அரசினர் ஆடவர் கலைக்கல்லூரி (தன்னாட்சி), நந்தனம், சென்னை – 35.

CODE: **196310** TIME: 3 Hrs

NOVEMBER 2020 MAX. MARKS: 50

*PART A* *(10 x 2=20)*

*Answer any **TEN** questions.*

1. What is Heitler-London approximation?
2. What is Russell-Saunders coupling?
3. What is Evans diagram. State its significance.
4. State the merits and disadvantages of the $H_2$-$O_2$ fuel cell.
5. Write the Ilkovic equation? Give its significance.
6. What is meant by the term corrosion? How it can be reduced?
7. What is meant by the term 'relaxation time'?
8. What are the parallel reactions? Give an example.
9. What is meant by pulse radiolysis?
10. Differentiate between the natural and synthetic polymers.
11. Differentiate between the addition and condensation polymerization.
12. What is co-polymerization? give an example.

*PART B* *(2 x 5=10)*

*Answer any **TWO** questions.*

13. Using LCAO-MO method, derive expressions for molecular orbital wave function, comment on the values of the energy obtained.
14. Outline the salient features of Hatree Fock Self Consistent Field (SCF) theory.
15. Derive an expression for the molecular vibrational partition function for an ideal diatomic molecule.
16. Explain the Principle, instrumentation and working of Dropping Mercury Electrode (DME).
17. Using the Rice-Herzfeld mechanism for chain reaction, derive the rate law expression for the formation of HBr from $H_2$ and $Br_2$.
18. Describe the primary and secondary salt effect on the reaction rate.
19. Explain the kinetics and mechanism of i) free radical polymerization ii) ionic polymerization.
20. Describe the determination of molecular mass of a polymer by the viscosity method.

*PART C* *(2 x 10=20)*

*Answer any **TWO** questions.*

21. What is Born-Oppenheimer approximation in quantum mechanics? How is it applied in the study of potential energy curve of $H_2^+$ ion?
22. Derive a mathematical expression for the Bose-Einstein statistics.
23. Explain the principle, instrumentation, electrode reactions and working of a $H_2$-$O_2$ fuel cell.
24. Explain the principle and working of stopped flow technique for analyzing the fast reaction.
25. Explain the determination of molecular mass of a polymer by sedimentation method

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