Indian Association for the Cultivation of Science

(Deemed to be University under *de novo* Category)

Integrated Bachelor's-Master's Program

Mid-Semester (Sem-II) Examination-Spring 2021

Subject: Structure and Spectroscopy ***Subject Code(s): CHS 1201***

Full Marks: 25 ***Time Allotted: 2 h***

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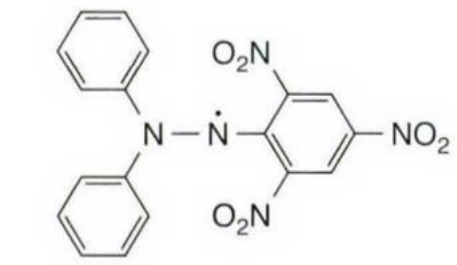
1. Arrange CH_3O^-, $CH_3CH_2O^-$, $(CH_3)_2CHO^-$ and $(CH_3)_3CO^-$ in terms of their basicity and nucleophilicity. Which of them kinetically or thermodynamically controlled? Show using the activation energy diagram. (5 marks)

2. Show the formal charge on tetramethyl ammonium cation. Explain why formal charges are not realistic description of the real charge distribution in molecules. (5 marks)

3. Draw the structure of azulene and explain why it has a permanent dipole moment. (5 marks)

4. Explain why cyclobutadiene is unstable but cyclobutadiene dianion is extremely stable. (5 marks)

5. The $t_{1/2}$ of methyl radical is only 20 microseconds but diphenylpicrylhydrazyl (DPPH) radical is stable for years. Why? (5 marks)



Diphenylpicrylhydrazyl (DPPH)