VIT
Vellore Institute of Technology

Final Assessment Test (FAT) – June 2022

Programme	**B.Tech**	Semester	**Winter Semester 2021-22**
Course Title	**ENGINEERING CHEMISTRY**	Course Code	**BCHY101L**
Faculty Name	**Prof. Sangeetha P**	Slot	**A1+TA1**
		Class Nbr	**CH2021222300117**
Time	**3 Hours**	Max. Marks	**100**
Answer any 10 questions Draw diagram and write equations wherever necessary.			

PART A (10 X 10 Marks)
Answer any 10 questions

1. a. The heat supplied to Carnot engine is 1971.8 kcal. How much useful work can be done by the engine which works between 30 °C and 130 °C. [10]

   b. Enzymes act as catalysts by lowering the E_a. Explain the above statement in brief with a reaction coordinate diagram.

2. a. Calculate the crystal field splitting energy for a metal with six 'd' electrons under (i) high spin and (ii) low spin conditions. [10]

   b. How does varied ligands influence the colour of the complexes. Explain with suitable examples.

3. Explain in brief the stability aspects of carbocation and carbanion with relevant examples. [10]
4. Identify a cell where the sensitizer can be based on a dye extracted from a naturally available agro based source material. Explain the construction, components and the working principle of the cell with a neat diagram. [10]
5. How polymers are made conductive? Explain the mechanism of the same with an example in detail with an illustration. [10]
6. Explain with a neat diagram the working principle of a microscopic technique which is used for the surface morphology of materials. [10]
7. Describe the method which is used to provide residual hardness of water less than 2ppm. Draw diagram and write equations for the same. [10]
8. a. Calculate the (i) work done, (ii) change in internal energy, (iii) change in enthalpy and (iv) the quantity of heat exchanged during reversible isothermal expansion of 2 moles of an ideal gas from 2.8 dm^3 to 5.4 dm^3 at 310 K. Explain each step with proper justification. R= 8.314 J/Mol/K. [10]

   b. Explain the structure, properties and applications of metal carbonyls?

9. a. Identify a dye which is soluble in nitrobenzene but insoluble in water. Mention the structure and preparation with an example. [10]

   b. Explain the construction of a cell which is used in submarines. Mention the components, construction and working principle of the cell in detail with a neat diagram.

10. a. Write short notes on metal matrix composites? [10]

    b. Explain the principle involved in XRD with a neat diagram.

11. a. Aluminium coating is done in most of the automobile parts. Identify a suitable technique for such type of coating and explain in detail with a neat diagram. [10]

    b. Explain in brief any one method for preparation of nanomaterials using bottom up approach

Course Title	**ENGINEERING CHEMISTRY**	Course Code	**BCHY101L**
Faculty Name	**Prof. Krishnendu Biswas**	Slot	**A2+TA2**
		Class Nbr	**CH2021222300132**
Time	**3 Hours**	Max. Marks	**100**

ANSWER ANY TEN QUESTIONS

Part A (10 X 10 Marks)
Answer any 10 questions

1. i) Compare the work done in an isobaric and an isochoric process with an explanation and an example. 5M [10]
   ii) Heat supplied to a Carnot engine is 200 kJ. Find out the work done if the engine works between 20 °C and 120 °C. 5M
2. Compare the dependency of half-life on the initial concentration of reactants for a zero and first-order reaction with an explanation. [10]
3. Between the complexes, $K_2[Ni(CN)_4]$ and $[Ni(NH_3)_6]Cl_2$, identify the one having absorption at a lower wavelength with an explanation. Also, deduce their geometry and magnetic moment based on valence bond theory. [10]
4. Metals in living beings are vital for survival. Justify by giving two examples with an explanation. [10]
5. Explain the factors determining the aromaticity of an organic compound with suitable examples and give their order of stability. [10]
6. Construct a cell for a given cell representation. Ni | Ni^{+2} (0.004 M) || Cu^{+2} (0.04 M) | Cu [10]
   Write the half-cell reactions and calculate the EMF of the cell at 30 °C. (Given: Cathodic potential is +0.34 eV and anodic potential is -0.25 eV; Faraday constant is 96500 C/mol. R = 2.0 Cal mol^{-1} K^{-1})
7. H_2 and CO can be used for generating electricity. Explain the cell which uses them to generate electricity and bring out its differences from conventional cells. [10]
8. "Nanomaterials have unique properties." Justify and explain any one method of synthesizing them. [10]
9. A sample is to be analyzed for its electromagnetic radiation absorption properties. Explain the principle of the instrumentation used with a block diagram. [10]
10. A water softening method gives a hardness of 1 ppm. Explain the method and bring out its differences from other water softening methods. [10]
11. i) 3.0 g of solid fuel was burnt in a bomb calorimeter. The water equivalent of the calorimeter and the latent heat of steam is given as 500 g and 587 Cal/g, respectively. The rise in temperature observed for 2 kg of water is 6 °C. If the fuel contains 2.0 % of hydrogen, calculate its GCV and NCV. 5M [10]
    ii) A pipe underground needs to be protected from corrosion. Bring out the difference between the techniques used to protect it. 5M
12. i) Explain a corrosion protection technique for a pipe lying underground. - 5 M [10]
    ii) Conducting polymers should have conjugation in the backbone of it. Justify with an example and explain how it can be made conducting nearly like a metal - 5 M