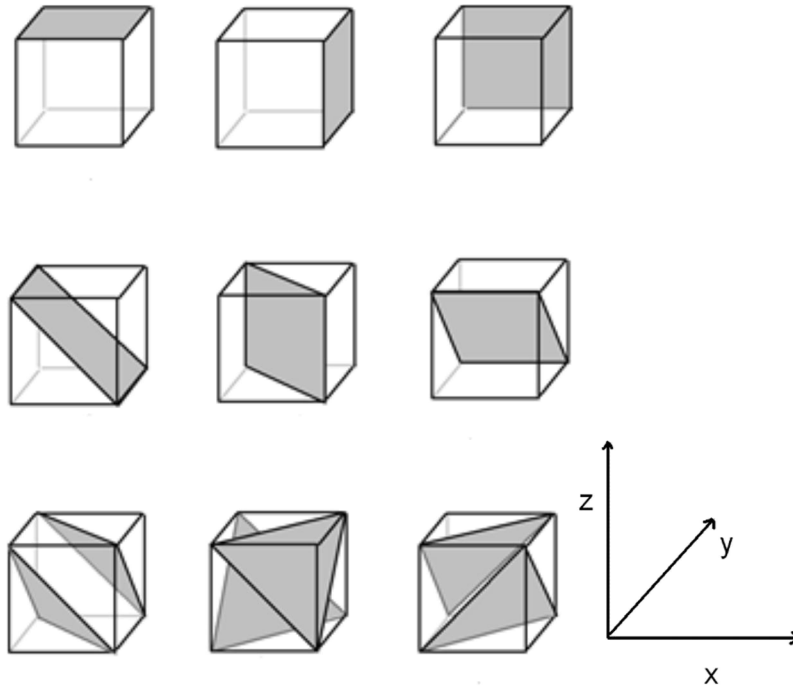1. The unit cell dimension, a, of NaCl is 564 pm. Which is the density of NaCl expressed in g/cm^3? Calculate the interplanar distance of the (111) family of plane of NaCl.

2. Determine the Miller indices of the following planes.

3. Which of the following doped semiconductors will be p-type, which will be n-type, and which are neither?
   a) arsenic in germanium
   b) germanium in silicon
   c) indium in germanium
   d) silicon on antimony site in InSb
   e) magnesium on gallium site in GaN

4. The file Physi.txt contains the results from the physisorption analysis of an Al_2O_3 sample. Draw the physisorption isotherm and comment on which kind of material is and which is the shape of pores. Considering that the cross sectional area of N_2 in 0.192 nm^2, calculate the specific surface area of the material (Note: the BET equation can be applied in the region $0.05 < p/p^0 < 0.40$).

5. Explain why Fe_3O_4 (magnetite) has in inverse spinel structure and magnetic properties.

6. Considering the rate law for ammonia synthesis on Fe-based catalysts and the thermodynamic of the reaction, explain:
   a) why the concentration of NH_3 must be maintained as low as possible;
   b) the conditions of temperature and pressure that must be employed;
   c) how the real mechanism of the reaction has been demonstrated;
   d) the promoting role of K.