



Preparing for the Certified Ethereum Professional (CEP) Exam

This guide is meant to help in your CEP exam preparation, not provide an exhaustive list of all possible test materials. Ethereum moves fast and our exams are updated regularly. For the CEP exam, you don't need to know how to implement the technology, but you will need to understand the basic features, what problems those features solve, and what problems they don't solve.

History of Ethereum and Ledger-based Economics

Centralized Ledgers: Understand what a centralized ledger is and how money has been organized on centralized ledgers in the modern digital economy.

Functions of Currency: Distinguish between functions of currencies such as unit of account, store of value, and medium of exchange. Understand how the properties of money relate to these functions.

Distributed Consensus: Know what "distributed consensus" means and explain what makes Ethereum's ledger different from centralized ledgers.

Ethereum Forks: Understand what a blockchain fork is and the history of Ethereum's planned and accidental forks.

Decentralized Computing: Define what it means to have a decentralized Turing-complete virtual machine. Explain how it is different from the Bitcoin protocol. Know the benefits and practical limitations in Ethereum.

Cryptography Basics

Terms and Definitions: Define and accurately use basic cryptographic terms such as cryptography, encryption algorithm, decryption algorithm, symmetric vs. asymmetric encryption, cipher vs. plain text.

Hash Functions: Explain the purpose of hash functions, how they are used in Ethereum, and how they help secure the Ethereum blockchain.

Asymmetric Cryptography: Understand the principles of asymmetric cryptography and the impact it has on key exchange, digital signatures, and transaction signing.

Digital Signatures: Understand the basic uses of digital signatures, and why they are used in Ethereum. Understand the relationship between digital signatures and asymmetric keys.

Ethereum Basics

Ethereum Community: Understand how users, developers, miners (and stakers), businesses, and governments impact the Ethereum Protocol. Explain what types of institutions are actively involved in promoting, maintaining, or lobbying in favor of Ethereum.

Ethereum Addresses and Keys: Understand how Ethereum addresses and keys are generated. Explain the relationship between Ethereum account types (externally owned accounts vs. contracts), public keys, private keys, and smart contracts; distinguish between these and describe the primary use of each. In terms of addresses and keys, describe how funds are accessed and transferred on the Ethereum network.

Ethereum Transactions: Describe an Ethereum transaction and how it is irreversible. Understand the structure of transactions and basics of nonces, gas price, and gas limits.

Ethereum Blockchain State Machine: Explain how Ethereum's blockchain functions as a state machine. Know how the state is stored, updated, and verified.

Ether the Unit: Know and understand the denominations of Ether, the currency, and their relation to one another (e.g. Wei, Ether). Explain the difference between Ethereum and Ether.

Ethereum the Network: Understand how the network is connected and the importance of independent nodes. Explain common network attacks (such as DDoS) and how the network is secured from these types of attacks. Know the different test networks on Ethereum.

Ethereum Improvement Proposals (EIPs): Understand what an EIP is and explain the basic process of submitting, evaluating, and implementing an EIP. Understand the review process of Ethereum Improvement Proposals on Github. Know how BIP-32 and BIP-39 are used in Ethereum.

Tokens and Standards: Explain how tokens standards are defined and implemented. Know the differences between fungible and non-fungible tokens.

Price Derivation & Exchanging Ether: Understand how the price of Ether is derived. Know the different ways users can buy and sell Ether. Know about centralized and decentralized Ethereum exchanges. Understand the risks of using exchanges and identify best practices. Explain how storing funds on decentralized exchanges differ from centralized exchanges.

Blockchain Explorers: Know what a blockchain explorer is and how they can be used to trace transactions.

Consensus

Purpose and Function: Explain the basic value that miners provide to the Ethereum network and how new Ether is created.

Mechanisms: Understand the basics and the differences between consensus mechanisms, such as Proof of Work, Proof of Stake, and Proof of Authority.

Algorithm: For the Ethereum mining algorithm, define the following: difficulty adjustment, hashing algorithm, and block reward. Know what an uncle block is and the purpose of having uncle block rewards.



Mining: From the perspective of the network, know the advantages and disadvantages of mining pools compared to solo miners. From the perspective of a miner, know what criteria should be considered when choosing a mining pool. Describe the differences between CPU, GPU, and ASIC hardware.

Security and Centralization: Under what conditions is a 51% attack feasible? Explain what a potential attacker can and cannot do with a large proportion of network hashing power. Understand the relationship between mining pools, specialized hardware, and the likelihood of attacks.

ETH 2.0: Know why Proof of Stake is considered an improvement over Proof of Work and why Ethereum is moving to Proof of Stake and sharding.

Wallets, Clients, and Key Management

Wallet Types: Understand what an Ethereum wallets are and how they are used. Explain the differences between software, web, brain, hot/cold, paper, hardware, multisig, and HD wallets. Know about deterministic wallets (BIP32) and the advantages they have over “Just a Bunch of Keys” wallets. Know how the legitimacy of wallet software is determined.

Ethereum Clients: Describe the difference between light and full clients and what the most popular clients are in the network. Understand the relation between updating nodes and network forks.

Backups, Importing and Exporting: Describe the process of backing up private keys, mnemonics (BIP-39), and restoring them to the same or new wallets.

Smart Contracts and EVM

Terms and Definitions: Understand the terms and vocabulary used in smart contracts and Ethereum, such as ERC, EVM, opcodes, nonce, etc.

Programming Fundamentals: Know what programming languages are used to develop smart contracts, such as Solidity, Vyper, and others. Understand what development tools are used to develop and test smart contracts.

Smart Contracts Interactions: Understand how to interact with smart contracts and the structure of smart contracts.

Security: Know how to securely transact on the Ethereum network and securely interact with smart contracts. Understand the common vulnerabilities of smart contracts, such as re-entrancy and overflows.

Decentralized Finance: Have a basic understanding of the benefits and challenges of DeFi and the various functions of tokens, including liquidity pools and decentralized exchanges.

