Heat

The quantity of heat (q) that flows varies directly with the quantity of substance (mass or volume), the specific or volumetric heat capacity (C) and the temperature change (ΔT).

FORMULA: **$q = mC\Delta T$** **or** **$q = vC\Delta T$**

In calculating q, the heat capacity constant (C) must correspond to the state of matter of the substance.

$1.9 \frac{MJ}{m^3 \cdot °C} = 1.9 \frac{kJ}{L \cdot °C}$

Sample Problem

By how much would the temperature of a 100. g ice cube increase if 1250 J of heat is added to the system?

$m = 100.\ g$

$q = 1250\ J$

$C = 2.01\ \frac{J}{g \cdot °C}$

$\Delta T = ?$

$q = mC\Delta T$

$1250\ J = (100.\ g)\left(2.01\ \frac{J}{g \cdot °C}\right)(\Delta T)$

$$\Delta T = \frac{1250\ J}{(100.\ g)\left(2.01\ \frac{J}{g \cdot °C}\right)}$$

$$\boxed{\Delta T = 6.22\ °C}$$

Determine the amount of heat required to increase the temperature of a 150.0 g block of aluminum from 12.0°C to 17.5°C.

$q = ?$

$m = 150.0\,g$

$C_{Al} = 0.900\ \frac{J}{g \cdot °C}$

$\Delta T = 5.5°C$

$q = mC\Delta T$

$q = (150.0\,g)\left(0.900\ \frac{J}{g \cdot °C}\right)(5.5°C)$

$q = 742\,J$

Unit Conversion

6 zeroes 3 zeroes

$1\ MJ = 10^6\ J$ $1\ kJ = 10^3\ J$

megajoule **kilajoule**

Ex. Convert 13000J to kJ and MJ.

$13000\ J \times \frac{1\ kJ}{1000\ J} = 13\ kJ \times \frac{1\ MJ}{1000\ kJ} = 0.013\ MJ$

Ex. Convert 41MJ to J and kJ.

$41\ MJ \times \frac{1000000\ J}{1\ MJ} = 41000000\ J$

$41\,000\,000\ J \times \frac{1\ kJ}{1000\ J} = 41000\ kJ$

Today's Assignment

Heat Worksheet

1) 31 200 J

2) -31 700 J

3) 120^{o}C

4) 28^{o}C

5) 1100 J

6) 14 900 J

7) 0.0456 J/g ^{o}C

8) 424 g

9) 2.60 J/g ^{o}C

10) 6.21 J

11) 42.6 L