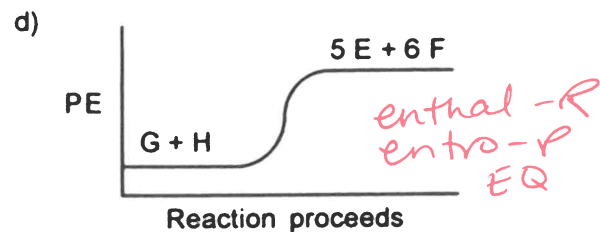
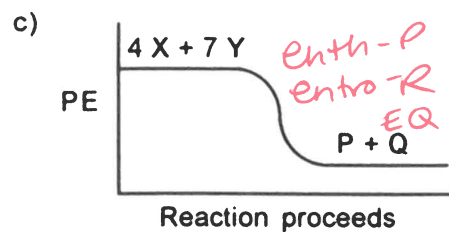
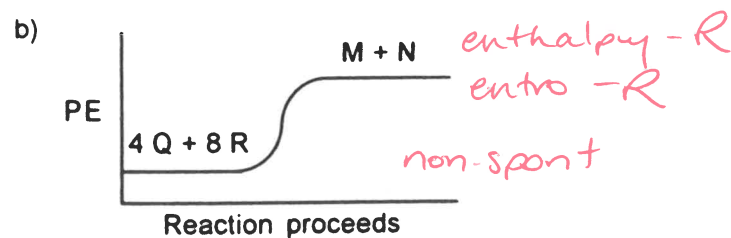
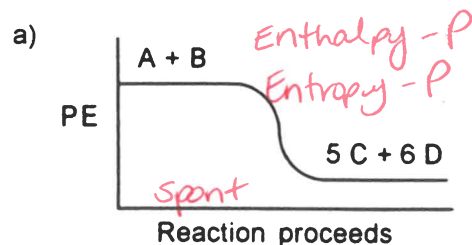


**KEY  
SPONTANEOUS,  
NON-SPONTANEOUS  
OR  
EQUILIBRIUM?**

15. In each of the following, decide
- which side is favoured by the tendency to minimum enthalpy; that is, which side of the reaction has the lower energy.
  - which side is favoured by the tendency to maximum entropy; that is, which side of the reaction has the more random species.
  - whether the reaction will be
    - a spontaneous reaction which goes to completion ("GOES 100%"), or
    - a non-spontaneous reaction in which NO products are formed ("WON'T OCCUR"), or
    - a spontaneous equilibrium reaction in which the tendency to minimum enthalpy will be balanced by an opposing tendency to maximum entropy ("EQUILIBRIUM").

KEY

**Note:** in parts (a) to (d) all the species are GASES



- e)  $\text{H}_2\text{SO}_4(\text{l}) + \text{H}_2\text{O}(\text{l}) \longrightarrow \text{H}_2\text{SO}_4(\text{aq}) + 150 \text{ kJ}$  *enth - P*  $\rightarrow$  *spont*  
*entrop - P*
- f)  $\text{C}_2\text{H}_6(\text{g}) \longrightarrow \text{C}_2\text{H}_2(\text{g}) + 2 \text{H}_2(\text{g}); \Delta\text{H} = 311 \text{ kJ}$  *enth - R*  $\rightarrow$  *EQ*  
*entrop - P*
- g)  $\text{C}_2\text{H}_2(\text{g}) + \text{Ca}(\text{OH})_2(\text{aq}) \longrightarrow \text{CaC}_2(\text{s}) + 2 \text{H}_2\text{O}(\text{l}); \Delta\text{H} = 183 \text{ kJ}$  *enth - R*  $\rightarrow$  *non-sp.*  
*entrop - R*
- h)  $2 \text{C}(\text{s}) + \text{O}_2(\text{g}) \longrightarrow 2 \text{CO}(\text{g}); \Delta\text{H} = -221 \text{ kJ}$  *enth - P*  $\rightarrow$  *spont*  
*entrop - P*