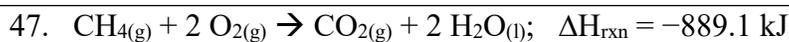


AP Chemistry: Thermodynamics

Multiple Choice

(You may use a calculator.)

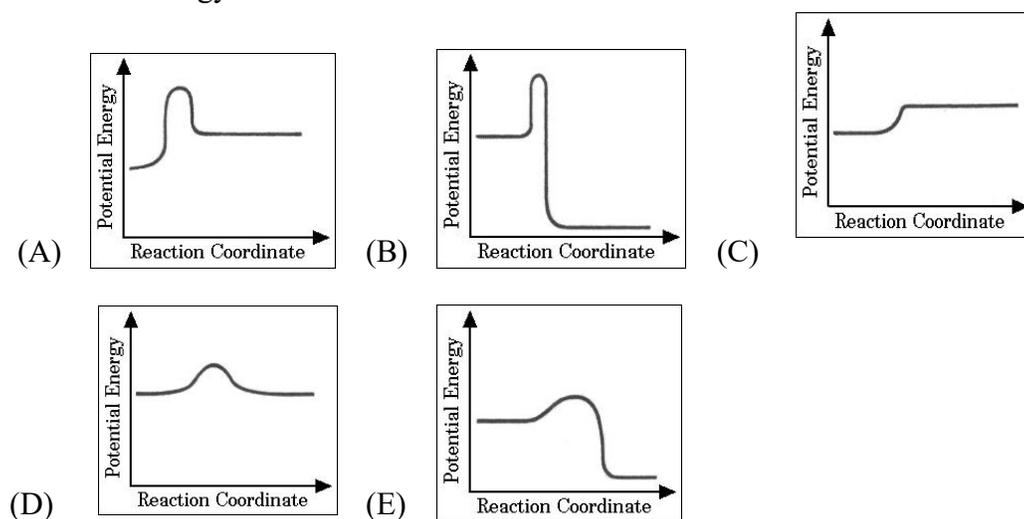


$\Delta H_f^\circ \text{H}_2\text{O}(\text{l}) = -285.8 \text{ kJ/mole} \quad \Delta H_f^\circ \text{CO}_2(\text{g}) = -393.3 \text{ kJ/mole}$

What is the standard heat of formation of methane, $\Delta H_f^\circ \text{CH}_4(\text{g})$, as calculated from the data above?

- (A) -210.0 kJ/mole (B) -107.5 kJ/mole (C) -75.8 kJ/mole (D) 75.8 kJ/mole (E) 210.0 kJ/mole

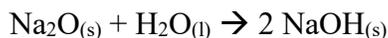
48. Which of the following is a graph that describes the pathway of reaction that is endothermic and has high activation energy?



25.

$\text{H}_2(\text{g}) + 1/2 \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$	$\Delta H^\circ = x$
$2 \text{Na}(\text{s}) + 1/2 \text{O}_2(\text{g}) \rightarrow \text{Na}_2\text{O}(\text{s})$	$\Delta H^\circ = y$
$\text{Na}(\text{s}) + 1/2 \text{O}_2(\text{g}) + 1/2 \text{H}_2(\text{g}) \rightarrow \text{NaOH}(\text{s})$	$\Delta H^\circ = z$

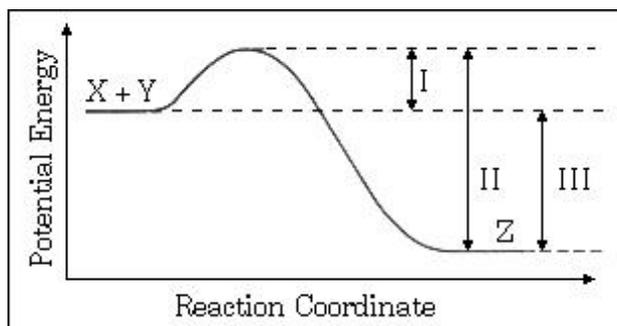
Based on the information above, what is the standard enthalpy change for the following reaction?



- (A) $x + y + z$ (B) $x + y - z$ (C) $x + y - 2z$ (D) $2z - x - y$ (E) $z - x - y$

30. The energy diagram for the reaction $\text{X} + \text{Y} \rightarrow \text{Z}$ is shown. The addition of a catalyst to this reaction would cause a change in which of the indicated energy differences?

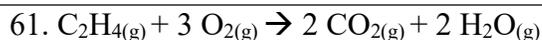
- (A) I only
 (B) II only
 (C) III only
 (D) I and II only



(E) I, II, and III

19. Which of the following best describes the role of the spark from the spark plug in an automobile engine?

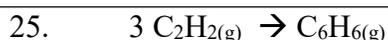
- (A) The spark decreases the energy of activation for the slow step.
- (B) The spark increases the concentration of the volatile reactant.
- (C) The spark supplies some of the energy of activation for the combustion reaction.
- (D) The spark provides a more favorable activated complex for the combustion reaction.
- (E) The spark provides the heat of vaporization for the volatile hydrocarbon.



For the reaction of ethylene represented above, ΔH is $-1,323 \text{ kJ}$. What is the value of ΔH if the combustion produced liquid water $\text{H}_2\text{O}(\text{l})$, rather than water vapor $\text{H}_2\text{O}(\text{g})$?

(ΔH for the phase change $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$ is -44 kJ mol^{-1} .)

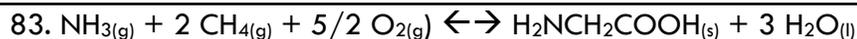
- (A) $-1,235 \text{ kJ}$ (B) $-1,279 \text{ kJ}$ (C) $-1,323 \text{ kJ}$ (D) $-1,367 \text{ kJ}$ (E) $-1,411 \text{ kJ}$



What is the standard enthalpy change, ΔH° , for the reaction represented above?

(ΔH°_f of $\text{C}_2\text{H}_2(\text{g})$ is 230 kJ mol^{-1} ; ΔH°_f of $\text{C}_6\text{H}_6(\text{g})$ is 83 kJ mol^{-1})

- (A) -607 kJ (B) -147 kJ (C) -19 kJ (D) $+19 \text{ kJ}$ (E) $+773 \text{ kJ}$



At constant temperature, ΔH , the change in enthalpy for the reaction above is approximately equal to...

- (A) $\Delta E - (11/2)RT$ (B) $\Delta E - (7/2)RT$ (C) $\Delta E + RT$ (D) $\Delta E + (7/2)RT$ (E) $\Delta E (11/2)RT$