

Assignment 8

1] What is the nature of force between two parallel screw dislocations of the same sign?

a) Repulsive

b) Attractive

c) They would annihilate

d) No force exerted

2] Application of an external stress σ_{xx} , a force is generated such that the dislocation climbs down. Upon continuation, a certain point is reached where further movement of dislocation by climb is not possible. Identify the force responsible.

a) Image force

b) Chemical force

c) Peierls force

d) Such an event doesn't occur

3] Mention the correct choices regarding chemical force

a) Chemical Force is only applicable for edge dislocations

b) It is equal and opposite in magnitude and direction to the shear stress applied

c) Small changes in concentration of vacancy can generate a very high force

d) It is assumed that the temperature during the process is very low to avoid diffusion

4] Using the formula given, find out the theoretical shear strength of Al, if the ratio of vacancies be 0.785 necessary for the chemical force to be equal to 1/100 of the theoretical shear strength of aluminium at room temperature (27°C). Lattice parameter of Al is 0.403 nm, $\alpha = \beta = 1$ and $P = 0$; $k = 1.3807 \times 10^{-23} \text{ J.K}^{-1}$.

(2Marks)

$$F_c = \frac{kT}{\alpha\beta b^2} \ln \frac{N_\sigma(T)}{N_e(T)} + Pb = -\sigma_{xx}b = -F_y$$

a) 27.33 GPa

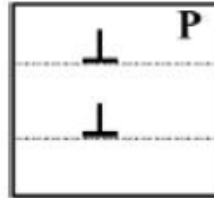
b) 27.48 GPa

c) 27.2 GPa

d) -27.2 GPa

5] At room temperature, two parallel edge dislocations are lying on parallel slip plane in different configurations.

I. Choose the correct option from the given configuration.



- a) Dislocation repel
- b) Dislocation attracts
- c) Dislocations are in stable equilibrium
- d) Dislocations are in unstable equilibrium

II. Choose the correct option from the given configuration.



- a) Dislocation repel
- b) Dislocation attracts
- c) Dislocations are in stable equilibrium
- d) Dislocations are in unstable equilibrium

6] Find out the nature of force act between a pair of parallel dislocations consisting of a pure edge and a pure screw.

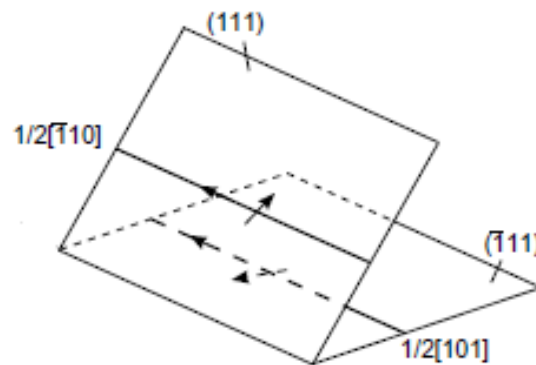
- a) Dislocation repel
- b) Dislocation attracts
- c) No force act between them
- d) None of these

7] $\frac{1}{2}[110]$ edge dislocation is the perfect dislocation in a face-centered cubic metal. The (110) planes perpendicular to b (burger vector) and have a two-fold stacking sequence ABAB...

The 'extra half-plane' consists of how many (110) half planes in the ABAB... sequence?

- a) 1
- b) 2**
- c) 3
- d) None of these

8] Consider two perfect dislocations gliding in different {111} planes as shown in figure.



$$\frac{1}{2} [\bar{1}10] + \frac{1}{2} [101] \rightarrow \frac{1}{2} [011]$$

Mention the correct choices regarding the dislocation reaction.

- a) New dislocation is sessile in nature.**
- b) The line direction of the new dislocation is [0-11].**
- c) The reaction results in a 50% reduction in dislocation energy per unit length.**
- d) It can glide on any of the four {111} planes.