NAN 242

Midterm 1 - Sample Questions

1. How are energy bands formed in a crystal?
2. What is the difference between an insulator and a conductor form an energy band point of view?
3. Define the Fermi level.
4. Estimate the diameter of an Aluminum atom (atomic weight = 27, density = 2.7gr/cm^3)
5. Define the mean free path for an atom.
6. Define the Knudsen number. What is its significance?
7. If we attach a 500 L/s pump to a chamber with a 500 L/s conductance port, what is the effective pumping speed from the chamber?
8. Give an example of an adsorption vacuum pump and a gas transfer pump.
9. How does a diffusion pump work?
10. How does an ion pump work?
11. What is the advantage and disadvantage of a turbomolecular pump?
12. Describe the operation of an ion gauge.
13. Briefly describe vacuum evaporation.
14. How long would it take to deposit a 2000 Angstrom thick gold film over a 20 cm^2 area using a 1 cm^2 source at 1065 °C? (atomic weight = 197, density = 19.3gr/cm^3, vapor pressure = $1.78x10^{-6}$ Torr@1065°C)
15. Which evaporation source is more suitable for depositing thicker films?
16. Explain how a quartz crystal thickness monitor works.
17. Outline the steps for vacuum evaporation.