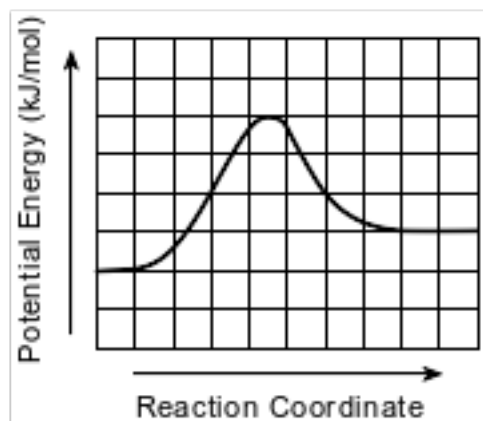


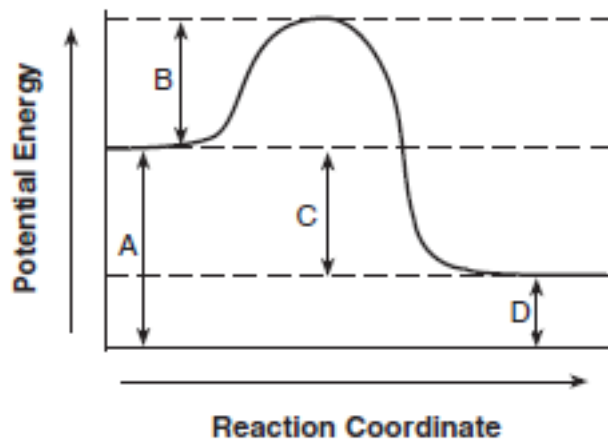


- 5 Given the potential energy diagram for a reversible chemical reaction:



Each interval on the axis labeled “Potential Energy (kJ/mol)” represents 10. kilojoules per mole. What is the activation energy of the forward reaction?

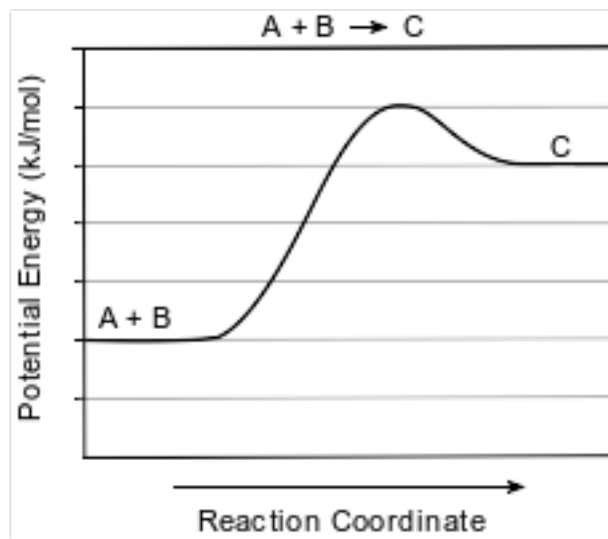
- (1) 10. kJ/mol                      (3) 40. kJ/mol  
 (2) 30. kJ/mol                      (4) 60. kJ/mol
- 6 Given the potential energy diagram representing a reversible reaction:



The activation energy for the reverse reaction is represented by

- (1) A + B                              (3) B + D  
 (2) B + C                              (4) C + D

- 7 Given the equation and potential energy diagram representing a reaction:



If each interval on the axis labeled “Potential Energy (kJ/mol)” represents 10. kJ/mol, what is the heat of reaction?

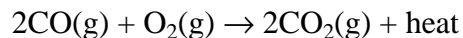
- (1) +60. kJ/mol                      (3) +30. kJ/mol  
 (2) +20. kJ/mol                      (4) +40. kJ/mol
- 8 Based on Table I, which equation represents a reaction with the greatest difference between the potential energy of the products and the potential energy of the reactants?
- (1)  $4\text{Al(s)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{Al}_2\text{O}_3\text{(s)}$   
 (2)  $2\text{H}_2\text{(g)} + \text{O}_2\text{(g)} \rightarrow 2\text{H}_2\text{O(l)}$   
 (3)  $\text{C}_3\text{H}_8\text{(g)} + 5\text{O}_2\text{(g)} \rightarrow 3\text{CO}_2\text{(g)} + 4\text{H}_2\text{O(l)}$   
 (4)  $\text{C}_6\text{H}_{12}\text{O}_6\text{(s)} + 6\text{O}_2\text{(g)} \rightarrow 6\text{CO}_2\text{(g)} + 6\text{H}_2\text{O(l)}$

- 9 Which value is defined as the difference between the potential energy of the products and the potential energy of the reactants during a chemical change?

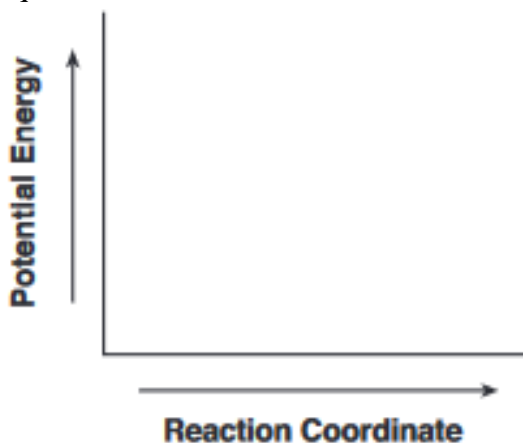
- (1) heat of fusion                      (3) heat of deposition  
 (2) heat of reaction                      (4) heat of vaporization

Base your answers to questions 10 on the information below and on your knowledge of chemistry.

Automobile catalytic converters use a platinum catalyst to reduce air pollution by changing emissions such as carbon monoxide,  $\text{CO}(\text{g})$ , into carbon dioxide,  $\text{CO}_2(\text{g})$ . The uncatalyzed reaction is represented by the balanced equation below.

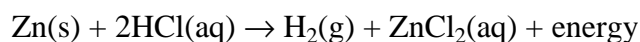


10 On the labeled axes below, draw a potential energy diagram for the reaction represented by this equation.



Base your answers to questions 11 on the information below and on your knowledge of chemistry.

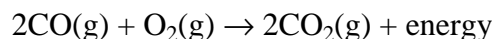
The balanced equation below represents the reaction between a 5.0-gram sample of zinc metal and a 0.5 M solution of hydrochloric acid. The reaction takes place in an open test tube at 298 K and 1 atm in a laboratory activity.



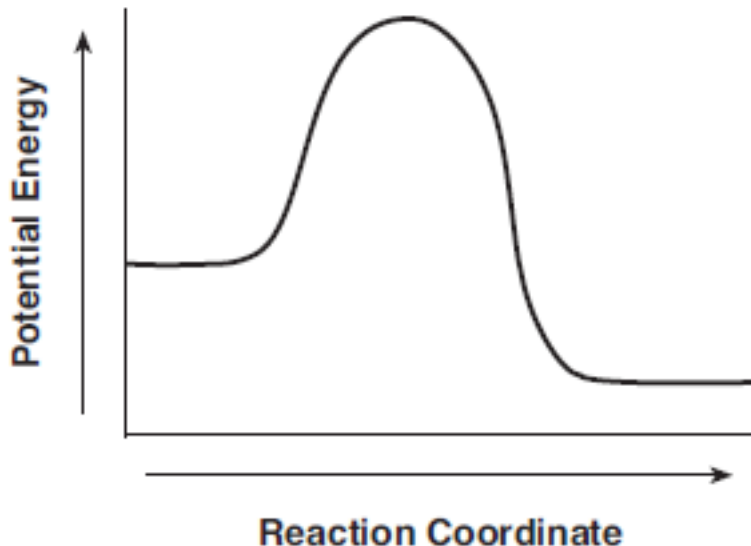
11 On the labeled axes in your answer booklet, draw a potential energy diagram for this reaction.

Base your answers to questions 12 on the information below and on your knowledge of chemistry.

The balanced equation below represents the reaction between carbon monoxide and oxygen to produce carbon dioxide.

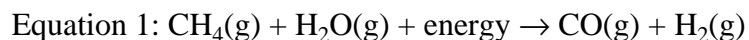


- 12 On the potential energy diagram below, draw a dashed line to show how the potential energy diagram changes when the reaction is catalyzed.

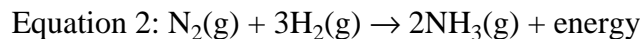


Base your answers to questions 13 on the information below and on your knowledge of chemistry.

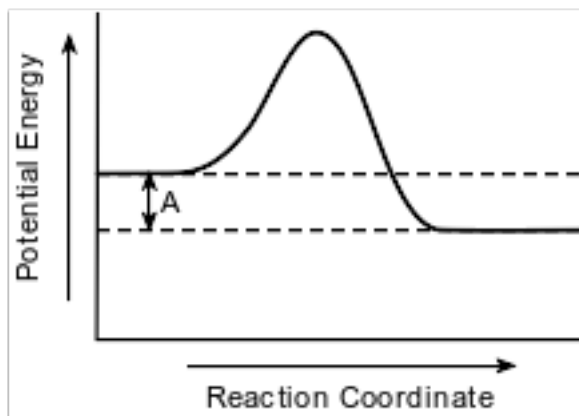
Millions of tons of ammonia are produced each year for use as fertilizer to increase food production. Most of the hydrogen needed to produce ammonia comes from methane gas reacting with steam. This reaction, which occurs in a container under controlled conditions, is shown below in unbalanced equation 1.



The reaction that produces ammonia is represented by balanced equation 2, shown below. A catalyst can be used to increase the rate of the reaction.



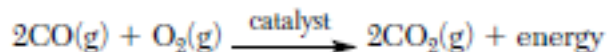
A potential energy diagram for equation 2 is shown below.



- 13 State what is represented by interval A on the potential energy diagram.

Base your answers to questions 14 on the information below and on your knowledge of chemistry.

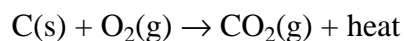
Carbon monoxide,  $\text{CO}(\text{g})$ , is a toxic gas found in automobile exhaust. The concentration of  $\text{CO}(\text{g})$  can be decreased by using a catalyst in the reaction between  $\text{CO}(\text{g})$  and  $\text{O}_2(\text{g})$ . This reaction is represented by the balanced equation below.



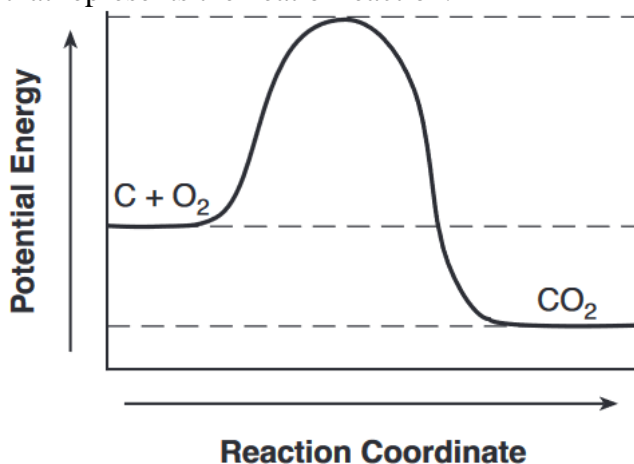
- 14 On the labeled axes in your answer booklet, draw the potential energy curve for the reaction represented by this equation.

Base your answers to questions 15 on the information below and on your knowledge of chemistry.

Coal is a fuel consisting primarily of carbon. In an open system, the carbon that burns completely in air produces carbon dioxide and heat. This reaction is represented by the balanced equation below.



- 15 On the potential energy diagram below, draw a double-headed arrow ( $\rightleftharpoons$ ) to indicate the interval that represents the heat of reaction.



## Answer Keys

1 2

2 4

3 4

4 2

5 3

6 2

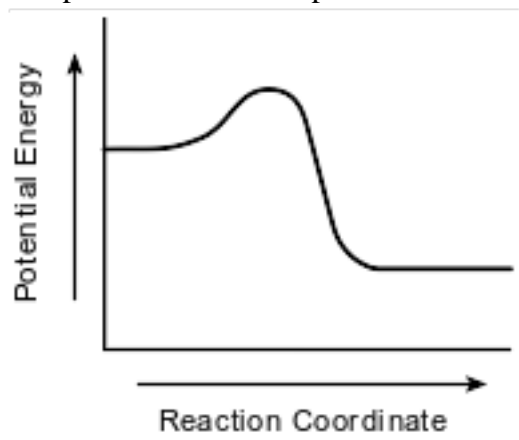
7 3

8 1

9 2

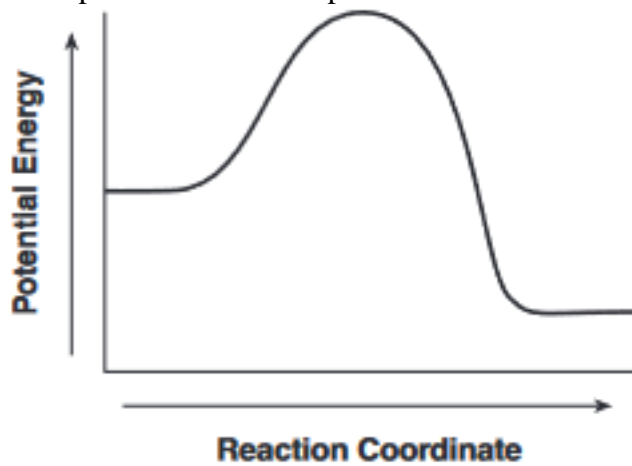
10 Allow 1 credit for showing that the PE of the products is lower than the PE of the reactants.

- Example of a 1-credit response:



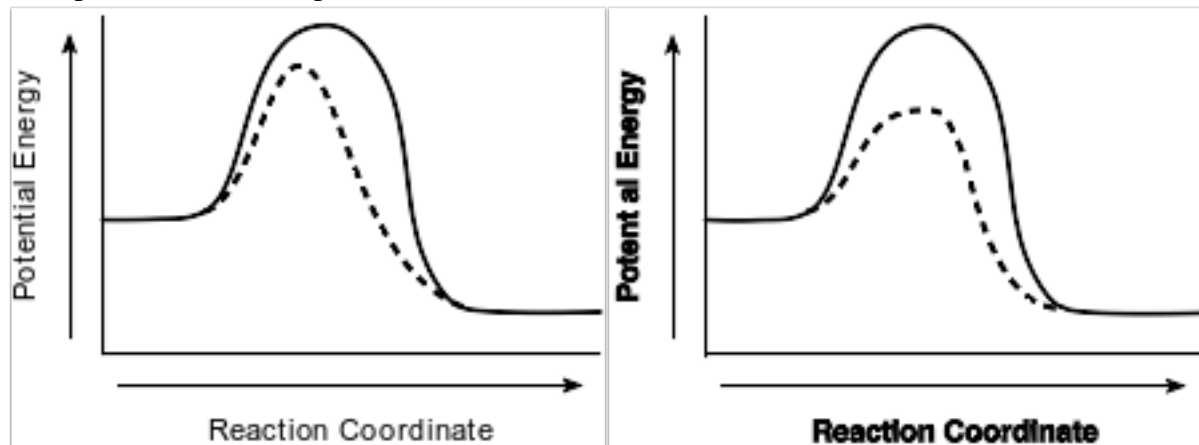
11 Allow 1 credit for showing that the PE of the products is lower than the PE of the reactants.

- Example of a 1-credit response:



12 Allow 1 credit.

- Examples of 1-credit responses:

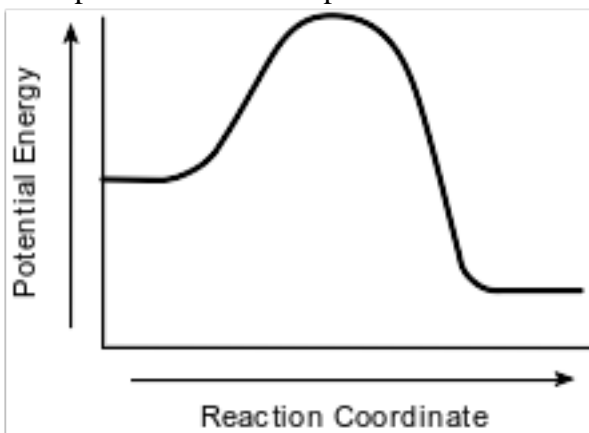


13 Allow 1 credit. Acceptable responses include, but are not limited to:

- Interval A represents the heat of reaction.
- Interval A represents the difference between the potential energy of the products and the potential energy of the reactants.
- $\Delta H$

14 Allow 1 credit for showing that the potential energy of the products is lower than the potential

- energy of the reactants.
- Example of a 1-credit response:



15 Allow 1 credit.

- Example of 1-credit response:

