

## Answer on Question #75422, Chemistry / General Chemistry

### Question:

Calculate the freezing point of a solution formed when 55.0 g of  $\text{NH}_3$  are mixed with 820.0 g of water. (NOTE:  $\text{NH}_3$  does not dissolve into multiple ions; each molecule dissolves as an individual whole. Also, the  $K_f$  of water is  $1.86\text{ }^\circ\text{C/m}$ .)

- A.  $-14.3\text{ }^\circ\text{C}$
- B.  $-7.15\text{ }^\circ\text{C}$
- C.  $0.0\text{ }^\circ\text{C}$
- D.  $7.15\text{ }^\circ\text{C}$
- E.  $14.3\text{ }^\circ\text{C}$

### Solution:

Each molecule dissolves as an individual whole, so the freezing-point depression law:

$$\Delta T_f = K_f \cdot m,$$

where  $m$  - molality

$$\text{Amount of } \text{NH}_3: 55.0 / 17.031 = 3.2294 \text{ mol}$$

$$\text{Molality of } \text{NH}_3: m = 3.2294 / 0.8200 = 3.93 \text{ mol/kg}$$

$$\Delta T_f = 1.86 \cdot 3.93 = 7.3\text{ }^\circ\text{C}$$

$$\Delta T_f = T_f^0 - T_f, \text{ therefore:}$$

$$T_f = T_f^0 - \Delta T_f = 0\text{ }^\circ\text{C} - 7.3\text{ }^\circ\text{C} = -7.3\text{ }^\circ\text{C}$$

### Answer:

- B.  $-7.15\text{ }^\circ\text{C}$