Answer to the Question 64913

1.)Calculate the mass of solute required to make a sodium chloride solution containing 169 g of water that has a melting point of -1.6 C.
2.)Calculate the mass of solute required to make 256 mL of a magnesium sulfate solution that has an osmotic pressure of 3.82 atm at 302 K
3.)Calculate the mass of solute required to make an iron (III) chloride solution containing 250 g of water that has a boiling point of 104 C

1.

$$\Delta t = \frac{k \cdot m \cdot 1000}{M \cdot m_{H_2O}}$$

$$k = 1.86$$

$$m_{H_2O} = 169g$$

$$M(NaCl) = 58.5g/mol$$

$$\Delta t = 1.6$$

$$m = \frac{\Delta t \cdot M \cdot m_{H_2O}}{k \cdot 1000}$$

$$m(NaCl) = \frac{1.6 \cdot 58.5 \cdot 169}{1.86 \cdot 1000} = 8.5g$$

*2.*

$$P = \frac{m}{M \cdot V} \cdot R \cdot T$$

$$m = \frac{P \cdot M \cdot V}{R \cdot T}$$

$$P = 3.82atm = 387061.5Pa$$

$$M(MgSO_4) = 120g/mol$$

$$V = 256mL = 0.000256\,m^3$$

$$R = 8.31J/mol \cdot K$$

$$T = 302K$$

$$m = \frac{387061.5 \cdot 120 \cdot 0.000256}{8.31 \cdot 302} = 4.73g$$

*3.*

$$\Delta t = \frac{k \cdot m \cdot 1000}{M \cdot m_{H_2O}}$$

$k = 0.52$

$m_{H_2O} = 250g$

$M(FeCl_3) = 162.5g/mol$

$\Delta t = 104 - 100 = 4°C$

$$m = \frac{\Delta t \cdot M \cdot m_{H_2O}}{k \cdot 1000}$$

$$m(FeCl_3) = \frac{4 \cdot 162.5 \cdot 250}{0.52 \cdot 1000} = 312.5g$$