

CHEMICAL HEAT

TEST _____

Hess's Law

Date: _____

1. I. $\text{CO}_{(g)} + \frac{1}{2} \text{O}_{2(g)} \Rightarrow \text{CO}_{2(g)} \quad \Delta H = -68 \text{ kcal}$
 II. $\text{H}_2 + \frac{1}{2} \text{O}_2 \Rightarrow \text{H}_2\text{O}_{(g)} \quad \Delta H = -58 \text{ kcal}$
 What is the ΔH for the reaction?
 $2\text{CO}_{2(g)} + 2\text{H}_2 \Rightarrow 2\text{CO}_{(g)} + 2\text{H}_2\text{O}_{(g)}$
 A) +18 B) -18 C) +10 D) +20 E) -20

2. For the given reaction $4\text{NH}_{3(g)} + 5\text{O}_{2(g)} \Rightarrow 4\text{NO}_{(g)} + 6\text{H}_2\text{O}_{(g)}$
 $\Delta H = -280 \text{ kcal}$. What are the ΔH for the reactions?
 I. $2\text{NH}_{3(g)} + \frac{5}{2} \text{O}_{2(g)} \Rightarrow 2\text{NO}_{(g)} + 3\text{H}_2\text{O}_{(g)}$
 II. $2\text{NO} + 3\text{H}_2\text{O} \Rightarrow 2\text{NH}_3 + 5/2 \text{O}_2$
- | | | |
|----|------|------|
| | I | II |
| A) | +140 | +280 |
| B) | -280 | +140 |
| C) | +140 | -280 |
| D) | +140 | +280 |
| E) | -140 | +140 |

3. I. $2\text{H}_2\text{S} + 3\text{O}_2 \Rightarrow 2\text{H}_2\text{O}_{(g)} + 2\text{SO}_2 \quad \Delta H = -270 \text{ kcal}$
 II. $\text{CS}_{2(g)} + 3\text{O}_2 \Rightarrow \text{CO}_{2(g)} + 2\text{SO}_2 \quad \Delta H = ?$
 III. $\text{CO}_2 + 2\text{H}_2\text{S} \Rightarrow \text{CS}_2 + 2\text{H}_2\text{O}_{(g)} \quad \Delta H = -126 \text{ kcal}$
 What is ΔH at the second reaction?
 A) -275 B) +396 C) -144 D) +144 E) -396

4. I. $\text{SO}_2 + \text{H}_2 \Rightarrow \text{H}_2\text{S} + \text{O}_2$
 II. $\text{H}_2\text{S} + 2\text{H}_2\text{O} \Rightarrow \text{SO}_2 + 3\text{H}_2$
 What data must be given to us to calculate ΔH of the second reaction?
 I. ΔH of the reaction I
 II. Heat of the formation of H_2O
 III. HS bond energy
 A) I B) II C) I - II D) II - III E) III

5. $2\text{A} + 3\text{B} \Rightarrow 4\text{C} + 3\text{D} \quad \Delta H = +300 \text{ kcal}$
 $\text{A} + 3\text{E} \Rightarrow 2\text{C} + 3\text{D} \quad \Delta H = -150 \text{ kcal}$
 What is the ΔH of the reaction $\text{B} + \text{D} \Rightarrow 2\text{E}$
 A) +400 B) -400 C) +200 D) -200 E) +350

6. $\text{P}_4 \Rightarrow 4\text{P} \quad \Delta H = 300 \text{ kcal}$
 $\text{H}_2 \Rightarrow 2\text{H} \quad \Delta H = +104 \text{ kcal}$
 $\text{P} + 3\text{H} \Rightarrow \text{PH}_3 \quad \Delta H = -220 \text{ kcal}$
 According to the given enthalpies, what is the ΔH of reaction?
 $\frac{1}{4} \text{P}_4 + 3/2 \text{H}_2 \Rightarrow \text{PH}_3$
 A) +11 B) -11 C) 451 D) -451 E) -22

7. $\text{H}_{2(g)} + \frac{1}{2} \text{O}_{2(g)} \Rightarrow \text{H}_2\text{O}_{(l)} \quad \Delta H = -58 \text{ kcal}$
 $\text{H}_2\text{O}_{(l)} + \frac{1}{2} \text{O}_{2(g)} \Rightarrow \text{H}_2\text{O}_{2(l)} \quad \Delta H = 40 \text{ kcal}$
 According to the given reactions
 I. Formation heat of $\text{H}_2\text{O}_{2(l)}$
 II. Evaporation heat of $\text{H}_2\text{O}_{(l)}$
 III. Formation heat of $\text{H}_2\text{O}_{(g)}$
 Which one(s) can be calculated?
 A) I - II B) II - III C) I D) III E) II

8. $\text{X} + 2\text{Y} \Rightarrow 2\text{Z} \quad \Delta H = -10 \text{ kcal}$
 $\text{Z} + \text{K} \Rightarrow 2\text{T} \quad \Delta H = -40 \text{ kcal}$
 X, Y and K are elements at the given reactions. What is the produced energy, during the formation reaction of 1.2 moles T from its elements?
 A) 27 B) 31.5 C) 180 D) 54 E) 90

9. $\text{C}_3\text{H}_4 + 4\text{O}_2 \Rightarrow 3\text{CO}_2 + 2\text{H}_2\text{O} + 440 \text{ kcal}$ According to the given reaction, in order to calculate heat formation of C_3H_4 .
 I. $\text{C} + \text{O}_2 \Rightarrow \text{CO}_2 \quad \Delta H_1$
 II. $\text{H}_2 + \frac{1}{2} \text{O}_2 \Rightarrow \text{H}_2\text{O} \quad \Delta H_2$
 III. $\text{O}_2 \Rightarrow 2\text{O} \quad \Delta H_3$
 Which one(s) of the reactions and of ΔH should be known?
 A) II B) III C) I - II D) I - III E) I

10. $\text{C}_{(s)} + \text{CO}_{2(g)} \Rightarrow 2\text{CO}_{(g)} \quad \Delta H = +41.2 \text{ kcal}$
 $4\text{CO}_{(g)} + 2\text{O}_2 \Rightarrow 4\text{CO}_{2(g)} \quad \Delta H = -270.4 \text{ kcal}$
 According to the given reactions what is the formation heat of CO_2 ?
 A) -94 B) 94 C) -68 D) 68 E) 44