

Answer question number (4) any two from the rest

1.(a) Draw the following planes having Miller Indices:

(i) $(2\bar{1}0)$, (ii) $1\bar{1}0$, (iii) (101)

(b) Discuss Bragg's law of X-ray diffraction. Describe how the powder method is used for the determination of crystal structure.

$4^{1/2} + (4+5^{1/2})$

2.(a) Assume the energy of two atoms in the field of each other be

$U = -A/r^n + B/r^m$ (symbols have their usual meaning).

Now derive the expression for bond length and force. Draw neatly the nature of variation of potential and force with atomic separation.

(b) Derive an expression for the binding energy of an ionic crystal and obtain the expression for Madelung constant for NaCl crystal.

$(2+3) + (4+5)$

3.(a) Explain the physical basis of classification of solids into conductors, semiconductors and insulators.

(b) Derive the expression for current density (j) in the metal on the basis of electron gas model.

(c) Define drift velocity and mobility.

$(6+5+3)$

4. Write short note (any one):

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(a) Bravais Lattice

(b) Free electron gas in one dimensional box.

(c) Covalent bonding of solids

(d) Defects of solids.