

Perfect — these are all core blockchain concepts 🙌
Here's a **clear, easy-to-understand explanation** of each one:

🧠 1. What is a Smart Contract?

A **smart contract** is a **program stored on a blockchain** that automatically executes actions when certain conditions are met.

It's like a digital agreement that doesn't need any middleman.

🧩 Example:

"If Prajakta deposits 1 ETH, then transfer ownership of a digital item to her automatically."

🔗 Key features:

- Runs on blockchain (e.g., Ethereum)
 - Immutable (can't be changed after deployment)
 - Executes automatically when conditions are true
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🔗 2. What is Blockchain?

A **blockchain** is a **distributed digital ledger** that records transactions in a secure, transparent, and tamper-proof way.

Each record (called a **block**) contains:

- Transaction data
- A timestamp
- A cryptographic link (hash) to the previous block

This creates a **chain of blocks** → hence the name **blockchain**.

🧩 3. Types of Blockchain

Type	Description	Example
Public Blockchain	Anyone can join, read, or write data. Fully decentralized.	Bitcoin, Ethereum

Type	Description	Example
Private Blockchain	Only selected participants can access. Controlled by one organization.	Hyperledger, Corda
Consortium Blockchain	Controlled by a group of organizations (semi-decentralized).	Energy Web Foundation
Hybrid Blockchain	Combination of public + private features.	IBM Blockchain

4. Centralized vs Decentralized

Feature	Centralized System	Decentralized System
Control	Controlled by one central authority	No single control — distributed across nodes
Example	Banks, Facebook	Bitcoin, Ethereum
Transparency	Low	High
Failure risk	Single point of failure	More secure and fault-tolerant

Example:

In a **centralized** bank, all data is stored in one server.

In a **decentralized** blockchain, copies are stored across thousands of computers worldwide.

5. What is a Wallet?

A **crypto wallet** is a **digital tool that stores your public and private keys** — used to send, receive, and manage cryptocurrencies or tokens.

- **Public key:** Like your bank account number (you can share it).
- **Private key:** Like your ATM PIN (keep it secret!).

Wallets can be:


- **Software wallets** (apps like MetaMask)
 - **Hardware wallets** (like Ledger, Trezor)
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6. What is MetaMask and Its Use?

MetaMask is a **crypto wallet and gateway to blockchain apps (DApps)**.

It's a browser extension or mobile app that allows users to:

- Store and send cryptocurrencies
- Connect to decentralized apps
- Deploy and interact with smart contracts


 **Use case:** When you deploy your Solidity smart contract on Ethereum testnet, you use MetaMask to:


- Pay gas fees
 - Sign transactions
 - Manage accounts
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7. What is Ethereum and Gas?

Ethereum is a **blockchain platform** that allows developers to create and deploy smart contracts and decentralized applications (DApps).

Its native cryptocurrency is **Ether (ETH)**.

 **Gas** is the **fee you pay to execute transactions or run smart contracts** on Ethereum. It compensates miners/validators for using their computing power.

 Example:

- Sending ETH → costs gas
 - Deploying a contract → costs more gas
 - The more complex the code, the higher the gas fee.
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8. What is Cryptocurrency?

A **cryptocurrency** is a **digital currency** that uses cryptography for security and operates on a blockchain.

It is **decentralized**, meaning it's not controlled by a government or bank.

Examples:

- Bitcoin (BTC)
 - Ethereum (ETH)
 - Binance Coin (BNB)
 - Solana (SOL)
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9. What is Solidity?

Solidity is a **programming language used to write smart contracts** on the Ethereum blockchain. It looks similar to JavaScript.

Example:

```
pragma solidity ^0.8.0;
```

```
contract HelloWorld {  
    string public message = "Hello Blockchain!";  
}
```

10. What Do You Mean by Transactions?

A **transaction** is any **action recorded on the blockchain**.

It can involve:

- Sending cryptocurrency
- Deploying a smart contract
- Calling a function (e.g., deposit, withdraw)

 Every transaction:

- Has a **sender and receiver**
 - Consumes **gas**
 - Gets recorded permanently on the blockchain
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Would you like me to make this into a **short summarized table or notes format** for your exam/practical file?

That's a great question, Prajakta 🙌 — here's a **complete list of commonly asked viva questions** on **Blockchain & Smart Contracts**, along with **clear, short answers** that will help you answer confidently in your practical or oral exam.

Top Blockchain Viva Questions with Answers

1. What is Blockchain?

A blockchain is a **distributed digital ledger** that records transactions securely and transparently in blocks linked using cryptography.

2. What is a Block?

A **block** is a container of data that stores:

- Transaction details
- Timestamp
- Hash of the previous block

Blocks are chained together to form the blockchain.

3. What is a Hash?

A **hash** is a unique digital fingerprint of data, generated using a cryptographic algorithm like **SHA-256**.

It ensures data integrity — if data changes, the hash changes.

4. What is a Node?

A **node** is a computer connected to the blockchain network that stores a copy of the ledger and participates in validating transactions.

5. What is a Smart Contract?

A **smart contract** is a self-executing program on a blockchain that runs automatically when certain conditions are met — no intermediaries needed.

6. What is Cryptocurrency?

A **cryptocurrency** is a digital currency built on blockchain that uses cryptography for security. Example: Bitcoin, Ethereum.

7. What is Ethereum?

Ethereum is a blockchain platform that supports **smart contracts** and **decentralized applications (DApps)**.

Its native cryptocurrency is **Ether (ETH)**.

8. What is Gas in Ethereum?

Gas is the **fee** required to execute operations (transactions, contract deployments) on the Ethereum network.

It compensates miners/validators for computation.

9. What is a Wallet?

A **wallet** is a tool (software or hardware) that stores public and private keys to manage cryptocurrencies and interact with DApps.

Example: MetaMask.

10. What is MetaMask?

MetaMask is a **browser extension and mobile app wallet** used to:

- Store Ethereum and tokens
- Connect to DApps
- Sign and send transactions

11. What is the Difference Between Bitcoin and Ethereum?

Feature	Bitcoin	Ethereum
Purpose	Digital currency	Smart contract & DApps platform
Launch Year	2009	2015
Token	BTC	ETH
Scripting	Limited	Full (Solidity)

12. What is Solidity?

Solidity is a **programming language** used to write **smart contracts** on Ethereum. It's similar to JavaScript in syntax.

13. What is a Transaction in Blockchain?

A **transaction** is a record of transferring value or executing a contract on blockchain. It's verified, timestamped, and stored permanently.

14. What is a Distributed Ledger?

A **distributed ledger** is a database shared across multiple nodes where each node holds a synchronized copy of the same data.

15. What is a Private Key and Public Key?

- **Public Key:** Like your account number — shared publicly.
 - **Private Key:** Like your password — must be kept secret; used to sign transactions.
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16. What is Mining?

Mining is the process of verifying transactions and adding new blocks to the blockchain. Miners are rewarded with cryptocurrency for their work.

17. What is Proof of Work (PoW)?

A **consensus algorithm** where miners solve complex puzzles to validate transactions and add blocks (used by Bitcoin).

18. What is Proof of Stake (PoS)?

A **consensus mechanism** where validators are chosen to create new blocks based on how much cryptocurrency they hold (used by Ethereum now).

19. What is a Genesis Block?

The **first block** in a blockchain. It has no previous block hash.

20. What are DApps?

Decentralized Applications (DApps) are apps built on blockchain that run on smart contracts instead of centralized servers.

Example: Uniswap, Aave, CryptoKitties.

21. What is Tokenization?

Tokenization is the process of representing real-world or digital assets (like property or shares) as blockchain-based tokens.

22. What is Consensus Mechanism?

A **consensus mechanism** is a method by which nodes in a blockchain network agree on the validity of transactions and blocks.

23. What is the Difference Between Centralized and Decentralized Systems?

Feature	Centralized	Decentralized
Control	One authority	Distributed among nodes
Example	Banks, Facebook Bitcoin, Ethereum	
Transparency	Low	High

24. What is a Test Network (Testnet)?

A **testnet** is a blockchain used for testing smart contracts without using real cryptocurrency. Example: Sepolia, Goerli.

25. What is the Difference Between Mainnet and Testnet?

Mainnet	Testnet
Real blockchain network	Testing environment
Uses real ETH	Uses free test ETH
Live transactions	Simulated transactions

26. What is Deployment in Blockchain?

Deployment means uploading and activating your **smart contract** on a blockchain (testnet or mainnet) so users can interact with it.

27. What are the Advantages of Blockchain?

- Transparency
- Security
- Immutability
- Decentralization
- Reduced intermediaries

⚠️ **28. What are the Limitations of Blockchain?**

- Scalability issues
- High energy use
- Slow transaction speed
- Privacy concerns

🔗 **29. What is an Address in Blockchain?**

An **address** is a unique identifier for a user or smart contract, derived from the public key. It's where funds or tokens are sent.

🧠 **30. What is an Example of a Smart Contract Use Case?**

- Online voting
- Supply chain tracking
- Automated insurance claims
- Decentralized finance (DeFi) apps

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