

**VIT**

Vellore Institute of Technology

Final Assessment Test – April 2025

Course: BCHY101L - Engineering Chemistry

Class NBR(s): 5999

Time: Three Hours

Slot: F2+TF2

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions
(10 X 10 = 100 Marks)

1. a) Demonstrate that the efficiency expected from a heat engine can not be 100%.
b) Discuss the application of homogeneous, heterogeneous and enzymatic catalysts in the decomposition of H_2O_2 .
2. "Coordination chemistry is extensively used in (i) softening of hard water and (ii) extraction of metal ions". Justify with a suitable example.
3. a) Explain with suitable examples the factors deciding the stability of carbocations.
b) Describe the preparation of paracetamol using phenol with the mechanism of the reaction pathway.
4. Explain how an organic dye can convert solar energy into electrical energy with appropriate illustration.
5. "Nanomaterials are so different and intriguing" Justify this statement by comparing physical and chemical properties of nano and bulk materials.
6. Explain the principle, instrumentation and applications of UV-visible spectroscopy with appropriate examples.
7. Explicate the softening of water by ion exchange process with appropriate chemical equations and suitable diagrams.
8. a) Calculate the change in enthalpy of 1.2 moles of an ideal monoatomic gas which expands reversibly and adiabatically from a volume of 6 dm^3 to 18 dm^3 at 30°C .
[Hint: $C_v = 1.5 R$]
b) A first order reaction takes 6 hours for 90% completion. Calculate the time required for 75% completion.
- 9.a) Differentiate thermoplastic and thermosetting polymeric resins and discuss on the synthesis and applications of phenol-formaldehyde resin.

[OR]

- 9.b) "Doping techniques are essential to improve the conductivity of polymers". Justify this statement with an appropriate example.

10.a) Discuss with suitable diagrams the two approaches followed for corrosion control in underground pipelines.

[OR]

10.b) i) Define calorific value, higher, lower calorific values and Dulong's formula.

ii) A sample of coal has C = 90%, H = 8% and ash = 1%. It was tested in a bomb calorimeter and the following data were obtained. Weight of burnt coal = 0.95 g; weight of water taken = 650 g; water equivalent to bomb calorimeter = 2500 g; rise in temperature = 4.5 °C; fuse wire correction = 50 cal; acid correction = 150 cal and latent heat of condensation of steam as 587 cal/g.

Calculate the gross and net calorific value of the coal in joules.

⇔⇔⇔ G/E/TY ⇔⇔⇔