

# Bond Energy: B.E.

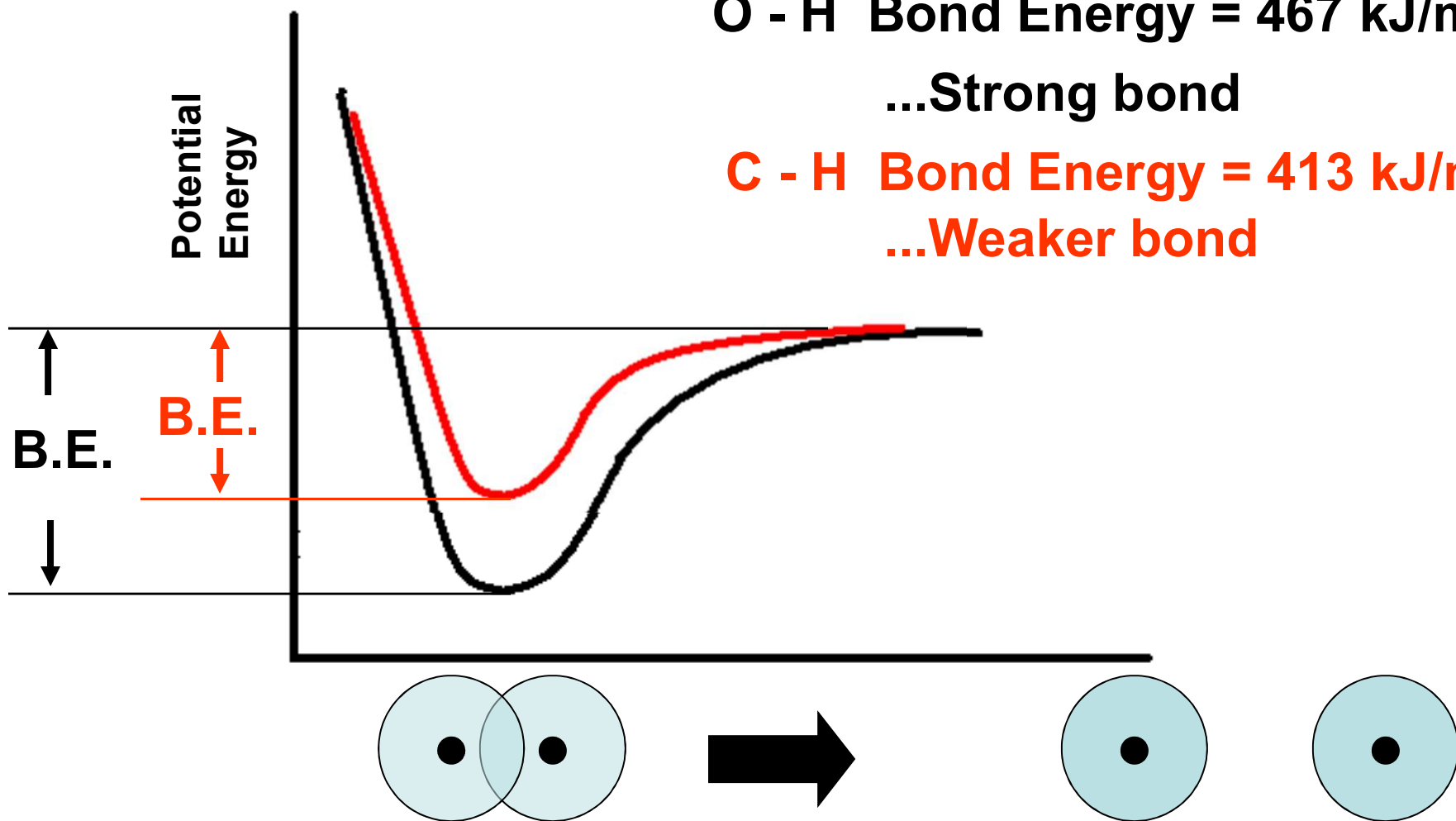
*The Energy Required to Break a Bond*

**O - H Bond Energy = 467 kJ/mol**

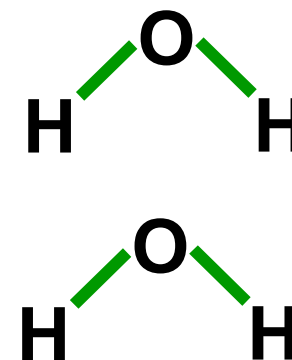
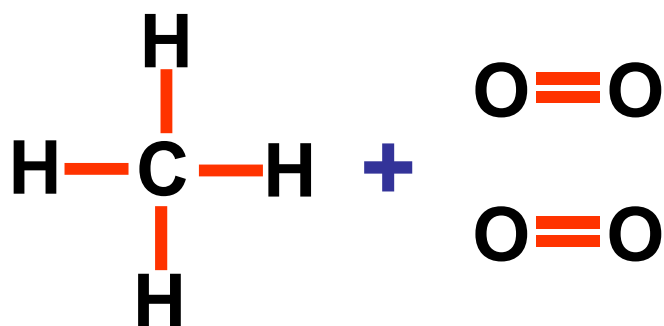
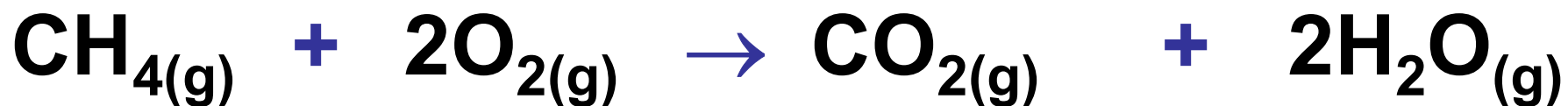
**...Strong bond**

**C - H Bond Energy = 413 kJ/mol**

**...Weaker bond**



# Bond Energies: Chemical Reactions



## Bonds Broken (Endothermic)

4 C-H Bonds @ 413 kJ/mol

2 O=O Bonds @ 498 kJ/mol

## Breaking Bonds Total E.

$$= (4 \times 413) + (2 \times 498)$$

$$= 2648 \text{ kJ/mol}$$

## Bonds Made (Exothermic)

4 O-H Bonds @ 467 kJ/mol

2 C=O Bonds @ 799 kJ/mol

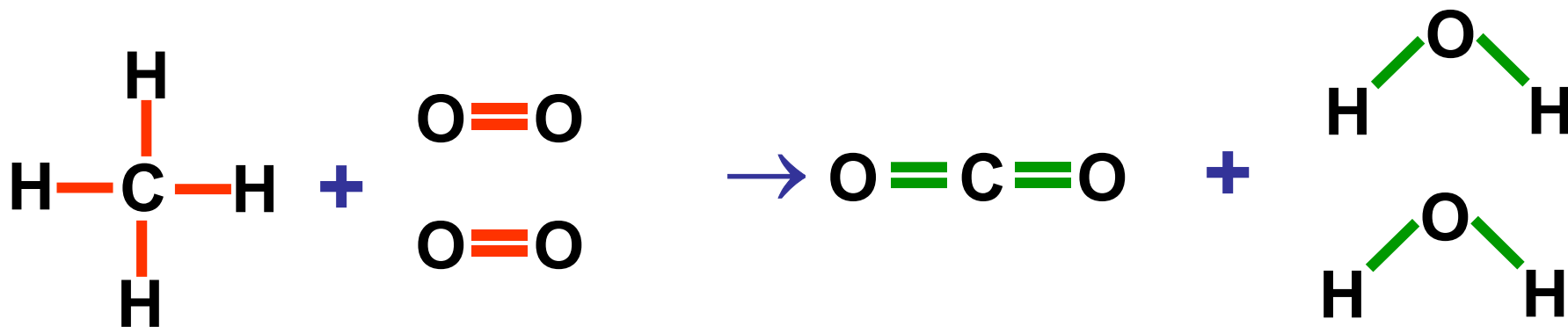
## Making Bonds Total E.

$$= (4 \times 467) + (2 \times 799)$$

$$= 3466 \text{ kJ/mol}$$



# Bond Energies: Chemical Reactions



**Breaking Bonds Total E.**  
 $= (4 \times 413) + (2 \times 498)$   
 $= 2648 \text{ kJ/mol}$

**Making Bonds Total E.**  
 $= (4 \times 467) + (2 \times 799)$   
 $= 3466 \text{ kJ/mol}$

$$\Delta H_{\text{combustion}} = \Sigma \text{B.E.}_{\text{reactants}} - \Sigma \text{B.E.}_{\text{products}}$$

$$\Delta H_{\text{combustion}} = 2648 \text{ kJ/mol} - 3466 \text{ kJ/mol}$$

$$\Delta H_{\text{combustion}} = -818 \text{ kJ/mol} \quad (\text{rxn is exothermic})$$

