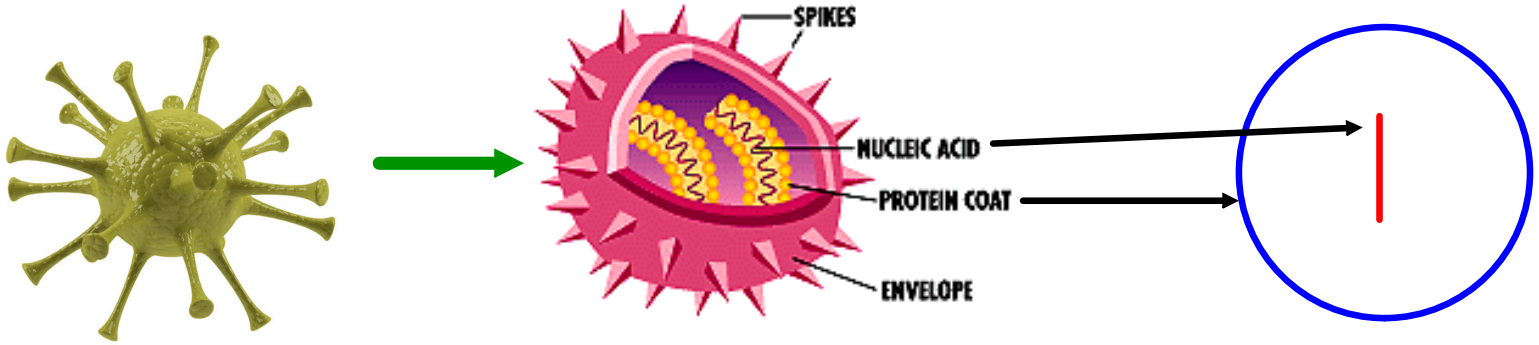
Chapter 39 -Viruses

Viruses are tiny. They are much smaller (50 times) than a bacterium.

They are **not made of cells** and **cannot reproduce** on their own.
Therefore they are not alive according to our rules.

They are made of a protein coat called a **capsid**.
They also have a **nucleic acid** (DNA or RNA).



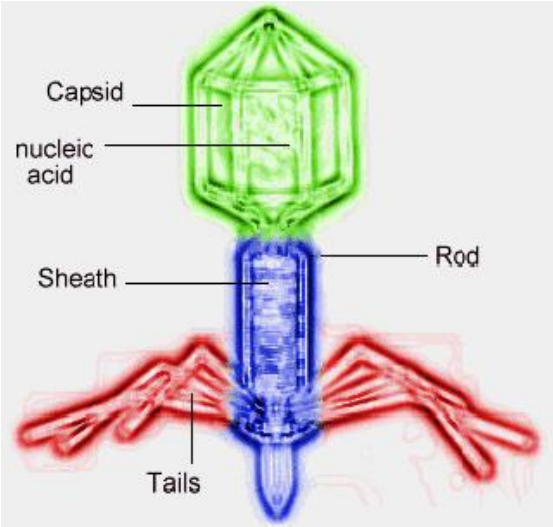
About Viruses

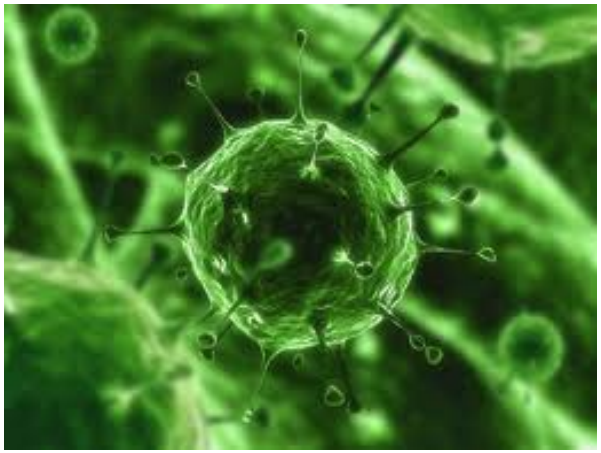
They can be **round, rod or complex** in shape.

They are **obligate parasites** as they need a host to reproduce.

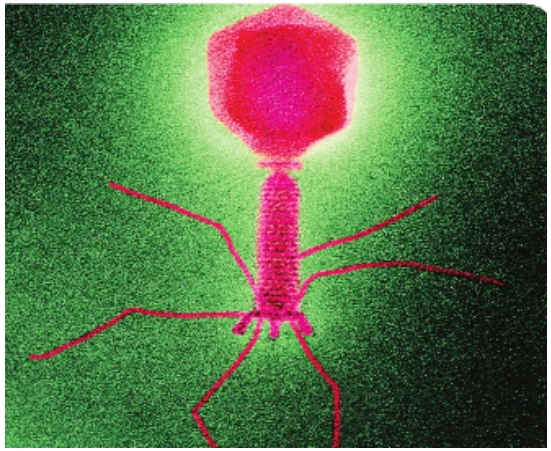
We do not use the word reproduction for viruses.

We use **replication** instead as viruses are not alive and need a host to make copies of themselves.





It's (Not) Alive!



Electron microscope picture of a virus

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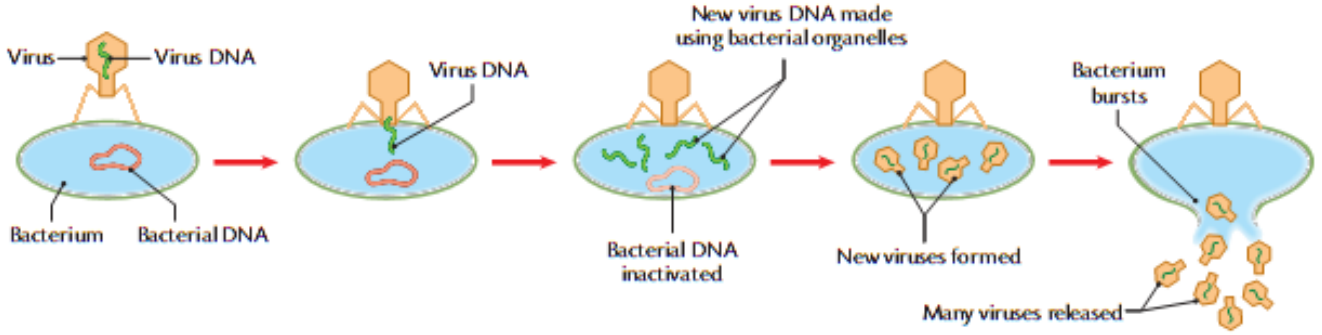
The living and non-living features of viruses	
Living	**Non-living**
1 Possess genetic material (either DNA or RNA)	**1** Are non-cellular
2 Posses a protein coat	**2** Cannot reproduce by themselves
3 Can replicate (inside a living cell)	**3** Do not possess ribosomes, mitochondria etc.
	4 Only have one type of nucleic acid (living things have both DNA and RNA)

Stages in Replication



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Attachment - Proteins on the virus match up with the wall of the host cell

Entry - The virus forms a hole and the viral DNA is injected into the bacteria

Synthesis - The host DNA is switched off and the viral DNA takes over.
It makes virus parts.

Assembly - The virus parts are put together and new viruses are made.

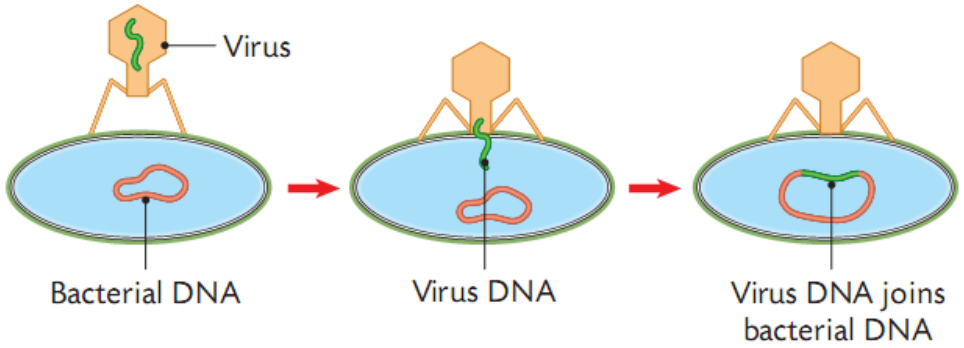
Release - The host cell bursts and releases thousands of the viruses.
These move to other cells.

Retrovirus

A **bacteriophage** is a virus that infects a **bacterium**.

The virus attaches to the bacterium.
It injects its DNA into the bacteria and joins into the bacteria's DNA.
When the bacteria multiplies it also multiplies the viral DNA.
The viral DNA may stay inactive or may produce toxins.

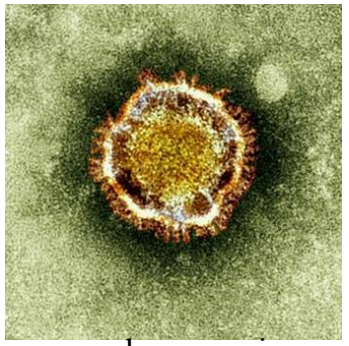
Diseases like AIDS and Scarlet fever are caused by retroviruses.



Disadvantages of Viruses

1. Human Diseases

Common cold, flu, measles, chickenpox, warts, AIDS.



novel coronavirus

2. Plant Diseases

Various mosaic diseases cause holes in leaves that can cost millions of euro's worth of damage.

3. Animal Diseases

Foot and mouth disease causes blisters and loss of milk - animals are destroyed.
Rabies - causes dogs to become excited, bite and eventually death.

Benefits of Viruses

1. **Genetic engineering**: Viruses are used to transfer genes from one organism to another.
   e.g. making **insulin**. Human DNA put into virus which then injects the DNA into a bacterium. The bacteria is grown in a bioprocessing vessel and insulin is produced.

2. **Control of infections**: **Bacteriophages** may be used to control bacterial infections.

CONTROL AND IMMUNITY

1. The general defence system of the body will defeat many viruses.
2. Vaccinations or the injection of antibodies will produce immunity.
3. Antiviral drugs have been developed.
4. Interferon is a substance produced by virus infected cells to protect healthy cells. It is being produced artificially.
5. Acyclovir is made to treat herpes.
6. AZT slows the development of AIDS.

Viruses are noncellular, intracellular parasites.

Virus:

- A piece of nucleic acid surrounded by a protein coat, called a capsid
- Depends on the resources of host organisms to reproduce
- Reprograms its host cell to replicate the viral genome and to synthesize more capsids