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# RF-3587-88

## M. Sc. (Part - II) Examination

**April / May – 2010**

## Physics : Paper - II

*(Material Science - I)*

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

**RF-3587**

**Instructions :**

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
**Fillup strictly the details of ☛ signs on your answer book.**

Name of the Examination :

☛ **M. Sc. (Part - 2)**

Name of the Subject :

☛ **Physics - 2**

☛ Subject Code No. : **3 5 8 7** ☛ Section No. (1, 2,.....) : **1**

Seat No. :

Student's Signature

(2) Answers to the two sections must be written in separate answer books.
(3) Attempt all questions, assume data if required.
(4) Symbols have their usual meaning.
(5) Simple calculators are allowed to use.
(6) Figures to right indicate full marks of the question.

**1** (a) Explain the following terms:- **3**
(i) Metallic glasses
(ii) Ceramic system
(iii) Plasma state of matter.

(b) What informations we avail from phase diagram? 4
Explain the practical aspects of phase diagram.

(c) Is it possible to determine the stress in a body if one dosen't know the corresponding strain? 4

**2** (a) 'Structure, properties and performance are corelates with one another in materials science.' explain and justify this statement. 4

(b) What is colloidal states of matter? Give the classification of such states of dispersion phase and dispersing phases are solid, liquid and gas. 3

(c) Show that the minimum ratio of possible sizes to permit a coordination number 6 is 0.41. 5

2 (a) Define the basic terms associated with phase diagram. Explain one component phase diagram in detail. 4

(b) Explain the types of bonding in macromolecules. 3

(c) Apply the Gibb's phase rule for nonvarient, monovarient and divarient equilibrium phase. Calculate their degree of freedom for each case. 5

**OR**

2 (a) Explain the phase diagram for : 4

(i) Ceramic materials and

(ii) Composite materials.

(b) List the applications of plastic deformations. 3

(c) Does a straight chain of mers in polyethylene show any angularity? What causes a polymer chain to become a coiled in this case. 5

3 (a) What is deformation? Explain the elastic and plastic behaviour of materials. 4

(b) Define fatigue. Explain environmental effects for fatigue. 3

(c) (i) In what respect is the action of a kink in crystalline polymer analogous to that of a dislocation in a metallic crystal? 5

(ii) When you bend a steel paper clip, it deforms by slip. By what mechanism would it deform if you first cooled it to $-100^{\circ}C$ and hit it with a hammer?

**OR**

3 (a) Explain viscous and viscoelastic deformations in detail. State the applications of plastic deformation. 4

(b) Write a brief note on composite materials. 3

(c) If the three materials Iron, Rubber and Boron have identical stress, say $12 \times 10^7$ N/m$^2$. calculate the strain values for these materials ( the Young's modulus are $18 \times 10^{10}$ N/m$^2$, $0.5 \times 10^{10}$ N/m$^2$ and $40 \times 10^{10}$ N/m$^2$ for Iron, Rubber and Boron respectively). 5

# RF-3588

**Instructions :**

(1)

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**Fillup strictly the details of ☛ signs on your answer book.**

Name of the Examination :

☛ **M. Sc. (Part - 2)**

Name of the Subject :

☛ **Physics - 2**

☛ Subject Code No. : **3 5 8 8** ☛ Section No. (1, 2,.....) : **2**

Seat No. :

Student's Signature

(2) Answers to the two sections must be written in separate answer books.

(3) Attempt all questions, assume data if required.

(4) Symbols have their usual meaning.

(5) Simple calculators are allowed to use.

(6) Figures to right indicate full marks of the question.

| | | | |
|---|---|---|---|
| **4** | (a) | In addition to high permeability, what are the essential characteristic needed in a soft Magnetic material ? Explain hard magnetic material also. | **4** |
| | (b) | What is the important characteristic of constenitic manganese steel? Why is such steel generally used in the form of castings? | **4** |
| | (c) | Calculate the energy of a photon of infrared light with wavelength of $10^{-6}$ m, where 1 J=0.625 eV. | **3** |
| **5** | (a) | Write the magnatic properties of material. Explain magnetic storage materials in detail. | **4** |
| | (b) | Discuss on optical properties of non metals. | **4** |
| | (c) | The magnetization within a bar of some metal alloy is $5.9\times10^{5}$ A/m at H field of 99.9 A/m. Compute the magnetic suscepitibility and permeability. | **4** |

**OR**

| | | | |
|---|---|---|---|
| **5** | (a) | Explain lumination phenomena of optical materials. | **4** |
| | (b) | Discuss on polymorphic transformations in alloy steel. | **4** |
| | (c) | Derive the equation for two phase composite material. | **4** |

6 (a) What is the role of Nickel and chromium metals in alloy steels ? Write differences between Brass and Bronze alloy's in detail. 4

(b) Discuss on wood and tool steels. which tool steels are used as a high speed cutting tools? Why? 4

(c) What would be the effect of addition at one percent chromium metal to a low carbon steel and high carbon steel cases. 4

**OR**

6 (a) Explain population inversion in a three level laser system. Derive the equation for thresold power. 4

(b) Which steels should be used for following applications? Why? 4

(i) Surgical tools and cuttery

(ii) Grinding and crashing machinary.

(iii) Ball and Roller bearings.

(iv) Truck gears and Railway tracks.

(c) A laser beam of wave length 650nm has coneronce time $3.5 \times 10^{-5}$ sec. Deduce the order of magnitude of its coherence length and spectral half width.