

•Liquids & Solids

How much heat (kJ) is needed to convert 27.5 g of water at 25.0°C to steam at 115.0°C?

$$s_{\text{steam}} = 1.99 \text{ J/g}^\circ\text{C}$$

$$s_{\text{water}} = 4.184 \text{ J/g}^\circ\text{C}$$

$$\Delta H_{\text{vap}} = 40.7 \text{ kJ/mol}$$

The vapor pressure of ether is 439.8 mmHg at 20.0°C. What is the vapor pressure at 34.2°C? $\Delta H_{\text{vap}}(\text{ether}) = 28.2 \text{ kJ/mol}$

Aluminum crystallizes in a fcc unit cell with edge length 404.55 pm. The atoms occupy lattice points in the unit cell. What is the density of aluminum metal? What is the radius of an Al atom?

•Solns

An antiseptic solution is 0.655 m H_2O_2 in water. What is the mole fraction of hydrogen peroxide?

Lemon juice contains 5.4 % by mass citric acid, $\text{H}_3\text{C}_6\text{H}_5\text{O}_7$. If the density of the juice is 1.490 g/mL, what is the molar concentration of citric acid?

Eugenol, $\text{C}_{10}\text{H}_{12}\text{O}_2$ MW=164.23amu, is a pale yellow liquid that dissolves in ethanol, $\text{C}_2\text{H}_5\text{OH}$ MW=46.082amu. What is the vapor pressure at 20.0°C of ethanol containing 8.56 g of eugenol in 50.0 g of ethanol? The vapor pressure of pure ethanol at 20.0°C is 44.6 mmHg.

Automotive antifreeze contains ethylene glycol dissolved in water. A 16.5 g sample of ethylene glycol is dissolved in 67.3 g of water. The boiling point of the resulting solution is 102.01°C. What is the molecular weight of ethylene glycol? $T_b=100.0^\circ\text{C}$, $K_b=0.51^\circ\text{C/m}$

A solution is prepared by dissolving 35.0 g of Hb (hemoglobin) in enough water to make 1.00 L of solution. If the osmotic pressure of the solution is 10.0 mmHg at 25.0°C, what is the molar mass of Hb? $R = 0.0821 \text{ (L}\cdot\text{atm)} / (\text{mol}\cdot\text{K})$