

M.Sc. Semester-IV Examination 2021
Sub: Bioorganic Chemistry (CH-508)

Time-2:00 hr

F.M.: 50

[10×2 = 20]

Q.1 Answer *all* of the following

- (a) Write down the Michealis Menten equation and illustrate the terms involve.
- (b) Write down the amino acid residue involve in chymotrypsin enzyme catalysis.
- (c) Illustrate Nucleophilic displacement on a phosphorus atom in ATP cleavage.
- (d) Write down the structure of NADP⁺.
- (e) Write down the structure of TPP and mention two biological importance.
- (f) Write down the structure of Biotin and mention two biological importance.
- (g) Illustrate strain or distortion involve in enzyme catalysis.
- (h) Write down the structure of lipoic acid and mention its biological importance.
- (i) Write down the structure Coenzyme A.
- (j) Depict the classification of enzymes.

Q.2 Answer *any six* of the following

[6×5 = 30]

- (a) Depict the reaction mechanism catalyzed by lysozyme enzyme.
- (b) Depict the reaction mechanism catalyzed by ribonuclease enzyme.
- (c) Explain proximity effect.
- (d) Illustrate how FAD involve in oxidation of Dihydrolipoate.
- (e) Depict Aldol condensation facilitates by Thymine Pyrophosphate.
- (f) Explain the event of Bicarbonate capture by Biotin in expanse of energy.
- (g) Illustrate the event of oxidative decarboxylation of Pyruvic acid.
- (h) Depict the reaction mechanism catalyzed by Carboxypeptidase A enzyme.

Department of Chemistry

End Semester Examination-2021

Semester-IV

Paper Code:CH-509

Organotransition Metal Chemistry

Full Marks-50

Time:2 Hours

Answer all the questions

Short Answer Questions:

[2X10 = 20]

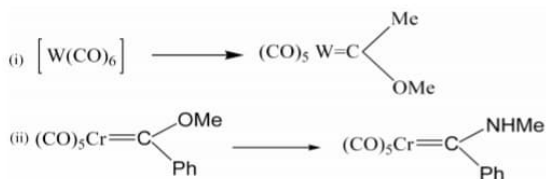
- 1)
 - a) Give one example each of Transmetalation and Reductive elimination reactions.
 - b) Write down the preparative method of Gilman reagent and WMe_6
 - c) Give one example of Schrock carbyne and determine the oxidation state of the metal centre.
 - d) Why $CoCp_2$ prone to oxidize?
 - e) Why organometallic compounds bearing metals at left side periodic table are unstable?
 - f) Why TEL ($PbEt_4$) has been replaced by ferrocene as antiknocking substance?
 - g) Why metal hydride, $HCo(CO)_4$, behaves as a strong acid?
 - h) What do you mean coordinative unsaturation? Discuss about it giving two suitable examples.
 - i) Between $HCo(CO)_4$ and $RhH(CO)(PPh)_3$ which one is a better catalyst for hydroformylation of alkene and why ?
 - j) For the hydrocarbonylation of alkene using $Rh(CO)_3(PPh_3)_2$ as catalyst ,write the first two steps of catalytic cycle.

Descriptive Type Questions

2. a) Depict the bonding in Fischer and Schrock carbene with clear orbital pictures. [4]
- b) Write the reaction of $[Ir(PPh_3)_2(CO)(Cl)]$ with Cl_2 and CH_3I [4]

OR

3. a) Write the path of the reactions with suitable reagents [4]



- b) Write a synthetic method of Schrock carbene and its reaction with acetone. [4]

4. a) Describe the synthesis, structure and bonding of Zeise's salt. [4]

b) Describe the synthesis and applications of Ni- π -allyl and Pd-- π -allyl complexes. [4]

OR

5. a) Describe the fluxional behaviours of polyene complexes. [4]

b) Write the synthesis and application of Ni(COD)₂. [4]

6. a) Discuss about the reaction steps involved for hydrogenation of alkene using Wilkinson's catalyst. [5]

b) Write down the mechanism of polymerisation of propene catalysed by Ziegler-Natta catalyst. [5]

7. Write short notes on:- [5+5]

a) Fischer -Tropsch synthesis

b) Monsanto Acetic acid synthesis

8) What are importance metal hydride in organometallic chemistry? Write down the important methods of preparation of transition metal hydrides with examples. [4]

OR

9) Discuss the different techniques used for characterisation of transition metal hydrides with advantages and disadvantages. [4]

M.Sc. 4th Semester Examination

2021

Full Mark: 50

Time: As in Programme

SUB: POLYMER CHEMISTRY (CH-510)

The figures in the right-hand margin indicates marks

Answer all questions

Group A

2X10

- 1.(a) Define the term polymer, monomer, degree of polymerization and homopolymer?
- (b) Write the name of the one initiator each uses for cationic and anionic polymerization reaction?
- (c) Define 'tear resistance' property of polymer?
- (d) Write the relationship between ' T_g ' and ' T_m '?
- (e) What is HDPE and LLDPE stands for? Write one application each of these polymers?
- (f) Define crystallinity of polymer?
- (g) Write the name of the factors only, that affect degree of crystallinity of polymer?
- (h) Give examples of two crosslinking agent and UV stabilizer agent used for compounding process?
- (i) Write monomers of Nylon 6, Nylon 6,6 and Nylon 6,10 and one application of each polymer?
- (j) Which polymers are used as dental polymers and artificial heart?

Group B

- 2.(a) Deduce the final expression for average molecular weight determination from light scattering method? [5]
- (b) Classify polymers according to chain topology? [3]
- (c) Define the term tensile strength and ultimate tensile strength? [2]

OR

- 3.(a) What is polydispersity index? Differentiate between monodisperse and polydisperse polymer? [1+4]
 - (b) Write a short note on coordination polymerization? [3]
 - (c) Define fatigue and impact strength of polymer? [2]
- 4.(a) What is T_g of polymer? How diluents, chemical structure, chain topology, branching and cross linking affect the T_g , explain with one example from each? [1+4]
 - (b) Write a short note on Heat Deflection Temperature (HDT) of polymer? [3]
 - (c) What is Engineering plastic? Why it is so important now-a-days? [2]

OR

- 5.(a) With neat picture, explain different morphology of crystalline polymers? [5]
 - (b) Write a short note on strain induced morphology of polymer? [3]
 - (c) How steric factor affect T_m of the polymer, explain with one example? [2]
- 6.(a) Explain injection moulding process in detail? How it is different from extrusion moulding? [5+1]
 - (b) Draw the structure of following 'commercial polymers and mention their property and application area. [4]

Polyvinyl chloride, and Polyester

OR

- 7.(a) Explain Calendaring and Wet spinning process in detail? [3+3]
- (b) Write a short note on electrically conducting polymer?



Group A

[2x10]

1. What are Cooper pairs
2. What is edge dislocation?
3. What are stacking faults?
4. Why filters are used in XRD method? Give one example.
5. Draw a XRD plot/graph.
6. What are thermal neutrons and mention their typical wavelength?
7. Mention the different types of magnetism.
8. What are the magnetic moment values of proton and neutron?
9. How is diffraction different than scattering?
10. Give examples of two organic superconductors.

Group B

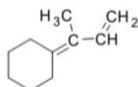
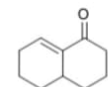
11. Discuss any two [2x5]
 - i. Describe solid state reactions.
 - ii. Derive the number of defects 'n' in Schottky defect.
 - iii. Discuss non-stoichiometry defects
 12. Discuss any [2x5]
 - i. Discuss the diffraction pattern of NaCl and KCl through structure factor calculations.
 - ii. Discuss the Debye Scherrer method of X-ray structure analysis.
 - iii. An orthorhombic crystal has unit cell dimensions, $a=50\text{pm}$, $b=100\text{pm}$, $c=150\text{pm}$. Calculate the diffraction angle for first order X-ray diffraction from (123) plane using radiation of wavelength 154.1pm .
 13.
 - i. Discuss the ferrimagnetic structure of Co_3O_4 . [5]
 - ii. Discuss optical reflectance in brief. [5]
- Or
- i. Neutron diffraction is useful in determination of NaH structure but X-ray diffraction cannot, provide the reasons. [5]
 - ii. Discuss Organic metals with examples. [5]

Answer all questions within 12 pages

- What is the peak position of tropylium cation form from toluene in mass spectrum?
 - How can you differentiate CH and CH₂ by DEPT-135.
 - ¹³C is NMR active while ¹²C is not. Explain?
 - What is base peak in mass spectroscopy?
 - How will you differentiate the type of hydrogen bonding by IR spectroscopy?
 - What do you mean by Finger print region of IR spectroscopy?
 - How will you differentiate (i) aldehyde and ketone (ii) cis-trans isomer by IR spectroscopy?
 - What do you mean by ²J and ³J Coupling?
 - Why TMS is used as internal standard for recording of NMR?
 - Describe the shift in absorption of n-π* when a polar solvent is used.
- An organic compound A with molecular formula, C₃H₉N absorbs at 3423 cm⁻¹(s), 3236 cm⁻¹(m), 3012cm⁻¹(m) and 1615cm⁻¹(m). When the compound A is treated with nitrous acid, we get compound B which shows a strong absorption peak at 3430 cm⁻¹. What are A and B? [5]
 - Explain the different factors influencing the vibrational frequencies in IR spectroscopy. [5]

OR

- Use the Woodward Fieser rule to calculate λ max for the following two compounds [5]



- What do you mean by positive and negative cotton effect [5]
- Write about chemically and magnetically equivalence phenomenon in NMR? [5]
 - Illustrate AB₂ and AX₂ spin systems with examples? [5]

OR

- Explain with example, the shielding and deshielding of proton in NMR spectroscopy. [5]
- The molecular formula of a compound is C₅H₁₂O₂. It gave three ¹³C NMR peaks at δ 15, 63 and 95 ppm with corresponding DEPT 135 [5]

positive, negative, negative respectively and no peaks in DEPT-90.
¹H NMR (δ, ppm): 4.6 (s), 3.5(q), 1.2 (t). Deduce its structure.

- Briefly describe ¹³C NMR spectroscopy. What are the extra advantages of it over proton magnetic resonance spectroscopy [5]
 - Explain why ¹³C DEPT experiment is more useful than normal ¹³C NMR experiment. Mention which type of carbon signal are positive in DEPT-45, DEPT-90, and DEPT-135 experiments. [5]

OR

- Write down principles of mass spectroscopy. What is the mass of the Mc Lafferty ion produced from pentanal? [5]
- What is metastable ion? Where it is formed and what is its m/z value? [5]

Mass spectrum of toluene shows strong peaks at m/z 91 and m/z 65, together with a strong broad peak at m/z 46.5. Explain it.

