

11/5/2018

last time...

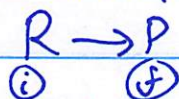
$$\Delta E = q_v \quad (\text{const vol heat, not useful})$$

$$\Delta E \neq q_p \quad (\text{const pressure heat, very useful!})$$

Can define a state fn, enthalpy:  $H = E + pV$

$$\Delta H = q_p \quad (\text{very useful!!})$$

changes in state fn: doesn't depend on path!



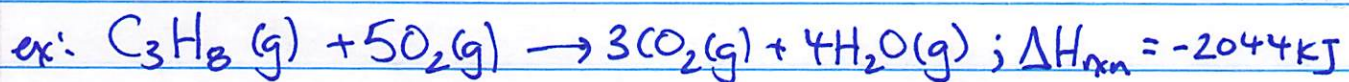
$\Delta H = -ve$ : rxn loses heat: exothermic feels hot to touch

$\Delta H = +ve$ : rxn gains heat: endothermic

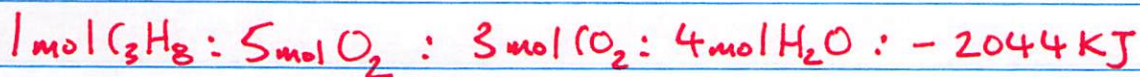
feels cold to touch

Stoichiometry involving  $\Delta H$ : Thermochemical equation

chem eq +  $\Delta H$   $K = 10^3$



Ratios



ex: What's  $q_{rxn}$  (const p) if we burn  $C_3H_8$  + end up w/  $12.0 \text{ g } H_2O$

$$12.0 \text{ g } H_2O \times \frac{1 \text{ mol } H_2O}{18.02 \text{ g } H_2O} \times \frac{-2044 \text{ kJ}}{4 \text{ mol } H_2O} = -511 \text{ kJ}$$

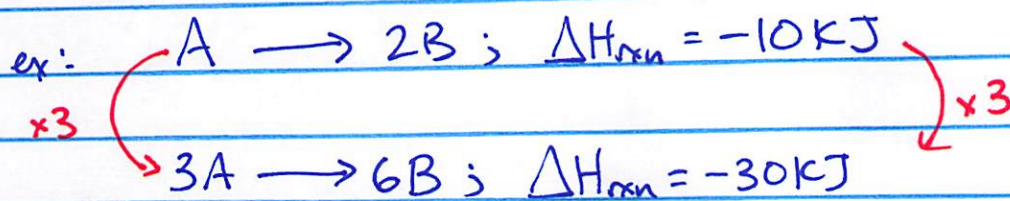
511 kJ of heat is released



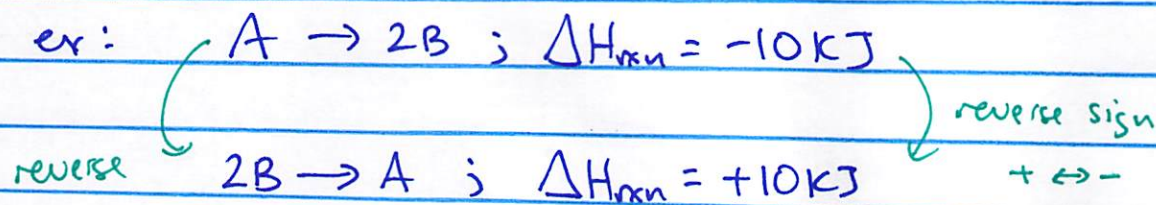
## Relationships involving $\Delta H_{rxn}$

if we change rxn, we change  $\Delta H_{rxn}$  in a well-defined way

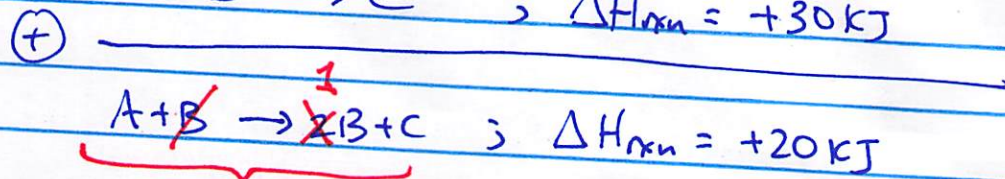
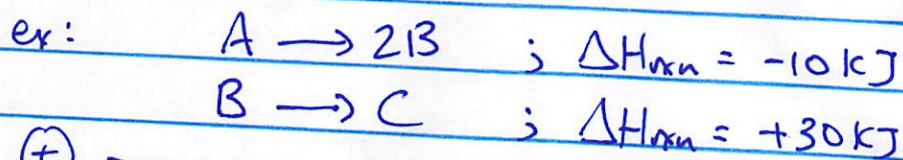
(1) rxn  $\times x$ ,  $\Delta H_{rxn} \times x$



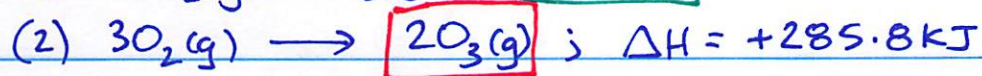
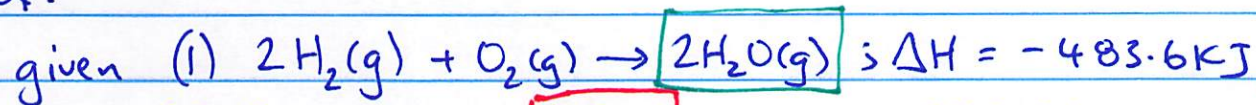
(2) if we reverse rxn, we reverse sign of  $\Delta H_{rxn}$ .



(3) If we add-up rxns, we add-up  $\Delta H_{rxn}$   
"Hess's law"

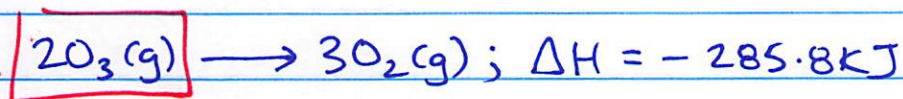


ex:

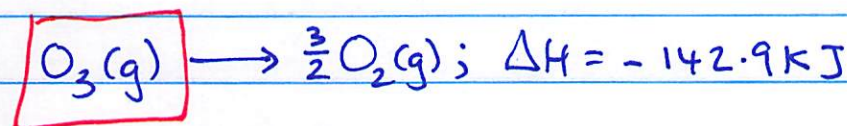


what is  $\Delta H_{\text{rxn}}$  for:  $3\text{H}_2(\text{g}) + \text{O}_3(\text{g}) \rightarrow 3\text{H}_2\text{O}(\text{g})$  ?

reverse (2)

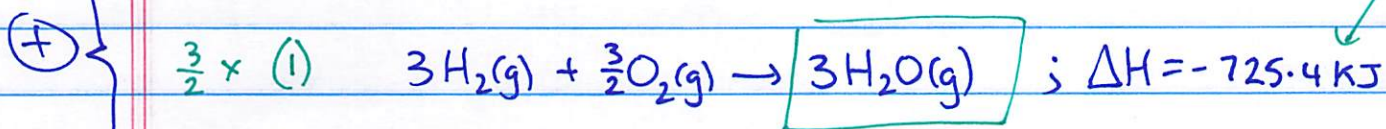


$\times \frac{1}{2}$



$\times \frac{1}{2}$

$\times \frac{3}{2}$

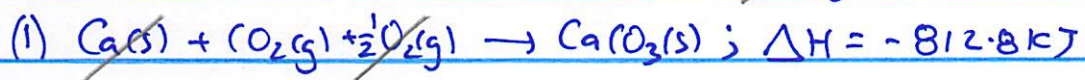
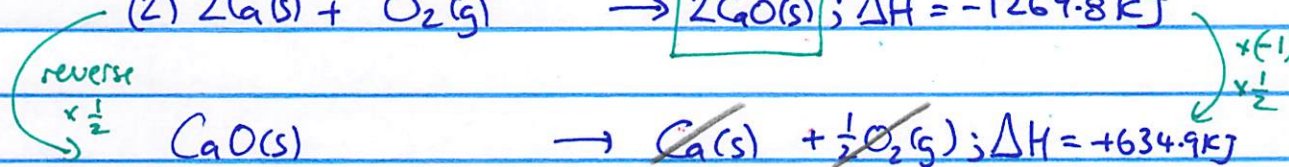
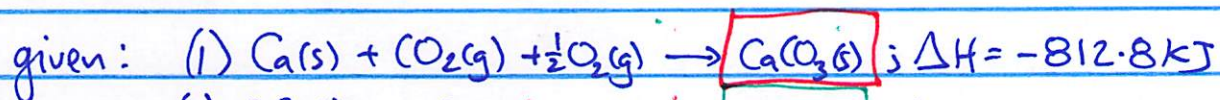
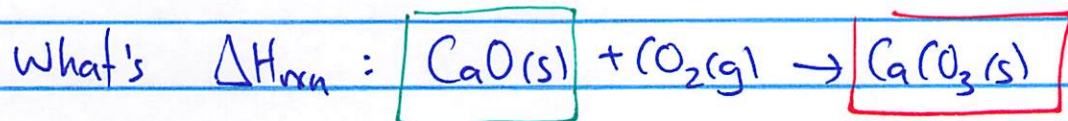


$\oplus$



$\checkmark$





MAS439.