

[36]

**SARDAR PATEL UNIVERSITY**  
**M.Sc. (PHYSICS) (III<sup>rd</sup> – Semester) Examination**  
**Day & Date : Thursday & 19/04/2018**  
**Time: 10:00 a.m. to 01:00 p.m.**

**Title: MAGNETIC AND OPTICAL PROPERTIES IN CONDENSED MATTER**  
**Course Code: PS03EPHY02**

**Instruction: Figures 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) The emission of light resulting from heating of material is referred as \_\_\_\_\_ luminescence.  
 (a) Electro (b) chemi (c) thermo (d) cathodo
- (2) \_\_\_\_\_ is used as activator in luminescent material.  
 (a) Fe (b) Ni (c) Co (d) Cu
- (3) Recoil energy in Mossbauer effect is calculated by using \_\_\_\_\_ equation.  
 (a)  $R = \frac{(E_0)^2}{2MC}$  (b)  $R = \frac{(E_0)}{2MC^2}$  (c)  $R = \frac{(E_0)^2}{2MC^2}$  (d)  $R = \frac{(E_0)}{2MC}$
- (4) The difference between two frequency at which the resonance is half at the peak of resonance is called \_\_\_\_\_ width.  
 (a) Natural line (b) Thermal line (c) Half (d) Full
- (5) At room temperature, perfect dielectric material has conductivity is almost \_\_\_\_\_.  
 (a) 100 (b) negative (c)  $\infty$  (d) 0
- (6) The life time of an electron before recombination is called \_\_\_\_\_ time.  
 (a) relaxation (b) mean life (c) response (d) half life
- (7) In ferromagnetic materials the equation of mean field approximation relates interaction between \_\_\_\_\_.  
 (a) atoms (b) domains (c) crystallites (d) all of them
- (8) The time taken for magnetization to reach saturation in the direction of the applied magnetic field is known as \_\_\_\_\_.  
 (a) longitudinal relaxation time (b) transverse relaxation time  
 (c) rest time (d) time of excitation

**[P.T.O.]**

- Q.2 Attempt any Seven of the followings: [14]
- (i) Explain Frenck-Condon principle for phosphorous material.
  - (ii) How the luminescent efficiency depends on the temperature?
  - (iii) Describe R. W. Wood experiment used for resonant absorption.
  - (iv) Explain P. B. Moon's experiment to observe resonance fluorescence.
  - (v) Describe any two applications of luminescence.
  - (vi) Define: response time and gain factor of photoconducting material.
  - (vii) What is polarizability? Mention different type of polarizabilities.
  - (viii) Describe thermal excitation of magnon in brief.
  - (ix) With relevant equations explain Knight Shift in brief.
- Q.3(a) Obtain the expression for the temperature dependent and independent exponential decay in phosphorous materials. [6]
- Q.3(b) What is electroluminescence? Explain Gudden-Pohl effect and Destriau effect in luminescent material. [6]
- OR
- Q.3(b) Describe characteristics and non-characteristic of the luminescent materials using suitable diagrams. [6]
- Q.4(a) Explain natural line width and the thermal line width observed in the Mossbauer effect. [6]
- Q.4(b) What is resonance? Discuss the cross section of resonance process in detail and write three different conditions to obtain large resonance cross section. [6]
- OR
- Q.4(b) Sketch the experiment of Mossbauer effect and explain its construction, requirements and working in detail. [6]
- Q.5(a) Describe propagation of light in conducting media in detail. [6]
- Q.5(b) With the help of suitable diagram explain in detail free carrier absorption and absorption processes involving impurities for semiconductor. [6]
- OR
- Q.5(b) Define dielectric constant? Describe different methods used to determine dielectric constant. Explain the term dielectric loss. [6]
- Q.6(a) Define magnetization and describe temperature dependence of saturation magnetization in detail. [6]
- Q.6(b) Differentiate between nuclear quadrupole resonance and nuclear magnetic resonance. Explain in detail nuclear magnetic resonance. [6]
- OR
- Q.6(b) With appropriate symbol and with necessary mathematical formulation derive anti-ferromagnetic resonance frequency equation. [6]