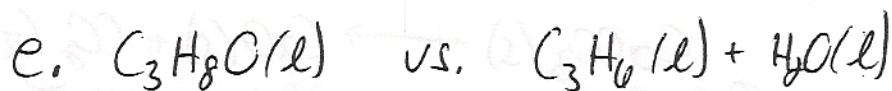
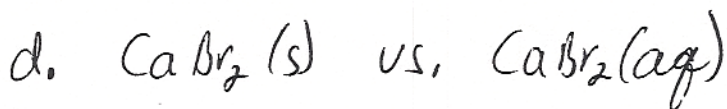
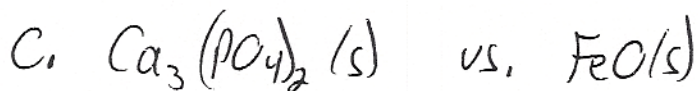
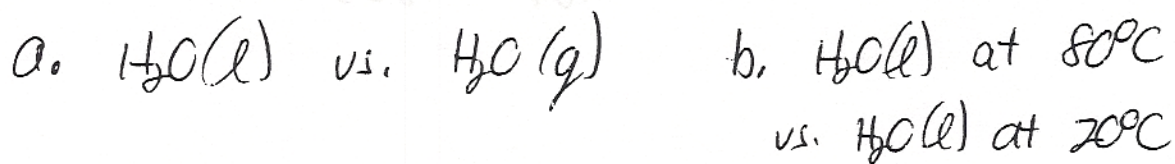
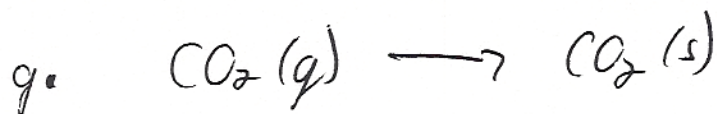
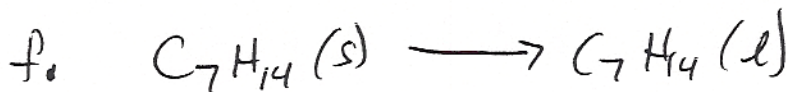
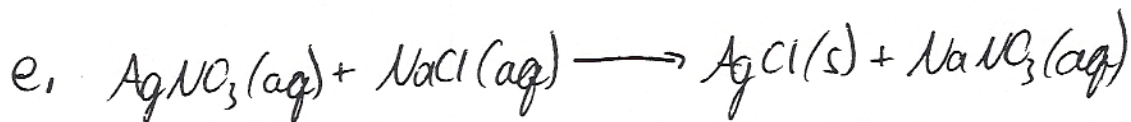
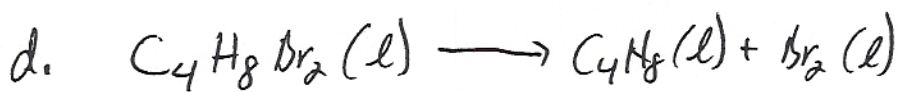
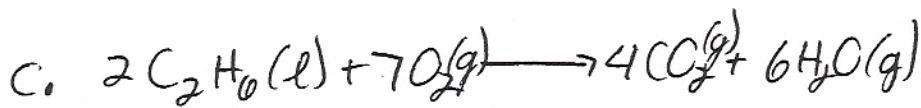
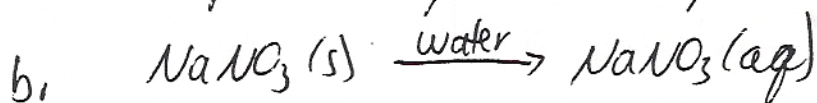
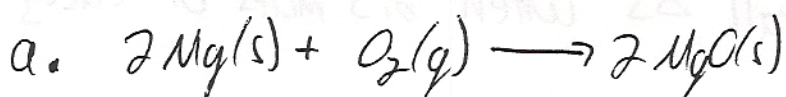


1. From each pair, which has more entropy?

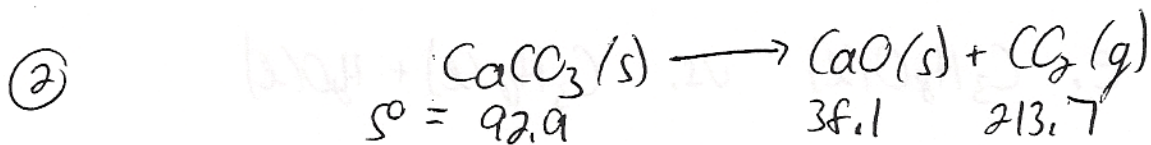
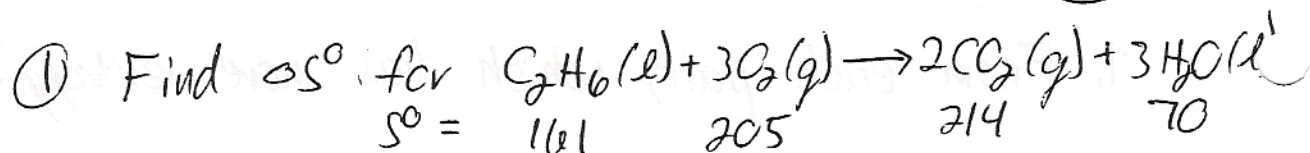


2. Will  $\Delta S$  be Positive or Negative?



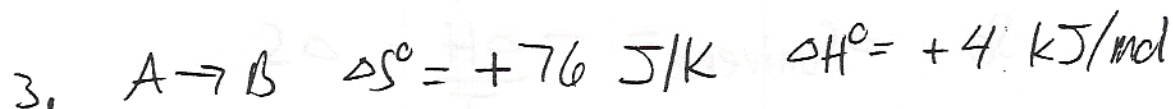
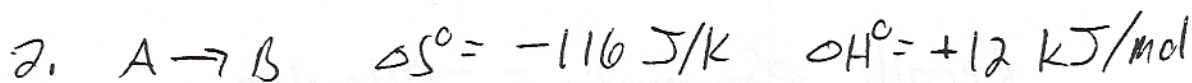
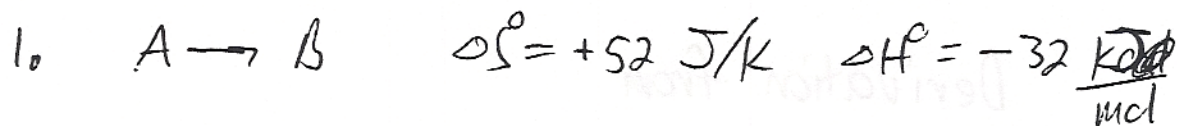
(2-81)

(18-7)

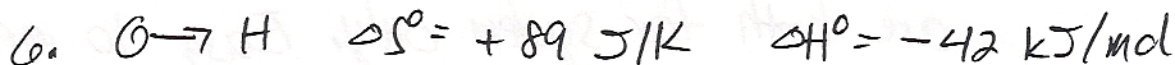
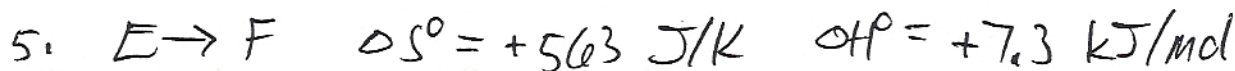
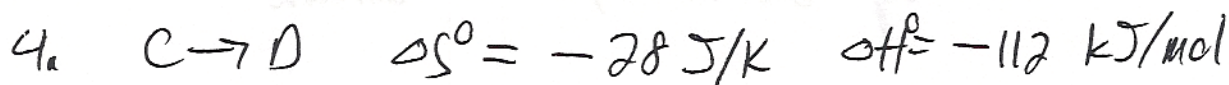


Calculate overall  $\Delta S$  when 2.3 moles of  $\text{CaCO}_3$  decomposes.

Classify as Product-Favored or Reactant-Favored



The following reactions are Product-Favored,  
which are enthalpy favored, entropy favored,  
or both?



$$\Delta G^{\circ} = \Delta H^{\circ} - T\Delta S^{\circ}$$

Derivation from

$$\Delta S_{\text{universe}} = \Delta S_{\text{surroundings}} + \Delta S_{\text{system}}$$

$$\text{Recall: } \Delta S_{\text{surroundings}} = -\frac{\Delta H_{\text{system}}}{T}$$

$$\text{So } \Delta S_{\text{universe}} = -\frac{\Delta H}{T} + \Delta S$$

Multiply by  $-T$

$$\text{So } -T\Delta S_{\text{universe}} = \Delta H - T\Delta S$$

$$\text{By definition, } -T\Delta S_{\text{universe}} = \Delta G$$

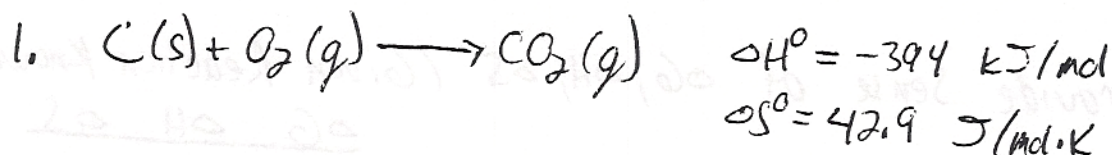
$$\text{So } \boxed{\Delta G = \Delta H - T\Delta S}$$

Note:  $\Delta G$  reflects  $\Delta S_{\text{universe}}$ , but  $\Delta H$ ,  $\Delta S$

are both for system only. Easy to measure

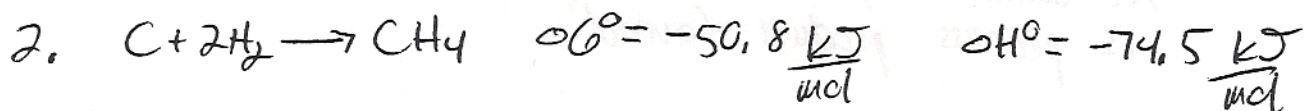
Note:  $\Delta G$  and  $\Delta S_{\text{universe}}$  have opposite sign



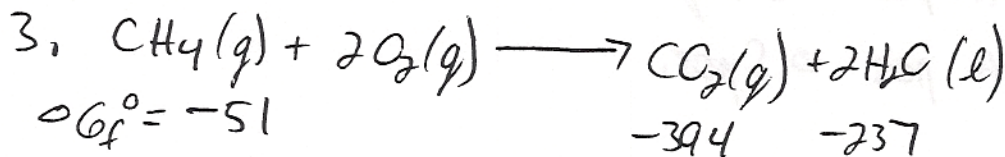


a. What is  $\Delta G^\circ$  at  $25^\circ\text{C}$ ?

b. What is  $\Delta G$  when 0.32 mol of C reacts?



What is  $\Delta S^\circ$  (by definition, at  $25^\circ\text{C}$ )



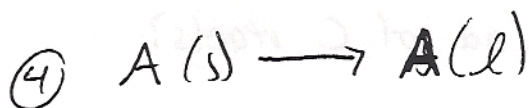
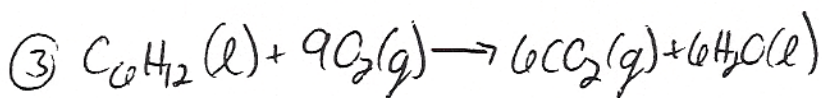
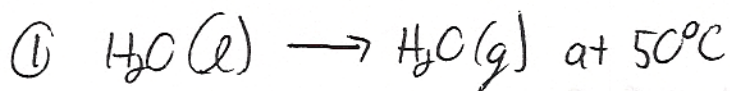
Find  $\Delta G^\circ$

Positive  $\Delta G$   
or  
Negative?  $\Delta S$   
 $\Delta H$

$\Delta H$  dominates over  
 $-T\Delta S$

Provide Sense of  $\Delta G$ ,  $\Delta H$ ,  $\Delta S$  (Given Reaction Knowledge)

$\Delta G$   $\Delta H$   $\Delta S$



$\Delta H^\circ = +13.2 \text{ kJ/mol}$

$\Delta S^\circ = +34.3 \text{ J/mol}\cdot\text{K}$

What is the melting  
temp for A?

At what temp limits  
is process product favored?

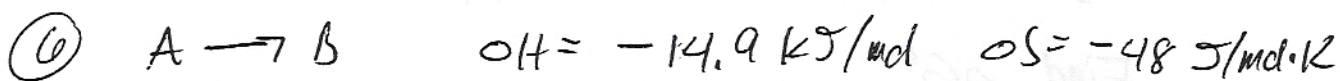
⑤ When will the following be Product-Favored?

a.  $\Delta H$  neg  $\Delta S$  neg

b.  $\Delta H$  neg  $\Delta S$  pos

c.  $\Delta H$  pos  $\Delta S$  neg

d.  $\Delta H$  pos  $\Delta S$  pos.



At what temp limits  
is process product-favored?