Assignment 11

1] Mention the correct choice with respect to interfaces:

a) Only edge dislocations arrange themselves to form a twist boundary

b) If the energy between three grain boundaries is same, then each angle is 108.5^{o}

c) Surface energy of a twin boundary is very less, due to associated coherency

d) Only screw dislocations arrange themselves to form a twist boundary

2] Mention the correct choices with respect to Martensitic transformation:

a) Total strain necessary to induce phase transformation by shear, can be reduced by giving a lattice invariant shear

b) Induced macrostrains during martensitic transformation, can be reduced by giving a rotation

c) The habit plane after transformation is unrotated and undistorted

d) FCC to HCP, martensitic transformation can uniquely be done by introduction of a single partial dislocation only

3] Mention the correct choice with respect to dislocations in HCP structure:

a) Slip occurs on prism plane if c/a ratio is >= 1.63

b) Slip occurs on basal plane if c/a ratio is < 1.63

c) Basal and pyramidal are the only slip planes in HCP structure

d) [0001] depicts the 'c-type' dislocation in HCP

4] The strain matrix for bcc to hcp transformation in Zirconium is given below

Identify the correct statements in this regard.

$$S_{ij} = \begin{pmatrix} -0.10 & 0 & 0 \\ 0 & 0.10 & 0 \\ 0 & 0 & 0.02 \end{pmatrix}$$

a) Strains induced along x, y and z directions in bcc unit cell are 1.1, 0.9 and 0.8 respectively

b) Strains induced along x, y and z directions in hcp unit cell are 1.1, 0.9 and 0.8 respectively

c) Lattice parameter along the chosen x, y and z directions in bcc structure changes to 1.1, 0.9 and 0.8 respectively

d) Sum of the pure strains is zero

5] For the conversion of an FCC structure to a HCP structure by martensitic transformation, mention the correct choices:

a) Can be achieved by giving a homogeneous shear of 1/6<11-2> on every (111) plane

b) Can be achieved by giving a homogeneous shear of 1/6<11-2> on every alternate (111) plane

c) By utilizing 3 different partials of 1/6<2-1-1> type on every alternate (111) plane, shape strain could be reduced.

d) Can be achieved by giving a homogeneous shear followed by a rotation and finally a lattice invariant shear.

6) Choose the correct statement with respect to iron (fcc-bcc) martensite.

a) Application of Bain strain generates lattice invariant shear

b) Application of Bain strain generates an unrotated and undistorted plane

c) Application of Bain strain generates an unrotated and undistorted line

d) Application of Bain strain generates an undistorted line

7) Choose the correct statement

a) Martensitic transformation is just a diffusionless transformation

b) Martensitic transformation is just a distortive and diffusionless transformation.

c) Macroscopic strain is the strain which brings about the structural transformation

d) Macroscopic strain and the strain to brings about the structural transformation are not the same

8) A single crystal of fcc cobalt is transformed into hcp through martensitic transformation. How many habit plane variants of the martensite form?

a) 1

b) 24

c) 4

d) 6

9) Identify the correct statements

a) Application of homogeneous strain along one axis changes the crystal structure of cubic to tetragonal.

b) Application of the same homogeneous strain along any two axes of a cube changes the crystal structure from cubic to orthorhombic

c) Application of the different homogeneous strain along any two axes of a cube changes the crystal structure from cubic to orthorhombic

d) Application of homogeneous strain along one axis of an orthorhombic unit cell may or may not bring change in crystal structure