**Materials for Engineers**

**Mock Quiz 1**

**(Use sketches wherever possible)**

* 1. Differentiate between the role of Material scientists and Material Engineers. [2]
  2. Explain with an example how Processing of materials can affect properties. [4]
  3. What are the classifications of Materials? [3]
  4. Explain how these classifications differ in terms of properties (Ex. Density, Elastic modulus, thermal conductivity etc.) [5]
  5. What are the types of bonds that can be found in materials? Explain each briefly. [4]
  6. What is Bond energy and how can it affect melting temperature and stiffness of a material? [5]
  7. What is the bond energy associated with random (non dense) and dense packing of materials?

[4]

* 1. What is meant by lattice and unit cell? [2]
  2. For metals, how many unit cells do you know of? Explain 3 with sketches. [6]

(Here you can explain simple cubic, BCC, FCC, HCP, monoclinic, tetragonal, trigonal etc.)

* 1. Why is density of metals generally higher than other classifications of materials? [3]
  2. What is the difference between single crystal and polycrystalline materials? Also explain the processing used to prepare them. [4]
  3. Define allotropy and anisotropy. [3]

1. Strontium forms a face centered cubic unit cell and has a density of 2.64 g/cm3. What is the radius of a strontium atom? (Atomic weight = 87.62 g/mol) [3]
2. Chromium forms a body centered cubic unit cell. If the radius of a chromium atom is 125 pm, what is the density of chromium in g/cm3? (Atomic weight = 51.996 g/mol) [3]
3. What is meant by equilibrium concentration of vacancies? How is it affected by temperature? [4]
4. Determine the composition, in atom percent, of an alloy that consists of 97 wt% aluminum and 3 wt% copper. (Atomic weight: Aluminium – 26.98; Copper – 63.55) [4]
5. Write about the interfacial defects that you know of. (external surfaces, grain boundaries, tilt, twist, twin boundaries, packing sequence defects) [5]