1. Given the equation and potential energy diagram representing a reaction:



Reaction Coordinate

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

A) +60. kJ/mol	B) +20. kJ/mol
C) +30. kJ/mol	D) +40. kJ/mol

2. Given the potential energy diagram representing a reversible reaction:



The activation energy for the reverse reaction is represented by

A) A + BB) B + CC) B + DD) C + D

3. Given the potential energy diagram and equation representing the reaction between substances *A* and *D*



Reaction Coordinate

$$A + D \longrightarrow G$$

According to Table I, substance G could be

A) HI(g)	B) $H_2O(g)$
C) $CO_2(g)$	D) $C_2H_6(g)$

- 4. In a chemical reaction, the difference between the potential energy of the products and the potential energy of the reactants is equal to the
 - A) activation energy
 - B) entropy of the system
 - C) heat of fusion
 - D) heat of reaction
- 5. Changes in activation energy during a chemical reaction are represented by a
 - A) cooling curve
 - B) heating curve
 - C) ionization energy diagram
 - D) potential energy diagram

6. The potential energy diagram for a chemical reaction is shown below.



Reaction Coordinate

Each interval on the axis labeled "Potential Energy (kJ)" represents 40 kilojoules. What is the heat of reaction?

- A) -120kJ B) -40kJ C) +40kJ D) +160kJ
- 7. Given the potential energy diagram for a reaction:



Reaction Coordinate

Which interval on this diagram represents the difference between the potential energy of the products and the potential energy of the reactants?

A) 1 B) 2 C) 3 D) 4

8. Given the potential energy diagram for a chemical reaction:



Reaction Coordinate

Which statement correctly describes the energy changes that occur in the forward reaction?

- A) The activation energy is 10. kJ and the reaction is endothermic.
- B) The activation energy is 10. kJ and the reaction is exothermic.
- C) The activation energy is 50. kJ and the reaction is endothermic.
- D) The activation energy is 50. kJ and the reaction is exothermic.
- 9. In a chemical reaction, the difference between the potential energy of the products and the potential energy of the reactants is defined as the
 - A) activation energy
 - B) ionization energy
 - C) heat of reaction
 - D) heat of vaporization
- 10. Which information about a chemical reaction is provided by a potential energy diagram?
 - A) the oxidation states of the reactants and products
 - B) the average kinetic energy of the reactants and products
 - C) the change in solubility of the reacting substances
 - D) the energy released or absorbed during the reaction

11. The potential energy diagram below represents a reaction.



Reaction Coordinate Which arrow represents the activation energy of the forward reaction?

A) A B) B C) C D) D

12. Given the reaction:

 $S(s) + O_2(g) \rightarrow SO_2(g) + energy$ Which diagram best represents the potential energy changes for this reaction?



13. According to Table *I*, which potential energy diagram best represents the reaction that forms H₂O(ℓ) from its elements?



14. Given the potential energy diagram of a chemical reaction:



Reaction Coordinate

Which arrow represents the potential energy of the reactants?

A) A B) B C) C D) D

15. Base your answer to the following question on the diagram shown below.



Which represents the activation energy for the forward reaction?

A) 1 B) 2 C) 3 D) 4 E) 6

Base your answers to questions 16 and 17 on the diagram below. The reaction $A + B \rightarrow C + D$ follows the energy path shown below.



- 16. What is the activation energy for the *forward* reaction?
 - A) 20.0 kJ•mol⁻¹ B) 40.0 kJ•mol⁻¹
 - C) 100. kJ•mol⁻¹ D) 120. kJ•mol⁻¹

E) 140. kJ•mol⁻¹

- 17. What is the activation energy for the *reverse* reaction?
 - A) 20.0 kJ•mol⁻¹
 B) 40.0 kJ•mol⁻¹

 C) 100. kJ•mol⁻¹
 D) 120. kJ•mol⁻¹

 E) 140. kJ•mol⁻¹

Base your answers to questions 18 through 20 on the diagram shown below.



A) 6 B) 2 C) 3 D) 4 E) 5

- 19. Which represents the activation energy for the forward reaction?
 - C) 3 A) 1 B) 2 D) 4 E) 6
- 20. A catalyst would change
 - A) 1 and 6 B) 2 and 3
 - C) 3 and 4 D) 4, 5 and 6
 - E) 3 and 6



- 21. Which of the following is the best explanation of the graph above?
 - A) The addition of the catalyst increases the potential energy of the reaction.
 - B) The catalyst makes the reaction proceed in the forward direction ONLY.
 - C) The addition of a catalyst lowers the activation energy of the reaction.
 - D) The catalyst is consumed by the reaction, and produces extra energy.
 - E) The catalyst slows down the speed of reaction.



22. Based on the above reaction mechanism, which of the following would not be affected by the addition of a catalyst?

A) A	B) B
C) C	D) D

) C	D) D
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E) None of these

- 23. A catalyst increases the rate of a chemical reaction by
 - A) increasing the kinetic energy
 - B) decreasing the heat of reaction
 - C) changing the concentration of the reactants
 - D) providing an alternate reaction mechanism
 - E) decreasing kinetic energy

24. $\frac{1}{2}$ H₂(g) + $\frac{1}{2}$ I₂(g) \rightarrow HI(g) Δ H = +28 kJ

The activation energy for the formation of HI, which is shown above, is 167 kJ. The activation energy for the decomposition of HI is

- A) 28 kJ
 B) 139 kJ

 C) 167 kJ
 D) 195 kJ
- E) 210 kJ



- 25. According to the above reaction mechanism, the distanced marked "Z" represents
 - A) the activation energy for $A(g) + B(g) \leftrightarrow C(g) + D(g)$
 - B) the heat of reaction for for $A(g) + B(g) \leftrightarrow C(g)$) + D(g)
 - C) the activation energy for $C(g) + D(g) \leftrightarrow A(g) + B(g)$
 - D) the heat of reaction for $C(g) + D(g) \leftrightarrow A(g) + B(g)$
 - E) none of these