

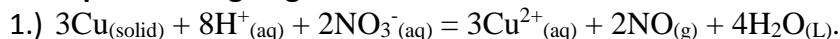
## Answer on Question #62613, Chemistry / General Chemistry

### Condition:

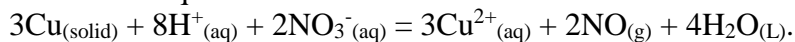
Calculate the standard enthalpy change for the following reaction at 25 °C.

### Solution:

**For example we are going to calculate this reaction**



Short ionic equation is:



According to the law of Hess, the enthalpy of the reaction is:

$$\Delta_r H^0 = 4\Delta_f H^0(\text{H}_2\text{O}_{(\text{L})}) + 2\Delta_f H^0(\text{NO}_{(\text{g})}) + 3\Delta_f H^0(\text{Cu}^{2+}_{(\text{aq})}) - 2\Delta_f H^0(\text{NO}_3^-_{(\text{aq})})$$

(Enthalpy of formation of copper ions and  $\text{H}^+$  are, by definition, 0). Substituting the values of enthalpies of formation (P.W. Atkins, Physical Chemistry, 5th edition, pp C9-C15), we find:

$$\Delta_r H^0 = 4 \times (-285.8) + 2 \times 90.25 + 3 \times 64.77 - 2 \times (-205.0) = -358.4 \text{ kJ}$$

(Three mole of copper).

**Answer: -358.4 kJ**