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AI—83—2017

FACULTY OF SCIENCE

M.Sc. (Second Year) (Third Semester) EXAMINATION

NOVEMBER/DECEMBER, 2017

(CBCS Pattern)

PHYSICAL CHEMISTRY

Paper (CH-532/3)

(Solid State Chemistry)

(Monday, 13-11-2017)

Time : 2.00 p.m. to 5.00 p.m.

Time— Three Hours

Maximum Marks—75

N.B. :— (i) Attempt all questions.

(ii) Use of log table and calculator is allowed.

(iii) Solve MCQs in one attempt only.

1. Solve any *three* of the following : 15

(a) Explain in brief coprecipitation as a precursor to solid state reaction.

(b) Write a short note on colour centres.

(c) Explain in brief ferromagnetism and antiferromagnetism.

(d) Write a note on organic charge transfer complex.

(e) Write a note on sintering.

2. Solve any *three* of the following : 15

(a) Explain kinetics of solid state reaction.

(b) If there are 10^{10} m^2 of edge dislocations in a simple cubic crystal, how much would each of these climbs down an average when the crystal

P.T.O.

is heated from 0 to 1000K ? The enthalpy of formation of vacancies is 1.03 eV atoms, the lattice parameter is 2Å. The volume of one mole of crystal is 5.5 cm³.

- (c) Explain in detail *p-n* junction.
- (d) Explain in detail new superconductors in organic solids.
- (e) An intrinsic semiconductor has a band gap of 1.5 eV. Calculate the wavelength of the EMR required to cause the material photoconducting.
3. (a) Explain in brief Magnetic Susceptibility. The length of the unit cell of iron (monoatomic bcc) is measured to be 286 pm using X-ray diffraction. What is the (radius) size of the iron atom ? 8

Or

Explain Quantum Mechanical aspect of band theory.

- (b) How can the reactivity in solids be improved ? 7
- Or
- Explain in brief experimental procedure for solid state reactions.
4. (a) Explain optical properties of solids. 8

Or

Explain in brief Magnetic domain hysteresis.

- (b) Explain thermodynamics of Schottky and Frenkel defects.

Derive :

$$n = [NNi]^{1/2} \exp [-E/kT].$$

7

Or

Explain imperfection due to transient atomic displacement. Cesium bromide has CsCl structure (body centred cubic type of lattice). Its density is 4.49 g cc^{-1} . Calculate the side of the unit cell.

5. (a) Select the *correct* alternative from the following : 5

- (1) Metal deficiency defect shows
- (a) FeO (b) FeS
- (c) NiO (d) All of these
- (2) TiO_2 shows structure.
- (a) Spinel (b) Ruttle
- (c) Perovsterite (d) None of these
- (3) An electron trapped at anion valency is known as
- (a) F-centre (b) V_k centre
- (c) H centre (d) None of these
- (4) If the current in the superconductor exceeds a critical current, the superconducting is destroyed. It is known as
- (a) Silsebee effect
- (b) Meissner effect
- (c) Sintering
- (d) None of the above

- (5) As temperature of a metal increases, conductance of the metal
 - (a) increases
 - (b) decreases
 - (c) No change
 - (d) None of these

- (b) Write short notes on any *two* of the following : 10
 - (i) Electrically conducting solids
 - (ii) Meissner effect
 - (iii) Edge dislocations.