

INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR

B. TECH 1st SEM SEMESTER (Group V-VIII) Final EXAMINATION, 2021

Chemistry (CH-1101)

FULL MARKS: 50

TIME: 1h 30min

Answer all questions

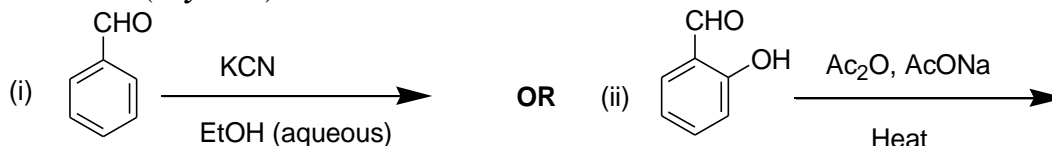
1. (a) Mention one use of the following reagent in organic synthetic transformation and write the chemical equation involved (*any One*).

(i) Lead Tetraacetate **Or** (ii) Dicyclohexylcarbodiimide

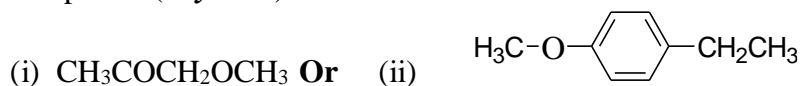
- (b) How Nylon 66 is prepared? Give reactions involved.

- (c) Classify Polymers on the basis of *Tacticity*?

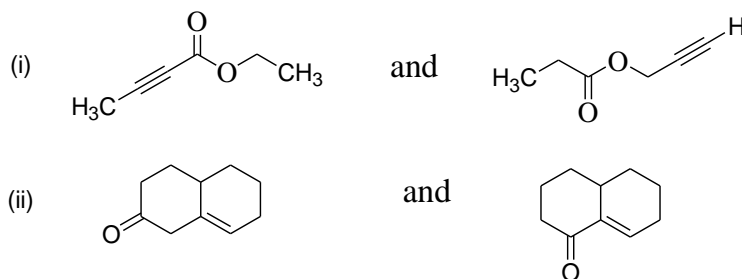
- (d) Predict the product(s) in the following reaction and give the mechanism of product(s) formation (*any One*).



- (e) What do you mean by Chemical shift? Predict the multiplicities and approximate chemical shifts for the absorptions in the proton NMR spectrum of the following compound (*any One*):



- (f) How can you distinguish the following pair of compounds with the help of IR spectroscopy?



[2+2+3+3+(1+2)+(2×2)]

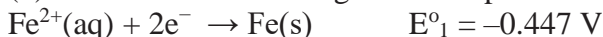
2. (a) Write down the criteria for a radioelement to be chosen for use as a radiodiagnostic agent or a radiotherapeutic agent. Give examples of radionuclides used as radiodiagnostic agents and radiotherapeutic agents.
- (b) Draw the crystal field splitting diagrams for a d^5 metal ion in octahedral high spin and low spin environments and then calculate their Crystal Field Stabilization Energies (CFSE).
- (c) Predict which of the following compounds will undergo Jahn-Teller distortion:
 $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$, $[\text{MnF}_6]^{3-}$ and $[\text{CoF}_6]^{3-}$.
- (d) $[\text{NiCl}_4]^{2-}$ is paramagnetic, $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic – explain in the light of crystal field theory.
- (e) Δ_o value for $[\text{Ru}(\text{H}_2\text{O})_6]^{3+}$ is greater than $[\text{Ru}(\text{H}_2\text{O})_6]^{2+}$ – give reason.
- [(4+1+1)+3+3+3+2]
3. (a) Arrange the following cations in increasing order of ionic mobility (with suitable reasons): H^+ , K^+ , Li^+ , Cs^+ and Na^+ .
- (b) The mobility of Na^+ ion is $7.623 \times 10^{-8} \text{ m}^2 \text{V}^{-1} \text{ sec}^{-1}$. (i) Calculate the ion conductance of Na^+ ion. (ii) Calculate the transport no. of Na^+ and Cl^- ions in an aqueous solution of NaCl , if the mobility of Cl^- ion is $4.239 \times 10^{-8} \text{ m}^2 \text{V}^{-1} \text{ sec}^{-1}$ and the equivalent conductance at infinite dilution is $127 \times 10^{-4} \text{ Sm}^2 \text{mol}^{-1}$.

OR

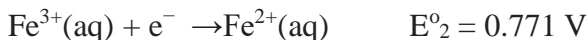
Explain the nature of the plot for the weak acid vs. strong base conductometric titration.

(c) Illustrate the following: (i) 'Relaxation effect' in Debye-Hückel-Onsager model; (ii) Reversible and irreversible electrochemical cells.

(d) Based on the following electrode potentials,



and



Compute the standard reduction potential and equilibrium constant for the following half-cell reaction:



[3+4+4+5]