F–2968

Sub. Code
7MCH2E2

M.Sc.DEGREE EXAMINATION, APRIL 2021 &
SUPPLEMENTARY / IMPROVEMENT / ARREAR EXAMINATIONS
Second Semester

Chemistry

***Elective*-COMPUTER IN CHEMISTRY**

(CBCS – 2017 onwards)

Time: Three Hours Maximum: 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Write the flowchart to find out the smallest number among three numbers.

2. Mention the role of CPU.

3. Name any four keyword used in C language and explain them.

4. Write down the formula to calculate normality and molarity of a solution.

5. What are two and single dimensional arrays?

6. Define binding energy.

7. What is the use of smile keys?

8. Expand the following: FTP, TCP, WAP and URL.

9. Mention any two software used in drug design.

10. Give the scope of cheminformatics.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Distinguish between algorithm and flow chart. List out the various symbols used in flow chart.

Or

(b) Explain the developments in the history of computers.

12. (a) Write a C program to calculate ionic radii.

Or

(b) Using If statement, write a C program to convert temperature from Celcius and Kelvin and vice versa.

13. (a) Write a C program to calculate mean activity coefficient an KC1 solution.

Or

(b) Write a C program to find out empirical formula of hydrocarbon.

14. (a) Discuss the advantages and disadvantages of e–mail.

Or

(b) List out the functions of HTTP protocols.

15. (a) Explain the following: chemical resources and chemical data base.

Or

(a) Discuss the five steps to develop a drug in drug industry.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Explain the functions of ALU and control units.

(b) Discuss the function of memory devices RAM and ROM.

17. Write a C program to calculate

(a) Cell constant

(b) Enthalpy of solution. (5 + 5)

18. Write is loop statement? Using for—Next loop statement write a C program to calculate the NMR frequency for a nucleus with spin ½.

19. (a) Discuss the architectures of ISP and URL.

(b) How do you compose and send an e-mail?

20. Mention the procedures used in drawing the chemical structure of a organic compound using chemDraw and chemsketch.

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F–4670	Sub. Code
	7MCH4C1

M.Sc DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Fourth Semester

Chemistry

INSTRUMENTAL METHODS OF ANALYSIS

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define error. A temperature indicator reads 189.8°C when the actual temperature is 195.5°C. Find the percentage error in the reading.
2. Distinguish between accuracy and precision.
3. What is the process of digestion? why is it useful in the gravimetric determination of a precipitate?
4. What is the process of nucleation?
5. Define over voltage and over potential.
6. Differentiate auxiliary electrode with working electrode
7. Classify the DSC techniques based on the mechanism of operation
8. What is meant by procedural decomposition temperature?
9. What is the principle of flourimetry?
10. Define Lambert's-Beer's law.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Define the terms correlation and regression. Explain the purpose of calculating the correlation coefficient.

Or

(b) What are the rules for calculating the significant figures? Determine the significant figure of 25.6, 21.6, 31.6, 19.6 and 21.7.

12. (a) Distinguish between co-precipitation and post precipitation.

Or

(b) Explain the process of precipitation from homogeneous solution.

13. (a) Discuss the principle and working of amperometry.

Or

(b) What is coulometry? Explain the advantages of coulometric titration over volumetric titration?

14. (a) Explain the TG and DTA curves of calcium oxalate monohydrate in air and nitrogen atmosphere.

Or

(b) Discuss the applications of DSC.

15. (a) Discuss the method of colour comparison in colorimetric analysis

Or

(b) Discuss the principle and instrumentation of turbidometry.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Obtain the values of slope and intercept using least square straight line fitting.

Temperature (°C)	20	40	60	80	100
Resistance (ohm)	107.5	117.0	117.0	128.0	142.5

(b) Write a note on 'F' test and explain its use in research. (5+5)

17. (a) What is meant by precipitate? Give the properties of precipitates.

(b) Explain the process of drying and ignition of precipitates (5+5)

18. Discuss the principle and applications of

(a) Chronopotentiometry

(b) Electrogravimetry (5+5)

19. Describe the theory and principle of TG and DTA. Explain the factors affecting TG and DTA curves.

20. Discuss the principle and applications of colorimetry. Estimate the amount of copper using colorimetric method.

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F–4671

Sub. Code
7MCH4E1

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Fourth Semester

Chemistry

Elective — NANOCHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are one dimensional materials? Give example.
2. Give the advantages of microwave assisted synthesis of nanomaterials.
3. What are semiconductor quantum dots? Why they are called so?
4. What are nanotubes? Give example.
5. What are carbon clusters?
6. Give a preparation of nano TiO_2.
7. Why AFM is called as layman technique?
8. Give the basic principle of Auger Emission Spectroscopy.
9. What are molecular diodes?
10. What are DNA knots?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Give an account of historical milestone of nanomaterials.

Or

(b) Explain reverse Micelle synthesis of nanoparticles with example.

12. (a) Write short notes on carbon nanotubes.

Or

(b) What are Graphenes? Discuss its advantages with applications.

13. (a) Explain the advantages and uses of alkali doped C_{60}.

Or

(b) Discuss the preparation properties and uses of ZnO nanomaterials.

14. (a) Give the principles and applications of particle size analyzer.

Or

(b) Discuss the principles and applications of Electron Spectroscopy for Chemical analysis (ESCA).

15. (a) Give a brief account of self assembled molecular transistors.

Or

(b) Write notes on force measurements in simple protein molecules.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain

    (a) Sonochemical synthesis of nanomaterials

    (b) Synthesis of nanomaterials using hydrothermal methods. (5+5)

17. Write detailed notes on the applications of nanomaterials in various fields.

18. (a) What are organic nanomaterials? Explain with two examples.

    (b) What are larger and smaller fullerenes? Give examples. (5+5)

19. Give the principles and applications of Transmission Electron Microscopy (TEM) and Scanning Electron microscopy (SEM).

20. Write notes on

    (a) DNA as nanomaterials.

    (b) Self assembled nano transistors. (5+5)

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F–4672	Sub. Code 7MCH4E2

M.Sc DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Fourth Semester

Chemistry

Elective: CORROSION CHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is electrochemical corrosion? Give an example.
2. Define the term corrosion.
3. What are Galvanic corrosion? Give an example.
4. Explain the term corrosion fatigue.
5. What is cladding?
6. Define paints.
7. What is electrochemical energy conversion? Give an example.
8. Define the term power density.
9. List out the advantages of the fuel cells.
10. What is electro catalysis of oxygen reduction?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) List out the importance of corrosion studies.

Or

(b) Explain the corrosion control methods.

12. (a) Write short notes on

(i) Waterline corrosion

(ii) Inter-granular corrosion

Or

(b) What is atmospheric corrosion? Explain the various factors influencing atmospheric corrosion.

13. (a) Explain the classification of the protective coatings.

Or

(b) Give an account of electroplating process.

14. (a) Explain the criteria for selection of anodes and cathodes.

Or

(b) Give the important applications of the secondary cells.

15. (a) Explain the functioning of Hydrocarbon-oxygen fuel cell.

Or

(b) Write a note Mercury porosimetry.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Write a note on theory of electrochemical corrosion.

(b) What are the factors influencing the corrosion?

17. Explain the following with suitable examples.

(a) Stress corrosion

(b) Microbiological corrosion

(c) Soil corrosion

18. (a) What are the factors affecting electroplating?

(b) Explain the following applications of electroplating.

(i) Chromate coating

(ii) Oxide coating

19. (a) Discuss the different types of primary cells.

(b) Write a note on solid polymer electrolytes.

20. (a) Explain the current-voltage relationship.

(b) Write a note on solid oxide fuel cell system.

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F–4673	Sub. Code
	7MCH4E3

M.Sc DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Fourth Semester

Chemistry

ELECTIVE — GREEN CHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What do you mean by the term "Sustainability" in production. Mention are suitable example.

2. Mention any two environmental protection laws and describe their purpose.

3. State and explain the principle of green chemistry that speaks on catalytic reagents.

4. Write the purpose of any two green chemistry awards.

5. Mention any two adverse effect of lead on human health.

6. Describe any two adverse effect of heavy metals on environment.

7. What are ionic liquids? Mention any two types of ionic liquid.

8. Describe any two role of the solvents in green synthesis.

9. What are sonochemical reaction. Give one suitable example.

10. Describe any two advantages of microwave assisted synthesis.

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe the role of green chemistry in moving from pollution control to pollution prevention with suitable examples.

Or

(b) Discuss any two green methods for production of green products and waste recycling.

12. (a) Discuss the scope of green chemistry in the present scenario.

Or

(b) Write a note on the role of international organizations in promoting green chemistry.

13. (a) Discuss the adverse effect of selenium and tellurium on the human health and environment.

Or

(b) Describe any two methods for removal of arsenic from water resources.

14. (a) Discuss the following organic synthesis in water.

(i) Strecker synthesis

(ii) Pinacol coupling (3+2)

Or

(b) Write in detail suzuki coupling reaction using inonic liquids.

15. (a) Discuss :

(i) Ultrasound assisted hydroboration reaction.

(ii) Microwave assisted hofmann elimination reaction. (2+3)

Or

(b) What are biocatalysts. Explain with suitable examples,their role in enzymatic hydrolysis.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Describe the following:

(a) Chemist's challenges ahead for green initiative.

(b) Recycling of waste by greener method. (5+5)

17. State and explain any five principles of green chemistry.

18. Describe the adverse effect of the following heavy metals on human health and environment.

(a) Uranium

(b) Mercury

(c) Thalium

(d) Selenium.

19. What are supercritical fluids? Write a note on super-critical CO_2. Discuss supercritical polymerisation with suitable examples.

20. What are phase transfer catalysts? Discuss on the types and advantages of phase transfer catalysts. Give its application.

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F–4674	Sub. Code
	7MCH4E4

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Fourth Semester

Chemistry

Elective: MOLECULAR PHOTOCHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is meant by non-radiative transition?

2. What is Stark-Einstein law?

3. Mention the importance of singlet oxygen.

4. What is photo oxidation in plants?

5. What is meant by metal-to-ligand charge transfer (MLCT) transition?

6. Define photo-rearrangement reaction? Give an example.

7. Both *cis*- and *trans*- 1, 2-diphenylethene isomers can be cyclized to phenanthrene. Explain how this is possible for the trans isomer.

8. Give any one organic reaction involving singlet moleculer oxygen radical.

9. What are chemical compounds used in actinometer?

10. How do you measure the sensitivity of actinometer?

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) What is Fluorescence? How does it differ from Phosphorescence?

Or

(b) Write a note on internal conversion and intersystem crossing.

12. (a) Explain the importance photo-oxidation reaction in quenching on Fluorescence.

Or

(b) Write short notes on oxetane formation and photo reduction reaction.

13. (a) Discuss the use of photochemistry of inorganic metal complexes in storage of solar Energy.

Or

(b) What is photo-redox reaction? Explain with suitable examples.

14. (a) Discuss the mechanism of Di-PI-Methane rearrangement involving aromatic nuclei.

Or

(b) What is Barton reaction? How this reaction is useful in the generation of ketoalcohol?

15. (a) What are lasers? Explain its principle and applications.

Or

(b) Explain the working of Reinecke's actinometer.

Part C (3 × 10 = 30)

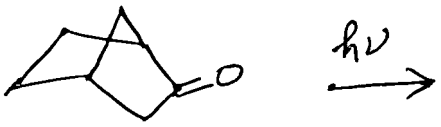
Answer any **three** questions.

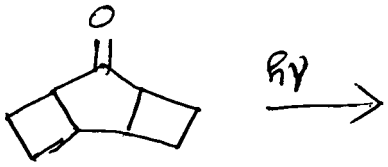
16. Draw and discuss the Jablonski diagram for depicting various photophysical and chemical processes.

17. Find out the major product and provide mechanisms.

(a) trans-5,6-dimethyl-1-cyclohexadine $\xrightarrow{\Delta}$

(b) 

(c) 

(d) 

(4 × 2.5)

18. Write short notes on the following:

(a) Photochemistry of metallocenes

(b) Photo-substitution reactions. (5+5)

19. Explain the following:

(a) Hofmann-Löffler-Freytag reaction

(b) Fries rearrangement of anilides

(c) Photochemical isomerisation reaction (3+4+3)

20. (a) Discuss the principle and working of potassium Ferrioxalate Actinometry.

(b) Explain the working principle and mode of operation of chemical actinometer. (5+5)

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F–5001	Sub. Code
	7MCH1C1

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary / Improvement / Arrear Examinations

First Semester

Chemistry

ORGANIC CHEMISTRY – I

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Explain Inductive effect with suitable examples.

2. Give Taft equation. Explain the terms involved.

3. Give the conditions for optical activity.

4. Define Chirality. Give necessary condition for chirality.

5. What are non-alterant hydrocarbons? Give one suitable example.

6. State Craig's rule.

7. What are non classical carbocations? Give one example.

8. What are carbenes? Give their types and structure.

9. What are ambident nucleophiles ? Give an example.

10. State Bredt's rule and explain.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) With suitable examples, explain steric inhibition of resonance.

Or

(b) Write a brief account on the following

(i) Hyper conjugation

(ii) Field effect.

12. (a) Write notes on the optical activity of biphenyls and spirans.

Or

(b) Discuss sharpless asymmetric epoxidation.

13. (a) Discuss aromaticity of non-benzenoid aromatic compounds.

Or

(b) What are fulvenes and Azulenes? Explain with suitable examples.

14. (a) Discuss the rearrangement reactions involving carbanions.

Or

(b) State and explain :

(i) Principle of microscopic reversibility.

(ii) Hammond Postulate.

15. (a) Write a short note on :

(i) Ambident substrates.

(ii) Pyrolytic cis-elimination.

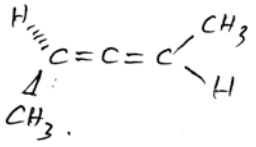
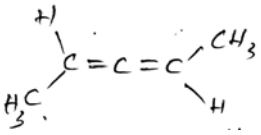
Or

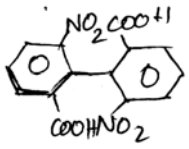
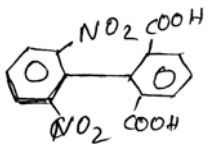
(b) Discuss the nucleophilic substitution at allylic carbon and vinylic carbon with suitable examples.

Part C (3 × 10 = 30)

Answer any **three** questions.

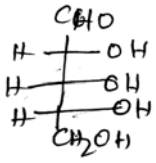
16. (a) Draw the Fischer projection for (R)-2-iodobutane and convert it to its flying wedge formula. (2)

(b) (i)  and 

(ii)  and 

Which of the above molecule are chiral? Explain. (4)

(c) Assign the absolute configuration R or S to each chiral centre in the following compounds. (4)

(i)  (ii) 

17. Discuss

(a) Chemistry of cylopentadienyl anion.

(b) Huckel's rule

(c) Annulenes. (3+3+4)

18. (a) Explain the stability of cyclopropylmethlyl carbocation.

(b) Compare and contrast S_NAr and Benzyne mechanism with suitable examples. (4+6)

19. Write short notes on :

(a) α-elimination.

(b) β-elimination.

(c) Nucleophillic substitution at allylic carbon and vinly carbon. (3+3+4)

20. Briefly describe the application of Hammett equation in describing the reaction mechanism.

F–5002	Sub. Code
	7MCH1C2

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

First Semester

Chemistry

INORGANIC CHEMISTRY - I

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Define electron affinity

2. What is effective nuclear charge?

3. Distinguish between bonding and non-bonding molecular orbitals

4. Predict the shape of XeO_3

5. Give the definitions of an acid and a base on the basis of Lewis theory.

6. What is conjugate acid-base pair? Give examples

7. Give the preparation of P_4S_{10}

8. In what ways, borazine differs from benzene?

9. What is point defect?

10. What is the condition for superconductivity of a material?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Discuss Born Faber's cycle of determining lattice energy

Or

(b) What is Slater's rule? How is it used to determine the effective nuclear charge?

12. (a) Compare VB and MO theories

Or

(b) Predict the shape of the following molecules on the basis of VSEPR theory. (i) ClO_4^- and (ii) NH_3

13. (a) Discuss any five reactions occurred in Liq. ammonia

Or

(b) What is HSAB principle? Discuss its applications.

14. (a) Give the preparation, properties and uses of S_4N_4.

Or

(b) Describe the preparation and uses of polymeric sulphur nitride

15. (a) Explain the different types of solids with neat diagrams

Or

(b) Discuss the band theory of solids

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) Discuss the different types of electrostatic interactions

    (b) What is covalent radii? How does it differ from ionic radii? (6+4)

17. Discuss the bond order and magnetic character of Nitrogen dioxide molecule based on MO theory.

18. (a) Discuss the various types of classifications of solvents

    (b) What are the factors affecting the strength of acids and bases? (5+5)

19. Discuss the preparation, properties and uses of (a) silicon nitride (b) P_4S_{10} (c) S_2N_2 (3+3+4)

20. (a) What is meant by defects in crystal? How are they classified? Give examples.

    (b) Explain the term High temperature superconductivity.

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F–5003

Sub. Code
7MCH1C3

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary / Improvement/ Arrear Examinations

First Semester

Chemistry

PHYSICAL CHEMISTRY – I

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Calculate the ionic strength of a solution which is 0.1 molal in kcl and 0.2 molal in K_2SO_4.

2. Write down the expressions for Debye-Huckel limiting law at higher concentrations. Identify the terms involved it.

3. Write equations for partial molar volume and partial molar free energy.

4. What is the relation between fugacity and activity of a substance?

5. What is relation between equilibrium constant and free energy change?

6. Explain the term eutectic point.

7. Define an ensemble.

8. What is population inversion? How is it achieved?

9. List out the differences between lyophilic and lyophobic sols.

10. Give the Freundlich adsorption isotherm and explain the terms in it.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain Debye-Huckel theory of strong electrolytes.

Or

(b) Explain how equilibrium constant of a cell reaction is determined from the standard emf of the cell.

12. (a) Derive Gibbs-Helmholtz equation.

Or

(b) How can fugacity of a gas be determined?

13. (a) Calculate the equilibrium constant of the reaction:

$Cu(OH)_2 \rightleftharpoons Cu^{2+} + 2OH^-$ given that

$Cu(OH)_2 + 2e^- \rightleftharpoons Cu + 2OH^- \quad E^0 = -0.224V$

$Cu^{2+} + 2e^- \rightleftharpoons Cu \quad E^0 = +0.337V$.

Or

(b) Discuss the phase diagram of zinc-magnesium system.

14. (a) Derive Boltzmann-Planck equation.

Or

(b) Describe the partition function and equilibrium constant.

15. (a) Explain the following terms:

(i) Coagulation

(ii) Zetapotential.

Or

(b) Derive Gibbs adsorption isotherm.

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) How is the solubility of Agel determined by conductivity method?

(b) Derive the Butler-Volmer equation. (4+6)

17. (a) Derive Gibbs-Duhem equation.

(b) How do you determine the activity and activity co-efficient of an electrolyte? (5+5)

18. Draw and explain the phase diagram of $Fecl_3 - H_2O$ system.

19. Discuss the following:

(a) Quantum statistics

(b) Bose-Einstein statistics. (5+5)

20. (a) Bring out the differences between the physisorption and chemisorptions. (4)

(b) Write a note on BET adsorption isotherm. (6)

F–5004	Sub. Code
	7MCH2C1

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary / Improvement/ Arrear Examinations

Second Semester

Chemistry

ORGANIC CHEMISTRY – II

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Draw the Newmann projection of eclipsed ethane

2. What is conformational isomer? Give example.

3. Give the relationship between wavelength, and wave number.

4. What is meant by parent ion?

5. What will be the ^{13}C frequency setting of an NMR spectrometer that operates at 100 MHz for protons?

6. How many signals would you expect to find in the ^{1}H NMR spectrum of each of the following compound? (a) butane, (b) 1 -butanol.

7. Explain the importance of DCC.

8. What is meant by hydroboration?

9. Draw the structure of testosterone with correct stereochemistry.

10. How will you prove the position of double bond in Progesterone?

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the stereoelectronic and steric factors in acyclic derivatives.

Or

(b) Correlate the conformation of acyclic and cyclic systems with their chemical properties.

12. (a) Discuss the factors influencing group frequencies.

Or

(b) Explain the mechanism of Mc Lafferety rearrangement.

13. (a) Discuss spin-spin coupling and shift reagents.

Or

(b) Write notes on,

(i) Double resonance,

(ii) Relaxation time.

14. (a) Write the mechanism of Birch reduction. What are the products obtained when the following are subjected to Birch reduction (i) Anisole, (ii) Benzamide. Compare the reaction rate in the above two cases.

Or

(b) Discuss the synthetic application of lithium dimethyl cuprate and PTC.

15. (a) Establish the structure of ergosterol.

Or

(b) Give the synthesis of, (i) Vitamin D_2 and (ii) Androsterone.

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss in detail on the conformation of mono and disubstituted cyclohexanes.

17. (a) How will you distinguish between the following pairs using UV spectral data? Give reasons. (3)

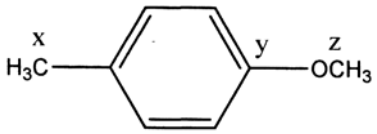
(i) Ethylbenzene and styrene and

(ii) 1 ,3-pentadiene and 1 ,4-pentadiene.

(b) Explain the principles of UV spectroscopy. (4)

(c) Explain Retro Diels-Alder reaction. (3)

18. (a) Consider carbons *x*, *y*, and *z* in *p*-methylanisole. One has a chemical shift of δ 20 ppm, another has δ 55 ppm, and the third δ 157 ppm. Match the chemical shifts with the appropriate carbons with explanation. (5)



(b) Discuss off-resonance decoupling technique in NMR spectroscopy. (5)

19. Discuss the mechanism, application and stereochemical aspects of, (a) Selenium dioxide, (b) N-BS.

20. Discuss the stereochemistry involved in cholesterol molecule and also give its synthesis.

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F–5005	Sub. Code
	7MCH2C3

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Second Semester

Chemistry

PHYSICAL CHEMISTRY-II

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all the** questions.

1. Give the relationship between rate constant and rate for zero order reaction.

2. Define consecutive reactions.

3. Methane does not show microwave rotational spectrum. Explain.

4. Draw the normal modes of vibration of CO_2 molecule.

5. What are stokes and anti-stokes lines? which is more intense in nature?

6. Define Koopman's theorem.

7. Write the basic theory of NQR spectroscopy.

8. Predict the ESR spectrum of phenyl radical.

9. Define proper axis of rotation and class.

10. What are Bethe notation and Mulliken notation?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe the Lindemann theory of unimolecular theory.

Or

(b) Discuss in detail the RRK theory of unimolecular reactions.

12. (a) The force constant of HF molecule is 970 Nm^{-1}. Calculate the fundamental vibration frequency and zero pin energy.

Or

(b) Discuss the information obtained from rotational spectra.

13. (a) Explain the classical theory of Raman scattering.

Or

(b) Discuss the principle of laser Raman spectra.

14. (a) Explain the terms Zero field splitting and Kramer's degenarcy.

Or

(b) Discuss the principle and applications of NQR spectroscopy.

15. (a) Using group orthogonality theorem, derive the character table for C_{2v} point group.

Or

(b) Establish the symmetry species of the normal modes of vibration NH_3 molecule.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) Discuss the Arrhenius theory of bimolecular reactions.

    (b) Illustrate the kinetics of H_2-Br_2 chain reactions. (5+5)

17. (a) Describe the isotope effect in rotational spectra.

    (b) Discuss the principle and instrumentation of FT IR spectroscopy. (5+5)

18. (a) Illustrate the important applications of PES.

    (b) Write a note on electronic spectra of ploy atomic molecule. (5+5)

19. (a) Discuss the role of lanthanide shift reagents in NMR spectroscopy.

    (b) Explain the hyper fine splitting in ESR spectroscopy. (5+5)

20. (a) Describe the procedures followed for constructing the hybrid orbitals in CH_4 molecule.

    (b) Distinguish between reducible and irreducible representations. (5+5)

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F–5006	Sub. Code
	7MCH2E1

M. Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Second Semester

Chemistry

Elective : ENVIRONMENTAL CHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all the** questions.

1. Give the scope of environmental chemistry
2. What are ozone depleting substances?
3. What are the components of hydrosphere?
4. Mention the principle of fluoridation in drinking water
5. What is meant by soil erosion?
6. Name any two important soil pollutants arid their effects.
7. What is the biochemical effect of lead?
8. How are radiation pollutions classified?
9. What is an earthquake?
10. What is disaster and types of disasters?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) What are pollutants? How are they classified? Give examples.

Or

(b) Discuss the possible ways to control the green house effect.

12. (a) Mention the types and their role of microorganisms in aquatic environment.

Or

(b) Discuss the principle involved in the determination of BOD and COD.

13. (a) Outline the origin of soil acidification. How does it affect the plant growth?

Or

(b) Discuss the different steps to be taken to prevent the soil erosion by wind and water

14. (a) Discuss the cause and effect of Bhopal gas tragedy

Or

(b) Write a note on radioactive fallout

15. (a) What is cyclone? Mention its types. How are cyclones formed?

Or

(b) Discuss in detail any one case studies of nuclear accidents.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Discuss the atmospheric reactions involving particles and ions.

(b) What are the important sources of NO and SOx in atmosphere? Explain how are they produced? (5+5)

17. (a) Compare the chemical composition of lakes and streams.

(b) Discuss the major sources of water pollution and their effects. (5+5)

18. (a) Describe the macro and micro nutrients in soil.

(b) What do you mean by soil profile? Discuss the characteristics features of different horizons of soil. (5+5)

19. (a) Discuss the nature of pollutants in the agro based and cement industry effluents.

(b) Explain the cause and effect of cyanide-bio-ware agents. (6+4)

20. (a) Discuss the five phases of emergency managements.

(b) Write short notes on Tsunami and Holocaust. (5+5)

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F–5007	Sub. Code
	7MCH3C1

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Third Semester

Chemistry

ORGANIC CHEMISTRY – III

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

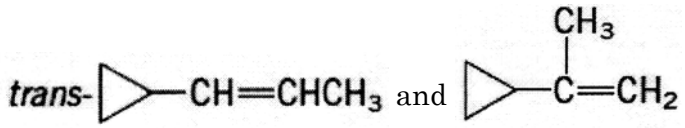
Part A (10 × 2 = 20)

Answer **all** questions.

1. What is Cope rearrangement?

2. State and give an example for Fries rearrangement.

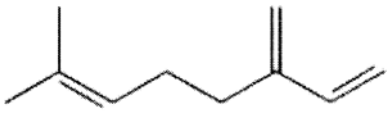
3. The rates of hydration of the two alkenes shown differ by a factor of over 7000 at 25C. Which isomer is the more reactive? Why?



4. Write the reaction and product when Cyclohexene is reacted with $CHBr_3$ in the presence of

   $KOC(CH_3)_3$/ $(CH_3)_3COH$.

5. State "Isoprene rule" and say how isoprenes are linked together in the following compound.



6. Draw the structure of camphor.

7. What is umpolung?

8. What are blocking groups in organic synthesis? Give an example.

9. What is cycloaddition reaction? Give an example.

10. Discuss the electrocyclic reaction of converting (3Z) hexa-1,3,5-triene.

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Write a mechanism of Wagner-Meerwin rearrangement with example.

Or

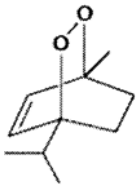
(b) Describe the mechanism of Favorski rearrangement.

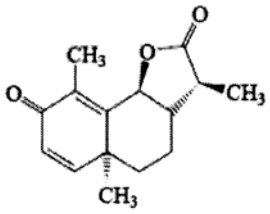
12. (a) Discuss the Sharpless asymmetric epoxidation with example.

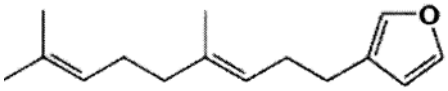
Or

(b) Explain the mechanism of Reformatsky reaction.

13. (a) Identify the isoprene units and classify the following naturally occurring substances:

(i) 

(ii) 

(iii) 

Or

(b) Discuss the synthesis of camphor.

14. (a) Exp1ain the Robinson annelation reaction with example.

Or

(b) Write synthetic procedure of 2,4-dimethyl-2-hydroxypentanoic acid.

15. (a) Draw and explain the Jablonski diagram of various photochemical processes.

Or

(b) Explain the FMO approach of pericyclic reactions.

Part C

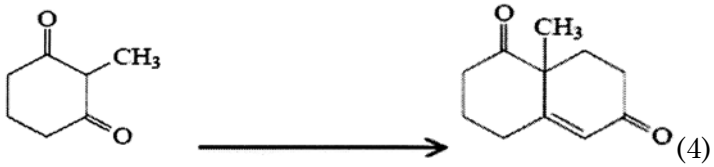
(3 × 10 = 30)

Answer any **three** questions.

16. (a) Discuss the mechanism of Bayer-Villeger oxidation with example.

    (b) Describe the steps involved in Dieneone-Phenol rearrangement. (5+5)

17. (a) Write the steps involved in the following reaction.



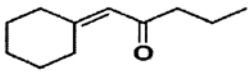
(4)

    (b) Explain the Shapiro reaction with its mechanism. (6)

18. Describe the structure and synthesis of a-pinene.

19. (a) Write a synthesis of trans-9methyl-1-decalone.

    (b) Propose a retro synthetic analysis of the following compound including synthons and the reagents that would be employed in the actual synthesis.



(5+5)

20. (a) What are electrocyclic reactions? Explain with two examples.

    (b) Discuss the sigmatropic reactions. (5+5)

F–5008	Sub. Code
	7MCH3C2

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Third Semester

Chemistry

INORGANIC CHEMISTRY -III

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all the** questions.

1. What are the conditions for a compound to show Mossbauer spectra?

2. Mention the selection rules of IR and Raman spectra.

3. What is Jahn Teller effect?

4. Even though PF_5 has axial and equatorial fluorine atoms, ^{19}F NMR spectrum shows only one peak. Why?

5. Give the structure of basic beryllium acetate.

6. What happens when lead is treated with NaOH and Conc. HCl?

7. Why Sm^{2+}, Eu^{2+} and Yb^{2+} ions in solutions are good reducing agents but an aqueous solution of Ce^{4+} is a good oxidizing agent?

8. What is the general electronic configuration of f block elements?

9. Give the general formula of *closo- and arachno-* borane.

10. How is diborane prepared? What happens when it is heated?

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe the use of IR and Raman spectra to distinguish geometrical and linkage isomers.

Or

(b) What is meant by recoilless nuclear transition? What are the conditions to satisfy for the recoilless nuclear transition?

12. (a) The octahedral high spin complex $[Cr(H_2O)_6]^{2+}$ shows only one peak. Assign the transition using an Orgel duagram

Or

(b) Explain the terms Contact shift and Pseudo contact shift.

13. (a) Discuss the extraction of beryllium from its ore?

Or

(b) Arrange the increasing order CO bond strength of isoelectronic following metal carbonyls $[Mn(CO)_6]^{+}$, $[Cr(CO)_6]$ and $[V(CO)_6]^{-}$. Explain.

14. (a) Discuss the position of actinides in the periodic table

Or

(b) How is the Pu extracted from its ore?

15. (a) Give the preparation and structure of diborane

Or

(b) Discuss the structure of $[Mo_6\ O_{19}]^{2-}$ ion.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Explain the MB spectra of $Fe[Fe(CN)_6]$ and $[Fe_3(CO)_{12}]$

(b) Illustrate the use of IR and Raman spectroscopy in elucidating the structure of metal nitrosyls (5+5)

17. (a) The electronic spectrum of $[Ni(H_2O)_6]^{2+}$ has exhibited bands at 8500 (v_1), 13800 (v_2) and 25300 $(v_3)\ cm^{-1}$ Calculate the 10 Dq and B values

(b) Discuss the applications of the shift reagent in the elucidation of complex NMR spectra. (5+5)

18. (a) Mention the ores of Germanium. How is lead extracted from its ore?

(b) Discuss the structures of $Cr(CO)_6$ and $Fe_2(CO)_9$ (5+5)

19. (a) Describe the oxidation and solvent extraction methods for the separation of lanthanides

(b) Give the preparation, properties and uses of Uranium. (5+5)

20. Discuss the structure and bonding of (a) ferrocene and (b) 12- hetero poly acid. (5+5)

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F–5009

Sub. Code
7MCH3C3

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary / Improvement/ Arrear Examinations

Third Semester

Chemistry

PHYSICAL CHEMISTRY – III

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Explain the terms internal conversion and inter system crossing.

2. What are the selection rules for radiationless transitions?

3. What are vanishing and non-vanishing commutors?

4. Define compton effect.

5. What are the characteristics of the wave function ψ ?

6. What are the steps involved in normalizing a wave function?

7. What is Hermite polynomial?

8. Predict the shape of 1s orbital with the help of its wave function.

9. What are fast reactions?

10. What are the general characteristics of catalysis?

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Write a note on chemical actinometers.

Or

(b) Differentiate between fluorescence and phosphorescence.

12. (a) What are commuting operators? Find the commutator of P_x and X.

Or

(b) Derive the quantum mechanical operator for kinetic energy.

13. (a) Solve the Schrodinger wave equation for a particle moving in a 3D box.

Or

(b) Write down the Schrodinger wave equation for rigid rotor and obtain its solution.

14. (a) Discuss the first order perturbation theory.

Or

(b) Set up the Schrodinger wave equation for simple harmonic oscillation and obtain its solution.

15. (a) Write a note on temperature jump method.

Or

(b) Define mean free path. How is it related to collision diameter?

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Derive Stern – Volmer equation and mention its uses.

(b) Discuss the mechanism, rate law and quantum yield of photo chemical $H_2 - Cl_2$ reaction. (5+5)

17. (a) Describe the postulates of quantum mechanics.

(b) Derive the quantum mechanical operator for potential energy.

18. (a) Solve the Schrodinger wave equation for an electron moving in a ring.

(b) Explain secular determinant and slates determinant.

19. Using HMO theory calculate the delocalisation energy for ethylene system.

20. (a) Explain the principle and working of flash photolysis.

(b) Discuss the kinetics of surface reactions.

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F–5010	Sub. Code
	7MCH3E1

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Third Semester

Chemistry

ELECTIVE - PHARMACEUTICAL CHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Explain pro and soft drugs with examples.
2. What is meant by lead modification?
3. Define β-lactam antibiotics and their importance.
4. What is meant be HIV and AIDS?
5. Give the synthesis of mechlorethamine
6. Explain sedatives.
7. Give the synthesis and chemical name of atenolol.
8. What are cardiovascular drugs?
9. Define analgesics and their utility.
10. Write the adverse effects of paracetamol.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Discuss the factors affecting bioactivity of drug.

Or

(b) Write a note on structure-activity relationship.

12. (a) Describe the SAR of tetracyclines.

Or

(b) (i) What is meant by antimalarial drugs? (2)

(ii) Give the synthesis of Chioroquine. (3)

13. (a) Discuss the role of alkylating agents in the treatment of cancer.

Or

(b) Write a note on neurochemistry of mental diseases.

14. (a) Write a brief note on antiinfective drugs.

Or

(b) How will you synthesize the following?

(i) Sorbitrate

(ii) amyl-nitrate

15. (a) Give the preparation and uses of aspirin and methyl salicylate.

Or

(b) Discuss the therapeutic action of hydralazine and sodium nitroprusside.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. (a) Discuss the specific role of absorption, distribution to enable a drug to reach the active site. (5)

(b) Explain the following physiochemical parameters,

(i) partition coefficient,

(ii) electronic ionisation constant. (5)

17. Discuss the structural features, SAR and synthesis of chloramphenicol.

18. (a) Give a brief account on CNS depressants.

(b) Outline the synthesis of chlorambucil. (5+5)

19. (a) Give an account on drug inhibitors of peripheral sympathetic function.

(b) Write the synthesis of Verapamil. (6+4)

20. (a) Explain the analgesic action of morphine.

(b) Write a note on volatile and non-volatile anaesthetics. (5+5)

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F–5121	Sub. Code
	7MCH1E2

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

First Semester

Chemistry

Elective: POLYMER CHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all the** questions.

1. What is meant by graft coploymer?
2. Define the term degree of polymerization.
3. Give the structure of PMMA.
4. Mention the uses of polycarbonate.
5. Explain the effect of intermolecular forces on the physical properties of polymer.
6. Distinguish between isotactic and atactic polymers
7. What is salol? Give its use.
8. What is the effect of antioxidant on oxidative degradation of a polymers?
9. Mention the use of polymer used in artificial heart.
10. How is reinforced plastics produced?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the significance of vulcanization of rubber.

Or

(b) Illustrate the mechanism of ionic polymerization.

12. (a) Write the monomer and polymer structure of polychloroprene and give the preparation of polychloroprene.

Or

(b) How is polycarbonate prepared? Mention their applications in industry.

13. (a) What is glass transition temperature? How does it depend upon with molecular weight and melting point?

Or

(b) Explain the different geometrical isomers of polymer.

14. (a) Explain the role of antioxidants in polymers.

Or

(b) How is polymer degradation classified? Explain ultrasonic degradation of polymer

15. (a) Explain the injection -moulding machine with a schematic diagram.

Or

(b) Write a note on Calendering in Plastic processing.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) What are linear and cross linked polymers? Give their structures

    (b) Discuss the mechanism of free radical polymerization. (5+5)

17. Illustrate the preparation, properties and uses of the following

    (a) Polyimides

    (b) polybutadiene (5+5)

18. (a) Write a note on kinetics of polymerization.

    (b) Explain cationic and anionic polymerization with suitable examples. (5+5)

19. Discuss the following polymerization techniques:

    (a) suspension

    (b) emulsion (5+5)

20. Using schematic diagram, explain the process of blow loulding and die casting.

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F–5430

Sub. Code
7MCH2C2

M.Sc. DEGREE EXAMINATION, APRIL 2021 &

Supplementary/Improvement/Arrear Examinations

Second Semester

Chemistry

INORGANIC CHEMISTRY II

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define CFSE.
2. What are labile and inert complexes? Give an example for each.
3. What is anation reaction? Give example.
4. Give two point of differences between SN^1 and SN^2 reaction mechanisms
5. What are metalloporphyrins?
6. Give the structure of Ferridoxin.
7. What is the significance of Ziegler-Natta catalyst?
8. Give an example for insertion reaction.
9. Compare the nuclear forces and chemical forces.
10. What are fissile and fertile isotopes?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Discuss the splitting of d-orbitals in octahedral complexes with examples.

Or

(b) A Fe^{2+} octahedral complex is diamagnetic. Whether it is inner orbital or outer orbital complex? Explain.

12. (a) Define trans effect. Explain the π-bonding theory of trans effect.

Or

(b) Describe the mechanism of acid and base hydrolysis reactions.

13. (a) Describe the process of nitrogen fixation in vivo and in vitro.

Or

(b) Give account of Iron-sulphur protein.

14. (a) What is meant by Willkinson catalyst? Explain its catalytic mechanism in hydrogenation of olefins.

Or

(b) Give an account of oxidative addition and reductive elimination reactions.

15. (a) Discuss the application of liquid drop model with respect to mechanism of nuclear fission.

Or

(b) Describe the thermonuclear reactions in stars.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Write note on the postulates of VB theory.

    (b) Give an account of stability constant of complexes.

17. Describe the applications of coordination compounds in various fields.

18. Discuss the structure and function of Hemoglobin and Myoglobin in dioxygen transport.

19. (a) Describe the cylclo oligomerisation acetylenes using Reppe's catalyst.

    (b) Discuss the mechanism of oxo process. (5+5)

20. (a) Explain the nuclear fission reactions in nuclear reactors.

    (b) Describe nuclear waste disposal and radiation protection in nuclear reactors. (4+6)

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