

**Answer on Question # 70626, Physics / Other**

**Question** Zinc has a hcp structure. The height of the unit cell is  $4.94 \text{ \AA}$  .the centres of the atoms are  $2.7 \text{ \AA}$  apart. Calculate the volume of the unit cell and density of zinc.

**Solution** Hcp is Hexagonal Close Packing. The unit cell is a hexagonal prism containing six atoms. Let  $a = 2.7 \text{ \AA}$  be the side length of its base and  $c = 4.94 \text{ \AA}$  be its height. The volume of the unit cell in this variables then is

$$V_{\text{crystal}} = \frac{3\sqrt{3}}{2}a^2c \approx 93.56 \text{ \AA}^3$$

Remembering we have 6 atoms in unit cell and mass of one atom is approximately  $m(\text{Zn}) = 1.0856 \cdot 10^{-25} \text{ kg}$ , we can find the density:

$$\rho = 6 \cdot m(\text{Zn})/V \approx 7.1 \cdot 10^3 \text{ kg/m}^3$$