Kelvin = unit of temperature

Reminder!

ABSOLUTE ZERO

- No molecular movement
- 0 K
- Never gotten to zero K

K = C + 273

We use CELSIUS for thermochemistry!

Specific Heat

How much heat can something absorb?

Specific Heat

The amount of energy it takes to raise the temperature of 1 gram of something by 1 °C

Units:

$$\frac{J}{g \cdot °C}$$

Specific Heat

$$\mathbf{Q = mC\Delta T}$$

Q = energy lost or gained
m = mass
C = specific heat
ΔT = "delta" T or change in temp

$$\mathbf{Q = m \times C \times (T_{final} - T_{starting})}$$

Positive or Negative?

Gaining Heat	Endothermic	$\Delta T = +$	$Q = +$
Losing Heat	Exothermic	$\Delta T = -$	$Q = -$

Chart from perspective of the SYSTEM

Showing work…

Couple of choices…

- UNITS:
  - Put units IN the math equation
  - Make a list of variables and put the units there instead of in the math equation *(what Mrs. Farmer likes to do)*
- ALGEBRA
  - Show rearranging your problem once the numbers are in *(what Mrs. Farmer likes to do)*
  - Or show rearranging your equation before you put the numbers in

$$5\ J = (10g)(0.5\ J/g°C)(\Delta T)$$

$Q = 5\ J$
$m = 10g$
$C = 0.5\ J/g°C$
$\Delta T = ?$
$5=(10)(0.5)(\Delta T)$

$$\Delta T = \frac{Q}{mc}$$

Specific Heat

$Q = mC\Delta T$

How much heat is needed to raise the temperature of 10 grams of a substance from 40 °C to 60 °C if the specific heat is 3.8 J/ g °C ?

$$Q = (10g)\ (3.8\frac{J}{g\,°C})\ \ (60\text{-}40°C)$$

$$Q = (10*3.8*20)\ \boxed{= \mathbf{760\ J}}$$

Positive because it is heating up!

It is ENDOthermic!

$$Q = (10\,\cancel{g})\left(3.8\,\frac{J}{\cancel{g}\,\cancel{^\circ C}}\right)(60\text{-}40\,^\circ\cancel{C})$$

$$Q = (10*3.8*20) = \mathbf{760\ J}$$

Positive because it is heating up!
It is ENDOthermic!

Specific Heat

$$Q = mC\Delta T$$

A 50 gram piece of hot metal is put into cold water. The metal transfers 5000 J of energy to the cold water. The specific heat of the metal is 6 J/g °C. What is the change in temperature of the metal?

Negative because it is cooling down!

It is EXOthermic!

$$\frac{-5000\ \text{J}}{(50\text{g})\ (6\frac{J}{g\ °C})} = \frac{(50\text{g})\ (6\frac{J}{g\ °C})\ (\Delta T)}{(50\text{g})\ (6\frac{J}{g\ °C})}$$

$(-5000)/(50*6) = \Delta T$

$= -16.7°C$

Negative because it is cooling down!

It is EXOthermic!

$$-5000\ J = (50g)\left(6\frac{J}{g\ °C}\right)(\Delta T)$$

$$\frac{-5000\ J}{(50g)\left(6\frac{J}{g\ °C}\right)} = \frac{(50g)\left(6\frac{J}{g\ °C}\right)(\Delta T)}{(50g)\left(6\frac{J}{g\ °C}\right)}$$

$$(-5000)/(50*6) = \Delta T$$

$$= -16.7°C$$

Specific Heat

Q = mCΔT

A 2 gram sample of a metal was heated from 260 K to 300 K. It absorbed 52 J of energy. What's the specific heat?

260K -273 = -13°C

300K – 273 = 27°C

Positive because it is heating up!
It is ENDOthermic!

$$\frac{52\ J}{(2g)\ (40\,^{\circ}C)} = \frac{(2\ g)\ (C)\ (27^{\circ}C - {}^{-}13)}{(2g)\ (40\,^{\circ}C)}$$

Careful with the double negative!

$$(52)/(2*40) = C$$

$$= \mathbf{0.65}\ \frac{J}{g^{\circ}C}$$

Positive because it is heating up!

It is ENDOthermic!

$$\frac{52\ \text{J}}{(2\text{g})(40^\circ\text{C})} = \frac{(2\ \text{g})(\text{C})(27^\circ\text{C} - {}^{-}13)}{(2\text{g})(40^\circ\text{C})}$$

$$(52)/(2*40) = \text{C}$$

$$= \mathbf{0.65}\ \frac{J}{g^\circ\text{C}}$$

Careful with the double negative!