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






Final Assessment Test (FAT) – June 2022

Programme	B.Tech	Semester	Winter Semester 2021-22
Course Title	ENGINEERING CHEMISTRY	Course Code	BCHY101L
Faculty Name	Prof. Fatch Veer Singh	Slot	A2+TA2
		Class Nbr	CH2021222300154
Time	3 Hours	Max. Marks	100

Answer ANY 10 questions.

Section A (10 X 10 Marks)

Answer any 10 questions

- In an isochoric process, the temperature of five moles of an ideal gas was increased from 300 K to 400 K after absorbing 200 Kcal of heat. Calculate the change in internal energy, molar heat capacity at constant volume and pressure and change in enthalpy. [10]
 (Given: $R = 2 \text{ calorie mol}^{-1} \text{ K}^{-1}$)
- (a) Prove that the $t_{1/2}$ for the first order reaction is independent on the initial concentration of the reactants. [10]
 (b) The rate constant of a reaction at 27 °C and 127 °C are 0.01 and 0.04 sec^{-1} , respectively. Calculate the activation energy the same reaction. (Given: $R = 2 \text{ calorie mol}^{-1} \text{ K}^{-1}$)
- (a) Explain hybridization and geometry of $[\text{Ni}(\text{CO})_4]$ based on valence bond theory. [10]
 (b) Calculate the CFSE of $[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$ and $\text{K}_3[\text{Co}(\text{CN})_6]$
- How will you synthesize benzyl alcohol and benzoic acid starting from Grignard Reagent? Write your answer with proper chemical reactions. Suggest the possible mechanism for both reactions. [10]
- (a) Benzylic carbanion is more stable than the allylic carbanion. Explain with proper reason. [10]
 (b) Explain the planarity of the following chemical species:
 (A)  (B) 
- Explain the criteria of aromaticity for following compounds: [10]
 (A)  (B)  (C)  (D)  (E) 
- Construct a cell for given cell representation. Write the half-cell reactions and calculate the EMF of the cell at 127 °C. [10]
 $\text{Sn} | \text{Sn}^{+2} (0.1 \text{ M}) || \text{Ag}^{+1} (0.01 \text{ M}) | \text{Ag}$
 (Given: $E^\circ_{\text{Sn}^{+2}/\text{Sn}} = -0.14 \text{ eV}$; $E^\circ_{\text{Ag}^{+}/\text{Ag}} = +0.80 \text{ eV}$; Faraday constant is 96500 C/mol, $R = 2.0 \text{ Cal mol}^{-1} \text{ K}^{-1}$)
- (a) A Ruthenium based dye molecule absorbs light in the visible region. Explain how it can be used to harvest solar energy to produce electricity. [10]
 (b) Differentiate between thermoplastic and thermosetting polymers.

9. (a) Describe the key properties and application of nanomaterials.

[10]

(b) What are doped conducting polymers? Explain their types with suitable examples.

10. Explain the principle involved in IR and UV instrumentation techniques.

[10]

11. (a) Write a note on the importance of NMR in Chemistry.

[10]

(b) Explain a suitable water purification method which could be used for the purification of sea water. Give your answer with suitable diagram.

12. (a) 2.5 g of coal was burnt in a bomb calorimeter. The water equivalent of the calorimeter and the latent heat of steam are given as 2.5 Kg and 580 Cal/g, respectively. The rise in temperature

[10]

observed for 1500 g water is given as 5 °C. If the fuel contains 10% of hydrogen, calculate its GCV and NCV calorific value.

(b) Describe anodic and cathodic metal coating process with proper electrochemical reactions.

