Biological Molecules: Student Activity Workbook

Learning Objectives and Introduction

Welcome to your exploration of biological molecules! By the end of these activities, you will be able to:

- Identify and describe the four main types of biological molecules
- Understand how molecular structure relates to function
- Analyze molecular interactions in living systems
- Apply molecular biology concepts to real-world scenarios

Pre-Assessment Knowledge Check (15 minutes)

Rate your current understanding of each topic from 1 (lowest) to 5 (highest):

Topic	Current Understanding (1-5)	What I Want to Learn
Proteins		
Carbohydrates		
Lipids		
Nucleic Acids		

Activity 1: Molecular Structure Detective (30 minutes)

Examine each molecular diagram and complete the analysis tasks below:

Molecule A: Protein Structure

1. Identify the basic building blocks of this molecule:
2. Draw and label the peptide bond formation:
3. List three functions of proteins in living organisms:

Molecule B: Carbohydrate Analysis

1. Draw the structure of a glucose molecule:
2. Explain how glucose molecules join to form:
   - Maltose:
   - Starch:

Activity 2: Molecular Function Investigation (25 minutes)

Complete these experimental design challenges:

Challenge 1: Enzyme Investigation

Design an experiment to investigate the effect of temperature on enzyme activity.

Component	Your Plan
Hypothesis	
Variables	
Method	
Expected Results	

Scientific Reasoning

1. Explain why temperature affects enzyme activity:

2. Predict what would happen if the pH was changed:

3. Connect this to real-world biological processes:

Activity 3: Lipid Analysis and Investigation (40 minutes)

Explore the properties and functions of different lipid molecules:

Part 1: Membrane Structure Investigation

Draw and label a phospholipid bilayer showing:

- Hydrophilic heads
- Hydrophobic tails
- Embedded proteins
- Cholesterol molecules

Membrane Fluidity Factors

Factor	Effect on Fluidity	Explanation
Temperature		
Cholesterol		
Saturation		

Activity 4: Nucleic Acid Structure and Function (45 minutes)

DNA vs RNA Comparison

Feature	DNA	RNA
Sugar Type		
Base Pairs		
Structure		
Function		

DNA Replication Practice

Complete the complementary DNA strand using base-pairing rules:

Original strand: A T G C C A T A G C T A

Complementary strand: __ __ __ __ __ __ __ __ __ __ __ __ __

Activity 5: Molecular Interactions Case Studies (35 minutes)

Case Study 1: Enzyme-Substrate Interactions

Scenario: A patient has a condition affecting their lactase enzyme production.

1. Explain the molecular basis of lactose intolerance:

2. Draw the lock-and-key model of enzyme action:

3. Suggest molecular-level solutions:

Case Study 2: Membrane Transport

Scenario: Analyzing cell membrane transport in different conditions.

Condition	Transport Type	Energy Required?
High to Low Concentration		
Low to High Concentration		

Activity 6: Molecular Biology Applications (30 minutes)

Real-World Applications

Research and explain how molecular biology is used in:

Medical Diagnostics

Explain the role of biological molecules in:

- Disease detection
- Genetic testing
- Drug development

Biotechnology

Describe applications in:

- Genetic engineering
- Protein production
- Biofuel development

Final Reflection

1. How has your understanding of biological molecules improved?
2. What connections can you make between different molecular types?
3. How might this knowledge influence your future studies or career?

Final Reflection and Assessment

Congratulations on completing your biological molecules investigation! Please complete this final reflection:

Learning Journey Review

1. The most important concept I learned today was:

2. One question I still have is:

3. I would like to learn more about:

Self-Assessment

Learning Objective	Achieved? (✓/✗)	Evidence
I can identify biological molecules		
I understand structure-function relationships		
I can analyze molecular interactions		

Teacher Feedback

For teacher use only:

Comments: Signed: _____ Date: _____