11. Cell Structure and Micro-organisms

📘 CELL: BASIC UNIT OF LIFE

1. What is a Cell?

- The **smallest structural and functional unit of living organisms**.
- All organisms—from microscopic bacteria to humans—are made up of cells.

2. History of Cell Discovery

- **1665:** *Robert Hooke* observed cork cells → coined the word "cell".
- **1838:** *Schleiden* and *Schwann* → Cell Theory:
  "All living organisms are made of cells."
- **1885:** *Rudolph Virchow* → "Cells arise from pre-existing cells".

3. Levels of Organization in Living Organism

1. **Cell**
2. **Tissue**
3. **Organ**
4. **Organ System**
5. **Organism**

4. Observing Cells

- Cells are extremely small → measured in **micrometers** and **nanometers**.
- Need a **compound microscope** or **electron microscope**.

5. Types of Cells

✓ **Plant Cells**

✓ **Animal Cells**

6. Shape & Size of Cells

- Vary according to function: circular (RBC), spindle-shaped (muscle), long (nerve), spherical (egg cell), irregular (amoeba).

📘 CELL STRUCTURE & ORGANELLES

1. Main Parts of a Cell

1. **Cell Wall**
    - Present only in **plant cells**.
    - Gives shape & protection.
2. **Cell (Plasma) Membrane**
    - Thin, flexible, outer covering of **animal cells**.
    - Controls entry/exit of materials.
3. **Cytoplasm**
    - Jelly-like fluid where organelles are present.
4. **Cell Organelles**
    - **Nucleus**
      Controls all cell activities; double membrane; contains DNA.
    - **Endoplasmic Reticulum (ER)**
      Network that modifies proteins and transports them.
    - **Golgi Bodies**
      Packaging & distribution centre of proteins.
    - **Mitochondria**
      "Powerhouse of the cell" → produce energy.
    - **Lysosomes**
      Digest unwanted materials; "suicide bags".
    - **Vacuoles**
      Storage; **large central vacuole in plant cells**, small in animals.
    - **Plastids (in plants only)**
        - *Chloroplasts* → contain chlorophyll → photosynthesis.

2. Differences Between Plant and Animal Cells

Plant Cell	Animal Cell
Cell wall present	Absent
Chloroplasts present	Absent
One large vacuole	Several small vacuoles
Mostly rectangular	Mostly round

3. Prokaryotic vs Eukaryotic Cells

- **Prokaryotic:** No membrane-bound organelles (bacteria).
- **Eukaryotic:** Have nucleus & organelles (plants, animals).

📘 MICRO-ORGANISMS

1. What are Micro-organisms?

- Tiny organisms **invisible to naked eye**, seen under a microscope.

2. Where Do They Occur?

- Air, water, soil, food, sewage, garbage, bodies of plants & animals.

3. Types of Micro-organisms

1. **Bacteria**
2. **Fungi**
3. **Algae**
4. **Protozoa**
5. **Viruses**

4. Microbial Cell Structure

- Most microbes are **unicellular**.
- **Bacteria** and **viruses** are **prokaryotic**.
- Components: **Plasma membrane, cytoplasm, nucleoid**, ribosomes.

5. Growth Requirements

- Temperature: **25°C – 37°C**
- Moisture and nutrients
- Some need oxygen; some do not
- Can survive extreme cold, heat, dryness by forming protective coverings.

6. Useful Micro-organisms

✓ **Decomposers** – convert waste into manure.

✓ **Nitrogen-fixing bacteria** – increase soil fertility.

✓ **Food production** – yoghurt, cheese, idli, bread via **fermentation**.

✓ **Medicines (Antibiotics)** – penicillin, streptomycin.

✓ **Vaccines** – provide immunity.

✓ **Biogas production**.

✓ **Cleaning oil spills** – oil-eating bacteria.

7. Fermentation

- Conversion of one carbon compound to another by microbes.
- Produces heat, CO_2 → causes dough to rise.

📘 HARMFUL MICRO-ORGANISMS & DISEASES

1. Spoilage of Food

Why food gets spoiled:

- Warm, moist conditions encourage microbial growth.
- Fungi appear as black/white patches.

Food poisoning:

- Caused by toxins (enterotoxins) produced by bacteria.

Prevention:

- Eat fresh food, boil water, cover food, avoid stale items.

2. Pathogens

Disease-causing microbes spread through:

- Contaminated food & water
- Airborne droplets (sneezing/coughing)
- Mosquito bites
- Unhygienic conditions

3. Diseases Caused by Micro-organisms

Water/Food-borne:

- Typhoid, cholera, jaundice, gastroenteritis, amoebiasis.

Air-borne:

- Common cold, influenza, pneumonia, TB.

Mosquito-borne:

- Malaria, dengue, chikungunya, Zika, yellow fever.

In Plants & Animals:

- Citrus canker, rust in crops, foot-and-mouth disease, anthrax.

4. Preventive Measures

- Maintain cleanliness in surroundings.
- Drain stagnant water to prevent mosquito breeding.
- Wash hands regularly.
- Store food properly.
- Proper waste disposal.
- Vaccination as per schedule.

5. Swachh Bharat Abhiyan

- 80% diseases occur due to unclean surroundings.
- Cleanliness drive prevents spread of infections.

6. Why Fever Occurs?

- Body temperature rises to destroy invading microbes.

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