Q1-Fill in Blank with one correct answer.
1- An element with atomic weight 56 gm/ mole, the radius of atom is---
2- Metals are shiny because of -------------------
3 - Bronze is an alloy of------------------------
4-Two equal charges but opposite in direction is called -----.
5- The component of the solid solution which is the largest is called -------
6- GaAs is a ------------------------materials
7- One nanometer is equal to ---------------meter
8- List one material with Simple cube crystal structure------------
8- ----- 
9- A material that gives few valence electrons is called -----------
9- --- 
10- Optical Microscope magnification is-------------------.
10- Answer

1- about 1°A
2- Electron Sea (Free Electrons)
3- Cu+Zn
4- Dipole
5- Solvent
6- Semiconductor Materials
7- $10^9$ meter
7-- The structure is ideal
9- Anion
9- up to X1500.
Q2) A cubic unit cell with a side length (a)L is shown in figure. The radius of atom is \( R = 1.5 \ \text{Å} \). Calculate the length of the cube.

Solution

The structure is FCC, then \( a = 2r \sqrt{2} \)

\[
a = 2 (1.5) \sqrt{2} = 4.24 \ \text{Å}
\]

Q3) Find the direction of AC in Fig below.

solution

\[
\begin{align*}
A &= \begin{bmatrix} 1/2 & 3/5 & 1 \end{bmatrix}, \\
C &= \begin{bmatrix} 1 & 4/5 & 0 \end{bmatrix}, \\
C - A &= \begin{bmatrix} 1/2 & 4/5 & 0 \end{bmatrix} - \begin{bmatrix} 1/2 & 3/5 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1/10 & 1 \end{bmatrix}
\end{align*}
\]

multiply by 10

Ans: \( AC = \begin{bmatrix} 5 & 2 & 10 \end{bmatrix} \)

Q4) Fill in Blank with one correct answer

1) The Electrical lamp's filament is made from ------------------.
2) The method of manufacturing ceramics cutting tools is---
3) The line between \( \alpha / \alpha + L \) is -------
4) Forcing a liquid metal into mold under pressure is called--
5) The magnification of SEM is ------------------
6) Amorphous mean ------------------
7) - Ceramagrophy is ------------------
8) List all type of carbon steel with C%

a- ------------------ b--------------------- c--
Answer:
1- Tungsten+ Thorium Oxide
2- Powder Metallurgy
2-solidsus
4- Pressure Die Casting
5- 50000X
6- Non Crystalline
7- To study the microstructures of ceramics and their qualitative and quantitative descriptions
8- a- low carbon steel C% < 0.25
   b- medium Carbon steel C% 0.25-0.6
   c- High carbon steel C% > 0.6

Q5) A 345 MN tensile load is applied along the axis of a cylindrical brass rod with a diameter 10 mm and 80 mm long. The modulus of elasticity of brass is 10x10^4 Mpa. Find the final length.

Q6) - Calculate the diffraction angle for X-ray with a wave length of 0.9 Å for (2 1 3) plane in a BCC structure. The atomic radius is 1.5 Å. The temperature is 25 degrees and the pressure is 1 atmosphere.

Q7) Copper has FCC structure with atomic radius 0.128 nm, the atomic weight is 63.5 g/mole. Compute the true density.

For FCC a = (2R), 1nm = 10Å
a = (2x 1.28 x √2) = 3.62 Å = 3.63x10^-8 cm
n=4 atoms, Atomic number = 63.5 g/mole,
Vc = a³, Nₐ=6.02x 10²³ g/mole
ρ = N M/(Vc Nₐ) = 8.9 g/cm³

Q8) Pb- Sn phase diagram shown below. Calculate(show all your work) the weight percentage of each phase present at: 225 °C for 30%Sn.
Q9) Show that the atomic packing factor for the FCC crystal structure is 0.74.

Q10) A piece of copper originally 305 mm long is pulled in tension with a stress of 276 MPa. If the deformation is entirely elastic, what will be the resultant elongation?

**Solution**

\[
\sigma = \epsilon E = \left( \frac{\Delta l}{l_0} \right) E
\]

\[
\Delta l = \frac{\sigma l_0}{E}
\]

Then

\[
\Delta l = 0.77 \text{ mm}
\]