

Student Name: _____

Class: _____

Due Date: _____

Essential Understanding:

- Types of chemical reactions
- Energy changes in reactions
- Factors affecting reaction rates
- Chemical equilibrium

Complete these concept checks:

1. Define and give an example of:

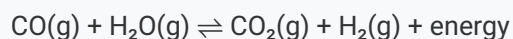
- Exothermic reaction
- Endothermic reaction
- Catalyst
- Activation energy

2. Draw and label an energy diagram for:

- A combustion reaction
- A decomposition reaction

Scenario 1: Industrial Chemistry

A chemical plant produces hydrogen gas through the water-gas shift reaction:



1. Analyze how these changes would affect hydrogen production:

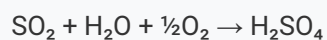
- Increasing temperature
- Adding more CO
- Removing H₂
- Adding a catalyst

2. Calculate the theoretical yield if:

- Initial CO = 5.0 moles
- Initial H₂O = 4.0 moles
- Reaction efficiency = 85%

Scenario 2: Environmental Chemistry

Study the formation of acid rain:



1. Explain each step of this multi-stage reaction

2. Propose three methods to reduce acid rain formation

3. Calculate the pH if 0.01M H_2SO_4 is formed

Choose ONE of these topics for detailed research:

1. Green Chemistry in Industry

- Research 3 examples of green chemistry innovations
- Analyze their environmental impact
- Evaluate economic feasibility
- Suggest future applications

2. Biochemical Reactions in Sports

- Explain ATP production during exercise
- Analyze lactic acid formation
- Connect to athletic performance
- Suggest optimal training strategies

3. Chemistry in Space Exploration

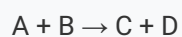
- Research rocket fuel reactions
- Study life support systems
- Analyze materials science challenges
- Propose solutions for Mars missions

Choose any combination:

1. Design and explain a chemical battery
 - Draw detailed diagrams
 - Write half-equations
 - Calculate potential voltage
2. Create a chemical reaction simulation
 - Use online modeling tools
 - Show concentration changes
 - Demonstrate equilibrium shifts
3. Write a scientific paper analyzing a recent chemical discovery
 - Include primary research
 - Evaluate methodology
 - Discuss implications

Case Study 1: Industrial Application

A manufacturing plant uses a chemical reaction to produce a product. The reaction is:

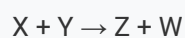


1. Analyze the reaction and identify the type of reaction

2. Calculate the theoretical yield of the product if 10 moles of A and 10 moles of B are used

Case Study 2: Environmental Impact

A chemical reaction occurs in the environment, releasing a pollutant into the air. The reaction is:



1. Analyze the reaction and identify the type of reaction

2. Propose a method to reduce the amount of pollutant released into the air

Complete these review questions:

1. What is the difference between an exothermic and endothermic reaction?

2. What is the purpose of a catalyst in a chemical reaction?

3. What is the concept of chemical equilibrium?

Section A: Multiple Choice Questions

1. What type of reaction is the combustion of gasoline?

2. What is the purpose of a catalyst in a chemical reaction?

Section B: Short Answer Questions

1. Explain the concept of activation energy

2. Describe the difference between a homogeneous and heterogeneous catalyst

Part 7: Conclusion (10 minutes)

Summary:

Summarize the key concepts learned in this activity

Introduction:

Provide a brief introduction to the activity and the topics that will be covered

Assessment:

Provide guidance on how to assess student understanding and progress throughout the activity