[78/A-19]

SARDAR PATEL UNIVERSITY
M.Sc. (Physics) (IIIrd –Semester) Examination
Day & Date : Friday, 28/10/2016
Time: 02.00 p.m. to 05.00 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)

Q.1   Write answer of all questions by showing your choice against the question   [8]
number.
(i) A glow curve is of _____ .
   (a) intensity Vs temperature at uniform rate of time
   (b) trmperature Vs intensity at different rate of time
   (c) time Vs temperature at uniform intensity
   (d) intensity Vs time at uniform rate of heating

(ii) Electro-luminescence occurs in _____ .
   (a) Electrical conductors (b) Electrical insulators (c) p-n junctions (d) all

(iii) In the Mossbauer effect, the recoiless emission of gamma rays is
    because of lattice vibration is _____ Nuclear life time.
   (a) Greater than (b) equal to (c) smaller than (d) infinity of

(iv) If the thermal motion of an atoms will introduce additional absorption and
    emission line is called _____ .
   (a) Natural broadening   (b) Doppler broadening
   (c) Half width   (d) Full width

(v) The skin depth is that distance in metal at which the amplitude of
   electromagnetic wave drops to --------of its value at the surface.
     (a) e^{1} (b) e^{2} (c) e^{-2} (d) e^{-1}

(vi) In unbiased p - n junction, the recombination current is balanced by
   _____ generated current.
     (a) thermally   (b) electrostatically   (c) potentially   (d) optically

(vii) _____material is used in r.f. transformers.
   (a) ferromagnetic   (b)antiferromagnetic
   (c) ferromagnetic   (d) paramagnetic

(viii) The quadrupole splitting is generally large in atoms having ____bond.
     (a) ionic   (b) covalent   (c) metallic bond   (d) hydrogen bond

Q.2   Attempt any Seven of the followings: [14]

   (i)   How radiationless transition occurs in phosphorous?

   (ii) Obtain the equation for effects of temperature on luminescent efficiency.

   (iii) What is luminescence? Define different types of luminescence.

   (iv) Describe natural broadening in Mossbauer spectroscopy.

   (v)   Sketch R.W.Wood experiment to observe resonant absorption and explain
         its working.

   (vi) Describe the absorption processes in direct gap and indirect gap
         semiconductors.

   (vii) What is the use of transformer oil? Why it should be tested at regular
         intervals?

   (viii) Discuss Curie- Weiss law in brief for magnetic material.

   (ix) Explain knight shift in nuclear magnetic resonance.

Q.3(a) Why activators are used in certain luminescent material? What are the effects   [6]
        by adding thallium activators in pure KCl crystal? Discuss it using necessary
        diagram in detail.

Q.3(b) Explain the sulphide phosphorous used in the luminescent material. Also   [6]
        discuss the change the properties of sulphide phosphorous by adding different
        types of activators and co-activators.
                                      OR
Q.3(b) Using necessary diagram, explain three different ways in which excitation is   [6]
        taking place in phosphorous.
        Discuss the various applications of the luminescent material.

Q.4(a) What is Mossbauer effect? Draw a schematic diagram of this effect and   [6]
        explain its working, conditions and requirements.

Q.4(b) Obtain an expression of Debye-Waller factor used in Mossbauer spectroscopy   [6]
        also show its temperature dependence.
                                      OR
Q.4(b) Describe mechanism of Mossbauer effect and also mention important   [6]
        applications of this effect.

Q.5(a) What is photoconductivity? Obtain the expression for total conductivity using [6] semi conducting material.

Q.5(b) In absorption process, discuss in detail the exciton, free carrier and impurities [6] Absorption supported by diagrams and mathematical equations.

OR

Q.5(b) What is dielectric loss and loss angle? Show that the energy absorbed by the [6] medium is directly proportional to the imaginary part of complex dielectric constant.

Q.6(a) Explain antiferromagnetic order in detail with the help of suitable example. [6]

Q.6(b) What are magnons? Derive the dispersion relation for magnons in [6] ferromagnetic material.

OR

Q.6(b) Obtain Bloch equations of motion for nuclear magnetic resonance in [6] ferromagnets. Also explain how to solve them and write the formula for power absorption.

XXXXXXXXXXX

——X —③—— X —