

## Measuring energy changes

-energy changes in a system depend on 3 things:

- 1) how much temperature is changed,  $\Delta T$
- 2) the amount of substance,  $m$  (mass)
- 3) the specific heat of the substance,  $c$  ( $J/(g \cdot ^\circ C)$ )

Specific heat capacity - the amount of energy needed to change one gram of a substance by one degree Celsius

$$Q = mc\Delta T$$

Diagram illustrating the equation  $Q = mc\Delta T$  with labels and arrows:

- heat energy (Joules, J) points to  $Q$
- mass(g) points to  $m$
- specific heat ( $J/g^\circ C$ ) points to  $c$
- change in temperature points to  $\Delta T$

ex: 10.0g of ice is added to 60.0g of  $H_2O$ . The initial temperature of the  $H_2O$  is  $26.5^\circ C$ . The final temperature of the mixture is  $9.7^\circ C$ . How much heat was lost by the  $H_2O$ ?

$$\text{mass } H_2O = 60.0g$$

$$Q = mc\Delta T$$

$$c \text{ of } H_2O = 4.184 J/g^\circ C$$

$$Q = (60.0g)(4.184 J/g^\circ C)(-16.8^\circ C)$$

$$\Delta T = T_f - T_i$$

$$Q = -4217 J$$

$$= 9.7^\circ C - 26.5^\circ C$$

$$Q = -4.22 kJ$$

$$= -16.8^\circ C$$