Specific Heat

How much heat can something absorb?

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

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

Units:

$$\frac{J}{g \cdot {}^{\circ}C}$$

Specific Heat

$$Q = mC\Delta T$$

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

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

Positive or Negative?

Gaining Heat	? thermic	ΔT =	Q =
Losing Heat	? thermic	ΔT =	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)(ΔT)

Q = 5 J
m = 10g
C = 0.5 J/g°C
ΔT = ?
5=(10)(0.5)(ΔT)

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

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 ?

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

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

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!

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

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

= -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!

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

Careful with the double negative!

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

$$= \mathbf{0.65}\ \frac{J}{g°C}$$

Worksheet #1

Specific heat problems.

SHOW YOUR WORK!!!

For #1-4 you MUST:

- Circle the variables
- Underline what you are solving for

(or you may use two colors of highlighter)

YouTube Link to Presentation

- https://youtu.be/5secsb7tH0I