



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

Reg. No.

Final Assessment Test(FAT) - Apr/May 2025

Programme	B.Tech.	Semester	Winter Semester 2024-25
Course Code	BCHY101L	Faculty Name	Prof. Subhayan Dey
Course Title	Engineering Chemistry	Slot	E1+TE1
		Class Nbr	CH2024250501039
Time	3 hours	Max. Marks	100

Instructions To Candidates

- Write only your registration number in the designated box on the question paper. Writing anything elsewhere on the question paper will be considered a violation.

Course Outcomes

- CO1: Understand the fundamental concepts in organic, inorganic, physical, and analytical chemistry.
CO2: Apply chemical concepts for the advancement of materials.
CO3: Analyze the principles of applied chemistry in solving the societal issues.
CO4: Evaluate the fundamental principles of spectroscopy and the related applications.
CO5: Design new materials, energy conversion devices and new protective coating techniques.

Answer any 10 Questions (10 × 10 Marks)

01. (A) Derive an expression for the work done in a reversible isothermal expansion and reversible isothermal compression of a gas (5 Marks)

(B) Derive the relation between the change in internal energy and the change in enthalpy for an ideal gas? Calculate the change in enthalpy when one mole of an ideal mono-atomic gas expands reversibly and isothermally. The change in the internal energy is 1384 J and work done by the gas is 923 J. (5 Marks)

[10] (CO1/K1)

02. (A) How does kinetics of a reaction varies with temperature and justify your answer. Calculate the activation energy of a reaction whose rate constant is tripled by a 10 °C rise in temperature in the vicinity of 27 °C. (5 Marks)

(B) Prove that the half-life time of a first order reaction is independent of initial concentration of reactant. Show that for a first-order reaction, the time requires for 99.9% completion of the reaction is 10 times that required for 50% completion. (5 Marks)

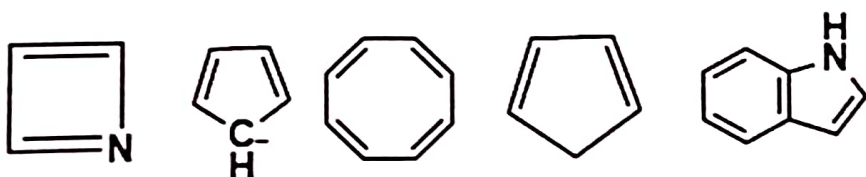
[10] (CO1/K2)

03. (A) Determine the CFSE of $[\text{CrF}_6]^{3-}$ and $[\text{Cr}(\text{CN})_6]^{3-}$. Despite the same oxidation number, the two complex solutions are in different colours. Explain (Given: atomic number of chromium is 24) (6 Marks)

(B) Determine the stability of ferrocene applying the 18-electron rule. (4 Marks)

[10] (CO1/K2)

04. Predict the type of aromaticity of the following compounds and justify your answer:



[10] (CO1/K3)

05. (A) Write the half-cell and net cell reactions take place in the following cell. Determine EMF generated during the operation of cell. (5 Marks)



The standard reduction potentials of $\text{Fe}|\text{Fe}^{2+}$ and $\text{Cu}^{2+}|\text{Cu}$ are -0.44 V and 0.34 V , respectively.

- (B) How charge carrier mobility takes place in p-type and n-type semiconductors. (5 Marks)

[10] (CO5/K4)

06. (A) High charge carrier mobility in semiconductors enhances the efficiency of solar cells. Explain a fabrication method used to produce a semiconductor material that meet this requirement. (6 Marks)

- (B) Discuss the working principle and construction of a fuel cell. (4 Marks)

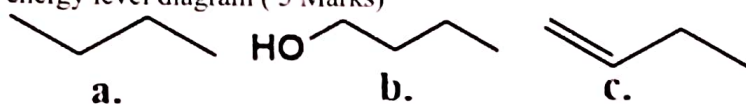
[10] (CO4/K5)

07. (A) Differentiate thermoplastics and thermosetting polymers. (5 Marks)

- (B) Explain the working principle of OLED with a neat sketch. (5 Marks)

[10] (CO3/K2)

08. (A) Discuss the possible electronic transitions that could take place in the following compounds with the help of energy level diagram (5 Marks)



- (B) How the diffraction patterns are formed during X-Ray analysis of a crystalline compound. Explain (5 Marks)

[10] (CO3/K2)

09. (A) Mixed-bed ion exchange method is more efficient than individual ion exchange method. Discuss with suitable chemical reactions. (5 Marks)

- (B) Explain the origin of knocking in diesel engine and state the significance of cetane number. (5 Marks)

[10] (CO2/K5)

10. (A) 0.90 gram of a fuel containing 90% carbon, when burnt in a bomb calorimeter, increased the temperature of water from 27.3° to 29.3°C . If the calorimeter contains 500 grams of water and its water equivalents is 250 grams, calculate the HCV of the fuel. Give your answer in KJ/Kg (5 Marks)

- (B) Discuss a physical vapor deposition for Ti coating on a self-cleaning glass. (5 Marks)

[10] (CO2/K5)

11. (A) Discuss the role of magnesium complexation to porphyrin ring in chlorophyll. (5 Marks)

- (B) Explain the synthesis and applications of paracetamol. (5 Marks)

[10] (CO4/K1)

12. (A) Define nanomaterials. Discuss a top-down approach for the synthesis metal oxide nanoparticles (5 Marks)

- (B) Distinguish optical and electron microscope (5 Marks)

[10] (CO5/K1)

BL-Bloom's Taxonomy Levels - (K1-Remembering,K2-Understanding,K3-Applying,K4-Analysing,K5-Evaluating,K6-Creating)

