

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2906

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Unique Paper Code : 2172544801

Name of the Paper : DSC: ADVANCED INSTRUMENTAL METHODS-II

Name of the Course : **B.Sc. (Prog.) ANALYTICAL CHEMISTRY**

Semester : VIII

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Answer **six** questions in all.
3. Attempt **all** parts of a question together.

1. (a) Explain the working principle of TGA. Discuss the various types of information obtained from TGA analysis.

(b) Describe various types of SEM sample preparation techniques.

(c) Explain the TGA-FTIR studies of the polyvinyl chloride (PVC) sample.

(5,5,5)

2. (a) Explain the various steps involved in the thermal decomposition of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ in the presence of air.

(b) What are the various factors which affect thermal analysis?

(c) Explain the TGA-MS analysis for the polystyrene samples.

(5,5,5)

3. (a) Explain the TEM images of metal nanoparticles.

(b) Define glass transition temperature (T_g). What is its importance for polymeric materials?

(c) Explain the use of DSC in determining purity of organic compounds.

(5,5,5)

P.T.O.

4. (a) Which materials are used for sample holders in thermal analysis and why?
(b) Differentiate between Dynamic vs. Isothermal methods.
(c) Why are heating/cooling rates and sample holder selection important in thermal analysis? (5,5,5)
5. (a) Discuss the importance of surface area to volume ratio in nanomaterials.
(b) Explain the instrumental setup and thermocouple configuration in DTA.
(c) Explain the difference between phase transition and decomposition. (5,5,5)
6. (a) Discuss baseline drift. What are the methods used to correct it in DSC/DTA.
(b) Explain the significance of inert and oxidative atmosphere in TGA.
(c) Explain the working principle of Thermomechanical analysis (TMA). (5,5,5)
7. (a) Explain various types of TEM sample preparation and what precautions should be taken.
(b) What is the role of DTG in thermal analysis and what information does it provide to support the TGA curve?
(c) Explain the relation between heat flow vs. temperature curves for Differential Scanning Calorimetry (DSC). (5,5,5)
8. Differentiate between :
(a) SEM and TEM
(b) TMA and DMA
(c) DSC and DTA (5,5,5)