

M. SC. CHEMISTRY EXAMINATION, 2019

(3rd Semester)

ANALYTICAL CHEMISTRY SPECIAL

PAPER XI - A

Time : Two hours

Full Marks : 50

(25 marks for each unit)

Use a separate answerscript for each unit.

UNIT - A - 3111

1. Answer *any five* from the following : 1×5
- i) How DTG of a sample give more information than TG ?
 - ii) Why a standard sample is necessary in DTA experiments?
 - iii) What types of furnaces are utilized for the construction of the thermal instruments ?
 - iv) How the compositions of the crucibles affect the results of TGA ?
 - v) How can you measure the ΔH of TNT by using a simple DTA/DSC instrument ?
 - vi) How dynamic thermogravimetric analysis differ from isothermal thermogravimetric analysis ?

[Turn over

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2. How the crystalline water and coordinated water are distinguished from TGA ? Give the TGA plot of “Blue vitriol” from ambient to 300⁰C and comment on the different types of water molecules present in their structure. How DTA can add more information to the same experiment ? 1+3+1
3. What is the working principle of DTA ? Mention how the DTA can be used to measure the ΔH of a reaction ? What are the advantages of determining ΔH by DTA over classical calorimetric method ? 2+1+2
4. What is automatic thermogravimetry ? Describe it with the example of CaCO₃ and SrCO₃. Does the mixture of Ca(ClO₄)₂ and Sr(ClO₄)₂ can be estimated by automatic thermogravimetry ? 3+1+1
5. What is thermometric titration ? How do you estimate Ca(II) in such titration using EDTA ? Give a line diagram of the DTA instrument mentioning all the components. 1+2+2

UNIT - A - 3112

6. What type of X-ray is needed for single crystal X-ray diffraction studies ? Answer with explanation. 3
7. (a) What is meant by a crystallographic point group ? 2
(b) State the meaning, and draw stereographic projection, of **any three** of the following : 1 $\frac{1}{2}$ × 3
i) 2mm ii) 32 iii) $\bar{4}$ iv) $\bar{6}2m$ v) 23

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8. Write short notes on **any three** of the following : 2 $\frac{1}{2}$ × 3
(i) isogonal symmetry group
(ii) diagonal glide
(iii) Bravais lattice
(iv) 2₁ screw axis
9. Write are Miller indices ? Draw the following planes : 2+2
i) (102)
b) (211)
10. A compound with molecular weight 868 is found to crystallize in monoclinic space group (P2₁/c), which has the following parameters :
 $a = 9.718 \text{ \AA}$, $b = 17.469 \text{ \AA}$, $c = 23.109 \text{ \AA}$, $\beta = 91.864^\circ$,
and $z = 4$.
Find out the density of the crystal in gm/cm³. 4