

Advanced Materials Science Challenge

Materials Science · Answer Key · 6 Questions

1. What crystallographic feature is directly quantified by the Burgers vector?

- A) The orientation of a crystal plane
- B) The magnitude and direction of lattice distortion around a dislocation**
- C) The distance between atoms in a unit cell
- D) The symmetry of a crystal system

2. In a binary phase diagram, what is the term for an invariant reaction where a liquid phase transforms directly into two different solid phases upon cooling?

- A) Peritectic reaction
- B) Eutectoid reaction
- C) Eutectic reaction**
- D) Monotectic reaction

3. Which mechanical property describes the time-dependent plastic deformation of a material under constant stress at elevated temperatures?

- A) Fatigue limit
- B) Creep**
- C) Tensile strength
- D) Yield strength

4. What is the critical temperature (T_c) of a superconductor defined as?

- A) The temperature at which its electrical resistance becomes infinite
- B) The temperature at which its magnetic susceptibility becomes positive
- C) The temperature at which its electrical resistivity drops to zero**
- D) The temperature at which it transitions from solid to liquid phase

5. What is the primary mechanism responsible for the shape memory effect observed in Nickel-Titanium (NiTi) alloys?

- A) Dislocation glide and entanglement
- B) Grain boundary sliding
- C) Thermoelastic martensitic phase transformation**
- D) Precipitation hardening

6. Which class of polymers can be repeatedly softened by heating and hardened by cooling, allowing for recycling and reshaping?

- A) Thermosets
- B) Elastomers
- C) Thermoplastics**
- D) Biopolymers