

## ATOMIC STRUCTURE AND INTERATOMIC BONDING

1. Allowed values for the quantum numbers of electrons are as follows:

$n=1, 2, 3, \dots$  (K, L, M, ... shells)

$l=0, 1, 2, 3, \dots (n-1)$  (subshell, e.g.  $l=1$  corresponds to p subshell)

$m_l=0, \mp 1, \mp 2, \mp 3, \dots (2l+1)$

$m_s= \mp 1/2$

Write the four quantum numbers for all of the electrons in the L shell in the form of 'nlm<sub>l</sub>m<sub>s</sub>' and note which corresponds to the s, p, d subshell.

2. Briefly cite the main differences between ionic, covalent and metallic bonding.
3. The percent ionic character of a bond between elements A and B (A being the most electronegative) may be approximated by the expression;

$$\% \text{ionic character} = (1 - e^{-(0.25)(X_A - X_B)^2}) \times 100$$

$X_A$  and  $X_B$  are the electronegativities for the respective elements.

Compute the percent ionic character of the interatomic bonds for the following compounds:  $\text{TiO}_2$  and  $\text{CsCl}$ .

4. Determine the number of the covalent bonds that are possible for atoms of the following elements: Ge and Cl
5. What type of bonding would be expected for each of the following materials and compounds:
- brass (a copper-zinc alloy),
  - rubber,
  - barium sulfide ( $\text{BaS}$ ),
  - solid xenon,
  - bronze,
  - nylon, and
  - aluminum phosphide ( $\text{AlP}$ )