Energy Changes

- Heat ($q = mC\Delta T$ or $q = vC\Delta T$)
- Enthalpy changes ($\Delta H = nH$)
- Phase changes
- Total Energy changes
- Heating / Cooling curves
- Calorimetry

Calculate the amount of energy required to solidify 17.0 g of water at 0.0°C.

$$\Delta H_{solid} = n H_{solid}$$

$$m = 17\,g \times \frac{1\,mol}{18.02\,g} = 0.943\,mol$$

$$H_{solid} = -6.01$$

$$= (0.943\,\cancel{mol})(-6.01\,\frac{kJ}{\cancel{mol}})$$

$$\boxed{= -5.7\,kJ}$$

Calculate the amount of energy required to heat 29.0 g of aluminum from 24^{o}C to 73^{o}C.

$q = mC\Delta t$

$m = 29\,g$

$C = 0.900 \frac{J}{g\,^{\circ}C}$

$\Delta t = 73 - 24$

49

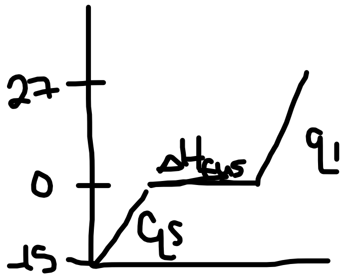
$q = (29\,g)(0.900 \frac{J}{\cancel{g}\,\cancel{^{\circ}C}})(49\,\cancel{^{\circ}C})$

$q = 1278.9\,J$

$\boxed{q = 1300\,J}$

Calculate the amount of energy required to heat 44.5 g of ice at -15.0^{o}C to water at 27^{o}C.

$\Delta E_{Total} = q_s + \Delta H_{fus} + q_l$



$q_s = mC\Delta t$

$(44.5g)(2.01)(15)$

$\boxed{1341.7J}$

$44.5g \times \frac{1 mol}{18.02g}$

$\Delta H_{fus} = nH_{fus}$

$(2.47)(6.01)$

$= 14.84 kJ \times 1000$

$\boxed{14840 J}$

$q_l = mC\Delta t$

$(44.5)(4.19)(27)$

$\boxed{5034.3J}$

$1341.7J + 5034.3J + 14840J$

$21216 J$

$\boxed{21000J}$

20.0 g of KNO_3 is added to a calorimeter containing 100. mL of water. The temperature of the water increased from 21.6°C to 24.8°C. Calculate the molar enthalpy of solution.

$\underline{KNO_3}$

$m = 20g$

$n = 20g \times \frac{1 mol}{161.11g}$

$= 0.198 mol$

$\Delta H_s = ?$

$\underline{H_2O}$

$V = 100 mL$

0.100L

$t_f = 24.8°C$

$t_i = 21.6°C$

$\Delta H_s = -q_{H_2O}$

$nH_s = -vC\Delta t$

$\frac{\cancel{(0.198)}H}{\cancel{(0.198)}} = \frac{-(0.100L)(4.19)(3.2)}{(0.198)}$

$\boxed{-6.77 KJ/mol}$

Energy Changes Worksheet