneous catalysis ? Explain with an example.

(*d*) Explain Cannizzaro's Reaction under sonication.

SECTION – B

Answer **all** questions : 12 × 4

2. (*a*) What is Green Chemistry ? What are its goals ? Explain.

Or

(*b*) Explain the various steps involved in designing a Green Synthesis.

3. (*a*) What are the benefits of using microwave energy source ?

Or

(*b*) Explain how Bhopal Disaster occured ? Propose an alternative green process for the preparation of methyl isocyanide (MIC).

4. (*a*) What is antifoulant ? Why Dichloro Octyl - Isothiazolinone is an environmentally safe marine antifoulant ?

Or

(*b*) Explain why supercritical CO_2 offers as a very good solvent for precision cleaning and has several benefits over organic solvents.

5. (*a*) Discuss about an efficient green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.

Or

(*b*) Explain briefly how Green Chemistry can be used for Sustainable Development.

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SH CHE-11

2018

(5th Semester)

Time : $2\frac{1}{2}$ hours

Full Marks : 60

Answer from **both** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(ORGANIC CHEMISTRY-IV)

SECTION—A

1. Answer *all* questions : 2×6

   (*a*) Write the name and structure of bases present in RNA.

   (*b*) Define Isoelectric Point.

   (*c*) What do you mean by peptide bond ? What happens when a polypeptide is hydrolysed ?

(*d*) Name one saturated and one unsaturated fatty acid present in oils and fats.

(*e*) Define catabolism and anabolism.

(*f*) What are antibiotics ? Name one antibiotic.

SECTION–B

Answer **all** questions : 12 × 4

2. (*a*) Discuss primary and secondary structure of DNA. 12

Or

(*b*) What are enzyme inhibitors ? How do they effect on enzyme activity ? Write two uses of enzyme inhibitors. 2 + 8 + 2

3. (*a*) How the primary structure of polypeptide is determined ? Explain one chemical method each of *C*-Terminal and *N*-Terminal end group analysis. 2 + 5 + 5

Or

(*b*) Write notes on the following : 6 + 6

(*i*) Solid phase peptide synthesis

(*ii*) Electrophoresis.

4. (*a*) (*i*) What is Saponification ? How the saponification value is determined in a fat or oil. 6

(*ii*) Explain iodine number and acidic value. What are their significances ? 2 + 2 + 2

Or

(*b*) Write notes on the following : 6 + 6

(*i*) Catabolic pathway of protein

(*ii*) Caloric value of food.

5. (*a*) (*i*) What are analgesics ? Discuss the synthesis and therapeutic uses of Ibuprofen.

(*ii*) What are antipyretics ? Discuss the synthesis and therapeutic uses of paracetamol. 6 + 6

Or

(*b*) (*i*) How the drugs are classified ?

(*ii*) Write a note on medicinal value of Vitamin-C. 8 + 4

SH CHE—12

2018

(5th Semester)

Time : $2\frac{1}{2}$ hours

Full Marks : 60

Answer from **both** the Sections as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(PHYSICAL CHEMISTRY - V)

SECTION – A

1. Answer *all* questions : 2×6

(*a*) Explain zero point energy.

(*b*) What is commutation rule ?

(*c*) Explain the directional character of covalent bond.

(*d*) What do you understand by molecular polarisation ?

(*e*) What are *Q*-branch lines in Raman spectroscopy ?

(*f*) What do you know about photo sensitisation ?

SECTION – B

Answer **all** questions : 12×4

2. (*a*) Derive Schrödinger's wave equation and solve this equation for particle in one dimensional box with potential energy zero inside the box. 6 + 6

Or

(*b*) What is rigid rotator ? Derive an expression for the energy of a rigid rotator using Schrödinger's wave equation. 2 + 10

3. (*a*) Discuss LCAO principle. What are
   (*i*) its limitations ? 8
   (*ii*) Distinguish between bonding and antibonding molecular orbitals. 4

Or

(*b*) Explain Valence bond theory. How this theory helps to explain the formation of H_2 molecule ? What are the limitations of VBT? 12

4. (*a*) Discuss quantum theory of Raman spectroscopy showing how Stoke's and antistoke's lines appear in the spectrum ? 12

Or

(*b*) Explain Born-Oppenheimer approximation in spectroscopy. 12

5. (*a*) Explain Franck Condon principle of
   (*i*) electronic transitions. 8
   (*ii*) Explain different types of forbidden transition. 4

Or

(*b*) (*i*) Define quantum yield in a photo chemical reaction. The quantum yield in the following reaction is only 0·01

where as the quantum yield in the combination of hydrogen and chlorine to form HCl is 10^4. How could you explain it ?

$$H_2(g) + Br_2(g) \rightarrow 2HBr(g)$$

7

(*ii*) Explain Chemiluminescence. 5

SD CHE—01

2018

(5th Semester)

Time : $2\frac{1}{2}$ hours

Full Marks : 60

Answer from **both** the Groups as per direction

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(POLYMER CHEMISTRY)

GROUP—A

1. Answer any *six* : 2×6

(*a*) What is a polymer ? How does it differ from a macromolecule ?

(*b*) Define degree of polymerisation. A polymer of polyethylene has degree of polymerisation 20,000. Calculate its molecular mass.

(c) Name two initiators for cationic polymerisation.

(d) Equal numbers of molecules with $M_1 = 10,000$ and $M_2 = 100,000$ are mixed. Calculate number average molecular mass.

(e) Write down two applications polystyrene.

(f) Define weight average molecular mass.

GROUP – B

Answer **all** questions as directed :

2. (a) Discuss the nature of forces present in polymers. 8

(b) Write down the IUPAC name of the following polymers : 2×2

(i) Poly vinyl chloride

(ii) Polystyrene.

Or

(a) What is functionality principle ? 4

(b) Which equation co-relates relative average functionality, extent of reaction and average degree of polymerisation. Derive the equation. 2+6

3. Discuss mechanism and kinetics of cationic polymerisation. 12

Or

Write notes on : 6+6

(i) Polymerisation techniques

(ii) Mechanism of co-polymerisation.

4. Define and distinguish between number average molecular mass and weight average molecular mass. Discuss determination of molecular mass of polymer by end-group analysis. 12

Or

Write notes on : 6+6

(i) Glass transition temperature and WLF equation

(*ii*) Determination of molecular mass of polymer by osmotic pressure method.

5. Discuss one method of preparation structure and three important properties of any two addition polymers. 6 + 6

Or

Write notes on (Structure, preparation and properties) : 6 + 6

(*i*) Bakelite

(*ii*) Polysiloxane.
