ABV-Indian Institute of Information Technology & Management-Gwalior

Minor Examination SEPT 24, 2024

IMT& IMG -I[st] Semester **Engineering Physics**

Time Duration: Two hours **Max Marks:30**

Note: -Attempt All. Non-Programmable scientific calculators allowed.

Q.1.Answer in True/False to *Any 5* of the following and justify your answer. **10**

(a) In the monoclinic crystal structure, angles between the axes are, $\alpha=\beta=90^{\circ}, \gamma=120^{0}$.

(b) 5-fold rotation symmetry doesn't exist in nature.

(c) Lattice planes are characterized with Miller indices (hkl)

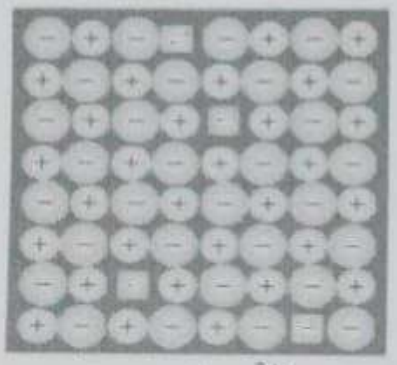
(d) Number of defects is the function of Activation energy only.

(e) All crystals with the same crystal system have the same symmetry.

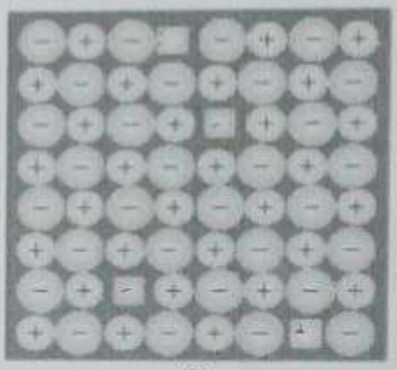
(f) The hexagonal close-packed (HCP) structure is one of the 14 Bravais lattices.

(g) The face-centered cubic (FCC) has ABCABC stacking.

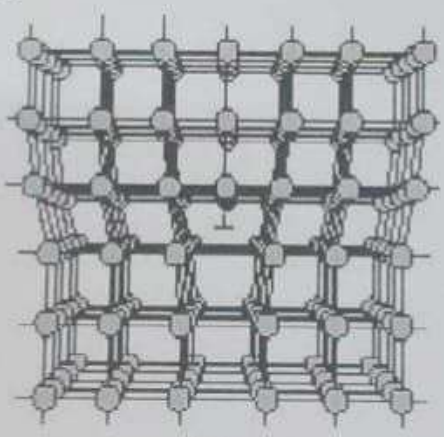
Q.2. Identify the following defects and explain briefly about the science of these defects. **05**



(a)



(b)



(c)

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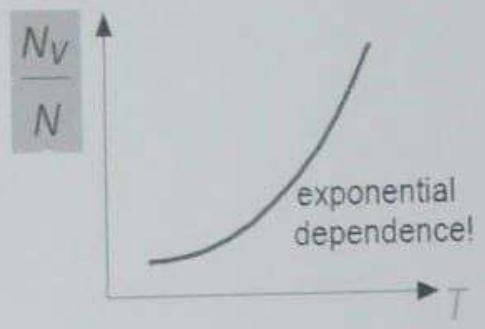
Q.3. (a) Using following tabled information, explain the rule of predicting more Al or Ag to dissolve in Zn? 2.5

Element	Atomic Radius (nm)	Crystal Structure	Electro-nega-tivity	Valence
Cu	0.1278	FCC	1.9	+2
C	0.071			
H	0.046			
O	0.060			
Ag	0.1445	FCC	1.9	+1
Al	0.1431	FCC	1.5	+3
Co	0.1253	HCP	1.8	+2
Cr	0.1249	BCC	1.6	+3
Fe	0.1241	BCC	1.8	+2
Ni	0.1246	FCC	1.8	+2
Pd	0.1376	FCC	2.2	+2
Zn	0.1332	HCP	1.6	+2

(b) Write any three possibilities because of which point defect may occur in crystals. Explain the computation of Equilibrium Concentration of point defects: Following is the hint. 2.5



Q.4. Given a face-centered cubic crystal structure whose edge length of the unit cell is measured to be 4.0 Angstrom: 05

a) Calculate the radius of the atom (r) in the FCC structure.
b) Determine the density of the material using atomic radius with atomic mass of the material is 58.44gm/mol and Avogadro's number is 6.022×10^{23} atoms/mol.

Q.5. Find the equilibrium concentration of vacancies in 1 m^3 of nickel at 350°C and 950°C. Analyze the effect of increasing temperature on the formation of vacancies. 05

0.9eV

OR

Determine the surface density of atoms on the (211) plane in a body-centered cubic lattice with a lattice constant of 0.5 nm.

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