

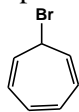
INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR
B.TECH 2nd SEM MID-SEMESTER (Group I–IV) EXAMINATION, JUNE 2021
Chemistry (CH1201)

Time: 45 Min.

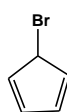
Full Marks: 30

Answer all questions

1. (a) Explain why in brief with appropriate reason of the following statements:
 - (i) The dipole moment of ethylchloride (2.05 D) is larger than that of vinylchloride ($\text{CH}_2=\text{CH-Cl}$, 1.44 D).
 - (ii) Guanidine [$\text{HN}=\text{C}(\text{NH}_2)_2$] is more basic than urea.
 - (iii) The ethanolic solution of p-nitrophenol shows λ_{max} 313 nm but on addition of dilute NaOH to the solution, the λ_{max} is shifted to 400 nm.
 - (iv) Compound **A** gives immediate precipitation of AgBr on aqueous ethanolic AgNO_3 solution but **B** does not response even in boiling condition.

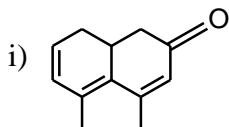


A

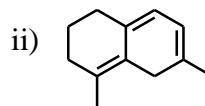


B

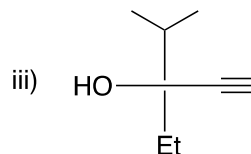
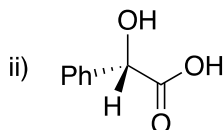
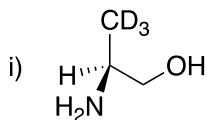
- (b) Calculate the λ_{max} in nm each of the following compounds.



and



- (c) Find out the absolute configuration of the following compounds (**any two**)



[(4×1½) + (2×1) + (2×1)]

2. (a) Using either Crystal field theory or Molecular orbital theory explain the following trend in Δ_o values: $\text{F}^- > \text{Cl}^- > \text{Br}^- > \text{I}^-$.
 (b) High spin d^4 and low spin d^7 complexes are expected to show much stronger Jahn-Teller distortions compared to low spin d^4 and high spin d^7 complexes. Explain with appropriate reasons.

[5+5]

3. (a) The gas-phase (exothermic) reaction $2 \text{NO} + \text{O}_2 = 2 \text{NO}_2$ has the observed rate law $R = k[\text{NO}]^2 [\text{O}_2]$. Devise a mechanism for this reaction that have a rate determining step and that lead to this rate law.
 (b) If a reaction proceeds by two competing mechanisms in parallel (parallel reaction), the overall rate constant of the decay kinetics of the reactant (say A) may not obey the Arrhenius equation. Comment and explain.

[6+4]