W-GC General Chemistry 4/27

Heat of Formation ΔH

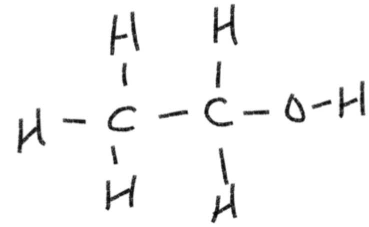
exergonic

ethanol -277.1 kJ/mol "exothermic"

277.1 kJ/mol

$\xrightarrow[\text{produce}]{}$ ethanol

C_2H_5OH



$$150\text{ g of } C_2H_5OH * \frac{1\text{ mol } C_2H_5OH}{46\text{ g } C_2H_5OH} * \frac{277.1\text{ kJ}}{\text{mol } C_2H_5OH}$$

$= 902$ kJ

Molar Mass

$2C = 2 * 12$ g/mol $= 24$ g/mol
$6H = 6 * 1$ g/mol $\quad$ 6 g/mol
$1O = 16$ g/mol $\quad$ 16 g/mol

46 g mol

$\Delta H = 250.0$ kJ/mol

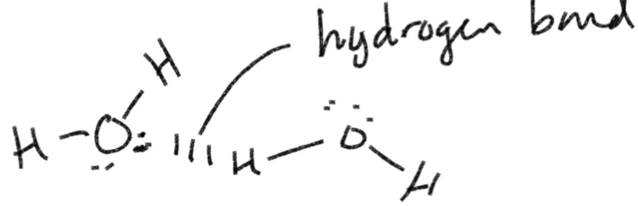
360g of C_8H_{18}

C_8H_{18}
$8C = 8 * 12 = 96$
$18H = 18 * 1 = 18$
$+ \overline{}$
114

$$360\text{ g } \cancel{C_8H_{18}} * \frac{1\text{ mol } \cancel{C_8H_{18}}}{114\text{ g } \cancel{C_8H_{18}}} * \frac{250\text{ kJ}}{1\text{ mol } \cancel{C_8H_{18}}}$$

$\boxed{789\text{ kJ}}$

Water → temperature buffer

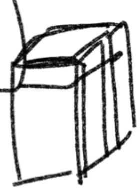


Take a lot of energy to form and a lot of energy to break.

A calorie is the amount of energy required to raise the temperature of 1 gram of water by 1°C

1 calorie = 4.184 J

1 mL = 1 g



1g

80°C

↑

20°C

$\Delta T = 80 - 20$

60°C

1000 mL = 1000g

1L = 1kg

$$\begin{array}{r} 60 \text{ cal} \\ \times\ 4.184 \\ \hline \approx 251 \text{ J} \end{array}$$

$q = mc\Delta T \leftarrow$ change in temp (°C)

q ↑ heat

m ↑ mass

c ↑ $\boxed{\text{specific heat}}$

different for each compound

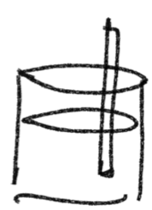
is the amount of energy required to raise the temp of 1 gram of substance by 1°C.

water

$c = 4.184\ J$

How much heat was released when 25.5 g of H_2O is warmed from 14°C to 22.5°C

$$q = mc\Delta T$$
$$= (25.5g)(4.184\ J/g°C)(22.5-14)°C$$
$$(25.5\cancel{g})(4.184\ J/\cancel{g°C})(8.5\cancel{°C})$$
$$= \boxed{907\ J}$$



500 mL

500 g H_2O

$c = 1$ cal

$T_i = 18°C$

$T_f = 72°C$

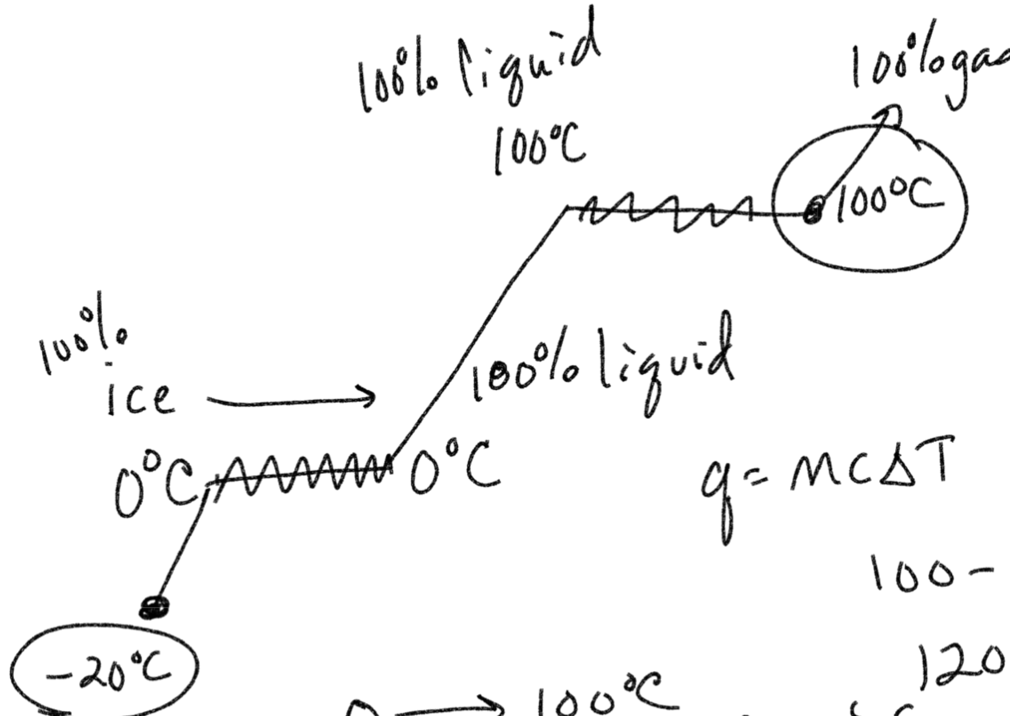
1 DoughNate

$q = mc\Delta T$ 54

$= (500g)(1\ cal)(72-18)$

$= 27000$ cal

27 kcal

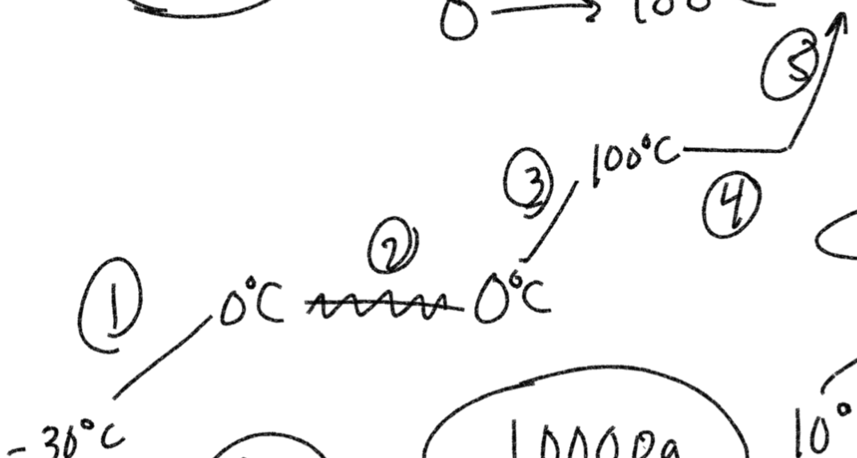


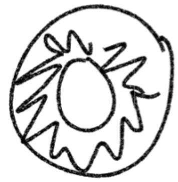
$q = mc\Delta T$

$100 - (-20)$

120°C

0 → 100°C





10,000g

10°C − 95°C

$q = mc\Delta T$

$(10{,}000g)(1\ cal)(85°C)$

85,000 cal

$\boxed{850\ kcal}$