[A-24] SEAT No._____ No. of Printed Pages : 2 SC

SARDAR PATEL UNIVERSITY

Third Semester B. Sc. Examination (NC)(Batch- 2010)

Monday, 26th November, 2018

Time: From 02:00 to 05:00 PM

Subject: PHYSICS [US03CPHY02]

Title: Solid State Physics, Thermodynamics and Wave oscillation

Total Marks 70

N.B:**(i) All the symbols have their usual meanings.**
(ii) Figures at the right side of questions indicate full marks.

Que.1 **Choose the correct option for the following questions.** **[10]**

1 The lattice parameters for a cubic crystal system is
(a) $a \neq b \neq c$, $\alpha = \beta = \gamma = 90°$ (b) $a=b=c$, $\alpha=\beta=\gamma = 90°$
(c) $a=b=c$, $\alpha \neq \beta \neq \gamma \neq 90°$ (d) $a=b=c$, $\alpha = \beta = \gamma \neq 90°$

2 The number of atoms present in the unit cell of bcc structure is
(a) 4 (b) 2 (c) 6 (d) 8

3 The atomic packing factor of hexagonal close-packed crystal structure is ____ %.
(a) 52 (b) 56 (c) 60 (d) 74

4 The full form for fcc is ____ .
(a) face centered cubic (b) full centered cubic
(c) face circle cubic (d) face centered circle

5 Radiation is one of the method through which _____ is transmitted.
(a) heat (b) protons (c) neutron (d) electrons

6 Amount of transmitted heat is directly proportional to ____difference.
(a) density (b) temperature (c) volume (d) pressure

7 According to the ____ law, the rate of emission of radiant energy is proportional to T^4.
(a) Stefan's (b) Gauss' (c) Kirchhoff's (d) Coulomb's

8 A resistive force proportional to the amplitude and independent of the frequency in solid is referred to as _____
(a) viscous (b) Coulomb friction
(c)structural damping (d)none of these

9 For _____ case, the reactance in the series LCR circuit is predominantly inductive.
(a) $\omega < \omega o$ (b) $\omega > \omega o$ (c) $\omega \leq \omega o$ (d) $\omega = \omega o$

10 The dark lines in the solar spectrum are called _____lines
(a) Raman (b) Emission (c) Fraunhofer (d) All above these

Que.2 **Answer *briefly* any Six of the following questions.** **[12]**

1 Define the terms: Lattice and Basis.
2 Differentiate between the crystalline solids and non-crystalline solids.
3 Show the planes (110) and (010) in the cubic crystals.
4 Draw the structure of CsCl.
5 What are the properties of the bad conductor.
6 State Wien's displacement law.
7 Obtain relation between the logarithmic decrement, relaxation time and duality factor.
8 Discuss in brief Nuclear Magnetic Resonance.

C.P.T.O

Que.3	a	Explain the symmetry elements in a cubic crystal system with necessary figures.	[05]
	b	Define the terms: 1. Crystal 2. Coordination number 3. APF.	[03]
		OR	
Que.3	a	Show that the APF for bcc structure is 0.68.	[05]
	b	Calculate the number of atoms per fcc structure.	[03]
Que.4	a	With suitable figure, explain procedure to determine Miller indices of a plane.	[05]
	b	Draw the following crystal directions in the unit cell. (i) [100] (ii) [002].	[03]
		OR	
Que.4	a	Discuss the Laue method to record the diffracted rays.	[05]
	b	State and explain Braggs' law of diffraction.	[03]
Que.5	a	Discuss Lee-Charlton's Method to determine thermal conductivity of a card board with necessary diagrams.	[05]
	b	What are Conduction and Convection of heat?	[03]
		OR	
Que.5	a	Discuss the Searle's method to determine thermal conductivity of a metal rod.	[05]
	b	Obtain the expression for heat transfer Q and define coefficient of thermal conductivity K.	[03]
Que.6	a	Explain in detail the experimental method for the determination of Stefan's constant.	[05]
	b	Draw the neat diagram of disappearing filament optical pyrometer.	[03]
		OR	
Que.6	a	State Stefan-Boltzmann's law and give mathematical proof of it.	[05]
	b	Draw the labeled diagram of total radiation pyrometer.	[03]
Que.7		What are damped oscillations? Derive the differential equation of the damping oscillator of a system having one degree of freedom with suitable diagram.	[08]
		OR	
Que.7		Derive the equation for total energy of a weakly damped oscillator and also discuss the average power dissipation during one time period.	[08]
Que.8		What is galvanometer? Using the example of moving coil Galvanometer and LCR circuit, explain mechanical damping and electromagnetic damping.	[08]
		OR	
Que.8		What are forced oscillations? Discuss the forced oscillations of a one-dimensional damped oscillator and obtain its general solution.	[08]