AP Chem - Unit 7 - NMSI - IMF

1) Given:

$n = 1$

$d = 1.54$ Å

$\emptyset = 19.3°$

$d = ?$

Soln: $n\lambda = 2d\sin\emptyset$ Bragg Eqn

$$d = \frac{n\lambda}{2\sin\emptyset}$$

$$= \frac{(1)(1.54\text{ Å})}{2\sin 19.3°}$$

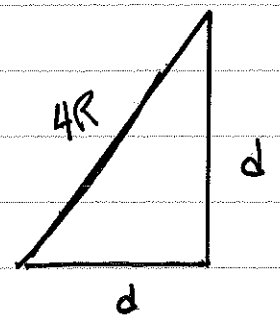
$$\boxed{d = 2.33\text{ Å}}$$

2) Given:

Ag in Cubic closest packed structure (CCP)

$R_{Ag} = 144$ picometers $\left(\frac{1\text{ cm}}{1\times10^{10}\text{ pm}}\right) = 1.44\times10^{-8}$ cm

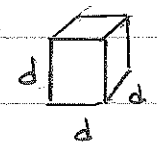
Density = ?



Soln:

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

Volume:



$V = d\times d\times d$

$C^2 = A^2 + B^2$ Pythagorean Theorem

$(4R)^2 = d^2 + d^2$

$16R^2 = 2d^2$

$d^2 = 8R^2 = 8(1.44\times10^{-8}\text{ cm})^2$

$d = 4.07\times10^{-8}$ cm

$V = d^3 = (4.07\times10^{-8}\text{ cm})$

$V = 6.74\times10^{-23}\text{ cm}^3$

Mass of Ag

Atoms in 1 cube of face centered

$\underbrace{(8\times\tfrac{1}{8})}_{\text{Corners}} + \underbrace{(6\times\tfrac{1}{2})}_{\text{Sides}} = 4$ Atoms Ag

$$\left(\frac{4\text{ Atoms Ag}}{1}\right)\left(\frac{1\text{ mole Ag}}{6.022\times10^{23}\text{ Atoms Ag}}\right)\left(\frac{107.89\text{ g}}{1\text{ mole Ag}}\right)$$

$= 7.166\times10^{-22}$ g Ag

$$d = \frac{7.166\times10^{-22}\text{ g}}{6.74\times10^{-23}\text{ cm}^3}$$

$$\boxed{d = 10.6\text{ g/cm}^3}$$

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4) use Table 10.7 Type of Solid formed?

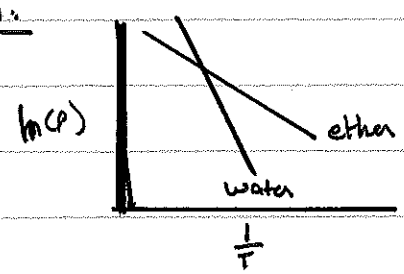
A) Gold - Atomic solid - metallic properties

B) CO_2 - molecular Solid - made of nonpolar molecules

C) LiF - Ionic Solid

D) Kr - Atomic Solid, But Since noble gases can only Interact By London dispersion, SO Molecular Solid w/ nonpolar molecules

5) Given:



Slope, m, = $\frac{\Delta H_{vap}}{R}$ ← constant

which has ↑ ΔH_{vap}?

Soln:

Ether has a smaller Slope ∴ smaller values of ΔH than H_2O

* makes sense Because H_2O has a higher Vaporization Point than Ether due to it's H Bonding in water

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6) Given:

water

$T_1 = 25°C = 298\ K$ $\qquad$ $T_2 = 50°C = 323\ K$

$VP_1 = 23.8\ Torr$ $\qquad$ $VP_2 = ?$

$H_{vap} = 43.9\ kJ/mol = 43900\ J/mol$ $\qquad$ $R = 8.31\ J/mol\ K$

Soln:

$$\ln\left(\frac{VP_1}{VP_2}\right) = \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$\ln\left(\frac{23.8\ Torr}{VP_2}\right) = \frac{43900\ \frac{J}{mol}}{8.31\ \frac{J}{mol\ K}}\left(\frac{1}{323\ K} - \frac{1}{298\ K}\right)$$

$$\ln\left(\frac{23.8\ Torr}{VP_2}\right) = -1.37$$

Antilog e^x

$$\frac{23.8\ Torr}{VP_2} = .254$$

$$VP_2 = \frac{23.8\ Torr}{.254}$$

$$\boxed{VP_2 = 93.7\ Torr}$$