Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **M.Sc**
MCYC403

4th Semester Regular Examination 2016-17
SOLID STATE CHEMISTRY
BRANCH(S): M.Sc.(AC)
Time: 3 Hour
Max marks: 70
Q Code:Z1192
Question No.1 which is compulsory and any five from the rest
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**

a) According to Bravais lattice scheme of classification of crystals, how many primitive crystal systems and their characteristics are described?

b) Define Atomic Packing Factor (APF) and mention its limiting values for primitive cubic crystals.

c) For a first order X-ray diffraction taking place in a crystal, what is the quantity in Bragg equation that needs to be experimentally determined?

d) 'While solid KCl is colorless as such, it imparts color to flame' – why?

e) Define lattice energy for ionic crystals.

f) How many types of extrinsic semi-conduction arise and why?

g) Non-stoichiometry defects are often observed in oxides and sulphides of metals with a particular property. What is that property?

h) What are the basic chemical components of Portland cement?

i) Which one of the primitive cubic crystals is the most closed packed in nature and why?

j) Vacancy creation in crystals occurs by involving/ by not involving mass transport, which one is the correct answer?

Q2 **a)** Describe with examples the pressure and temperature induced phase transformations with reference to a dielectric material. **(6)**

b) Compare and contrast phase transformation processes involved in annealing and sintering. **(4)**

Q3 **a)** 'X-ray diffraction(XRD) is an instrumentation technique very much necessary on measurements involving crystals.'- Justify the statement with respect to the principle of measurement and instrumentation. **(6)**

b) How is X-ray absorption technique useful in qualitative and quantitative analyses? **(4)**

Q4	**a)**	Are optical microscopes sufficient for value addition choice of coarse minerals for industry setup? Discuss.	**(3)**
	b)	'Although scanning transmission electron microscopy (STEM) is a costly affair in research, it is still very frequently utilized to study surface property of the materials'- discuss with reference to the individual and the composite instrumentation techniques.	**(7)**
Q5	**a)**	With examples, briefly discuss the Wagner's theory and Landau's theory of solid state diffusion.	**(6)**
	b)	"Particle size of crystal depends on the initial nucleation, growth, solidification and segregation"- discuss.	**(4)**
Q6	**a)**	"Austenite steel, on sudden quenching at lower temperature below -250 °C, becomes hardened Martensite steel". Discuss on the phase transformation process including the diffusionless behavior.	**(6)**
	b)	"Monoclinic zirconia, at different temperatures, transforms in to t-ZrO_2 and e-ZrO_2". Discuss on the nature and type of phase transformation.	**(4)**
Q7	**a)**	Describe Fick's laws (1^{st}& 2^{nd}) of diffusion with examples.	**(6)**
	b)	Explain the mechanism of solid state reactions involved in(i) the α-Ag_2S formation from Ag metal and molten sulfur and in (ii) rust formation from iron metal in aerial atmosphere.	**(4)**
Q8	**a)**	Describe briefly, the techno-outline of Portland cement manufacture.	**(4)**
	b)	What 'silicate' structures are commonly encountered?	**(3)**
	c)	How is light-weight, scratch-proof, UV-light repelling photo-chromatic glass manufactured? How does it work	**(3)**