

### Answer on the Question #67812, Chemistry / General chemistry

3.92 grams of solid NaOH are mixed with 200.0 ml of HCl solution at 18.4 degrees C. if the temperature rise to 30.5 degrees C, what is the heat of reaction (in kcal/mol)

**Solution:**

$$q = C\Delta T = m \cdot c_{sp} \cdot (T_{final} - T_{initial})$$

For this case:

$$q = (C_{NaOH} + C_{HCl})\Delta T = (n_{NaOH} \cdot c_{sp} + n_{HCl} \cdot c_{sp}) \cdot (T_{final} - T_{initial})$$

For NaCl  $c_{sp} = 0.864 \text{ J/g}\cdot\text{K}$ , for HCl assume that  $c_{sp}$  equal to water =  $4.184 \text{ J/g}\cdot\text{K}$

$$q = \left( \frac{3.92 \text{ g} \cdot 0.864}{40 \text{ g/mol}} + \frac{200 \cdot 4.184}{36.5 \text{ g/mol}} \right) \cdot (30.5 - 18.4) = 278.4 \frac{\text{J}}{\text{mol}} = 0.278 \text{ kJ/mol}$$

Conversion to kcal/mol:

$$1 \frac{\text{kJ}}{\text{mol}} = 0.239 \frac{\text{kcal}}{\text{mol}}$$

$$q = 0.278 \cdot 0.239 = 0.066 \frac{\text{kcal}}{\text{mol}}$$

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