

06/29/22

Which substance has the higher boiling point: butane (C_4H_{10}) or hexane (C_6H_{14})? Explain.

Both nonpolar so only have ID/ID interactions
 C_6H_{14} - more atoms, more e^- , more ID/ID

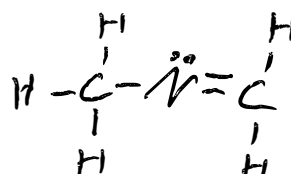
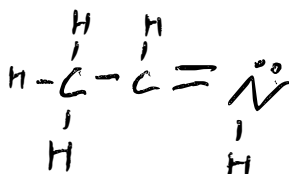
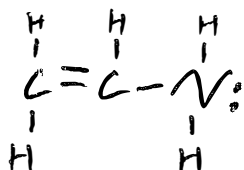
Which substance has the higher boiling point: Br_2 or ICl ? Explain.

ICl and Br_2 pretty similar in size
but Br_2 non polar and ICl is polar
so it has stronger D/D interactions

Rank the following substances from lowest to highest boiling point: C_5H_{12} , Ne, CCl_4 , C_2H_6

Ne C_2H_6 C_5H_{12} CCl_4

Draw 3 Lewis structures for C_2H_5N and explain which one has the lowest boiling point.



↑
lowest BP
No hydrogen bonding

How many hydrogen bonding interactions are there in a beaker that contains 250 mL of water?

$$250g \times \frac{1 \text{ mol } H_2O}{18g} = 13.9 \text{ mol } H_2O \quad \text{Each H-bond requires 1 H + 1 lp}$$

$$13.9 \text{ mol } H_2O \text{ has } \begin{array}{l} 27.8 \text{ mol H} \\ 27.8 \text{ mol lp} \end{array} \rightarrow 27.8 \text{ mol H-bonds} \\ \text{or } 1.67 \times 10^{25}$$

What is the ΔH_{vap} of water if the temperature of boiling water atop Mt Whitney is 85.1°C . The summit of Mt. Whitney is 14505 feet above sea level and the atmospheric pressure at the summit is 0.58 atm.

$$\ln\left(\frac{0.58 \text{ atm}}{1 \text{ atm}}\right) = -\frac{\Delta H_{\text{vap}}}{R} \left(\frac{1}{358.25 \text{ K}} - \frac{1}{373.15 \text{ K}} \right)$$

$$-0.545 = -\frac{\Delta H_{\text{vap}}}{R} \left(1.15 \times 10^{-4} \text{ K}^{-1} \right)$$

$R = 8.314 \frac{\text{J}}{\text{mol K}}$

$$\Delta H_{\text{vap}} = 40638 \text{ J/mol}$$

What is the boiling point of water on the top of Mt. Everest where the atmospheric pressure is 250 mmHg?

$$\ln\left(\frac{250 \text{ mmHg}}{760 \text{ mmHg}}\right) = \frac{-40638 \frac{\text{J}}{\text{mol}}}{8.314 \frac{\text{J}}{\text{mol K}}} \left(\frac{1}{T_b} - \frac{1}{373.15} \right)$$

$$2.27 \times 10^{-4} = \frac{1}{T_b} - \frac{1}{373.15}$$

$$\frac{1}{T_b} = 2.907 \times 10^{-3} \text{ K}^{-1}$$

$$T_b = 343.95 \text{ K or } 70.8^\circ\text{C}$$