DF-1519

M. Sc. (Sem. III) Examination

March/April – 2016

Physics : SPL : Materials Science

[PH-(M) 534 Advanced Materials Science]

Time : **3** Hours]   [Total Marks : **70**

Instructions :

(1)

(2)   Figures to the right hand side indicate full marks.

(3)   Assume data if required.

(4)   Symbols have their usual meaning.

(5)   Non scientific calculator is permissible to use.

1   Attempt any two :

   (a)   Explain the following terms :   **7**

      (i)   Biomaterials

      (ii)   Spintronic

      (iii)   Fullerene.

   (b)   (i)   Write a brief note on Materials and Civilization   **4**
         with suitable examples.

      (ii)   Explain schematic diagram of Materials science.   **3**

   (c)   (i)   Explain a piece of wood as a material. Describe   **3**
         some of its structure characteristics in light of
         materials science.

      (ii)   How ceramics and composites are differ ? Explain   **4**
         with suitable examples.

2   Attempt any two :
    (a) (i) Briefly explain "Theory of Liquids" and list their   3
             findings.
        (ii) How transitions between state of matter can   4
             takes place ? Justify relevant thermodynemical
             parameters.

    (b) Explain the following terms :   7
        (i)   Glass
        (ii) Emulsion
        (iii) Liquid crystals

    (c) State the following phases and give exemples of   7
        such states and their significance in Materials Science.

Dispersion State	Dispersive State
Solid	Solid
Solid	Liquid
Solid	Gas
Liquid	Solid
Liquid	Liquid
Liquid	Gas
Gas	Solid
Gas	Liquid

3   Attempt any two :   7
    (a) Explain the bonds presents in Macro molecules. State
        role of secondary bonds in macro molecules with suitable
        examples.

    (b) (i) "Protein, Nucleoic Acid, DNA and RNA are   4
             macro molecules, it is possible to determine
             their structures through development in
             Materials Science". Justify this statement.
        (ii) Differentiate r and R in macro molecules. Show   3
             the effect of r/R ratio on their three dimensional
             structure co-ordination, number.

    (c) (i) Explain Hydrogen Bridge in detail.   3
        (ii) Find the critical radius ratio for triangular   4
             coordination.

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4   Attempt any two :   7

   (a)   What do we call the system in which complete liquid and
         solid solubility of two component is observed ? Take the
         example of Copper-Nickel system. Draw its phase
         diagram and explain it.

   (b)   (i)   State Gibb's phase rule. Explain all terms with   4
               suitable examples.

         (ii) Classify non-crystalline phases. Explain properties 3
               of phases in any one non crystalline phase.

   (c)   (i)   What informations we avail from the phase   4
               diagram ? State the significance of phase diagrams
               in materials science.

         (ii) Give the statement of Lever's rule and list   3
               the applications of phase diagrams.

5   Attempt any two :

   (a)   Wood, Teeth and Horn may in which class of   7
         materials ? Explain such class of materials in detail.

   (b)   How the non equilibrium conditions may explain in   7
         phase diagram ? Briefly explain such conditions with
         suitable examples.

   (c)   (i)   List the types of ceramics and their uses.   4

         (ii) Hemicellulose ($C_6H_{10}O_5$) is an important component 3
               in wood. Calculate its molecular weight for a degree
               of polymerization of 150.

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