The Human Excretory System: Interactive Learning Journey

Initial Knowledge Assessment (15 minutes)

Work individually to answer these questions. This will help us understand what we already know about the excretory system.

Quick Write: Take 3 minutes to write everything you know about kidneys and their function.

Vocabulary Check: Match these key terms with their definitions:

1. Nephron	____
2. Glomerulus	____
3. Bowman's Capsule	____

Nephron Structure Investigation (20 minutes)

Using your textbook and provided resources, complete this detailed nephron analysis.

Part 1: Structural Analysis

1. Draw and label a nephron in the space below, including all major parts:

2. For each structure, explain its function:

Structure	Function
Glomerulus	

Proximal Tubule	
Loop of Henle	

Filtration Process Analysis (25 minutes)

Work with a partner to explore how the kidney filters blood.

Blood Filtration Sequence:

Number these steps in the correct order (1-6):

___ Blood enters the glomerulus

___ Useful substances are reabsorbed

___ Filtrate enters Bowman's capsule

___ Waste products form urine

___ Water is reabsorbed in collecting duct

___ Concentrated waste exits through ureter

Critical Thinking Questions:

1. Why is blood pressure important in the filtration process?

2. How does ADH (antidiuretic hormone) affect urine concentration?

3. What would happen if the proximal tubule failed to function?

Real-World Application Challenge (20 minutes)

Analyze these real-life scenarios and apply your knowledge of the excretory system.

Scenario 1: The Marathon Runner

Sarah is training for a marathon in hot weather. She notices her urine is darker than usual.

1. What is happening in Sarah's kidneys?

2. What hormonal changes are occurring?

3. Design a hydration plan for Sarah:

Time	Action	Reasoning
Before Exercise		
During Exercise		
After Exercise		

Creative Assessment Task (15 minutes)

Choose ONE of the following creative tasks to demonstrate your understanding:

1. Create a comic strip showing a day in the life of a nephron
2. Write a story from the perspective of a water molecule passing through the kidney
3. Design an infographic about maintaining healthy kidneys

[Space for creative work]

Learning Reflection

1. What was the most surprising thing you learned about the excretory system?

2. How will this knowledge change your daily habits?

3. What questions do you still have about kidney function?

Homeostatic Regulation Deep Dive (30 minutes)

Explore how the kidneys maintain homeostasis through complex feedback mechanisms.

Part 1: Feedback Loop Analysis

Condition	Hormone Response	Kidney Action	Result
High Blood Pressure			
Low Blood Calcium			
Dehydration			

Part 2: Hormone Investigation

For each hormone, describe its:

- Source
- Target cells in the kidney
- Specific effect
- Role in homeostasis

1. Aldosterone

2. Antidiuretic Hormone (ADH)

3. Parathyroid Hormone (PTH)

Clinical Applications and Disease States (45 minutes)

Analyze common kidney disorders and their effects on homeostasis.

Case Study 1: Chronic Kidney Disease

Patient X presents with elevated blood pressure, fatigue, and decreased urine output. Blood tests show elevated creatinine and urea levels.

1. What nephron structures are likely damaged?

2. How does this affect filtration rate?

3. What homeostatic imbalances would you expect?

Case Study 2: Diabetes Insipidus

Patient Y reports excessive thirst and frequent urination, producing 5-6 liters of dilute urine daily.

1. What hormone is involved in this condition?

2. Explain the mechanism causing these symptoms

3. Design a treatment approach

Laboratory Investigation: Urinalysis (40 minutes)

Conduct simulated urinalysis tests and interpret results.

Materials Needed:

- Simulated urine samples (A, B, C)
- pH test strips
- Glucose test strips
- Protein test strips
- Color chart

Test	Sample A	Sample B	Sample C
Color			
pH			
Glucose			
Protein			

Analysis Questions:

1. What does the presence of glucose in urine indicate?

2. Why might protein appear in urine samples?

3. How does pH variation affect kidney function?

Final Assessment and Integration (30 minutes)

Demonstrate your comprehensive understanding of the excretory system.

Task 1: System Integration

Create a concept map showing how the excretory system interacts with other body systems:

Task 2: Problem-Solving Scenarios

Scenario A: An athlete takes protein supplements and exercises intensively. How might this affect their kidneys?

Scenario B: A patient's blood test shows elevated potassium levels. Explain the kidney's role in addressing this imbalance.

Task 3: Research Connection

Choose one current research topic in nephrology and explain its potential impact:

- Artificial kidneys
- Stem cell therapy
- Novel filtration methods

Final Learning Reflection

1. How has your understanding of kidney function evolved?
2. What lifestyle choices will you make to protect your kidneys?
3. How might you use this knowledge in your future career?

Final Assessment

Complete this quick assessment to demonstrate your understanding.

1. List three ways to maintain healthy kidneys:

2. Explain the relationship between blood pressure and kidney function:

3. Describe how diabetes can affect the excretory system:

Homework Assignment

Complete these tasks for next class:

1. Research a kidney disorder and prepare a one-page summary
2. Track your water intake for three days
3. Create a kidney-friendly meal plan for one day