M. Sc. Chemistry Examination, 2017

(3rd Semester)

Inorganic Chemistry Special

Paper - XI-I

Time : Two hours Full Marks : 50

(25 marks for each unit)

Use a separate answerscript for each unit.

UNIT - I - 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

example of the dynamic TGA of "Blue vitriol" from ambient to 275^{o}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 $CaCO_3$ and $SrCO_3$. 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) 3_1– screw axis

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 :

    $a = 20.578\,\text{Å}$, $b = 8.943\,\text{Å}$, $c = 29.158\,\text{Å}$,

    $\beta = 90.268^{o}$, $Z = 8$

    Find out the density of the crystal in gm/cm^3. 5