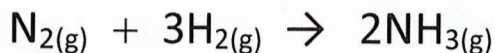


Energy Balance / Bond Energies Additional Practice:

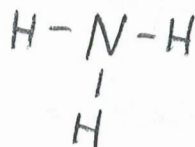
name: SOLUTIONS

Use P.419 of your textbook for bond energies

1) Consider the following equation for the formation of ammonia from its elements.



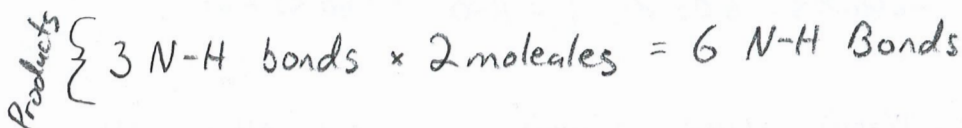
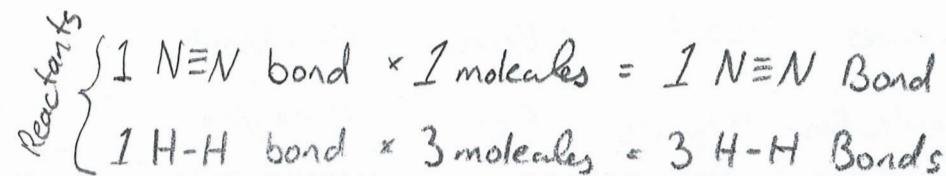
Use Lewis diagrams and bond energies to calculate the energy balance for this reaction.



1 molecule

3 molecules

2 molecules



$$E_{\text{N} \equiv \text{N}} = 945 \text{ KJ/mol}$$

$$E_{\text{H} - \text{H}} = 436 \text{ KJ/mol}$$

$$E_{\text{N} - \text{H}} = 339 \text{ KJ/mol}$$

$$\text{Reactants: } \Delta H_{\text{Bonds Broken}} = 1(945) + 3(436) = \underline{2253 \text{ KJ/mol}}$$

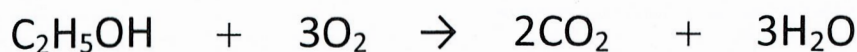
$$\text{Products: } \Delta H_{\text{Bond Formed}} = - (6)(339) = \underline{-2034 \text{ KJ/mol}}$$

$$\Delta H = \Delta H_{\text{Bonds Broken}} + \Delta H_{\text{Bonds Formed}}$$

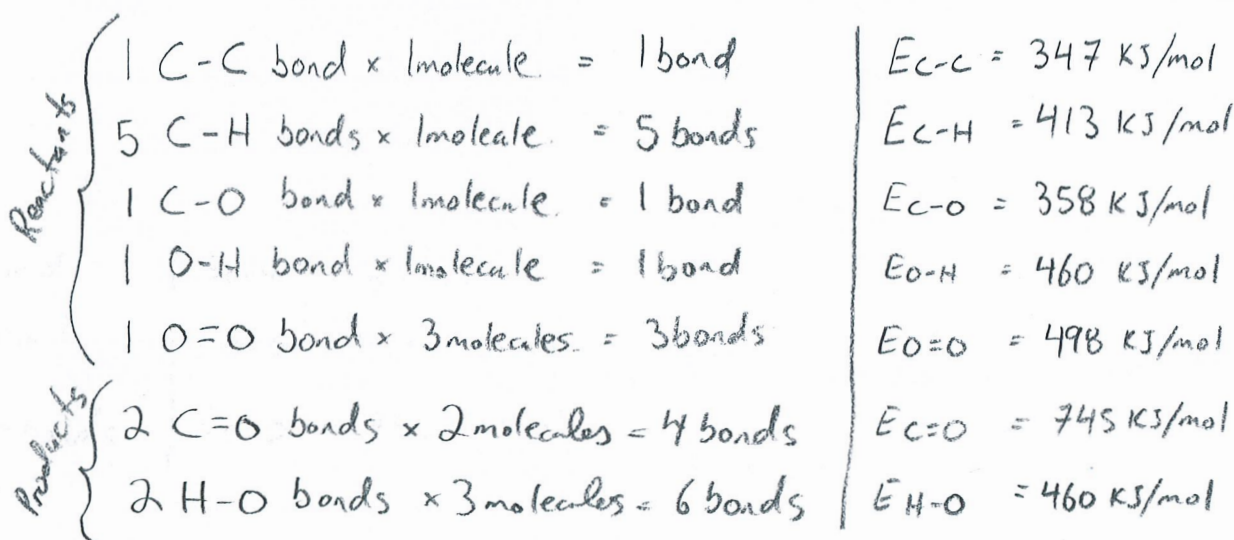
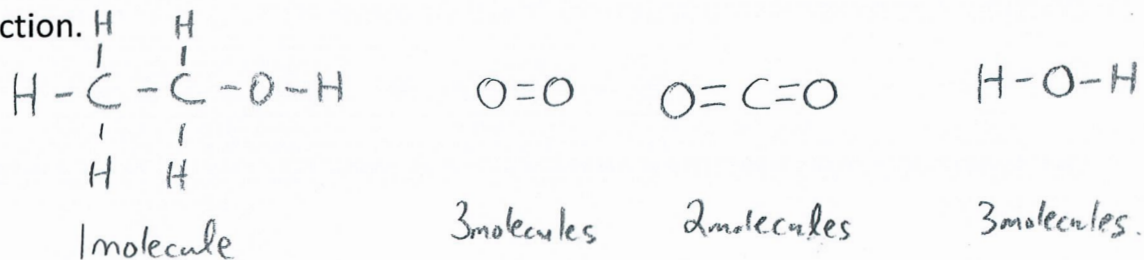
$$\Delta H = 2253 + (-2034)$$

$$\Delta H = 219 \text{ KJ/mol} \rightarrow \text{Endo}$$

2) Consider the following equation:



Use Lewis diagrams and bond energies to calculate the energy balance for this reaction.



$$\begin{array}{l}
 \text{Reactants} \\
 \left\{ \begin{array}{l} \Delta H \\ \text{Bonds} \\ \text{Broken} \end{array} \right. = 1(347) + 5(413) + 1(358) + 1(460) + 3(498) \\
 = \underline{4724 \text{ kJ/mol}}
 \end{array}$$

$$\begin{array}{l}
 \text{Products} \\
 \left\{ \begin{array}{l} \Delta H \\ \text{Bonds} \\ \text{Formed} \end{array} \right. = -[(4)(745) + (6)(460)] \\
 = \underline{-5740 \text{ kJ/mol}}
 \end{array}$$

$$\Delta H = \Delta H_{\text{Bonds Broken}} + \Delta H_{\text{Bonds Formed}}$$

$$\Delta H = 4724 + (-5740)$$

$$\Delta H = -1016 \text{ kJ/mol}$$

EXO



Answer Key: 1) 219 kJ/mol ENDO

2) -1015 kJ/mol EXO