

L36: Lab - Testnet Swap

Module E: DeFi Ecosystem

Blockchain & Cryptocurrency

December 2025

In this lab, you will:

- Set up a testnet wallet (MetaMask)
- Acquire testnet ETH from faucet
- Execute a token swap on Uniswap testnet
- Calculate and observe slippage
- Provide liquidity to a pool
- Track impermanent loss over time
- Document your experience and findings

Network: Sepolia Testnet (Ethereum)

Time: 90 minutes

Before Starting:

- 1 Web browser (Chrome, Firefox, or Brave recommended)
- 2 No real money required (testnet only)
- 3 Pen and paper for calculations

Safety Reminders:

- This is testnet - funds have NO real value
- NEVER share your seed phrase (even for testnet)
- Do NOT send real ETH to testnet address
- Keep testnet and mainnet wallets separate

Step 1: Install MetaMask

Actions:

- 1 Go to <https://metamask.io>
- 2 Click “Download” and add to your browser
- 3 Create new wallet (or import if you have testnet wallet)
- 4 Write down seed phrase (keep safe even for testnet)
- 5 Set a password

Network Setup:

- Click network dropdown (top right)
- Enable “Show test networks” in settings
- Select “Sepolia Test Network”

Verify: You should see “Sepolia” in network selector and 0 ETH balance.

Step 2: Acquire Testnet ETH

Sepolia Faucets (pick one):

- <https://sepoliafaucet.com>
- <https://faucet.quicknode.com/ethereum/sepolia>
- Alchemy faucet: <https://sepoliafaucet.alchemy.com>

Process:

- 1 Copy your Sepolia address from MetaMask
- 2 Paste into faucet website
- 3 Complete captcha or sign in (varies by faucet)
- 4 Request testnet ETH (usually 0.5-1 ETH per request)
- 5 Wait 1-2 minutes for transaction to confirm

Verification: Check MetaMask balance shows testnet ETH.

Note: If faucet fails, try alternative or ask instructor for testnet ETH.

Step 3: Access Uniswap Testnet

URL: <https://app.uniswap.org>

Actions:

- 1 Connect wallet (click “Connect Wallet” button)
- 2 Select MetaMask
- 3 Approve connection request
- 4 Verify you’re on Sepolia network (check top right)

Interface Overview:

- **Swap:** Exchange tokens
- **Pool:** Provide/remove liquidity
- **Settings:** Slippage tolerance, deadline

Troubleshooting:

- If network wrong: Switch to Sepolia in MetaMask
- If connection fails: Refresh page and reconnect

Step 4: Execute Your First Swap

Goal: Swap 0.1 ETH for USDC (or available testnet token).

Process:

- 1 Click "Swap" tab
- 2 Select ETH in "From" field
- 3 Enter amount: 0.1 ETH
- 4 Select USDC (or DAI) in "To" field
- 5 Note the exchange rate and expected output
- 6 Click "Swap"
- 7 Review transaction details in MetaMask
- 8 Click "Confirm" in MetaMask
- 9 Wait for transaction confirmation (30-60 seconds)

Record:

- Amount sent: ____ ETH
- Amount received: ____ USDC
- Exchange rate: ____ USDC per ETH
- Gas fee: ____ ETH

Step 5: Analyze Slippage

Before executing second swap, calculate expected slippage.

Experiment:

- 1 Try swapping small amount (0.01 ETH) - note price
- 2 Try swapping medium amount (0.1 ETH) - note price
- 3 Try swapping large amount (1 ETH) - note price
- 4 **Do NOT execute**, just observe quote

Questions:

- How does price change with swap size?
- What is the percentage difference between small and large swap?
- Why does slippage increase non-linearly?

Slippage Tolerance:

- Click settings icon (gear)
- Try different tolerance: 0.1%, 0.5%, 1%
- What happens if you set it too low?

Step 6: Provide Liquidity

Goal: Become a liquidity provider (LP).

Process:

- 1 Click "Pool" tab
- 2 Click "+ New Position" (V3) or "Create a pair" (V2)
- 3 Select token pair (e.g., ETH/USDC)
- 4 Choose fee tier (0.05%, 0.3%, or 1%)
- 5 **For V3:** Set price range (try full range for simplicity)
- 6 Enter amounts (e.g., 0.05 ETH + equivalent USDC)
- 7 Click "Preview"
- 8 Approve USDC spending (if first time)
- 9 Confirm liquidity provision
- 10 Wait for transaction confirmation

Record:

- ETH deposited: ____
- USDC deposited: ____
- Fee tier: ____
- Price range (V3): ____

Step 7: Monitor Your Position

After providing liquidity:

Check:

- Pool share percentage
- Current liquidity value (in USD)
- Fees earned (if any trades occurred)
- Price range status (V3: in range or out of range?)

Simulate Price Change:

- Execute a large swap in one direction (buy ETH with USDC)
- Observe how your position changes
- Check if fees accrued
- Note any change in token ratio

Impermanent Loss Tracking:

- Initial deposit value: ____ USD
- Current position value: ____ USD
- If you had just held tokens: ____ USD
- Impermanent loss: ____%

Step 8: Remove Liquidity

Goal: Withdraw your liquidity and observe final outcome.

Process:

- 1 Go to “Pool” tab
- 2 Click on your position
- 3 Click “Remove Liquidity”
- 4 Select percentage to remove (try 100%)
- 5 Click “Remove”
- 6 Confirm transaction in MetaMask
- 7 Wait for confirmation

Record Final Amounts:

- ETH received: ____
- USDC received: ____
- Total fees earned: ____
- Compare to initial deposit

Calculate Net Result:

$$\text{Profit/Loss} = (\text{Final Value} + \text{Fees}) - \text{Initial Value} - \text{Gas Costs}$$

Optional Experiments:

1. Multi-Hop Swaps

- Try swapping between two tokens without direct pair
- Observe how Uniswap routes through multiple pools
- Compare fees and slippage to direct swaps

2. V2 vs. V3 Comparison

- Provide liquidity in V2 (full range, simpler)
- Provide liquidity in V3 (concentrated, complex)
- Compare fee earnings and management complexity

3. Price Impact Analysis

- For different pool sizes, test same swap amount
- Observe how liquidity depth affects slippage

Lab Report Structure:

- ❶ **Introduction** (1 paragraph)
 - Overview of activities performed
- ❷ **Swap Analysis** (1 page)
 - Trade details (amounts, rates, gas fees)
 - Slippage observations
 - Screenshots of transactions
- ❸ **Liquidity Provision** (1 page)
 - LP position details
 - Fee earnings (if any)
 - Impermanent loss calculation
- ❹ **Reflections** (1/2 page)
 - Challenges encountered
 - UX observations (ease of use, clarity)
 - Comparison to centralized exchanges

Impermanent Loss Calculation Example

Scenario:

- Initial deposit: 0.05 ETH + 100 USDC (ETH = \$2,000)
- ETH price changes to \$2,500

If you just held:

- 0.05 ETH now worth: $0.05 \times \$2,500 = \125
- 100 USDC still worth: \$100
- **Total: \$225**

If you provided liquidity:

- Pool rebalances (constant product formula)
- New ratio: 0.0447 ETH + 111.8 USDC
- Value: $(0.0447 \times \$2,500) + \$111.8 = \$223.55$
- **Impermanent Loss: $\$225 - \$223.55 = \$1.45$ (0.64%)**

Add fees earned: If you earned \$3 in fees, net profit = $\$3 - \$1.45 = \$1.55$.

Problem: Transaction Fails

- **Solution:** Increase slippage tolerance or reduce swap amount

Problem: Insufficient Liquidity

- **Solution:** Use more popular pairs (ETH/USDC, ETH/DAI)

Problem: High Gas Fees (even on testnet)

- **Solution:** Wait for lower network congestion or use L2 testnet

Problem: Can't Find Token

- **Solution:** Import token contract address manually

Problem: Out of Testnet ETH

- **Solution:** Use multiple faucets or ask instructor

Answer in your lab report:

- 1 How does the Uniswap UX compare to centralized exchanges (Coinbase, Binance)?
- 2 What are the main advantages of AMMs from a user perspective?
- 3 What are the main risks or disadvantages you observed?
- 4 Would you consider providing liquidity on mainnet with real funds? Why or why not?
- 5 How could the interface be improved for better user experience?
- 6 What surprised you most about the DeFi experience?

Your lab report should include:

- 1 Cover page with name and date
- 2 Transaction hashes (Etherscan links)
- 3 Screenshots of key steps (wallet, swaps, liquidity provision)
- 4 Completed data tables (amounts, rates, fees)
- 5 Impermanent loss calculation (with formula)
- 6 Reflection answers (1-2 paragraphs per question)
- 7 Total: 3-4 pages

Format: PDF

Deadline: [Instructor to specify]

Key Takeaways:

- Testnets allow risk-free DeFi experimentation
- Slippage increases with trade size relative to pool liquidity
- Providing liquidity earns fees but exposes to impermanent loss
- V3 concentrated liquidity offers higher returns but requires active management
- DEX UX has improved significantly but still more complex than CEX
- Understanding mechanics is crucial before risking real capital

Next Lecture: Lending Protocols - How Aave and Compound enable borrowing and lending.