Register Number:
Date:

JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27

M.Sc. PHYSICS - IV SEMESTER
SEMESTER EXAMINATION: APRIL 2018.
PH-DE0517: MATERIAL SCIENCE

Time: 2.5 hours **Max Marks: 70**

This paper contains 3 printed pages

PART – A

Answer any 7 questions. Each question carries 10 marks. (7x10=70)

1. (i) What is level of structure? Depending on the level how are materials classified. (5)

   (ii) Define: (i) Pseudo Elasticity (ii) super Elasticity behavior (2)

   (iii) What are the different methods available for creating nanoparticles? (3)

2. (a) (i) How do you calculate the band gap from UV-Vis absorption spectra of thin films consisting of MgO_2 and other metal complexes? (2)

   (ii) Explain the principle of SILAR process and what is the kind of material one can obtain using this method?

(3)

   (b) (i) Draw General scheme of preparation of sol-gel method. (3)

   (ii) What is the difference between sol-gel method and Chemical precipitation method? (2)

3. (i) Explain lever rule with Tie Line. (4)

   (ii) Derive Phase rule and discuss its advantages and limitations. (6)

4. What are the failures of Langevin theory? How was Weiss able to explain the essential features of these materials by extending Langevin's theory of paramagnetism.

5. (a) Two metals A (melting point 800 ^{o}C) and B (melting point 600 ^{o}C) form a binary isomorphous system. An alloy having 35% B has 75% solid and rest liquid whereas an alloy having 55% B has 25% solid at 700 ^{o}C. Estimate the composition of solidus and liquidus at the above temperature.

(b) A binary alloy having 28 wt % Cu & balance Ag solidifies at 779 ^{o}C. The solid consists of two phases α & β. Phase α has 9% Cu whereas phase β has 8% Ag at 779 ^{o}C. At room temperature these are pure Ag & Cu respectively. Sketch the phase diagram. Label all fields and lines. Melting points of Cu & Ag are 1083^{o} & 960 ^{o}C respectively. Estimate the amount of α & β in the above alloy at 779 ^{o}C and at room temperature.

6. (a) A copper block of mass 2.5 Kg is heated in a furnace to a temperature of 800 ^{o}C and then placed on a large ice block. What is the maximum amount of ice that can melt? Specific heat of Copper is 0.39 $Jg^{-1}C^{-1}$. Heat of fusion of water =335 Jg^{-1} (5+5)

(b) An iron rod of density 7700 kg m^{-3} and specific heat capacity 460.4 J $kg^{-1}k^{-1}$ is subjected to cycles of magnetization at the rate of 60 C/s. If the area of B-H curve for the specimen is 5000 Joules, find the rise in temperature per minute of the specimen, assuming that the heat generated is not radiated.

7. (a)What is the importance of hysteresis curves? (5)

(b) What are antiferromagnetic materials and mention their properties. (3)

(c) What are ferrites? (2)

8. (a) What are the basic entities responsible for thermal conduction of a solid?

(b) Define Coefficient of Thermal Conductivity? (2 marks each)

(c) Define thermal Diffusivity.

(d) Derive the unit for thermal conductivity.

(e) What is meant by temperature gradient?

9. (a) What is Seebeck coefficient of metals (2 marks each)

(b) Write vector differential equation of Seebeck coefficient

(c) What is chromel and alumel?

(d) Define (i) law of intermediate metals (ii) law of intermediate temperatures

10. (a) Explain the phase diagram of Silver-Lead system (8)

(b) Define: (i) Peritectic point (ii) Peritectoid point (2)