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1. The OSI Model (Guaranteed 3-4 Questions) ⭐⭐⭐⭐⭐

Short Note: The 7-layer architecture of networking. You must memorize the **Order**, **Function**, and **Devices/Protocols** for each layer.

- Mnemonic: Please Do Not Throw Sausage Pizza Away
  (Physical, Data Link, Network, Transport, Session, Presentation, Application)

Layer	Function	Protocols/Devices	Exam Trick/Question
7. Application	User interface & Network services	HTTP, FTP, SMTP	"Which layer interacts with the user?"
6. Presentation	**Encryption**, Compression, Translation	SSL/TLS, JPEG	"Which layer handles Encryption?"
5. Session	Session management (Start/Stop)	RPC, NetBIOS	"Which layer manages dialogue control?"
4. Transport	**End-to-End** delivery, Flow/Error control	**TCP, UDP**	"Which layer ensures reliable delivery?"
3. Network	**Routing**, Logical Addressing (IP)	**IP, ICMP**, **Router**	"Routers operate at which layer?"
2. Data Link	**Physical Addressing (MAC)**, Framing	Ethernet, **Switch**	"Switches operate at which layer?"

1. Physical	Bits transmission, Topologies	Cables, **Hub**, Repeater	"Hubs operate at which layer?"

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2. IP Addressing (Guaranteed 2-3 Questions) ⭐⭐⭐⭐⭐

Short Note: Identifying Class A, B, C IPs and Subnet Masks.

The Rules (Memorize the First Byte Range):

- **Class A:** 0 – 127 (Default Mask: 255.0.0.0)
- **Class B:** 128 – 191 (Default Mask: 255.255.0.0)
- **Class C:** 192 – 223 (Default Mask: 255.255.255.0)
- **Class D:** 224 – 239 (Multicasting - No mask)
- **Class E:** 240 – 255 (Experimental)

Important Special IPs:

- **127.x.x.x:** Loopback Address (Localhost). Used for testing.
- **255.255.255.255:** Limited Broadcast Address.

Example Exam Question:

"Which class does the IP 172.16.0.1 belong to?"

- *Explanation:* Look at the first number (172). It falls between 128 and 191.
- *Answer:* **Class B**.

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3. TCP vs UDP (Transport Layer) ⭐⭐⭐⭐

Short Note: The two ways data is sent.

Feature	TCP (Transmission Control Protocol)	UDP (User Datagram Protocol)
Reliability	**Reliable** (Guarantees delivery)	**Unreliable** (Best effort)
Connection	**Connection-Oriented** (3-Way Handshake)	**Connectionless** (Fire and forget)

Speed	Slower (Overhead of checks)	Faster (Streaming, Gaming)
Example	Email, Web Browsing (HTTP), File Transfer	Video Calls, DNS, Online Gaming

Exam Trick:

If the question asks about "Live Streaming" or "Real-time voice", the answer is UDP.

If it asks about "Email" or "File Download", the answer is TCP.

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4. Important Protocols & Ports (Memorize Numbers) ⭐⭐⭐⭐

Short Note: You will get a "Match the following" or direct question on port numbers.

- **FTP (File Transfer):** Port **20** (Data), **21** (Control).
- **SSH (Secure Shell):** Port **22** (Secure remote login).
- **Telnet:** Port **23** (Insecure remote login).
- **SMTP (Simple Mail Transfer):** Port **25** (Sending Email).
- **DNS (Domain Name System):** Port **53** (Maps Name $\to$ IP). *Uses UDP.*
- **HTTP (Web):** Port **80**.
- **POP3 (Receiving Email):** Port **110**.
- **HTTPS (Secure Web):** Port **443**.

Example:

"Which protocol is used to send emails?" $\to$ SMTP.

"Which protocol retrieves emails?" $\to$ POP3 or IMAP.

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5. Network Devices ⭐⭐⭐

Short Note: Hardware roles.

- **Hub:** Dumb device. Broadcasts data to **ALL** ports. (Physical Layer).
- **Switch:** Smart device. Sends data **ONLY** to the destination MAC address. (Data Link Layer).
- **Router:** Connects **different** networks (LAN to WAN). Uses IP address. (Network Layer).
- **Gateway:** Acts as a "translator" between networks with different protocols. (Can be all layers, mostly Application).

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6. Top Exam Tricks & One-Liners (Don't Miss These)

1. **MAC Address Size: 48 bits** (6 Bytes). Represented in Hexadecimal (e.g., 00:1A:2B:3C:4D:5E).
2. **IPv4 Size: 32 bits** (4 Bytes).
3. **IPv6 Size: 128 bits**.
4. **Ping Command:** Uses **ICMP** (Internet Control Message Protocol).
5. **Error Detection:** Done using **CRC** (Cyclic Redundancy Check) at Data Link Layer.
6. **Flow Control:** Sliding Window Protocol is used here.

Quick Mock Question (Test Yourself)

Q: Which of the following is a private IP address?

- A) 192.168.1.1
- B) 172.16.0.1
- C) 10.0.0.1
- D) All of the above

Answer: D) All of the above.