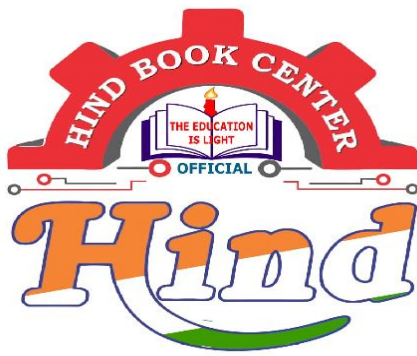




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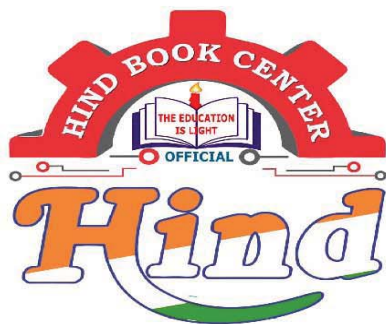
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CHAPTER - 1

INTRODUCTION

Q-What is material science?

- Material science deals with the study of relationship that exists b/w structure and properties of materials.
- In contrast material engineering deals with designing the structure of material to produce a pre-determined set of properties on the basis of structure property correlations.

MATERIAL

- Material can be defined as something that consist of matter. It is the stuff by which something can be made.

Engineering materials are classified as

1. Metals and alloys
2. Ceramics and glasses
3. Organic polymers
4. Composites

STRUCTURE

- The structure of a material usually relates to the arrangement of its internal components.

Structures can be classified as:

1. Macrostructure : • Examined with naked eye / under low-level magnification.

- The internal symmetry of crystalline material may reflect in the external form of a crystal. Such as Quartz.

2. Microstructure : • Observed under the optical microscope which can magnify a structure upto about 1500 times without loss of resolution of details of the structure.

- Structures obtained by using ~~we~~ a microscope with much higher magnification and resolution than an optical microscope.
- for example - In e^- microscope a magnification of 10,00,000 times linear is possible.

3. Crystal Structure : • It tells the details of an atomic arrangement within a crystal. Arrangements of atoms in crystals are expressed in terms of unit cells.

- Unit cell is defined as the smallest group of atoms by repeating which periodically in all the crystallographic directions crystal is formed.

4. Electronic Structure : • The electronic structure of a solid refers to the electrons in the outermost orbitals of individual atoms that constitute the solid.

5. Nuclear Structure : • It is a study by Nuclear spectroscopic such as Nuclear magnetic resonance & (NMR) Mossbauer studies.

PROPERTY

A property is a material trait in terms of the kind and magnitude of response to a specific imposed stimulus.

Properties of solid materials can be :

1. Mechanical Properties

2. Electrical "

3. Magnetic "

4. Thermal "

5. Optical "

6. Deteriorative "

Q- Consider the following statements

I Material science deals with strength & stiffness behaviour of components (buildings / machines / vehicle facilities) based on their response to imposed stresses (forces / moments / torque, etc).

II Material properties are dependent on their microstructure and response to their force field and surface interactions.

which of the above statement is/are correct.

- a) I only b) II only c) both I & II d) neither I nor II

Solⁿ (b) because I is definition of Material Engg.

Q- Consider the following statements regarding material

I - In micro structure, external forms of the crystal may reflect the internal symmetry of atom.

II - Electronic structure is the arrangement of e's in different orbit of atom.

III - A crystal is formed by a non-repeating cell in unidirect

IV - Nuclear structure can be studied by Mossbauer studies.

which of these statements are correct.

- a) I, II & III b) I, II & IV c) I, III & IV d) II, III & IV

Solⁿ (b)

Q- which of the following are the engg. materials.

(i) Metals and Alloys

(ii) Ceramics & glasses

(iii) Organic Polymers

a) (i) & (ii)

b) (ii) & (iii)

c) (i) & (iii)

d) (i), (ii) & (iii)

Solⁿ

(d)

CHAPTER - 2.

ATOMIC STRUCTURE & CHEMICAL BONDING (2 to 3 ds)

ATOMIC NUMBER (Z):

$Z \rightarrow$ No. of protons in the Nucleus

(or)

No. of electrons in a neutral atom.

ATOMIC MASS NUMBER (A):

$$A = Z + n$$

where, $Z \rightarrow$ No. of protons

$n \rightarrow$ No. of neutrons.

(protons and neutrons collectively known as nucleons.)

