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[A-84]

No. of printed pages: 02

SARDAR PATEL UNIVERSITY
M.Sc. (Physics) (IIIrd -Semester) Examination
Day & Date : Tuesday & 28/04/2015
Time: 02.30 p.m. to 05.30 p.m.

Subject: MAGNETIC AND OPTICAL PROPERTIES IN CONDENSED MATTER
Paper No. : PS03EPHY02

Instructions:

(a) Figure to the right indicate marks.

Total Marks : 70

(b) All questions are compulsory.

Q.1 Write answer of all questions by showing your choice against the question number. [8]

(1) Glow curve is _____ at uniform rate of heating.

- (a) Intensity vs temperature (b) Time vs Intensity
(c) Temperature vs intensity (d) Intensity vs time

(2) If we increase the concentration of activator atoms then luminescence efficiency is _____.

- (a) Increase (b) Increase and then decrease (c) Decrease (d) Constant

(3) Overlap of emission line and absorption line called:

- (a) Natural line width (b) Thermal line width
(c) Half width (d) Full width

(4) The recoil energy (R) can be calculated by :

- (a) $R = \frac{(E_0)^2}{2MC^2}$ (b) $R = \frac{E_0}{2MC^2}$ (c) $R = \frac{(E_0)^2}{2MC}$ (d) $R = \frac{E_0}{2MC}$

(5) response time of photoconductivity is calculated by :

- (a) $t_0 = \frac{\sigma}{e\mu L}$ (b) $t_0 = \sqrt{\frac{\sigma}{e\mu L}}$ (c) $t_0 = \frac{\sigma}{\mu L}$ (d) $t_0 = \sqrt{\frac{\sigma}{\mu L}}$

(6) Dielectric constant of Glass is varies between:

- (a) 3.7 to 10 (b) 7.3 to 10 (c) 0.37 to 1 (d) 0.37 to 10

(7) In a magnetic field, a nucleus with $I = \frac{1}{2}$ has _____ energy levels corresponding to m_I .

- (a) One (b) Two (c) Three (d) Zero

(8) In metallic shift, at a fixed frequency, the resonance of a nuclear spin observed at slightly different magnetic field in a metal than in a _____ solid.

- (a) diamagnetic (b) paramagnetic (c) ferrimagnetic (d) anti-ferromagnetic

P.T.O.

- Q.2 Attempt any Seven of the followings: [14]**
- (i) What is luminescence? Define different types of luminescence.
 - (ii) What do you mean by radiationless transition? Explain it in brief using necessary diagram.
 - (iii) Explain Guddeen-Pohl effect in luminescent material in brief.
 - (iv) What is Doppler broadening? What are the factors that affect and broaden the absorption and emission line?
 - (v) Describe the R.W. Wood experiment to observe resonant absorption.
 - (vi) Using necessary diagram explain direct and indirect band gap in semiconductor in brief.
 - (vii) Define exciton and free carrier absorption in semiconducting material.
 - (viii) What is magnons?
 - (ix) Define hyperfine splitting.
- Q.3(a) Obtain the expression for temperature dependent and independent exponential decay in luminescent material. [6]**
- Q.3(b) What is the role of activator atoms in alkali halide material? Explain thallium activated alkali halide crystal using necessary diagram in detail. Also mention its requirements. [6]**
- OR**
- Q.3(b) Mention important applications of luminescent material. [6]**
- Q.4(a) Draw schematic diagram of Mossbauer effect and discuss its working in detail. Also mention its requirements. [6]**
- Q.4(b) Why Mossbauer experiment performed at low temperature? Obtain expression of Debye – Waller factor. [6]**
- OR**
- Q.4(b) Obtain the expression of cross section of resonance processes. [6]**
- Q.5(a) What is photoconductivity? Obtain the expression of photoconductivity. [6]**
- Q.5(b) Discuss in detail complex dielectric constant and dielectric loss in dielectric material. [6]**
- OR**
- Q.5(b) Define dielectric constant. Explain in detail complex dielectric constant in non-polar solids. [6]**
- Q.6(a) What is ferrimagnets? Discuss in detail Curie temperature and susceptibility of ferrimagnets. [6]**
- Q.6(b) Define resonance. Explain nuclear quadrupole resonance and ferromagnetic resonance in detail. [6]**
- OR**
- Q.6(b) What do you mean by saturation magnetization? Describe temperature dependence of saturation magnetization in detail. [6]**

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