

Engineering Materials (UES012)
School of Physics and Materials Science
Tutorial Sheet No 1-2

1. Name the different mechanical, thermal, electrical, magnetic, chemical, optical and physical properties of materials.
2. Plot an engineering stress-strain graph for a metallic specimen and define the following:
(a) Yield strength (b) stiffness (c) toughness (d) ultimate tensile strength e) resilience
3. Mention different technological properties of metals and alloys and explain them.
4. Give five examples and applications of each of metal, alloy, ceramic, polymer, composite and electronic materials.
5. Differentiate between grain and grain boundary. Find some good micrographs showing grain and grain boundary clearly.
6. Identify the type(s) of bonding(s) present in the following materials: Graphite, Bakelite, Glass, SiC, CdS, AgCl, MgO, Al₂O₃, Clay, Germanium, Brass, ZnO and also give their respective applications.
7. Compare and contrast:
 - (a) Strength, ductility and toughness.
 - (b) Resistance, resistivity and conductivity.
 - (c) Resilience and toughness.
8. What is the difference between macrostructure, microstructure and substructure of the material?
9. Find at least two optical microscope and SEM images of pure metals, alloys and composite materials.
10. What is the difference between an element and compound? List five elements which are metals, non-metals and metalloids.
11. On the basis of structure-processing-correlation, explain how will you go for selecting a material for :
 - a) Designing spring
 - b) Gear tooth
 - c) Relay switch
 - d) Heating element
12. Explain the difference between an amorphous and crystalline material with suitable example. Show a microstructure of any amorphous material.
13. What are composite, ceramics and alloys? Contrast between mixture and compound.
14. What do you understand by structure sensitive and structure insensitive properties of materials? Give at least three examples of each.
15. Which technique can be used to determine the substructure and crystal structure of materials? Give their resolution powers.
16. Which crystal systems are the least and most symmetric. Explain the reason.
17. Show that FCT does not exist in Bravais Lattice list.
18. Write down the physical, electrical, mechanical properties of at least five polymeric materials.