

M. Sc. CHEMISTRY EXAMINATION, 2017

(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) What is the fundamental difference between TG and DTG?
 - ii) How do the shapes of the crucibles affect the result of TGA?
 - iii) Why heat flux DSC can not accurately determine the ΔH of a transformation?
 - iv) How vibration can affect the sensitivity of a thermal balance ?
 - v) How can you measure the ΔH of TNT by using a simple DTA/DSC instrument ?
 - vi) What types of furnaces are utilized for the construction of the thermal instruments ?
2. What is dynamic thermogravimetric analysis ? How does it differ from isothermal thermogravimetric analysis ? Give an

[Turn over

[2]

example of the dynamic TGA of "Blue vitriol" from ambient to 275°C and comment on the different types of water molecules present in their structure. 1+1+2+1

3. What are the criteria for a good thermal balance ? Give a line diagram of the thermogravimetric instrument mentioning all the components. 3+2
4. What is the working principle of DTA ? Why a standard sample is necessary in DTA experiments ? What is the principal criterion to select such standard samples ? 3+1+1
5. What do you mean by automatic thermogravimetry ? Describe it with the example of CaCO₃ and SrCO₃. What do you mean by power compensation DSC ? 3+2

UNIT - A - 3112

6. What kind of X-ray is needed for single crystal X-ray diffraction studies ? Explain with reasoning. 3
7. Write short notes on *any two* of the following : 3×2
 - i) Isogonal symmetry group
 - ii) diagonal glide
 - iii) 3₁- screw axis

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8. a) What is meant by crystallographic point group ? 2
b) State the meaning, and draw stereographic projections, of *any two* of the following : 2×2
 - i) mmm ii) $\bar{3}m$ iii) 422 iv) $\bar{6}$
9. What are Miller indices ? Draw *any two* of the following planes : 2+(1 $\frac{1}{2}$ ×2)
 - i) (002) ii) (101) iii) (210)
10. A compound with molecular weight 644 crystallizes in monoclinic system, and have the following crystallographic parameters :
 $a = 20.578 \text{ \AA}$, $b = 8.943 \text{ \AA}$, $c = 29.158 \text{ \AA}$,
 $\beta = 90.268^\circ$, $Z = 8$

Find out the density of the crystal in gm/cm³. 5

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