

ASYNCHRONOUS PROGRAMMING — KEY TERMS REVISION (MASTER)

1 Synchronous (Sync)

Meaning:

Kaam **ek ke baad ek**, wait karke.

Real life:

- Phone call → jab tak baat khatam nahi, kuch aur nahi

Programming:

- Ek task khatam → tab next task

2 Asynchronous (Async)

Meaning:

Wait karte hue **dusra kaam karna**.

Real life:

- Text bheja → kaam karta raha → reply aaya

Important:

- Async ≠ faster CPU
- Async = better time usage

3 Blocking

Meaning:

Code **ruk jaata hai**, sab kuch ruk jaata hai.

Example:

```
time.sleep(2)
```

Effect:

- Program freeze
- Event loop kuch nahi kar sakta

4 Non-Blocking

Meaning:

Sirf current kaam rukta hai, **program nahi**.

Example:

```
await asyncio.sleep(2)
```

Effect:

- Dusre tasks chalte rehte hain

5 Concurrency

Meaning:

Ek hi time pe **multiple kaamon ka management**.

Reality:

- Single CPU core
- Fast switching

Async = Concurrency

6 Parallelism

Meaning:

Sach mein ek saath kaam chalna.

Reality:

- Multiple CPU cores / GPU
- ML training, image processing

7 I/O Bound Work

Meaning:

Jahan **wait zyada**, kaam kam.

Examples:

- Website request
- API call
- Database query

Best tool:

👉 Async

8 CPU Bound Work

Meaning:

Jahan **calculation heavy** hoti hai.

Examples:

- Big loops
- ML training
- Image processing

Best tool:

👉 Multiprocessing / GPU

❌ Async useless here

9 **async def (Async Function)**

Meaning:

Aisa function jo **pause/resume** ho sakta hai.

```
async def work():  
    ...
```

Important truth:

- Ye function **run nahi hota**
- Ye **coroutine** banata hai

10 **Coroutine**

Meaning (most important):

Ek **paused function** jo baad mein resume ho sakta hai.

Normal function:

start → end

Coroutine:

start → pause → resume → pause → end

1 1 await

Meaning (LOCK THIS 🔒):

“Main yahan rukta hoon, event loop dusra kaam kar le.”

Rules:

- Sirf `async def` ke andar
- Sirf `async` cheezon ke saath

✗ Wrong:

```
await time.sleep(1)
```

✓ Correct:

```
await asyncio.sleep(1)
```

1 2 Event Loop

Meaning (simple):

Manager jo decide karta hai:

- kaunsa task chale
- kaunsa ruke
- kaunsa resume ho

Important facts:

- Single thread
- Single core
- Control sirf `await` pe milta hai

1 3 Starvation

Meaning:

Event loop ko **control hi nahi milta**.

Cause:

- Infinite loop
- Blocking code
- No `await`

1 4 `await` outside function Error

Meaning:

Python bol raha hai:

“`await` sirf async function ke andar allowed hai”

Fix:

Hamesha ek `main()` async function banao.

1 5 `asyncio.run()`

Meaning:

Event loop **start** karne ka button.

```
asyncio.run(main())
```

Iske bina:

- Async code chalega hi nahi

FINAL ONE-SCREEN SUMMARY (MOST IMPORTANT)

`async def` → coroutine banta hai

`await` → pause karta hai

`event loop` → manage karta hai

`asyncio.run` → system start karta hai