Aim

To study the structure and features of **T-Even Bacteriophage** (*T-Phage*) with the help of **electron microphotographs** or **models**.

Requirements

- Electron microphotographs of T-Phage
- 3D model of bacteriophage (if available)
- Pointer or label cards for identifying parts

Principle

A bacteriophage is a virus that infects bacteria. The **T-Even phages** (e.g., T2, T4) infect *Escherichia coli* and have a **complex structure** with a head and tail. The head contains **double-stranded DNA**, and the tail helps inject the DNA into the host cell. Electron microscopy is required to study their detailed morphology, as they are too small for light microscopes.

Observation Points (for diagrams/models)

When examining a microphotograph or model, you should be able to **identify and label**:

1. **Head (capsid)** – Icosahedral protein coat enclosing DNA.
2. **Collar** – Narrow region connecting head to tail.
3. **Tail sheath** – Contractile tube used for injecting DNA.
4. **Base plate** – Disc-shaped structure at tail end.
5. **Tail fibers** – Leg-like projections for attachment to bacterial cell wall.

Key Features to Remember

- Genome: **dsDNA**
- Shape: **Complex symmetry** (head – icosahedral; tail – helical)
- Host: *E. coli* and other bacteria
- Size: Head ~90–100 nm; tail length ~100 nm
- Infects host by attaching to specific receptor sites and injecting DNA through the tail tube.

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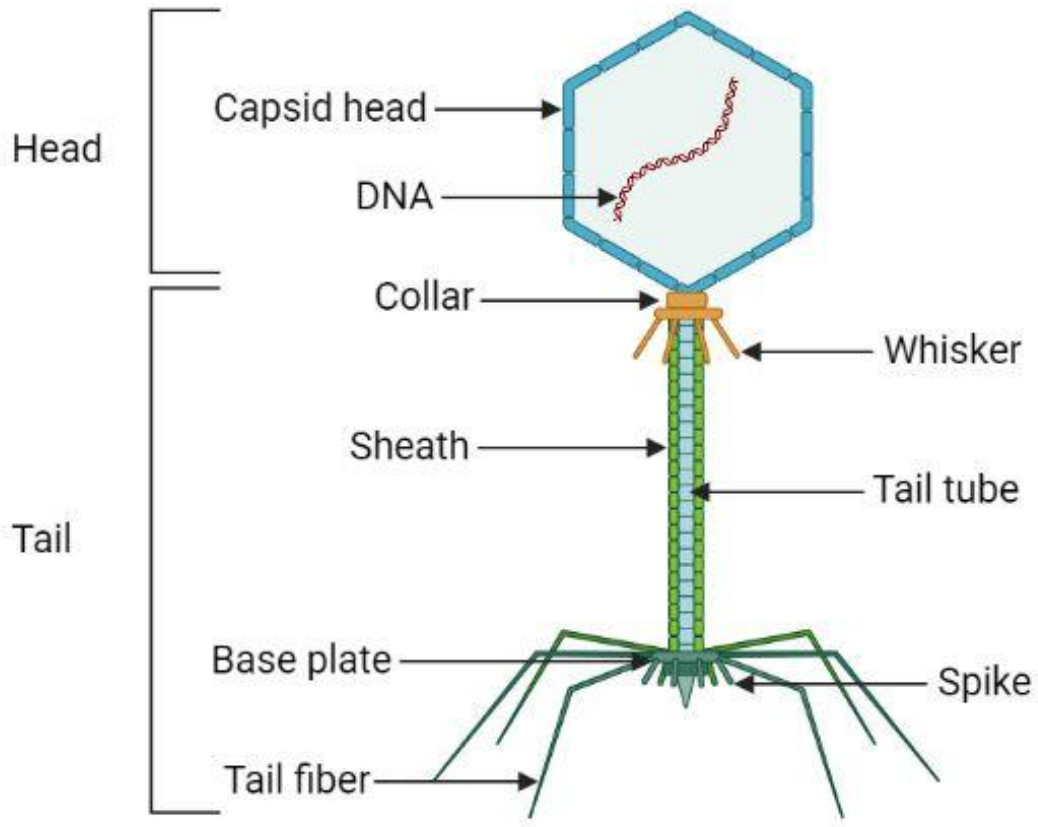
Life Cycle (Simplified for Practical)

1. **Adsorption** – Tail fibers attach to bacterial cell wall.
2. **Penetration** – Tail sheath contracts, DNA injected into host.
3. **Replication** – Viral DNA replicates using bacterial machinery.
4. **Assembly** – New phage heads, tails, and fibers are formed and assembled.
5. **Lysis** – Host cell bursts, releasing new phages.

Diagram Practice Tip

For exams, draw a **neatly labeled diagram** of a bacteriophage showing:

- Head
- Collar
- Tail sheath
- Base plate
- Tail fibers



Aim

To study the structure and features of **Tobacco Mosaic Virus (TMV)** with the help of **electron microphotographs** or **models**.

Requirements

- Electron microphotographs of TMV
- 3D model of TMV (if available)
- Pointer or labels for identifying parts

Principle

Tobacco Mosaic Virus is a **plant virus** that infects tobacco and related species. It was the **first virus ever discovered** (by Adolf Mayer, 1886; purified by Wendell Stanley, 1935) and is visible only under an **electron microscope**. TMV is a **rod-shaped** virus with a **single-stranded RNA** genome and a protein coat (capsid) arranged in **helical symmetry**.

Observation Points (for diagrams/models)

When examining a microphotograph or model, you should be able to **identify and label**:

1. **RNA core** – Single-stranded RNA molecule located centrally.
2. **Capsid** – Protein coat made of ~2130 identical subunits.
3. **Helical arrangement** – Protein units spirally arranged around the RNA.
4. **Dimensions** – Length ~300 nm, diameter ~18 nm.

Key Features to Remember

- Genome: **ssRNA** (positive-sense)
- Shape: **Rod-shaped** with helical symmetry
- Host: Tobacco plant (*Nicotiana tabacum*) and other solanaceous plants
- Size: ~300 × 18 nm
- Transmission: Mechanical injury, contaminated tools, insect vectors

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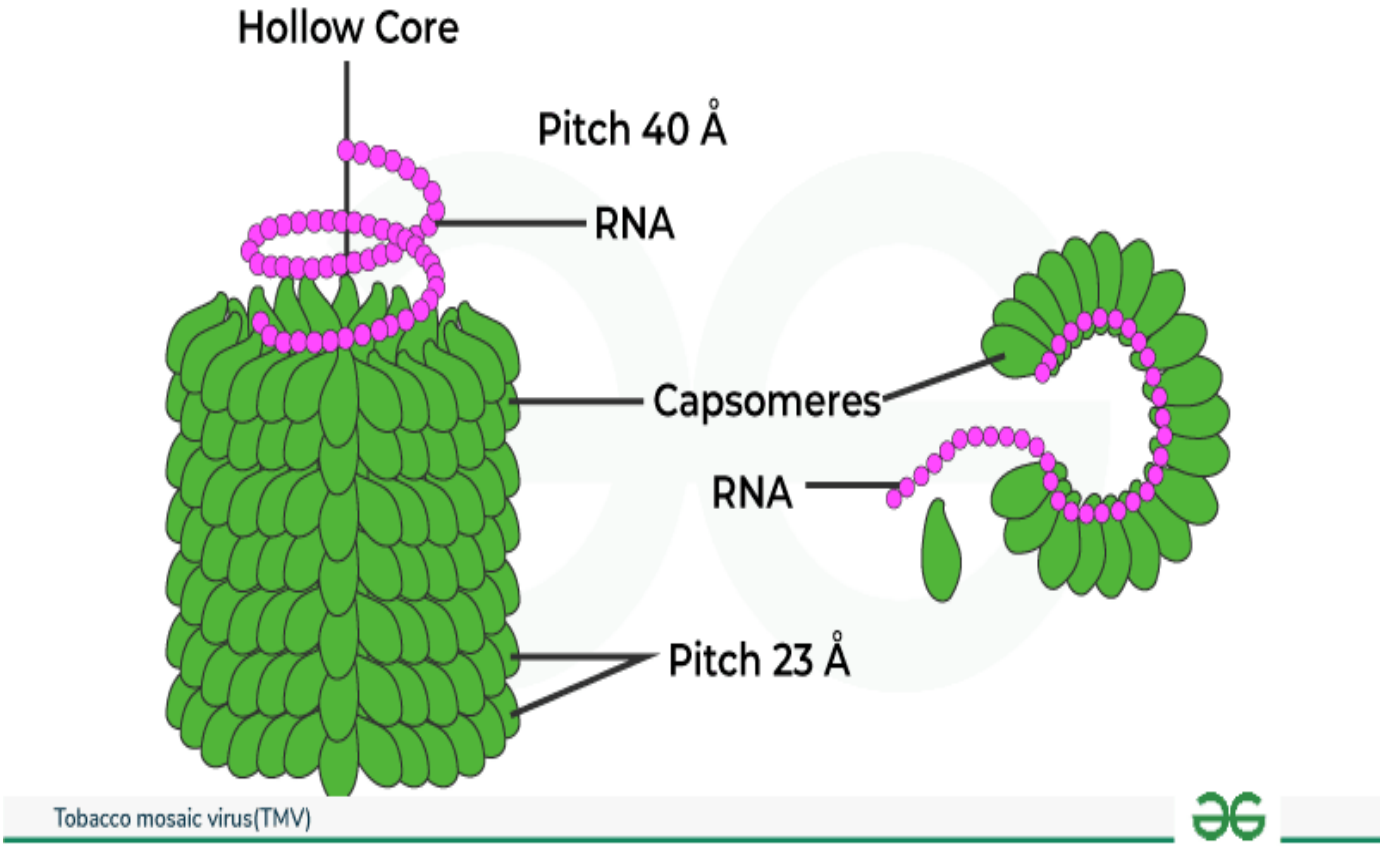
Life Cycle (Simplified for Practical)

1. **Entry** – Virus enters plant cell through mechanical wounds.
2. **Uncoating** – Protein coat removed, RNA released into cytoplasm.
3. **Translation** – Viral RNA acts as mRNA, producing viral proteins.
4. **Replication** – RNA replicated in host cytoplasm.
5. **Assembly** – Capsid proteins self-assemble around RNA.
6. **Movement** – Virus spreads to adjacent cells via plasmodesmata.

Diagram Practice Tip

For practical exams, draw a **neatly labeled diagram** of TMV showing:

- RNA core
- Capsid subunits
- Helical arrangement



Feature	T-Phage	TMV
Type of virus	Bacteriophage (infects bacteria)	Plant virus (infects tobacco and related plants)
Host	*Escherichia coli* and other bacteria	*Nicotiana tabacum* and other solanaceous plants
Genome type	Double-stranded DNA (dsDNA)	Single-stranded RNA (ssRNA), positive-sense
Shape	Complex structure (head + tail)	Rod-shaped
Symmetry	Head – Icosahedral; Tail – Helical	Helical symmetry
Capsid	Protein coat around DNA in head	Protein subunits (capsomeres) surrounding RNA
Size	Head ~90–100 nm; Tail ~100 nm	Length ~300 nm; Diameter ~18 nm
Mode of infection	Attaches to bacterial cell wall and injects DNA	Enters plant cell through mechanical injury
Replication site	Bacterial cytoplasm (uses bacterial machinery)	Plant cell cytoplasm
Transmission	By bacterial contact or specific vectors in lab conditions	Through contaminated tools, insects, or wounds
Example in lab study	Seen in electron micrographs with head-tail morphology	Seen as rigid rods in electron micrographs