

# What is Thermochemistry and Enthalpy?

## Worksheet

Enthalpy change is calculated as  $H = H(\text{products}) - H(\text{reactants})$ . If  $H$  is negative, the reaction releases heat and is exothermic. If  $H$  is positive, the reaction absorbs heat and is endothermic. The magnitude of  $H$  is called the heat of reaction.

$$H = H(\text{products}) - H(\text{reactants})$$

## Questions

1. Exothermic reaction means:

- A) heat is absorbed
- B) heat is released
- C) no energy change
- D) equilibrium is reached

2. Which has  $H > 0$ ?

- A) Combustion
- B) Freezing water
- C) Melting ice
- D) Neutralization

3.  $H$  formula is:

- A)  $H = \text{reactants} - \text{products}$
- B)  $H = \text{products} - \text{reactants}$
- C)  $H = (\text{products} + \text{reactants})/2$
- D)  $H = \text{reactants} / \text{products}$

4. If burning 1 mol of ethane releases 1560 kJ,  $H =$

- A) +1560 kJ/mol
- B) +156 kJ/mol
- C) 1560 kJ/mol
- D) 0 kJ/mol

5. Combustion of methane releases 890 kJ/mol. Write the enthalpy change and classify the reaction.

6. Melting ice absorbs 6.01 kJ/mol. Is this endothermic or exothermic?

7. If  $H(\text{reactants}) = 250$  kJ/mol and  $H(\text{products}) = 100$  kJ/mol, calculate  $H$ .

8. Define: What is thermochemistry?

9. Define: Define enthalpy ( $H$ ).

10. Define:  $H = H(\text{products}) - H(\text{reactants})$ . If  $H$  is negative?

## Answer Key

1. B) heat is released - Exothermic reactions release heat to the surroundings,  $H < 0$ .
2. C) Melting ice - Melting ice requires heat input, so  $H = +6.01$  kJ/mol.
3. B)  $H = \text{products} - \text{reactants}$  -  $H = H(\text{products}) - H(\text{reactants})$ .
4. C) 1560 kJ/mol - Energy released means  $H$  is negative:  $H = -1560$  kJ/mol.
5.  $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$   $H = -890$  kJ/mol Negative  $H$  indicates exothermic reaction (heat released) Energy is released, so this is an exothermic combustion
6.  $\text{H}_2\text{O}(\text{s}) \rightarrow \text{H}_2\text{O}(\text{l})$   $H = +6.01$  kJ/mol Positive  $H$  indicates endothermic process Energy must be absorbed to break ice crystal structure
7.  $H = H(\text{products}) - H(\text{reactants})$   $H = 100 - (250)$   $H = 100 - 250 = -150$  kJ/mol Endothermic: energy is absorbed
8. The study of heat changes that occur during chemical reactions.
9. The total heat content of a system.
10. The reaction is exothermic; heat is released.

### Bounlu

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