

## Potential Energy Diagram Worksheet Answer Key PDF

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### Part 1: Building a Foundation

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**What does a potential energy diagram primarily depict?**

undefined. A) The speed of a reaction

**undefined. B) The change in potential energy during a reaction ✓**

undefined. C) The color change of reactants

undefined. D) The mass of the products

A potential energy diagram primarily depicts the change in potential energy during a reaction.

**Which of the following are components of a potential energy diagram? (Select all that apply)**

**undefined. A) Reactants ✓**

**undefined. B) Activation Energy ✓**

undefined. C) Catalyst concentration

**undefined. D) Transition State ✓**

Components of a potential energy diagram include reactants, activation energy, and transition state.

**Describe the significance of the activation energy in a chemical reaction.**

**Activation energy is significant because it determines the minimum energy required for reactants to undergo a chemical reaction.**

**List the two types of reactions based on energy change and briefly define each.**

1. Exothermic reaction

**A reaction that releases energy, usually in the form of heat.**

2. Endothermic reaction

**A reaction that absorbs energy from its surroundings.**

The two types of reactions are exothermic (release energy) and endothermic (absorb energy).

**Part 2: comprehension and Interpretation**

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**In an exothermic reaction, how does the potential energy of the products compare to that of the reactants?**

undefined. A) Higher

**undefined. B) Lower ✓**

undefined. C) The same

undefined. D) Unrelated

In an exothermic reaction, the potential energy of the products is lower than that of the reactants.

**Which statements are true about the transition state in a potential energy diagram? (Select all that apply)**

undefined. A) It is the lowest energy point in the diagram.

**undefined. B) It represents a high-energy, unstable condition. ✓**

undefined. C) It occurs after the products are formed.

**undefined. D) It is the peak of the energy diagram. ✓**

The transition state is a high-energy, unstable condition and is the peak of the energy diagram.

**Explain how a catalyst affects the potential energy diagram of a reaction.**

**A catalyst lowers the activation energy, which alters the shape of the potential energy diagram by reducing the peak height.**

**Part 3: Application and Analysis**

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**If a reaction has a high activation energy, what can be inferred about its rate?**

undefined. A) It will be fast.

**undefined. B) It will be slow. ✓**

undefined. C) It will be unaffected.

undefined. D) It will depend on the temperature only.

A reaction with a high activation energy will generally be slow.

**How might a chemist lower the activation energy of a reaction? (Select all that apply)**

undefined. **A) Increase the temperature ✓**

undefined. **B) Add a catalyst ✓**

undefined. C) Increase the concentration of reactants

undefined. **D) Use a different solvent ✓**

A chemist can lower activation energy by adding a catalyst, increasing the temperature, or using a different solvent.

**Given a potential energy diagram, identify the reactants, products, and activation energy. Explain your reasoning.**

**The reactants are found at the starting energy level, products at the final level, and activation energy is the height of the peak.**

**Which part of the potential energy diagram would change if a catalyst is added to the reaction?**

undefined. A) The initial energy level

undefined. **B) The peak height (activation energy) ✓**

undefined. C) The final energy level

undefined. D) The overall energy change ( $\Delta H$ )

The peak height (activation energy) would change if a catalyst is added.

**Analyze the following scenario: A reaction is exothermic, but it proceeds very slowly. What could be the reasons? (Select all that apply)**

undefined. **A) High activation energy ✓**

undefined. **B) Low concentration of reactants ✓**

undefined. C) High concentration of products

undefined. D) Presence of a catalyst

Reasons for a slow exothermic reaction could include high activation energy and low concentration of reactants.

**Compare and contrast the potential energy diagrams of an endothermic and an exothermic reaction. What are the key differences?**

**Endothermic diagrams show an increase in energy, while exothermic diagrams show a decrease; the shapes reflect these energy changes.**

## Part 4: Evaluation and Creation

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**Which statement best evaluates the role of potential energy diagrams in understanding chemical reactions?**

undefined. A) They only show the speed of reactions.

**undefined. B) They provide insight into the energy changes and stability of reactions. ✓**

undefined. C) They are only useful for endothermic reactions.

undefined. D) They depict the color changes during reactions.

Potential energy diagrams provide insight into the energy changes and stability of reactions.

**Evaluate the following statements about catalysts. Which are correct? (Select all that apply)**

undefined. A) Catalysts are consumed in the reaction.

**undefined. B) Catalysts lower the activation energy. ✓**

undefined. C) Catalysts change the overall energy change ( $\Delta H$ ) of the reaction.

**undefined. D) Catalysts provide an alternative reaction pathway. ✓**

Correct statements include that catalysts lower activation energy and provide an alternative reaction pathway.

**Design a potential energy diagram for a hypothetical reaction, labeling all key components. Explain the choices you made in your design.**

**The design should include labeled reactants, products, activation energy, and transition state, with explanations for each choice.**