

## Dilution of H<sub>2</sub>SO<sub>4</sub>

**Description:** Concentrated H<sub>2</sub>SO<sub>4</sub> is diluted by varying amounts and the temperature changes associated with dilution are measured.

**Materials:**

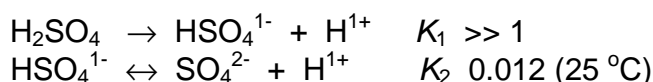
H<sub>2</sub>SO<sub>4</sub>  
Deionized water

Beakers  
Thermometer

**Procedure:**

In three separate beakers measure the temperature increase when 10, 20, and 30 mL of H<sub>2</sub>SO<sub>4</sub> are diluted by addition TO 100 mL of water. Temperatures can rise up to 90 °C.

**Discussion:** The heat released in this demonstration is a result of the hydration of the various ions formed upon dissociation of the acid:



The heats of reaction for the described dilutions have been calculated by Shkhashiri. The following table details the results from those calculations:

H <sub>2</sub> SO <sub>4</sub> (mL)	H <sub>2</sub> O (mL)	ΔH <sub>rxn</sub> (kJ)	ΔT (°C)
10	100	-11	25
20	100	-26	48
30	100	-30	70

**Safety:** Wear proper protective equipment including gloves and safety glasses when preparing and performing this demonstration. Avoid contact with the beaker as reaction can create enough heat to cause burns. Concentrated solutions of acids and bases (>2 M) can irritate the skin and cause burns. When diluting concentrated acids, add acid to water to avoid spattering.

**Disposal:** Solutions should be diluted with sodium bicarbonate and flushed down the drain with plenty of water.

**References:**

Shkhashiri, B. Z. In *Chemical Demonstrations: A Handbook for Teachers of Chemistry*; The University of Wisconsin Press: 1983; Vol. 1, p 17-18.

Leenson, I. A. *J. Chem. Educ.* **2004**, *81*, 991.