# Dispositivos Fotovoltaicos: Materiais e Tecnologia
## Série 1

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1. A compound has a generic formula $Ni_xAl_y$ , where x and y are integers, and it is formed by 42,04 wt % nickel and 57,96 wt % aluminium. What's the formula of this compound?
   [R: $NiAl_3$]

2. The energy levels of quantum states in the hydrogen atom are described by
   $$E_n = E_0/n^2$$
   Where $E_0=-13,6eV$ is the binding energy of the fundamental state, and n is the main quantum number. Knowing that the Balmer spectral lines of the hydrogen emission sprectra correspond to electronic transitions from upper levels to level n=2,
   a) calculate the energy and wavelentgh of the lower energy transition lines;
   b) calculate the energy and wavelentgh of the most energetic line in this series;
   d) what lines are visible?

3. Calculate the photon wavelength necessary to excite an electron at the ground state of the hydrogen atom to the orbital with quantum number n=4

4. Give a value of the Miller indexes of the directions defined by the points (3/4,0,1/4) e (1/4,1/2,1/2).

5. Draw the following crystallographic planes of the cubic cells:
   a) $(10\bar{1})$;
   b) $(1\bar{1}0)$;
   c) $(221)$.

6. In a body centered cubic cell draw the plane $(\bar{1}10)$ and give the coordinates of the atoms that lie in that plane.

7. At 20º C, iron has a BCC (body centered cubic) crystal structure, and its atomic radius is 0,124nm. Estimate the lattice parameter of iron.

8. Copper has a FCC (face centered cubic) structure, with a lattice parameter of 0,361nm. What is the distance between the planes with Miller indexes (220)?

9. The atomic radius of copper is 0,1278nm. Estimate its density (Cu – 63,54g/mole).