**WORKSHEET-SOLIDS**

**Set A:**

1. Indicate the **type of crystalline** solid each of the following would form upon crystallization. Tell what **type of particles** are located at the lattice points and the **types of attractive forces** that exist between the particles.

| Chemical | Type of crystalline solid | Type of particles at lattice points | Attractive forces between lattice points |
|---|---|---|---|
| SiC | | | |
| HBr | | | |
| Cu | | | |
| $Br_2$ | | | |
| $NH_4ClO_3$ | | | |

2. Crystalline aluminum has cubic structure. The unit edge length is $4.440 \times 10^{-8}$. The density of solid aluminum is 4.096 g/cm$^3$. Calculate the number of aluminum atoms in one unit cell.

Answer=8.00 atoms/unit cell

3. The volume of a manganese **atom** is $9.21 \times 10^{-24}$ cm$^3$. Manganese crystallizes in a face-centered cubic system. What is the density of manganese? Answer: 7.34 g/cm$^3$

Setup:

**Set B:**

1. $CaCl_2$ (s) crystallizes in a cubic lattice. The unit cell has an edge of $4.77 \times 10^{-8}$ cm. The density of $CaCl_2$ (s) is 6.80 $g/cm^3$. How many formula units of $CaCl_2$ must there be per unit cell?

Answer: 4 formula units

2. A metal crystallizes in a cubic closest packing structure and its density is 9.25 $g/cm^3$. What is the molar mass of the metal, if the volume of its **atom** is $8.23 \times 10^{-24}$ $cm^3$?

Answer: 61.8 g/mole

3. a. Name the five types of crystalline solids.

i) _____ ii) _____ iii) _____ iv) _____ iv) _____

b. Indicate the **type of crystalline solid** each of the following would form upon solidification. Tell what **type of particles** are located at the lattice points and the **types of attractive forces** that exist between the particles.

| Chemical | Type of crystalline solid | Type of particles at lattice points | Attractive forces |
|---|---|---|---|
| $S_8$ | | | |
| HF | | | |
| potassium permanganate | | | |
| Ni | | | |
| $SiO_2$ | | | |

**Set C :**

1. Nickel has a cubic unit cell. The edge of the unit cell is $3.524 \times 10^{-8}$ cm. The density of metallic nickel is 8.91 g/cm$^3$.
a) How many nickel atoms are in the unit cell?
b) Calculate the radius of a nickel atom based on your result of question (a) above.

Answer: a) 4 atoms
b) $1.24 \times 10^{-8}$ cm

2. The volume of a metal **atom** is $7.24 \times 10^{-24}$ cm$^3$. The metal crystallizes in a cubic closest packing structure. The density of the metal is 8.77 g/cm$^3$. What is the molar mass of the metal?

Answer : 51.5 g/mole

3. Indicate the **type of crystalline solid** each of the following would form upon solidification. Tell what **type of particles** are located at the lattice points and the **types of attractive forces** that exist between the particles.

| Chemical | Type of crystalline solid | Type of particle(s) at lattice point | Attractive forces between lattice points |
|---|---|---|---|
| $NH_4HSO_4$ | | | |
| $SiO_2$ | | | |
| Si | | | |
| HCl | | | |
| Al | | | |
| $I_2$ | | | |

4. Manganese crystallizes in a face-centered cubic system. The radius of the manganese **atom** is $1.30 \times 10^{-8}$ cm. What is the density of manganese? Answer: 7.32 g/cm3

5. Associate each of the solids: CsI, $SiO_2$, Ni, and $SiCl_3H$ with one of the following sets of properties:

a) A very hard solid subliming at 2900 ° C. _____

b) A yellowish solid having a melting point of 40 ° C and is a nonconductor of electricity in the molten state. _____

c) A lustrous solid melting at about 1600 ° C . Both the solid and the liquid are electrically conductors. _____

d) A white solid melting at about 700 ° C . The liquid is electrically conducting although the solid is not. _____