

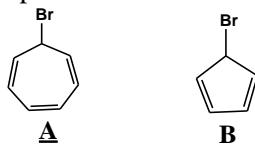
**INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR**  
**B.TECH 2<sup>nd</sup> SEM MID-SEMESTER (Group I-IV) EXAMINATION, JUNE 2021**  
**Chemistry (CH1201)**

**Time: 45 Min.**

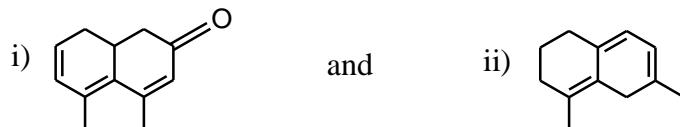
**Full Marks: 30**

**Answer all questions**

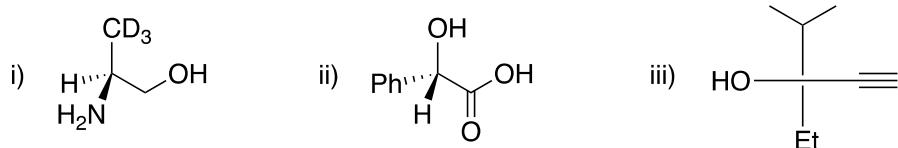
1. (a) Explain why in brief with appropriate reason of the following statements:
  - (i) The dipole moment of ethylchloride (2.05 D) is larger than that of vinylchloride ( $\text{CH}_2=\text{CH}-\text{Cl}$ , 1.44 D).
  - (ii) Guanidine [ $\text{HN}=\text{C}(\text{NH}_2)_2$ ] is more basic than urea.
  - (iii) The ethanolic solution of p-nitrophenol shows  $\lambda_{\max}$  313 nm but on addition of dilute NaOH to the solution, the  $\lambda_{\max}$  is shifted to 400 nm.
  - (iv) Compound **A** gives immediate precipitation of  $\text{AgBr}$  on aqueous ethanolic  $\text{AgNO}_3$  solution but **B** does not respond even in boiling condition.



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



- (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  $\Delta_O$  values:  $\text{F}^- > \text{Cl}^- > \text{Br}^- > \text{I}^-$ .
- (b) High spin d<sup>4</sup> and low spin d<sup>7</sup> complexes are expected to show much stronger Jahn-Teller distortions compared to low spin d<sup>4</sup> and high spin d<sup>7</sup> 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]