Warm Up

Determine the enthalpy change associated with converting 250. g of water to ice at 0.0°C.

Homework - Worksheet

$\Delta H_{fus} = ?$

$m = 80.0\ g$

$H_{fus} = 6.03\ kJ/mol$

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

$\Delta H_{fus} = \left(\frac{80.0\ g}{18.02\ g/mol}\right)\left(6.03\ \frac{kJ}{mol}\right)$

$\boxed{\Delta H_{fus} = 26.8\ kJ}$

(2)

$m = 500.\ g$

$C_2H_4(OH)_2$

$H_{vap} = 58.8\ kJ$

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

$\Delta H_{vap} = \left(\frac{500.\ g}{62.08\ g/mol}\right)\left(58.8\ \frac{kJ}{mol}\right)$

$\boxed{\Delta H_{vap} = 474\ kJ}$

Heat (q)

- change in kinetic energy
- measures transfer of energy when there are temperature changes (heating or cooling)

Enthalpy (H)

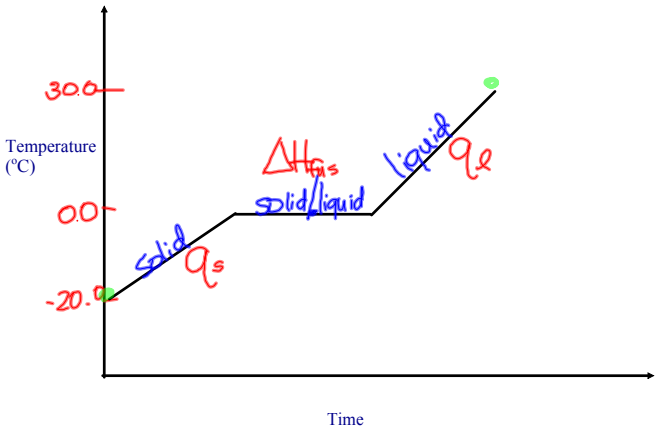
- measures potential energy
- change in energy transfer when system is at constant pressure and same initial and final temperatures

What we've looked at so far...

- Energy changes when the temperature changes
  (heating water from 20°C to 50°C)
- Energy changes when the temperature remains the same.
  (melting of ice at 0°C)

What if you heat 10. g of ice at -20.°C until it is water at 30.°C?

Heating Curve of Water



$$\Delta E_T = q_s + \Delta H_{fus} + q_\ell$$

$q_s = mC\Delta T$

$q_s = (10.g)\left(2.01 \frac{J}{g°C}\right)(20.°C)$

$q_s = 402 J$

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

$\Delta H_{fus} = \left(\frac{10.g}{18.02 g/mol}\right)\left(6.03 \frac{kJ}{mol}\right)$

$\Delta H_{fus} = 3.346 kJ$

$q_\ell = mC\Delta T$

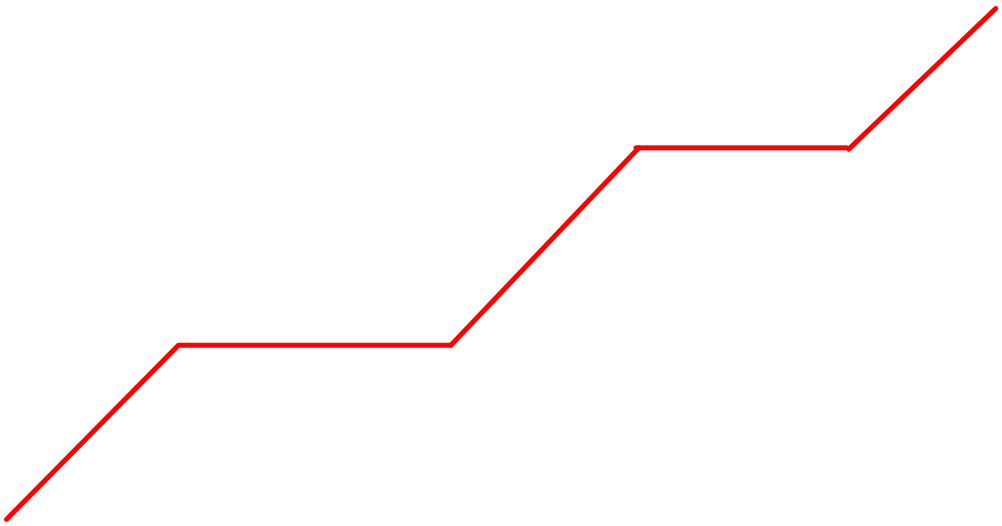
$q_\ell = (10.g)\left(4.19 \frac{J}{g°C}\right)(30.°C)$

$q_\ell = 1257 J$

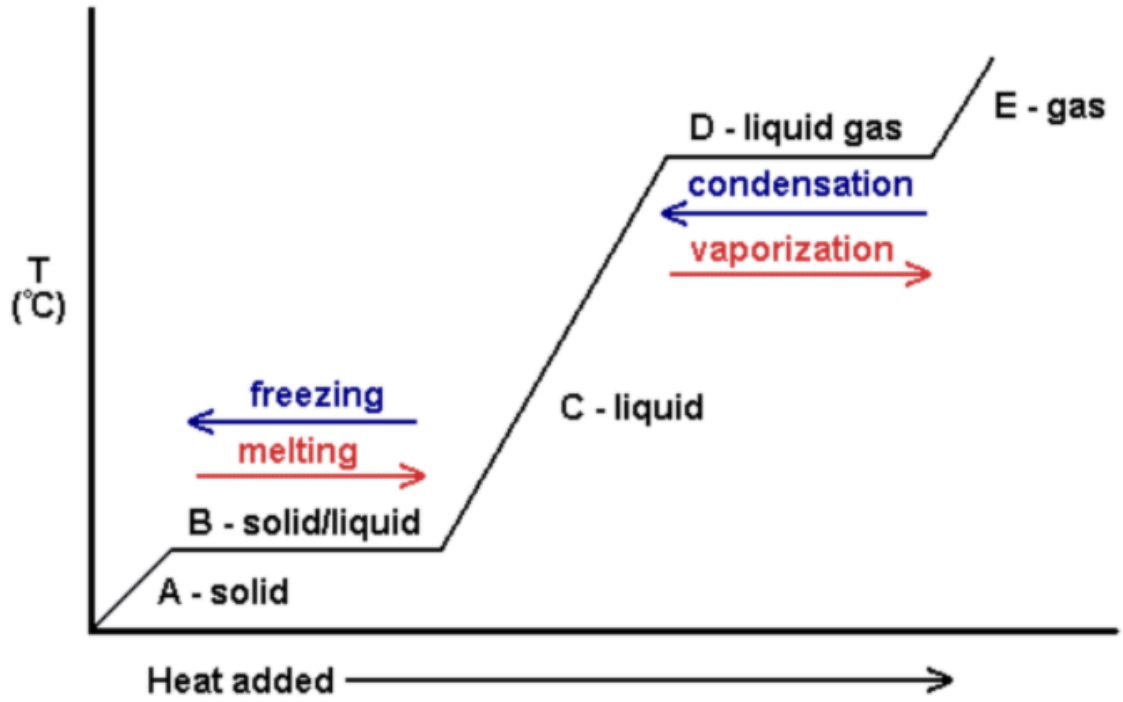
$\Delta E_T = q_s + \Delta H_{fus} + q_\ell$

$= (0.402 kJ) + (3.346 kJ) + (1.257 kJ)$

$\Delta E_T = 5.0 kJ$



Worksheet


T
(°C)
E - gas
D - liquid gas
condensation
vaporization
freezing
C - liquid
melting
B - solid/liquid
A - solid
Heat added