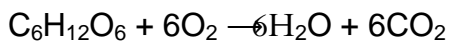


## QUIZ

**Enthalpies of Formation and Reaction**

1. A student is trying to develop a model of an instant heat pack. What is the essential characteristic of the chemical reaction that the student should use to develop the heat pack?
- A. The standard enthalpy of reaction should be zero.
  - ☒ B. The standard enthalpy of reaction should be negative.
  - C. The enthalpy of formation of reactants should be positive.
  - D. The enthalpy of formation of products should be negative.
2. Which statements about the standard enthalpy of formation of a compound are **true**? Select all that apply.
- ☒ A. It is calculated when all substances are in their gaseous states.
  - ☒ B. It is calculated when all substances are in their respective states at STP.
  - C. It is the enthalpy change accompanying the formation of 1 g of the compound.
  - ☒ D. It is the enthalpy change accompanying the formation of 1 mole of the compound.

3. The chemical equation for the oxidation reaction of glucose is shown.



The table shows the standard enthalpies of the entities participating in the reaction.

Standard Enthalpies of Formation at STP	
Substance	$\Delta H_f^\circ$ (kJ/mol)
$\text{H}_2\text{O}(l)$	-285.8
$\text{CO}_2(g)$	-393.5
$\text{C}_6\text{H}_{12}\text{O}_6$	-1271

Calculate the standard enthalpy for the reaction. Show your work.

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

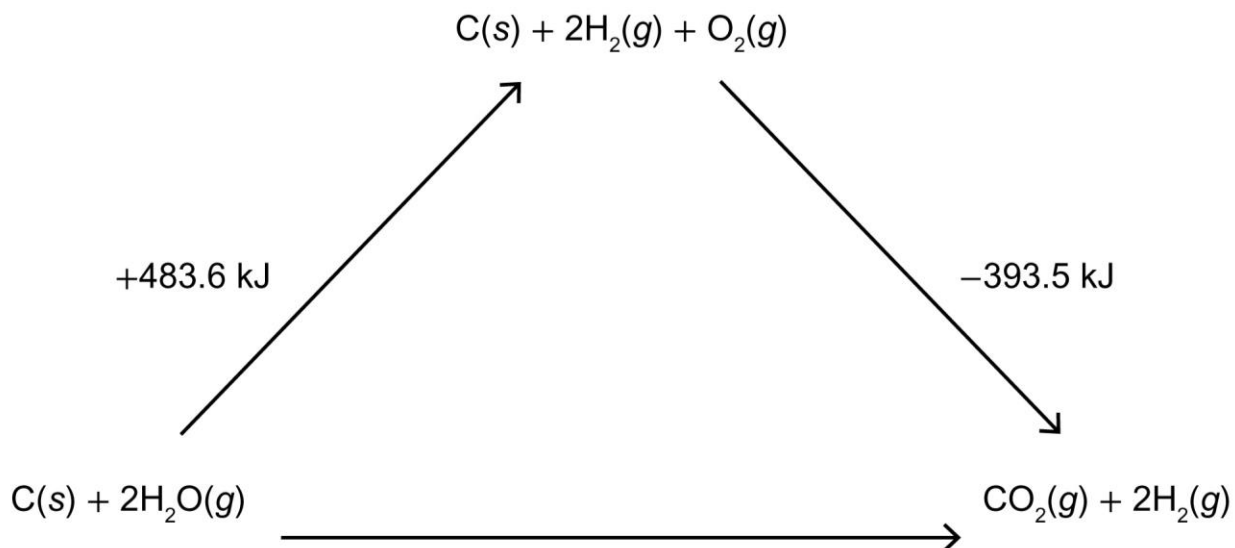
$$H_f^\circ(\text{products}) = [6(-285.8) + 6(-393.5)] \times 6 = -4075.8 \text{ kJ/mol}$$

$$H_f^\circ(\text{reactants}) = -1271 \text{ kJ/mol}$$

$$H^\circ = -4075.8 \text{ kJ/mol} - (-1271 \text{ kJ/mol}) = -2804.8 \text{ kJ/mol}$$

**Read the passage and use the diagram to answer the next two questions.**

The illustration shows two different paths the reaction between carbon and water vapor can take to form carbon dioxide and hydrogen gas.



4. Based on the illustration, calculate the enthalpy for the reaction between the solid form of carbon and water vapor. Based on the value obtained, predict if heat is absorbed or released during the reaction.

The enthalpy for the reaction between the solid form of carbon and water vapor can be calculated by adding the given steps of reaction. The mathematical equation will be  $H^\circ = H1^\circ + H2^\circ$ . So, this translates to  $483.6 \text{ kJ} + (-393.5 \text{ kJ}) = 90.1 \text{ kJ}$ . The value of enthalpy of the reaction is positive, so it can be predicted that the reaction is endothermic. This means heat will be absorbed during the reaction.

5. Choose the words to complete the sentences. According to the illustration, the enthalpy of a reaction along a path \_\_\_\_\_ connecting the reactants to the products will be equal to the sum of enthalpies of all intermediate reactions. This proves that enthalpy of a multi-step reaction is \_\_\_\_\_.

A. directly; path dependent

B. directly; path independent

C. indirectly; path dependent

D. indirectly; path independent