Cellular Biology: Understanding Life's Building Blocks

Pre-Assessment Knowledge Check (15 minutes)

Before we begin our exploration of cells, let's assess what you already know. Answer the following questions to the best of your ability:

1. What do you think is the smallest unit of life? Explain your reasoning.

2. Draw what you think a cell looks like and label any parts you know.

3. How do you think cells get their energy?

Key Vocabulary Introduction (20 minutes)

Matching Activity:

Match these essential terms with their definitions by drawing lines between them:

1. Cell membrane	A. Powerhouse of the cell
2. Mitochondria	B. Control center containing DNA
3. Nucleus	C. Selective barrier around the cell
4. Cytoplasm	D. Gel-like substance inside the cell

Cell Structure Investigation (25 minutes)

Using the microscope provided, observe the prepared slides and complete the following tasks:

Observation Record:

Slide Type	Magnification	Drawing	Key Features
Onion Cell			
Cheek Cell			

Cellular Transport Challenge (30 minutes)

Understanding how materials move in and out of cells is crucial. Complete these activities to demonstrate your understanding:

Part 1: Transport Mechanism Classification

Classify each scenario as either Active Transport or Passive Transport:

1. Sugar moving from high to low concentration

   _____

2. Sodium ions moving against concentration gradient

   _____

3. Oxygen entering red blood cells

   _____

Part 2: Osmosis Investigation

Design an experiment to show osmosis using potato strips. Include:

- Hypothesis:

  _____

- Materials needed:

  _____

- Method (step by step):

  _____

- Expected results:

  _____

Cell Organelle Functions (20 minutes)

Create a Cell Organelle Reference Guide:

Organelle	Function	Analogy
Nucleus		
Mitochondria		
Endoplasmic Reticulum		
Golgi Apparatus		

Cell Division and Reproduction (45 minutes)

Explore the stages of mitosis and meiosis through these interactive activities:

Mitosis Stage Sequencing

Number these stages in the correct order and describe key events:

Order	Stage	Key Events
	Metaphase	
	Prophase	
	Telophase	
	Anaphase	

Mitosis vs. Meiosis Comparison

Feature	Mitosis	Meiosis
Number of Divisions		
Number of Daughter Cells		
Chromosome Number in Daughter Cells		

Cellular Energy and Metabolism (40 minutes)

Photosynthesis Investigation

Design and conduct an experiment to show how light intensity affects the rate of photosynthesis:

Materials Needed:

- Elodea (water plant)
- Beakers
- Light source
- Ruler
- Stopwatch

Data Collection Table:

Distance from Light (cm)	Number of Bubbles (1 min)	Trial 1	Trial 2	Trial 3	Average
10					
20					
30					

Cellular Respiration Deep Dive (35 minutes)

Create a Concept Map

Fill in the boxes to show the relationship between glucose breakdown and ATP production:

[Draw arrows between boxes and fill in the missing information]

Glucose	_____	Pyruvate
ATP Produced: ___	ATP Produced: ___	ATP Produced: ___

Critical Thinking Questions:

1. Why is cellular respiration considered an aerobic process?

2. Compare and contrast the efficiency of aerobic and anaerobic respiration:

3. Explain why muscle cells might switch to anaerobic respiration during intense exercise:

Cell Specialization and Differentiation (30 minutes)

Stem Cell Research Case Study

Read the following scenario and answer the questions:

Scientists at a research facility are studying how stem cells can be used to treat spinal cord injuries. They have successfully transformed stem cells into nerve cells in the laboratory and are preparing for clinical trials.

1. What makes stem cells different from specialized cells?

2. Explain the process of cell differentiation:

3. Discuss two potential applications of stem cell research:

Specialized Cell Types Comparison

Cell Type	Special Features	Function	Location in Body
Nerve Cell			
Muscle Cell			
Red Blood Cell			

Assessment and Reflection (15 minutes)

What I Learned Today

Complete these reflection statements:

1. Today I learned that...

   _____

2. The most interesting thing about cells is...

   _____

3. I would like to know more about...

   _____

Homework Assignment

Choose ONE of the following activities:

- Create a 3D model of a cell using household materials
- Write a story from the perspective of a cell organelle
- Design a comic strip showing how cells transport materials

Due Date: Next class session