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SARDAR PATEL UNIVERSITY
M.Sc. (Physics) (IIIrd -Semester) Examination

Day & Date : Wednesday & 13/04/2016

Time: 02.30 p.m. to 05.30 p.m.

Subject: MAGNETIC AND OPTICAL PROPERTIES IN CONDENSED MATTER

Paper No. : PS03EPHY02

Instruction:

(a) Figure to the right indicate marks.

Total Marks : 70

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

(1) In a tri-colour picture tube in television is made of _____ colours.

- (a) green, blue & red (b) green, blue & white
(c) green, blue & black (d) green, blue & yellow

(2) The carrier injection luminescence phenomena was discovered by :

- (a) Gudden-Pohl (b) Destriau (c) Hynes-Briggs (d) Johnson - Williams

(3) If we want to perform Mossbauer experiment, the energy of the gamma rays should be fall between:

- (a) 100-200 keV (b) 10-100 keV (c) 10 -200 keV (d) 20-200 keV

(4) In Mossbauer experiment, detector is made of _____.

- (a) Ir (b) NaCl (c) Te (d) NaI

(5) The transition of electron occurs within the band in _____ type of transition.

- (a) direct gap (b) indirect gap (c) interband (d) intraband

(6) The metals are _____ for electromagnetic radiation with frequency higher than plasma frequency.

- (a) transparent (b) opaque (c) translucent (d) luminescent

(7) The fundamental condition for magnetic resonance is _____.

- (a) $\omega_0 = \gamma B_0$ (b) $\omega_0 = \gamma M B_0$ (c) $\omega_0 = \mu B_0$ (d) $\omega_0 = \gamma \mu B_0$

(8) _____ is a typical ferrimagnetic material.

- (a) Fe_2O_3 (b) FeO (c) Fe_3O_4 (d) Fe_2O_2

Q.2 Attempt any Seven of the followings:

(i) Explain thermoluminescence and glow curve.

[14]

(ii) Describe Franck-Condon principle in luminescent material in brief.

(iii) Why efficiency of the luminescent material is depends on concentration of activator atoms?

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(P.T.O.)

- (iv) Mention important requirements to perform Mossbauer effect experiment.
- (v) With help of suitable diagram, explain R.W. Wood experiment to observe resonant absorption.
- (vi) Using necessary diagram, explain in brief fundamental absorption process in semiconductor.
- (vii) Explain absorption process involving impurities in semiconductor.
- (viii) Describe anti-ferromagnetic magnons in brief.
- (ix) Explain ferromagnetic order.

- Q.3(a) What is luminescence? Explain different types of luminescence. Obtain the equation for temperature dependent luminescence efficiency. [6]
- Q.3(b) Describe Destriau effect and Gudden-Pohl effect in luminescent material. [6]
- OR
- Q.3(b) Discuss characteristics and non-characteristics of luminescence using necessary diagram in detail. [6]
- Q.4(a) Explain magnetic hyperfine interactions and quadrupole interaction in detail. [6]
- Q.4(b) Discuss in detail natural broadening and Doppler broadening. What are the factors are affected to broaden the spectral line? [6]
- OR
- Q.4(b) Obtain an expression of Debye - Waller factor and also show its temperature dependence. [6]
- Q.5(a) Explain propagation of light in conducting media in detail. [6]
- Q.5(b) Discuss in detail the theory of dielectrics in alternating field. Obtain the expression for the dielectric constant in terms of the frequency relaxation time. [6]
- OR
- Q.5(b) How are the insulators classified? Describe various parameters and importance of an insulating materials in detail. [6]
- Q.6(a) Define magnons. Explain thermal excitation of magnons in detail. [6]
- Q.6(b) What is resonance? Describe spin wave resonance in detail. [6]
- OR
- Q.6(b) Distinguish between ferromagnets and ferrimagnets? Explain Curie temperature and susceptibility of ferrimagnets in detail. [6]

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