12.1: Crystal Lattices and Unit Cells

12.1.1. Crystalline solids differ from amorphous solids by _____.

a. Substantial intermolecular attractive forces
b. A long-range repeating pattern of atoms, molecules, or ions
c. Atoms, molecule, or ions that are close together
d. Much larger atoms, molecules, or ions
e. No orderly structure

12.1.2. _____ is a unit cell with all sides the same length and all angles equal to 90° that has lattice points only at the corners.

a. Body-centered cubic
b. Face-centered cubic
c. Monoclinic
d. Primitive cubic
e. Spherical cubic

12.1.3. What is the fraction that each corner atom takes up in a face-centered cubic unit cell?

a. 1
b. 1/2
c. 1/4
d. 1/8
e. 1/16

12.1.4. A face-centered cubic unit cell contains how many atoms?

12.1.5. Based on sodium chloride structure, which of the following cannot form a solid lattice?

a. NaBr
b. LiF
c. RbI
d. CuO
e. $CuCl_2$

12.1.6. What type of solid is held together by dispersion, dipole-dipole or hydrogen bonds?

a. Ionic
b. metallic
c. molecular
d. covalent network

12.1.7. What type of compounds are held together by covalent bonds?

a. ionic
b. metallic
c. molecular
d. covalent network

12.1.8. Solid Iodine is a ____type of substance:

a. ionic lattice
b. metallic
c. molecular
d. covalent network

12.1.9. Diamond lattices are a ___ type of substance

a. ionic crystal
b. metallic
c. molecular
d. network covalent

12.1.10. How many basic crystal systems are there?

a. 3
b. 4
c. 6
d. 7

12.1.11. Which is not a type of cubic unit cell?

a. tetragonal
b. body centered
c. face centered
d. primitive

12.1.12. Which type of unit cell is the least efficient in packing?

a. primitive
b. body-centered
c. face-centered
d. none of the above

12.1.13. Which type of unit cell is most efficient in packing?

a. primitive
b. body-centered
c. face-centered
d. none of the above

12.1.14. Primitive, Face Centered & Body Centered Cubic Cells have respective coordination numbers of

a. 1,2,4
b. 2,4,6
c. 6,8,12
d. 6,12,8

12.1.15. What is the unit cell of CsCl, when it crystallizes in a unit cell that contains a Cs^+ ion at the center of a cube and a Cl^- ion at each corner?

a. Amorphous
b. Body-centered cubic
c. Close packed
d. Face-centered cubic
e. Primitive cubic

12.1.16. In a face-centered cubic cell, what portion of the volume of each atom or ion on the face of a unit is within the unit cell? The atoms or ions in corners? Faces 1/2, corners 1/8

12.1.17. Gallium crystallizes in a primitive cubic unit cell. What is the radius of the Ga atom in Angstroms if the length of the unit cell edge is 3.70Å?

12.1.18. Potassium metal crystallizes in a body-centered cubic unit cell. What is the radius of the K atom in Angstroms if the length of the unit cell edge is 5.31Å?

12.1.19. What is the radius of a copper atom in Angstroms if the length of the unit cell edge is 5.34Å? Copper has a face-centered cubic structure.

12.1.20. Silver has a density of 10.5g/cm^3 and forms an FCC structure. What is the atomic radius of silver in Angstroms? Assume that nearest neighbor atoms contact each other.

12.1.21. An unknown element has a density of 11.07g/mL and forms a SCC. What is the atomic radius of the unknown element in Angstroms? (unknown element has molar mass of 207.2g/mol)

12.1.22. Tungsten has a density of 19.25g/cm^3 and forms a BCC structure. What is the atomic radius of tungsten in Angstroms?

12.7: Phase Diagrams

12.7.1. A substance under normal conditions would rather sublime than melt if _____.

a. Its critical point occurs at a pressure above atmospheric pressure
b. Its critical point occurs at a temperature above room temperature
c. Its critical temperature is above its normal boiling point
d. Its triple point occurs at a pressure above atmospheric pressure
e. Its triple point occurs at a pressure below atmospheric pressure

12.7.2. If a phase diagram has a solid-liquid phase boundary line that has a negative slope (leans to left) the substance,

a. Can go from solid to liquid, within a small temperature range, via the application of pressure
b. Cannot be liquefied above its triple point
c. Cannot go from solid to liquid by application of pressure at any temperature
d. Melts rather than sublimes under ordinary conditions
e. Sublimes rather than melts under ordinary conditions

12.7.3. The critical temperature, on a phase diagram, is _____.

a. The temperature above which a gas cannot be liquefied
b. The temperature at which all these states are in equilibrium
c. The temperature below which a gas cannot be liquefied
d. The temperature required to cause sublimation of a solid
e. The temperature required to melt a solid

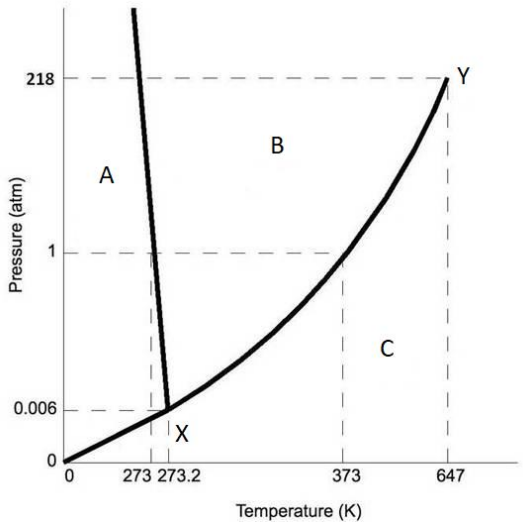

Figure 12.7.1: Use this figure to answer the following questions.

12.7.4. The point X represents

a. the critical point, where a solid, liquid and vapor can coexist
b. The critical point where the two fluid phases cannot be distinguished
c. The triple point, where a solid, liquid and vapor can coexist
d. The triple point, where the fluid phases cannot be separated

12.7.5. The point Y in the figure represents

a. the critical point, where a solid, liquid and vapor can coexist
b. The critical point where the two fluid phases cannot be distinguished
c. The triple point, where a solid, liquid and vapor can coexist
d. The triple point, where the fluid phases cannot be separated

12.7.6. Region A of the figure represents

a. solid
b. liquid
c. vapor
d. none of the above

12.7.7. Region B of the figure represents

a. solid
b. liquid
c. vapor
d. none of the above

12.7.8. Region C of the figure represents

a. solid
b. liquid
c. vapor
d. none of the above

12.7.9. The negative slope between regions A and B of figure 12.7.1 indicates:

a. the solid is denser than the liquid
b. the liquid is denser than the solid
c. the vapor is denser than the liquid
d. the vapor is denser than the solid

12.7.10. The figure 12.7.1 is consistent with a phase diagram for which compound

a. carbon dioxide
b. sodium
c. water
d. carbon dioxide and water

12.7.11. The compound in figure 12.7.1 sublimes at pressures:

a. greater than deg O°C
b. Pressures greater than 1.0 atm
c. pressures between 0.0060 and 1.00 atm
d. pressures less than 0.0060 atm

12.7.12. Consider a 1 atm isobar for the compound in figure 12.7.1. Moving left to right in region A represents

a. freezing
b. melting
c. heating supercooled ice
d. none of the above

12.7.13. Consider a 1 atm isobar for the compound in figure 12.7.1. Adding heat to a substance in region A causes it to warm, what happens when you reach the line between region A & B?

a. it boils
b. it melts
c. it freezes
d. it continues to warm up

12.7.14. Consider a 1 atm isobar for the compound in figure 12.7.1. Moving left to right in region B represents

a. melting
b. boiling
c. heating liquid water
d. cooling liquid water

12.7.15. Consider a 1 atm isobar for the compound in figure 12.7.1. Adding heat to a substance in region B causes it to warm, what happens when you reach the line between region B & C?

a. it continues to warm
b. it condenses
c. it boils
d. none of the above

12.7.16. Consider a 1 atm isobar for the compound in figure 12.7.1. Moving left to right in region C represents

a. cooling water
b. heating liquid water
c. heating ice
d. heating steam

12.7.17. At what pressure can liquid, solid and gaseous water coexist?

a. 218 atm
b. 1.00 atm
c. 0.0060 atm
d. none of the above

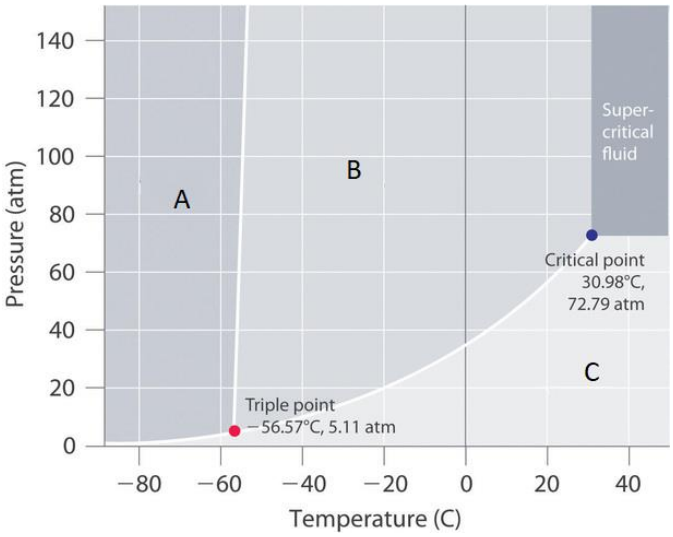

Figure 12.7.2: Use this Phase Diagram to answer the following questions

12.7.18. Consider a -50°C isotherm for the compound in Figure 12.7.2. Moving from region A to C represents

a. Condensation then Freezing
b. Freezing then Condensation
c. Melting then Vaporizing
d. Vaporizing then Melting

12.7.19. Consider a 5 atm isobar for the compound in Figure 12.7.2. Moving from region C to A represents

a. Condensation
b. Deposition
c. Sublimation
d. Vaporization

12.7.20. What phase would this compound be in if the pressure and temperature were at room conditions?

12.7.21. The positive slope between regions A and B of figure 12.7.2 indicates:

e. the solid is denser than the liquid
f. the liquid is denser than the solid
g. the vapor is denser than the liquid
h. the vapor is denser than the solid

12.7.22. Figure 12.7.2 is consistent with a phase diagram for which compound

a. Carbon dioxide
b. Carbon dioxide and water
c. Sodium
d. Water