

Bacteriophage Reproduction

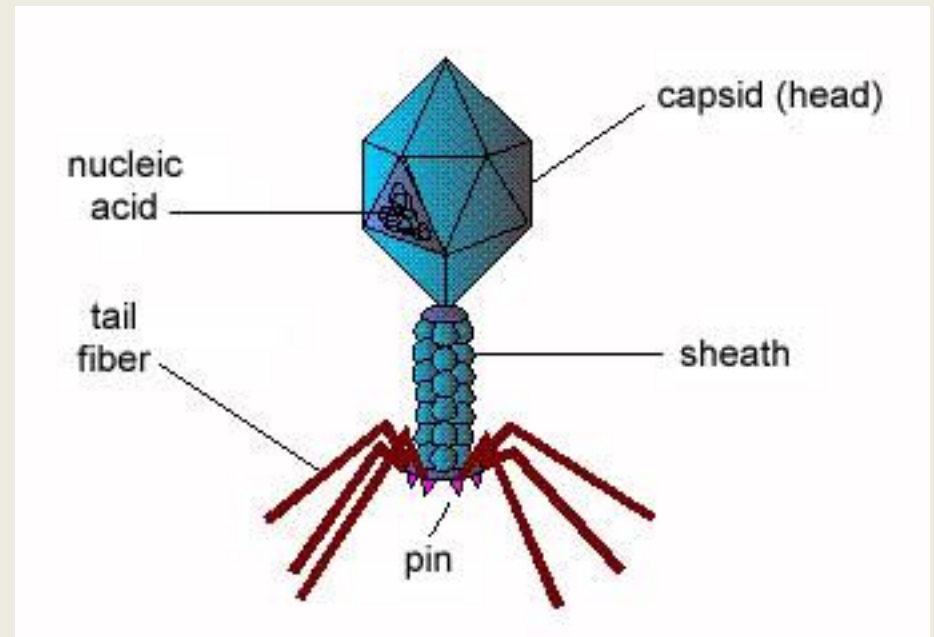
Lytic and Lysogenic Cycles

The following information is taken from:

<http://student.ccbcmd.edu/courses/bio141/lecguide/unit3/index.html#charvir>

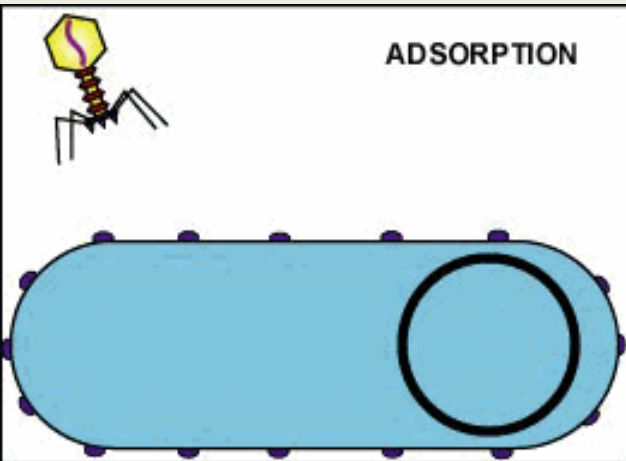
Bacteriophage Structure

- More complex compared to other types of viruses
- Head = naked icosahedral capsid
- Tail = sheath with fibers at the end

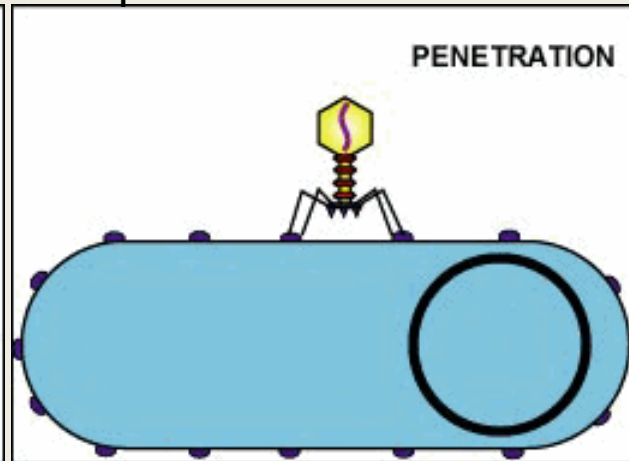


Bacteriophage Life Cycle Overview

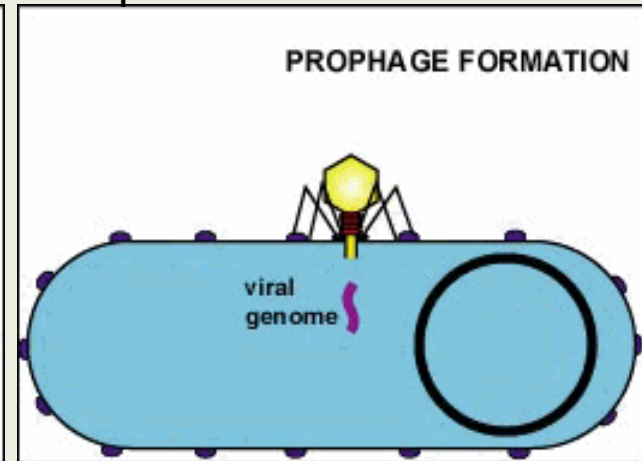
Step 1



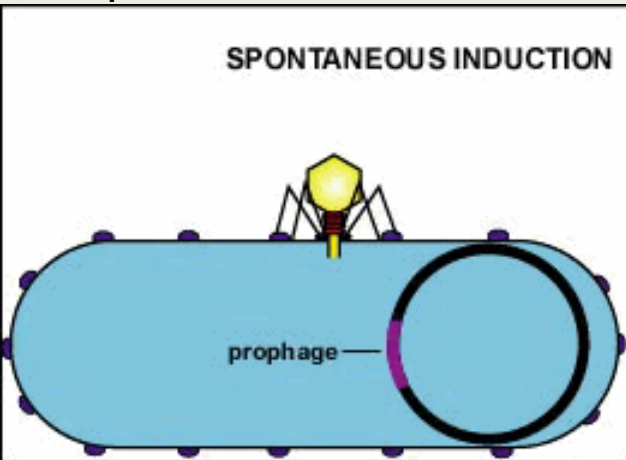
Step 2



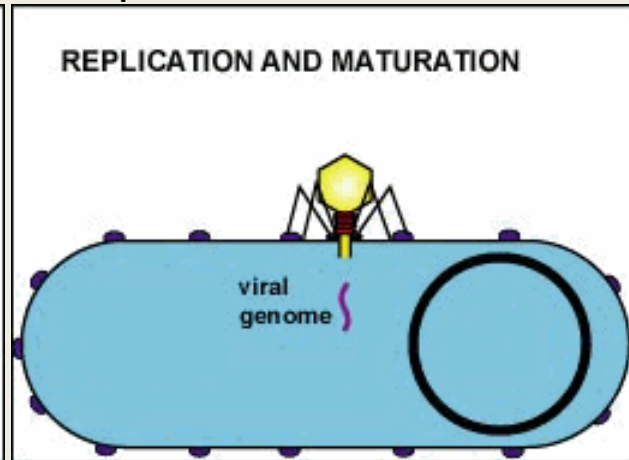
Step 3



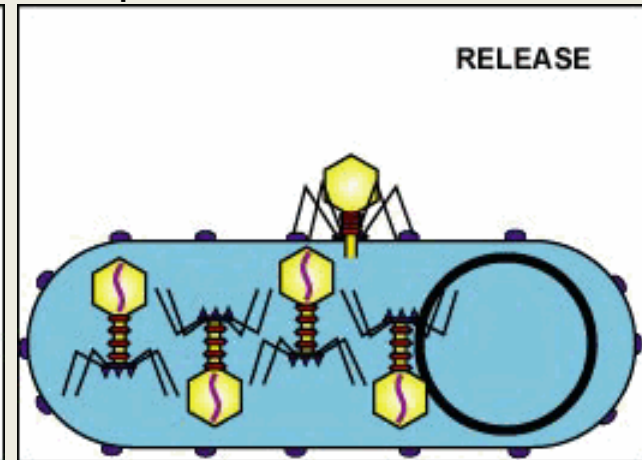
Step 4



Step 5



Step 6



Lytic = steps 1, 2, 5, 6

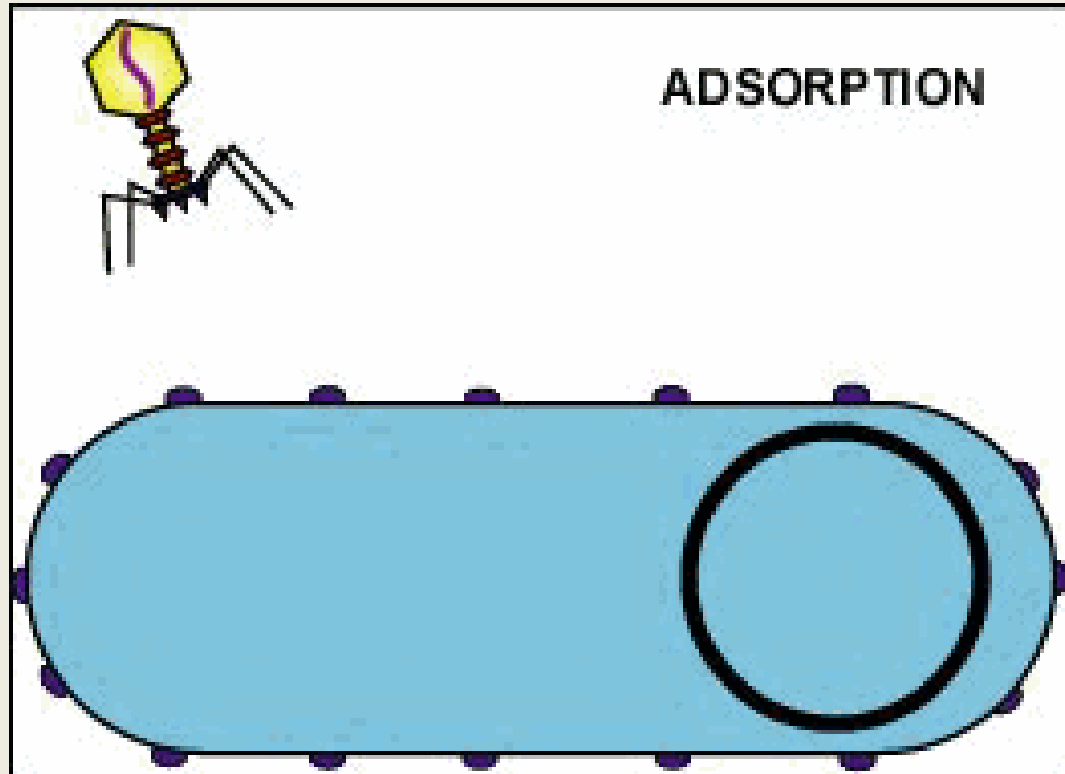
Lysogenic = steps 1, 2, 3, 4 (5 & 6 occur later)

The Lytic Cycle

The following information is taken from:

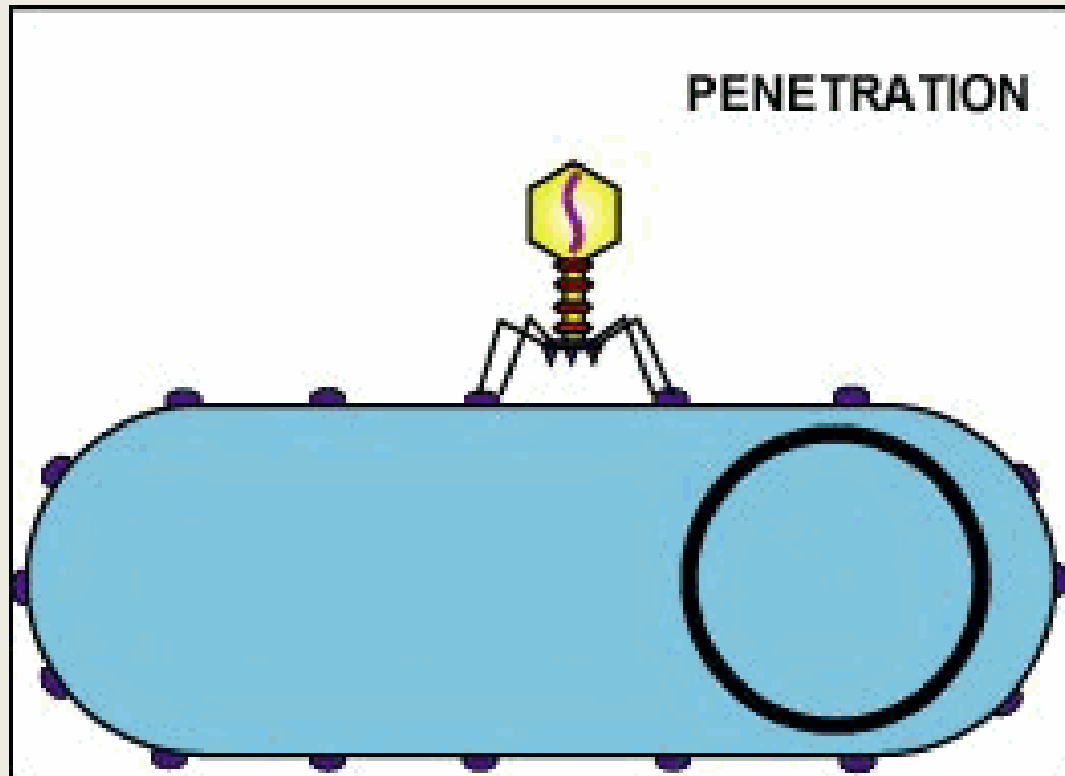
<http://student.ccbcmd.edu/courses/bio141/lecguides/unit3/index.html#charvir>

Adsorption of a Bacteriophage to the Cell Wall of the Bacterium



Protein on viral surface attaches to a specific receptor on the host cell surface.

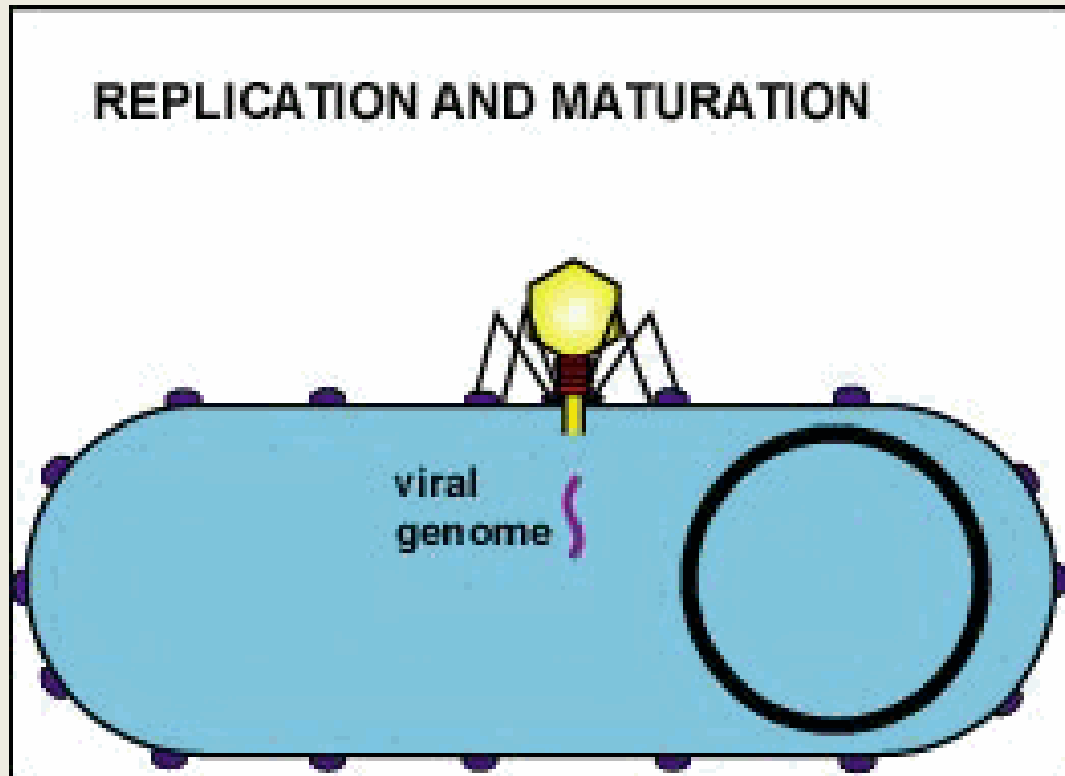
Penetration of the Viral Genome into the Cytoplasm of the Bacterium



This step is also known as 'Entry'.

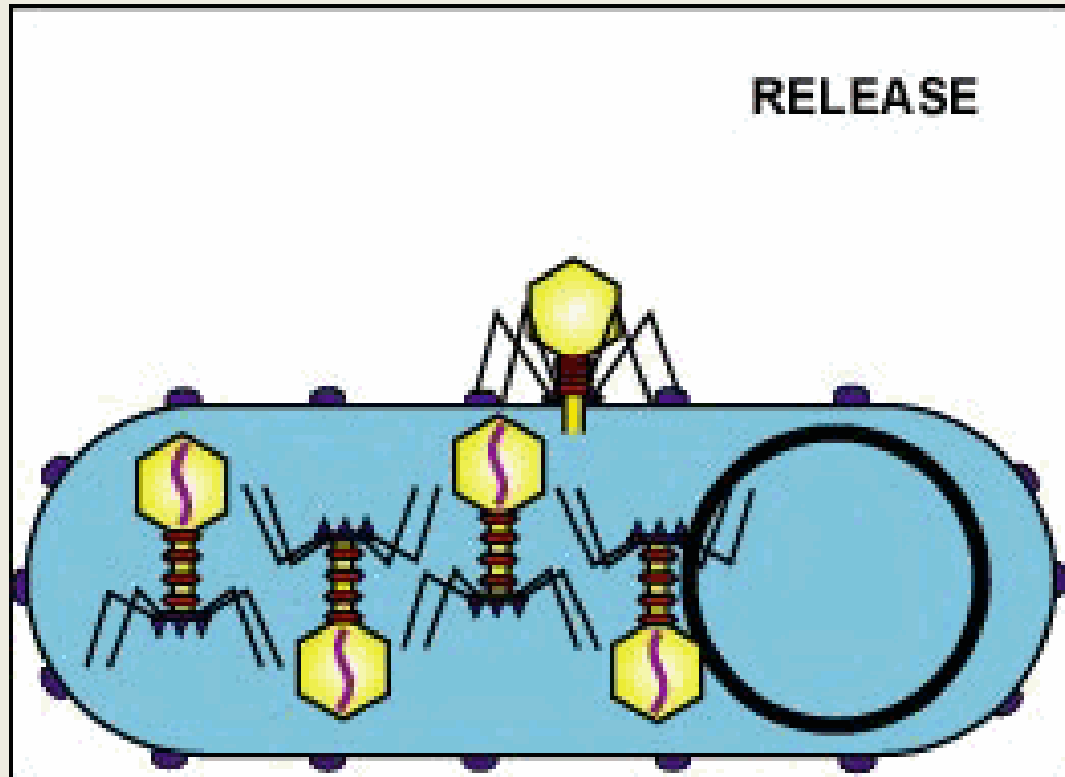
The viral genome (DNA or RNA) enters the host cell.

Viral Replication and Maturation



Viral DNA is transcribed and then translated by the host cell. The protein parts produced are then assembled together while still inside the host cell.

Release of the Bacteriophages by Lysis of the Bacterium



The fully formed viruses burst from the host cell by lysing it.

Lytic Cycle Summary

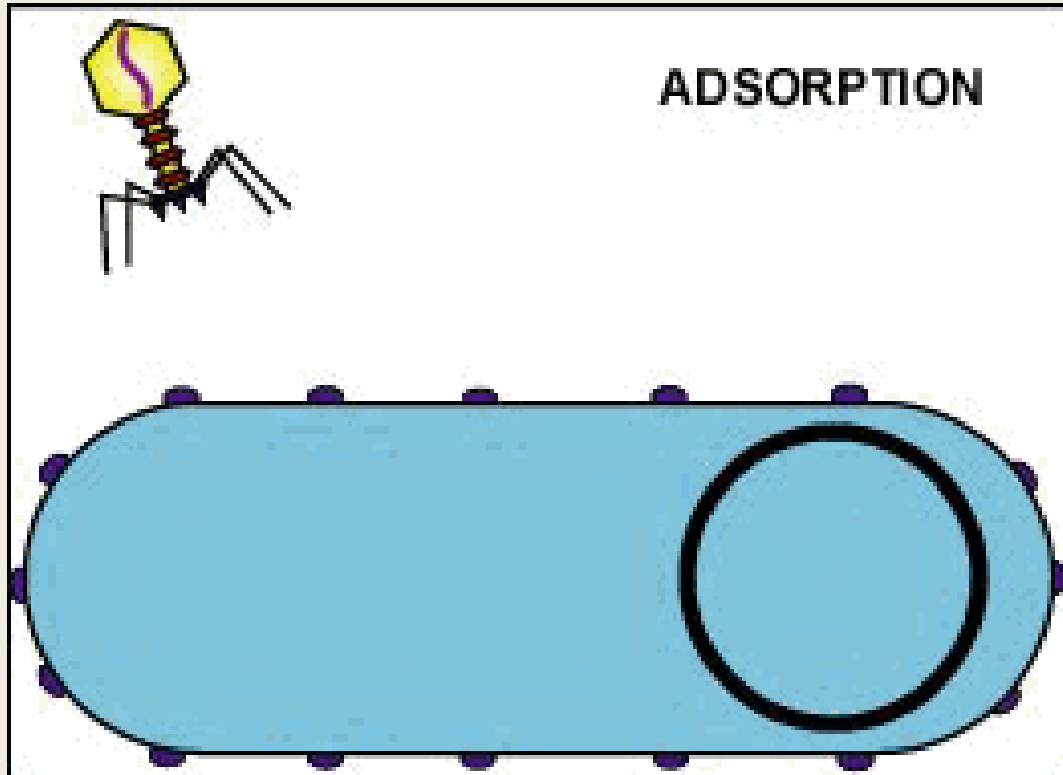
1. Adsorption: Attachment of virus to host cell surface
2. Entry/Penetration: Insertion of viral genome into the host cell
3. Replication: using viral genome to make viral RNA and proteins
4. Assembly of new virus components
5. Lysis of host cell & Release of virions

The Lysogenic Cycle

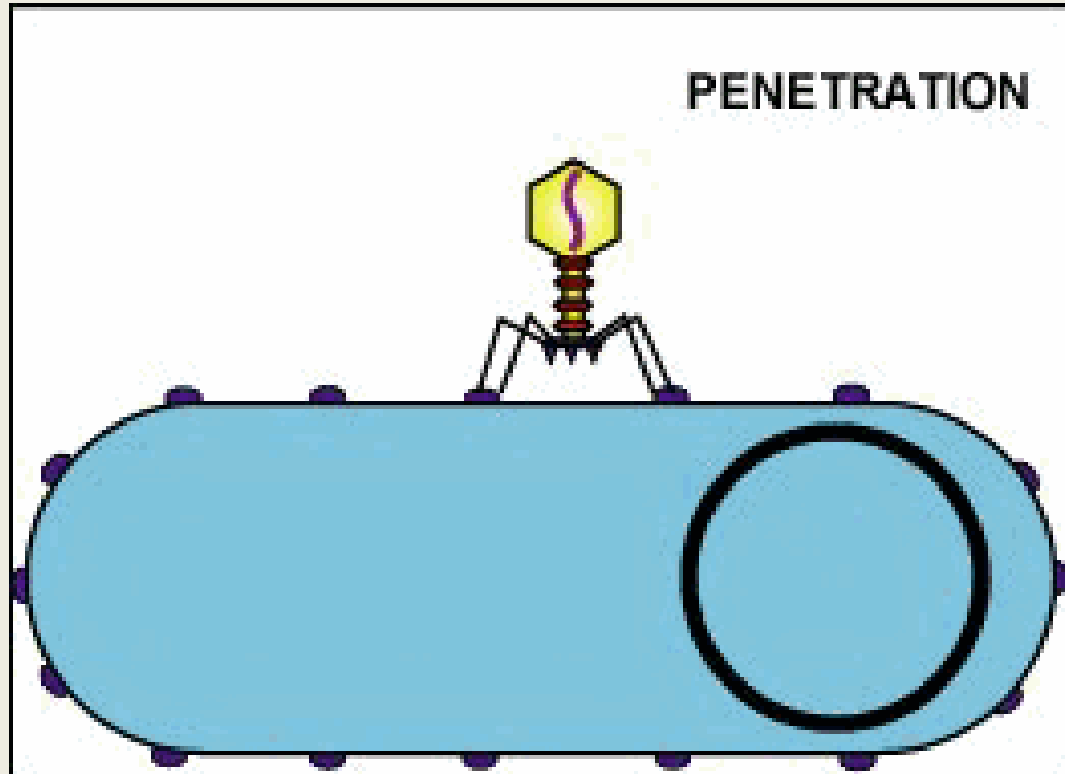
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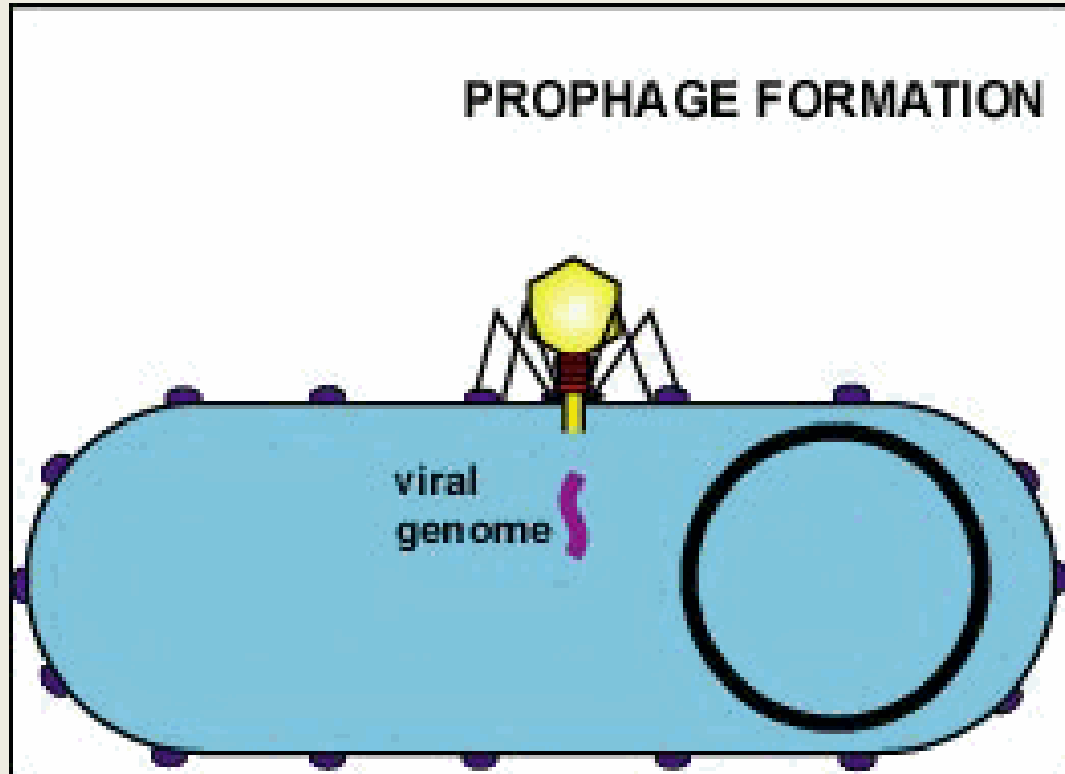
Adsorption of a Bacteriophage to the Cell Wall of the Bacterium



Penetration of the Viral Genome into the Cytoplasm of the Bacterium

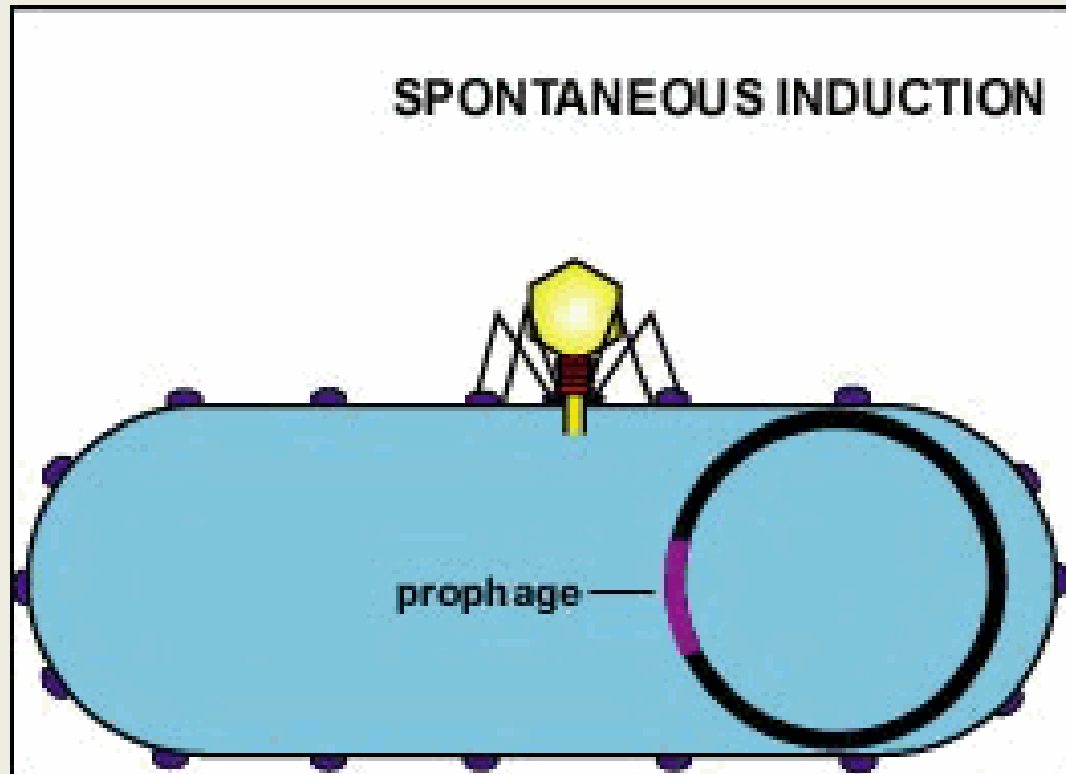


Integration



The viral DNA is inserted into the host cell's chromosome. As the host cell replicates its own DNA and divides itself during division

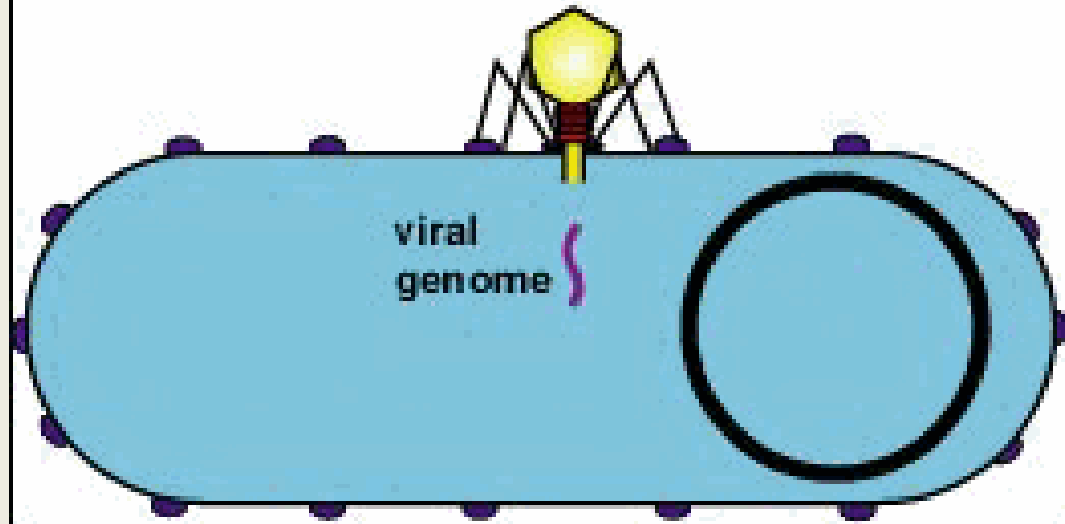
Spontaneous Induction



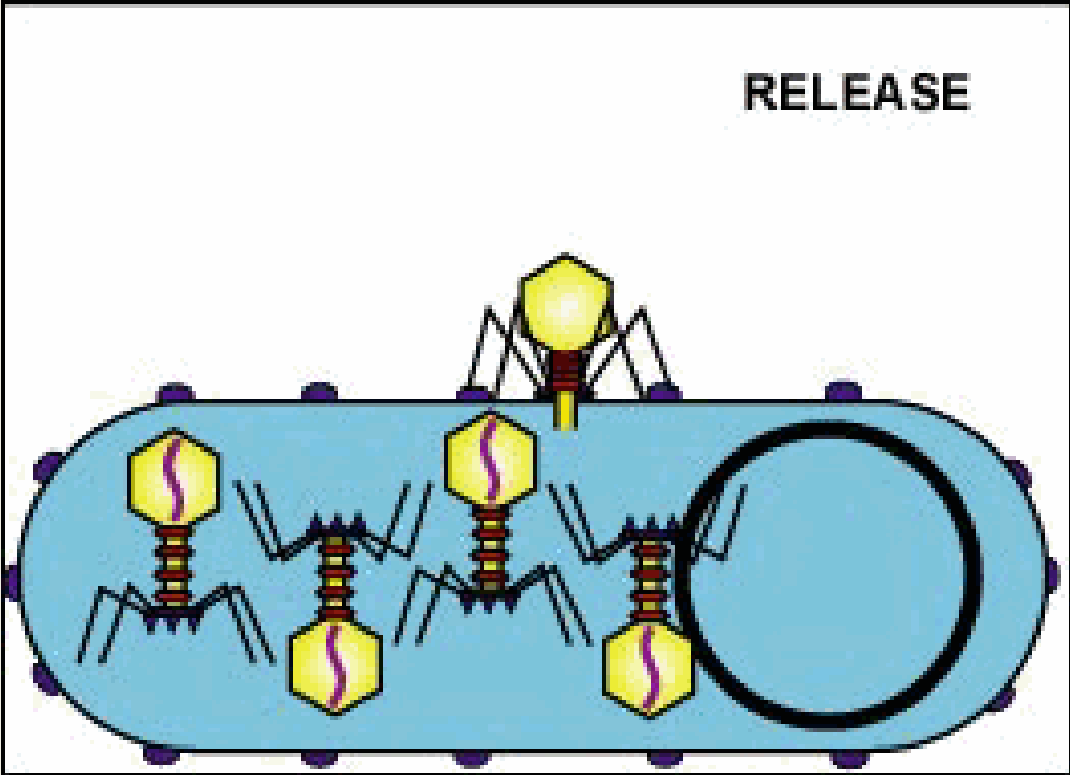
The separation of the provirus from the host chromosome. At this point the virus will complete the steps of the lytic cycle.

Viral Replication and Maturation

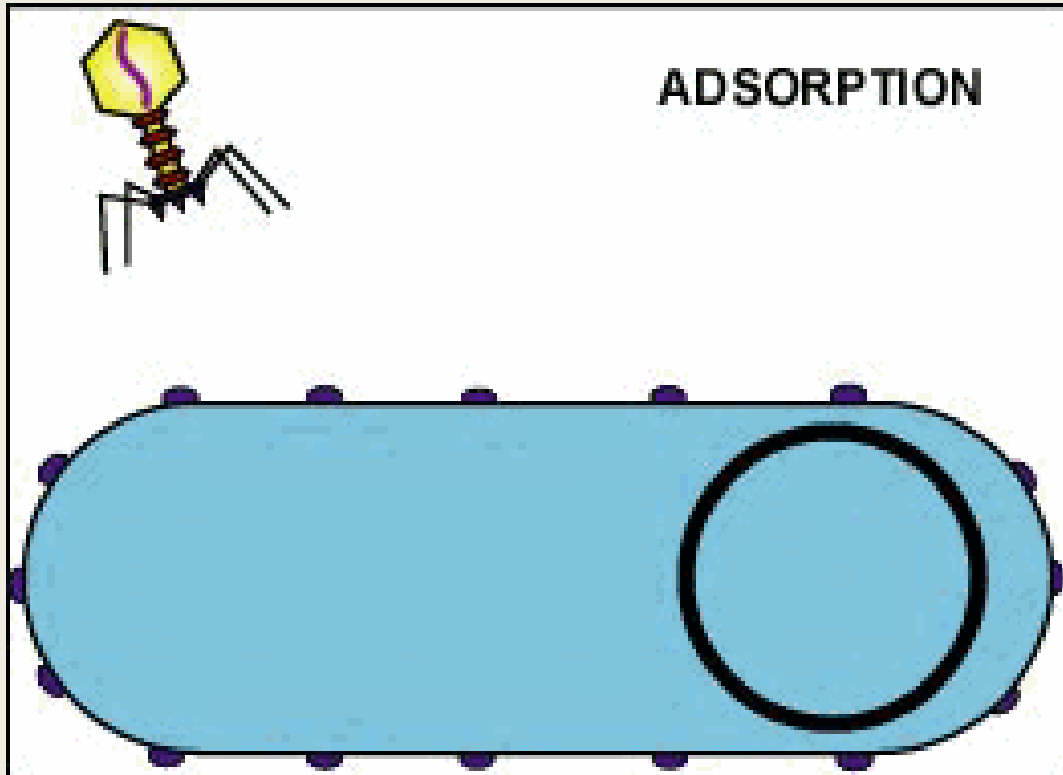
REPLICATION AND MATURATION



Release of the Bacteriophages by Lysis of the Bacterium



Summary of the Entire Lysogenic Cycle

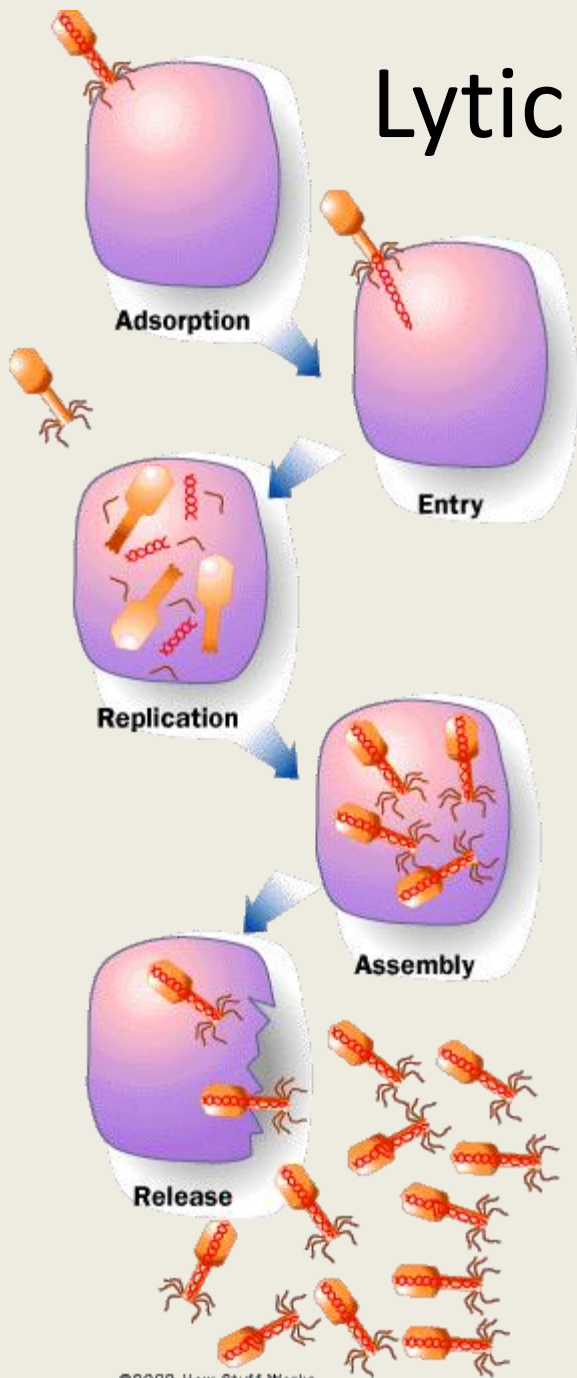


1. Adsorption
2. Entry
3. Integration: formation of provirus or prophage by inserting viral DNA into host genome
4. Spontaneous induction: release of viral DNA from host genome
5. Replication
6. Assembly
7. Lysis & Release

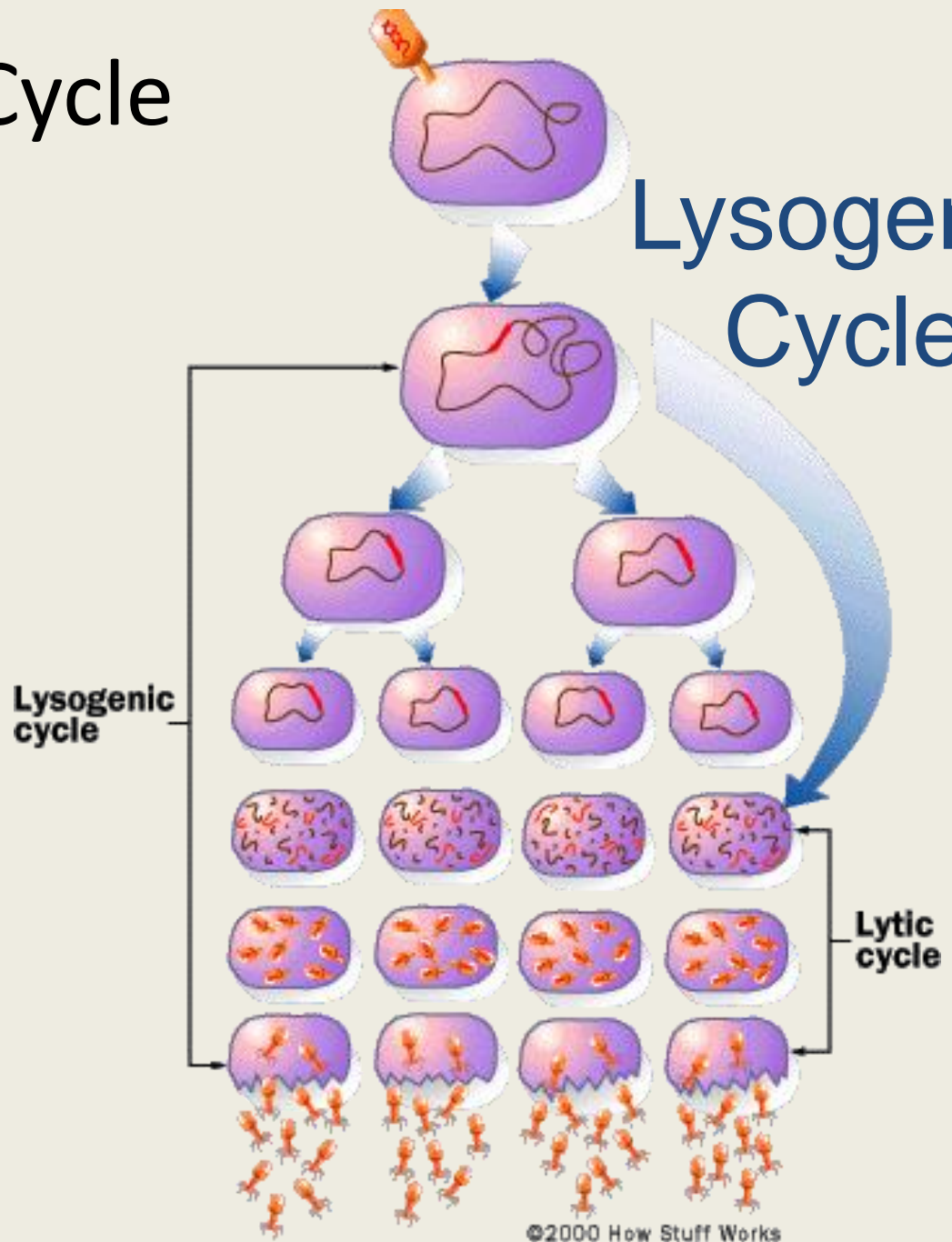
Comparing the two Reproductive Strategies

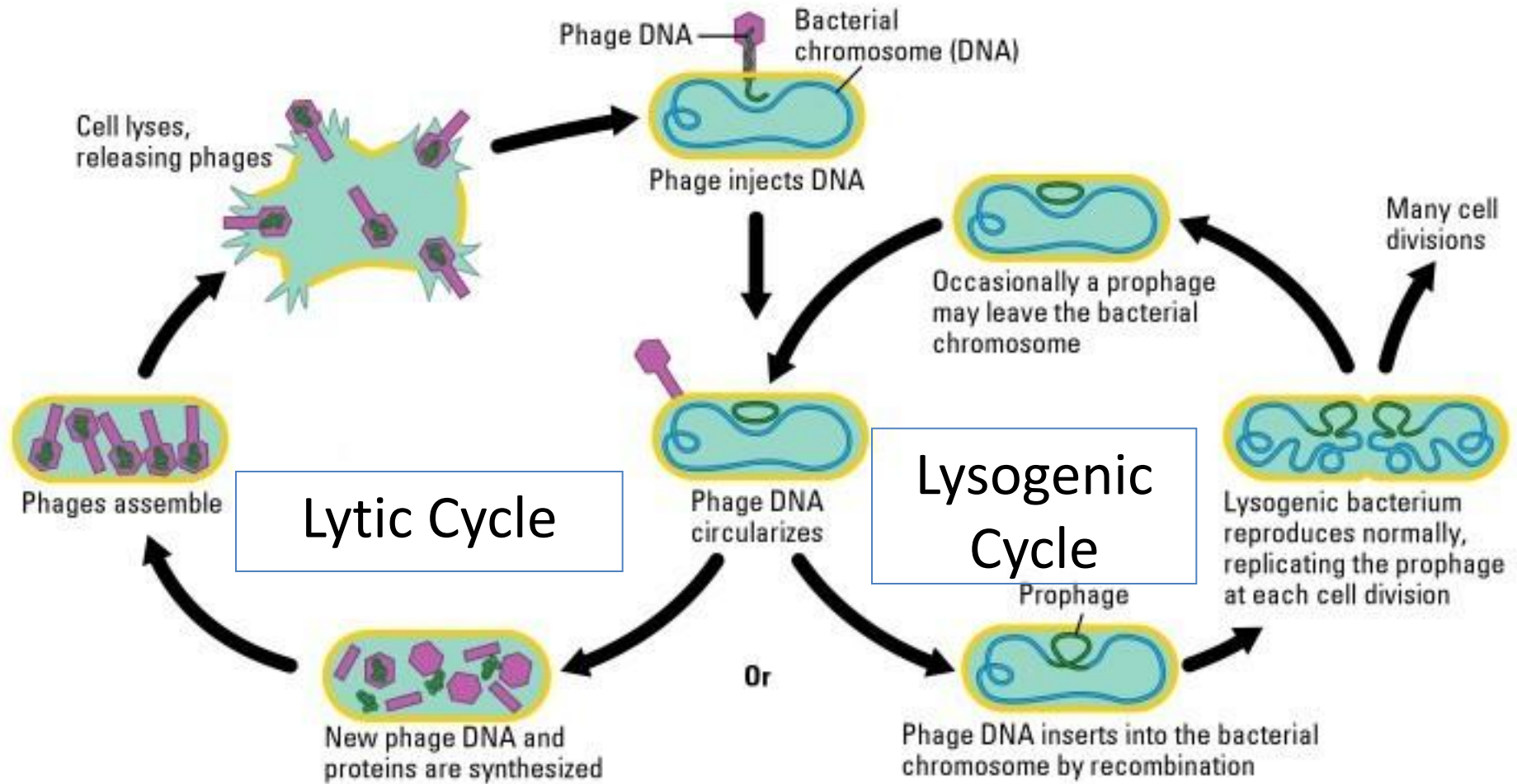
Lytic versus Lysogenic

Lytic Cycle



Lysogenic Cycle





Advantages and Limits

Lytic cycle

- Replication of new viruses is fast
- However, the host is also immediately killed preventing the viral genome from passing onto the next generation of host cells

Lysogenic cycle

- Many more viruses can be made because the viral genome is passed onto future generation of host cells
- However, replication is takes longer because it is dependent on the host cell's replication