

## **Potential Energy Diagram Worksheet**

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Part 1: Building a Foundation
What does a potential energy diagram primarily depict?
Hint: Think about what the diagram represents in terms of energy changes.
<ul><li>A) The speed of a reaction</li><li>B) The change in potential energy during a reaction</li></ul>
○ C) The color change of reactants
O) The mass of the products
Which of the following are components of a potential energy diagram? (Select all that apply)
Hint: Consider the elements that are typically included in such diagrams.
A) Reactants
☐ B) Activation Energy
C) Catalyst concentration
D) Transition State
Describe the significance of the activation energy in a chemical reaction.
Hint: Think about how activation energy affects the rate of a reaction.

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



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Hint: Consider the direction of energy flow in these reactions.
1. Exothermic reaction
2. Endothermic reaction
Part 2: comprehension and Interpretation
In an exothermic reaction, how does the potential energy of the products compare to that of the reactants?
Hint: Think about the energy changes that occur during the reaction.
O A) Higher
○ B) Lower
<ul><li>○ C) The same</li><li>○ D) Unrelated</li></ul>
Which statements are true about the transition state in a potential energy diagram? (Select all that apply)
Hint: Consider the characteristics of the transition state.
A) It is the lowest energy point in the diagram.
B) It represents a high-energy, unstable condition.
<ul><li>C) It occurs after the products are formed.</li><li>D) It is the peak of the energy diagram.</li></ul>
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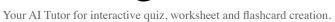
Explain how a catalyst affects the potential energy diagram of a reaction.

Hint: Think about the role of a catalyst in lowering activation energy.



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Part 3: Application and Analysis
If a reaction has a high activation energy, what can be inferred about its rate?
Hint: Consider the relationship between activation energy and reaction speed.
○ A) It will be fast.
○ B) It will be slow.
C) It will be unaffected.
O) It will depend on the temperature only.
How might a chemist lower the activation energy of a reaction? (Select all that apply)
Hint: Consider methods that can influence the energy barrier of a reaction.
A) Increase the temperature
☐ B) Add a catalyst
C) Increase the concentration of reactants
D) Use a different solvent
Given a potential energy diagram, identify the reactants, products, and activation energy. Explain your reasoning.
Hint: Refer to the key features of the diagram to identify these elements.





Which part of the potential energy diagram would change if a catalyst is added to the reaction?
Hint: Think about how catalysts influence energy levels.
○ A) The initial energy level
○ B) The peak height (activation energy)
○ C) The final energy level
$\bigcirc$ D) The overall energy change ( $\triangle$ H)
Analyze the following scenario: A reaction is exothermic, but it proceeds very slowly. What could be the reasons? (Select all that apply)
Hint: Consider factors that could affect the rate of an exothermic reaction.
A) High activation energy
☐ B) Low concentration of reactants
C) High concentration of products
D) Presence of a catalyst
Compare and contrast the potential energy diagrams of an endothermic and an exothermic reaction. What are the key differences?
Hint: Think about the energy changes and the shape of the diagrams.
Part 4: Evaluation and Creation
Which statement best evaluates the role of potential energy diagrams in understanding chemical reactions?
Hint: Consider the overall purpose of these diagrams in chemistry.
○ A) They only show the speed of reactions.
O B) They provide insight into the energy changes and stability of reactions.
C) They are only useful for endothermic reactions.



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D) They depict the color changes during reactions.
Evaluate the following statements about catalysts. Which are correct? (Select all that apply)
Hint: Consider the properties and effects of catalysts in reactions.
<ul> <li>A) Catalysts are consumed in the reaction.</li> <li>B) Catalysts lower the activation energy.</li> <li>C) Catalysts change the overall energy change (ΔH) of the reaction.</li> <li>D) Catalysts provide an alternative reaction pathway.</li> </ul>
Design a potential energy diagram for a hypothetical reaction, labeling all key components. Explain the choices you made in your design.  Hint: Think about the elements that should be included in your diagram.