

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2024.

Fourth Semester

Chemistry

Core - SELECTED TOPICS IN CHEMISTRY

(For those who joined in July 2021-2022)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

- Which method is much faster than Ab - initio calculations but the results are mostly erratic

 - Molecular dynamics
 - Nano Science method
 - Semi empirical method
 - Minimal method

- The approximate energies calculated by Har tree Fock calculation method are always equal or greater than the exact _____ value
 - Ground state energy
 - Common value
 - Excited state
 - Average value
- Ion exchange chromatography is based on _____
 - Electrostatic attraction
 - Electrical mobility of ionic species
 - Adsorption chromatography
 - Partition chromatography
- In thin layer chromatography the stationary phase is made of _____ and the mobile phase is made of _____
 - Solid, liquid
 - Liquid, liquid
 - Liquid, gas
 - Solid, gas

- Phenomenon by which a metal or alloy shows high corrosion resistance due to formation of a highly protective very thin quite invisible surface is

 - Passivity
 - Resistivity
 - Conductivity
 - None
- Substances which are able to reduce the rate of corrosion are called _____
 - Accelerator
 - Stimulator
 - Inhibitors
 - None
- Bio sensors detect _____ biological components
 - Cells
 - Proteins
 - Nucleic acid
 - All the above
- The transducers used for the measurements are

 - Temperature
 - Vibration
 - Velocity
 - All of these
- Iron oxide used in MRI scans because it _____
 - High toxicity
 - Brighten the signal
 - Low toxicity
 - None

- Which contrast agent for MR imaging of the liver and mitochondria rich organs like pancreas and kidneys
 - Gadolinium - based agents
 - Manganese based agents
 - Fe III based agents
 - Fe II based agents

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

- Write a note on potential energy scan of molecule.

Or

 - How will you optimize a molecule computationally?
- Explain why corrosion takes place at anode but corroded product forms at cathode or nearly cathode area.

Or

 - Define corrosion. What are the different types of corrosion?

13. (a) What is Thin Layer Chromatography?

Or

(b) Write a note on ion exchange chromatography.

14. (a) Write down the definitions for sensors and Bio Sensors. Give an example.

Or

(b) Explain the primary and secondary type of transducers.

15. (a) Write down the basic principle of MRI and types of contrasting agents.

Or

(b) Explain the advantages of Gadolinium and Manganese based contrast agents.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Derive schrodinger equation.

Or

(b) Write short notes on the following :

(i) Ab - initio method.

(ii) Semi - empirical methods.

Page 5

Code No. : 5425

17. (a) Define corrosion inhibition. How are they classified? Write down the mechanism of action in acidic medium.

Or

(b) Explain the weight loss in corrosion coupon method.

18. (a) Discuss in detail about Solid - Phase Nano Extraction (SPNE).

Or

(b) Discuss the methods of extraction and applications of solvent extraction.

19. (a) Discuss in detail about cell based biosensors and how does it work.

Or

(b) What are the applications of sensors and bio sensors?

20. (a) What are the different types of nuclear imaging? List a few radio isotopic imaging agents.

Or

(b) What are the advantages and disadvantages of manganese based contrast agents?

Page 6

Code No. : 5425