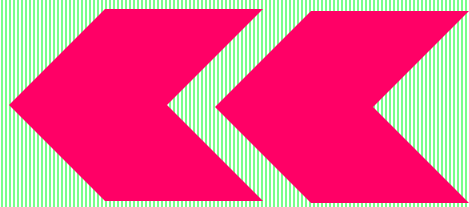


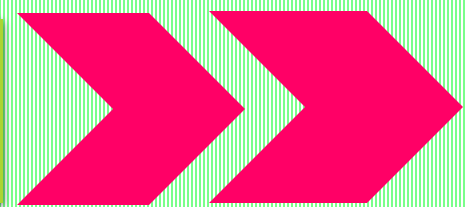
UNIT 1: DIVERSITY OF LIVING WORLD

PART- 5





Chapter Outline



1.1 Attributes of Living organisms

1.2 Viruses

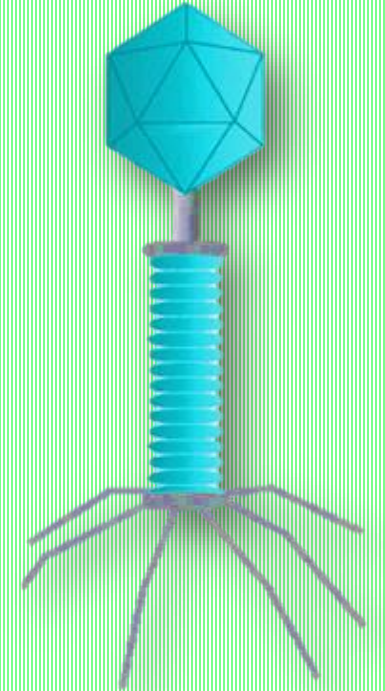
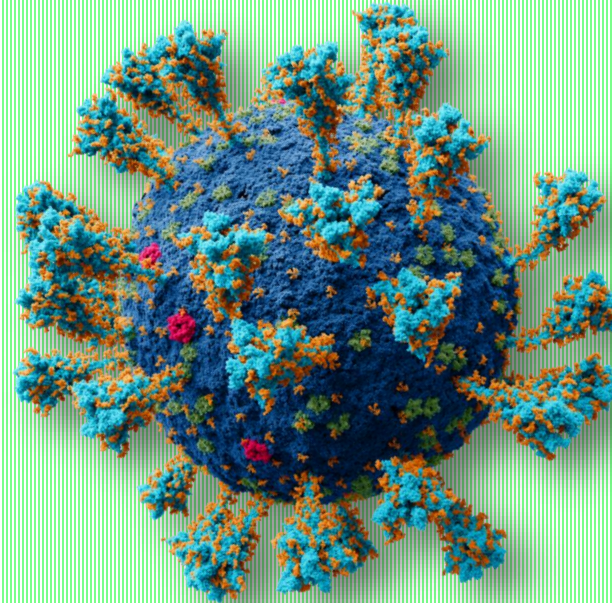
1.3 Classification of Living world

1.4 Bacteria

1.5 Fungi

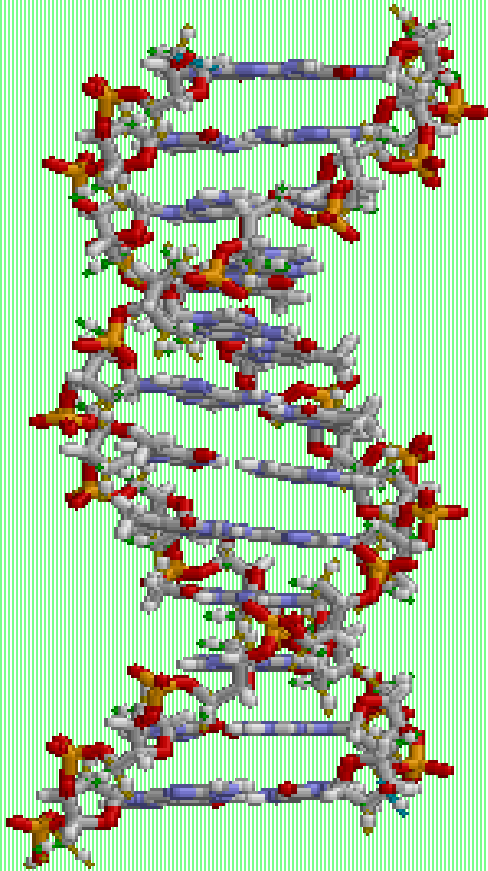
1.2 Viruses

- **Introduction**
- **Milestones of Virology**
- **Size and shape**
- **Characteristic Features of viruses**
- **Classification of Viruses**
- **Tobacco Mosaic Virus(TMV)**
- **Bacteriophage**
- **Multiplication or Life cycle of Phages- Lytic & Lysogenic cycle**
- **Viral Diseases**

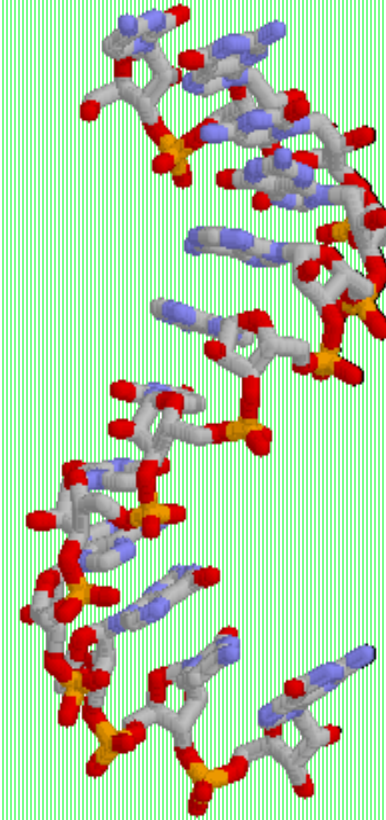


Viral Genome

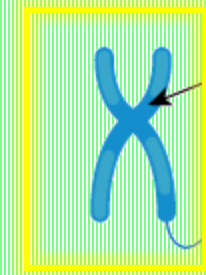
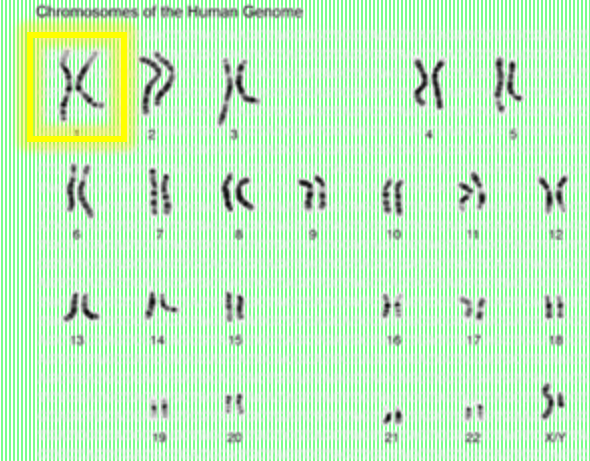
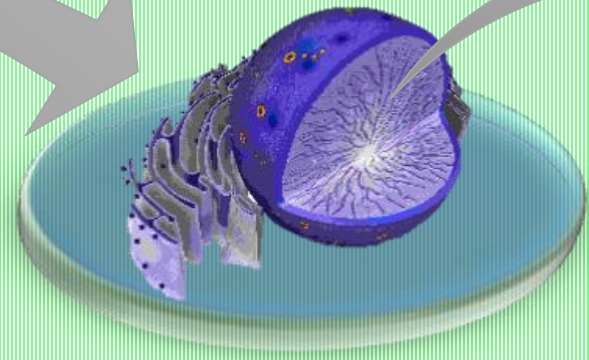
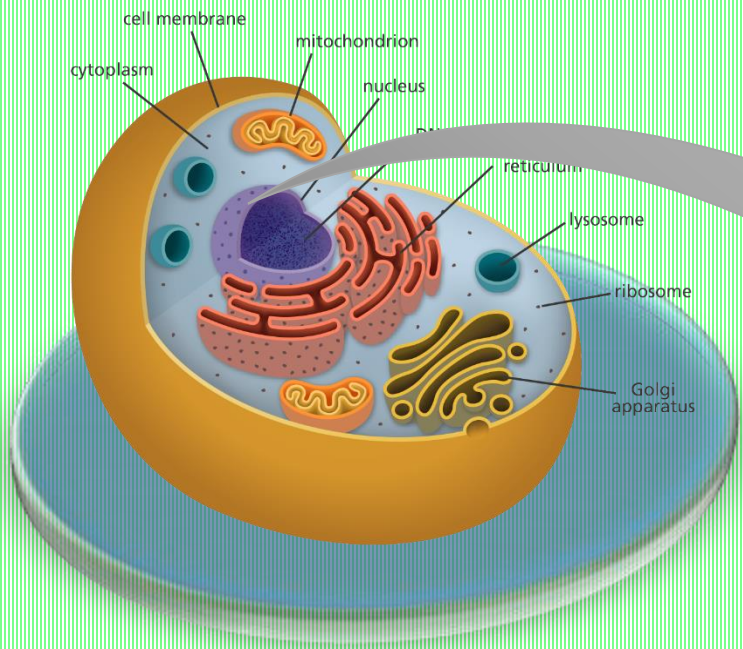
- ▶ Virus possesses only one type of nucleic acid either DNA or RNA (Genetic material)



DNA



RNA



Chromosome

Chromatin

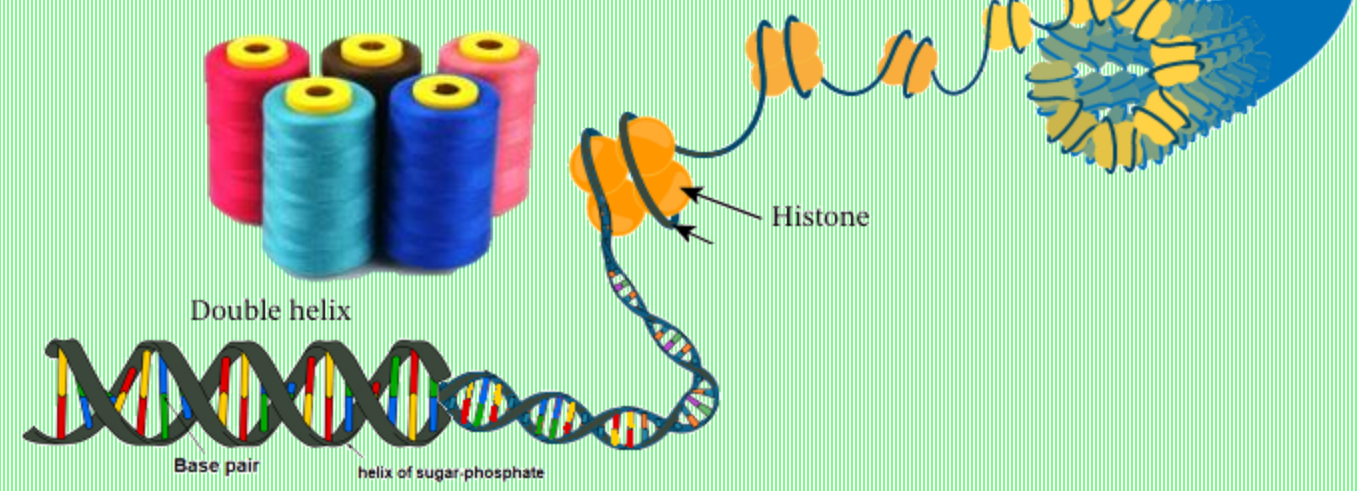
Nucleosome

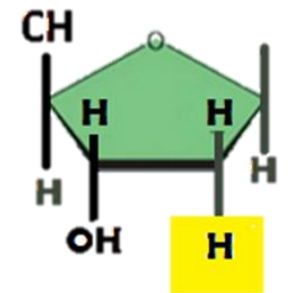
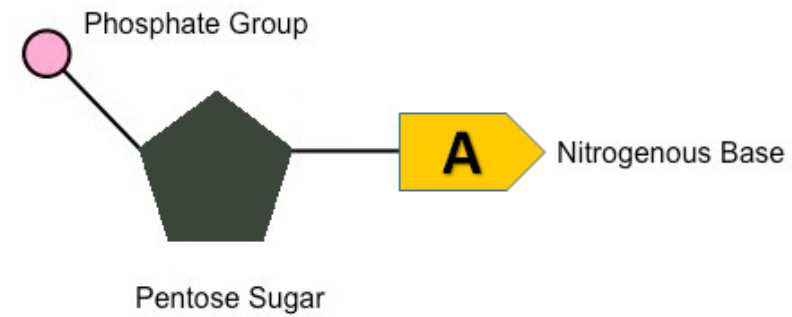
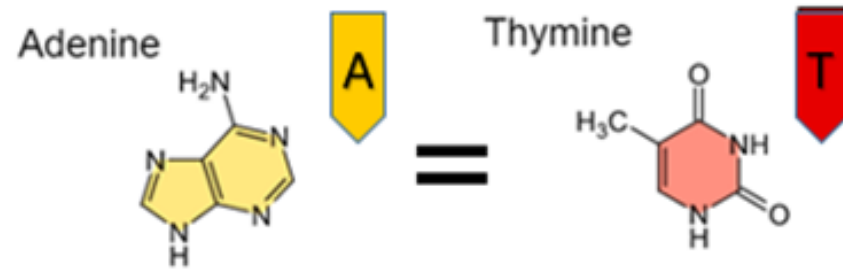
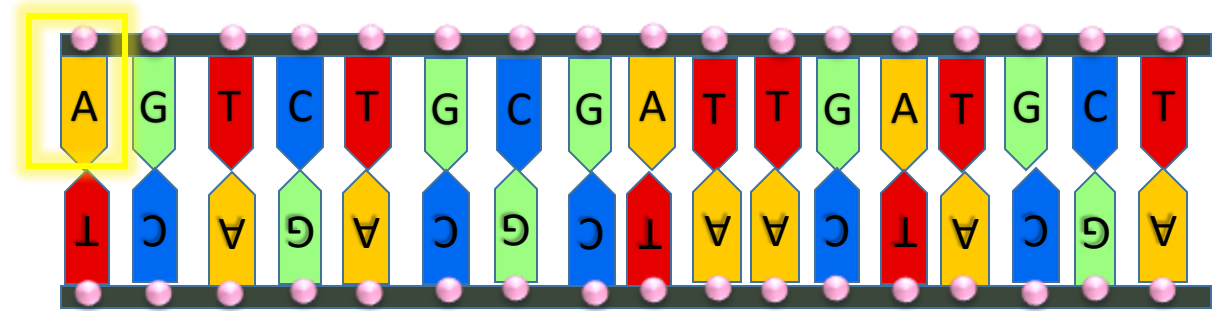
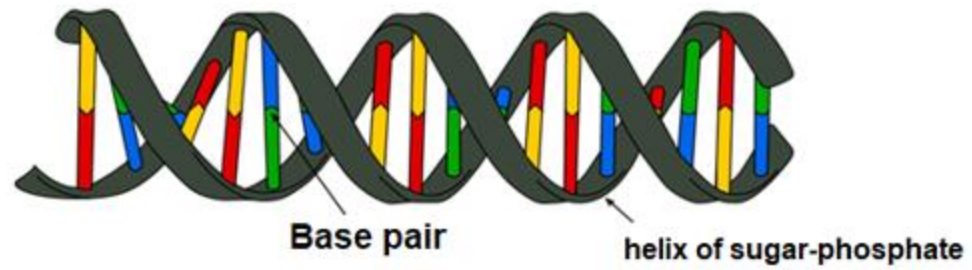
Histone

Double helix

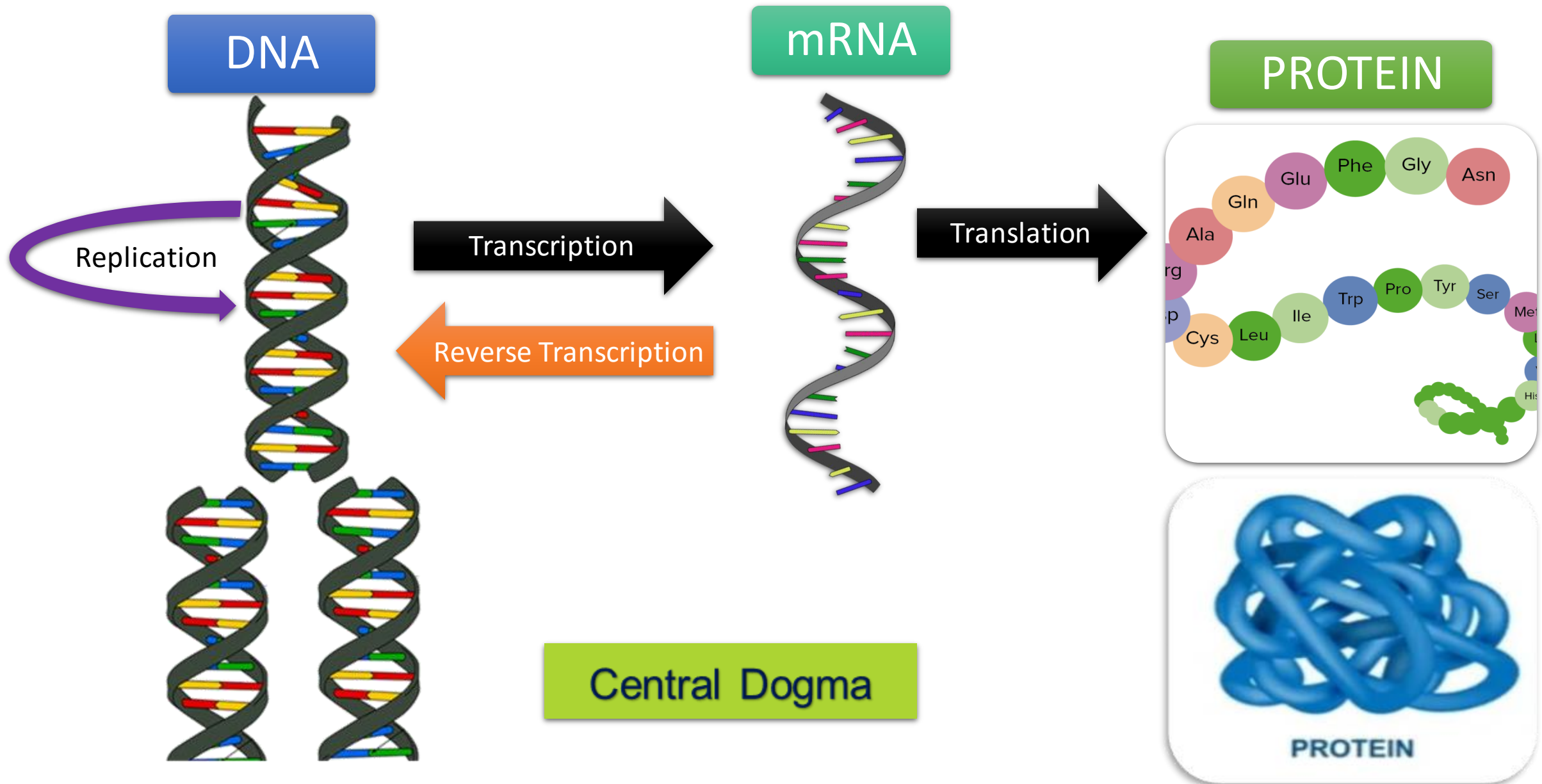
Base pair

helix of sugar-phosphate





NUCLEOTIDE

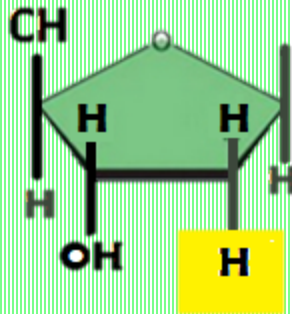


DNA Vs RNA

DNA

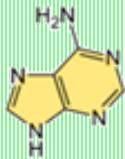


Double stranded



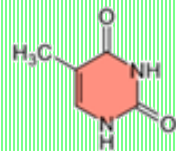
Deoxyribose as sugar

Adenine



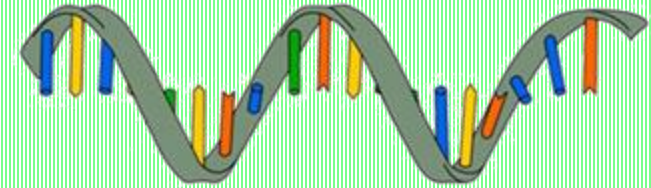
A

Thymine

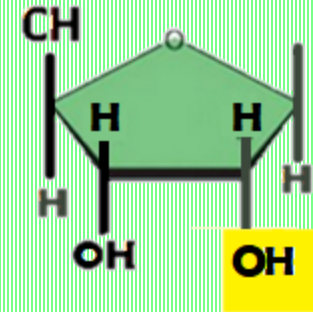


T

RNA

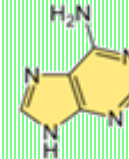


Generally single stranded



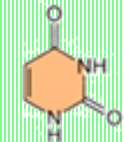
Ribose as sugar

Adenine



A

Uracil



U

Nucleobases
of RNA

Viral Genome

- ▶ The nucleic acids may be single stranded or double stranded
- ▶ The viruses possessing DNA are called '**Deoxyviruses**'
- ▶ The viruses possessing RNA are called '**Riboviruses**'.
- ▶ Animal and bacterial viruses - **DNA viruses**
 - ❖ (HIV is the animal virus which possess RNA)
- ▶ Plant viruses – **RNA viruses**
 - ❖ (Cauliflower Mosaic virus possess DNA)

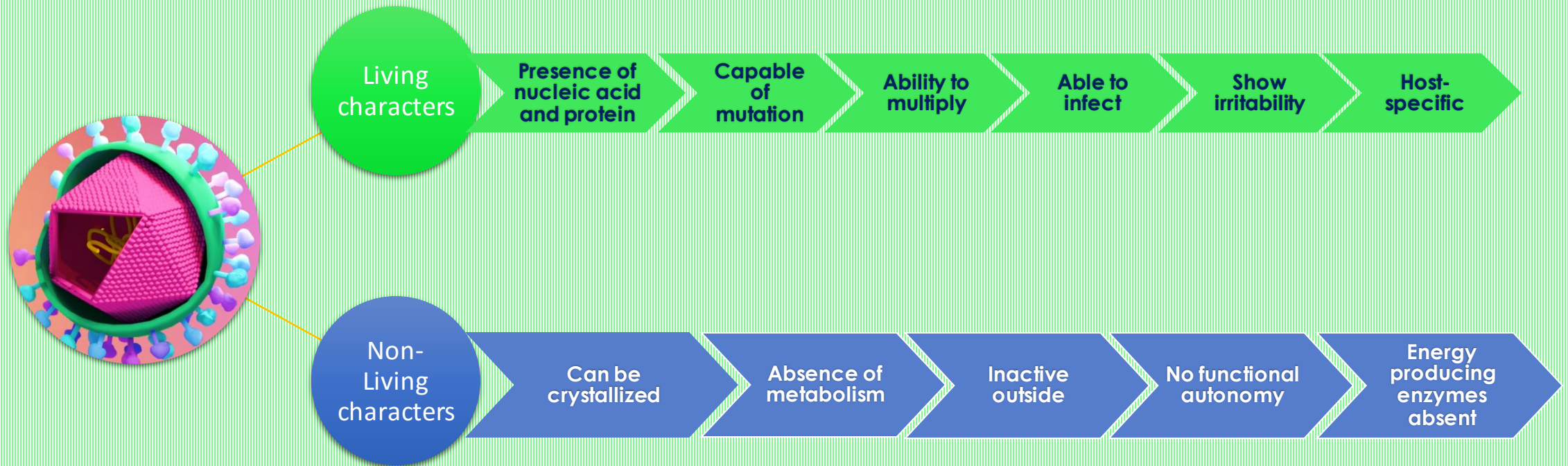
DNA Viruses



RNA Viruses



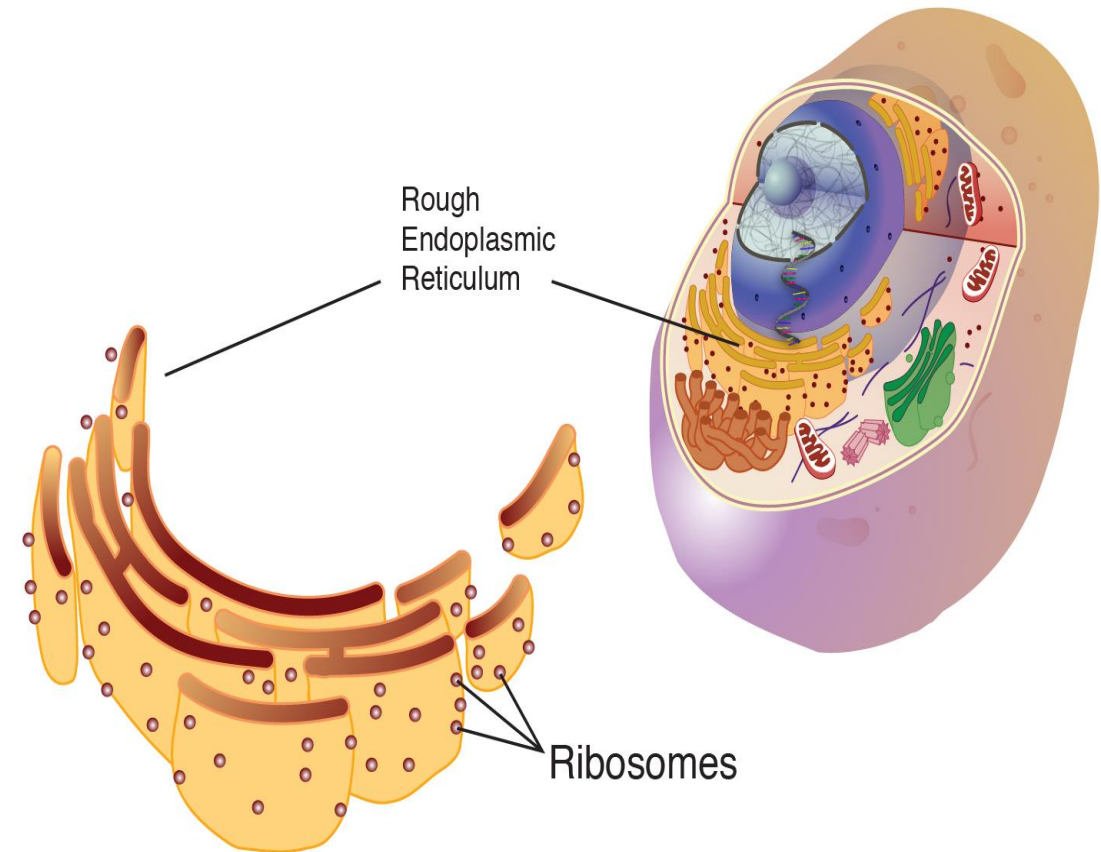
Characteristic Features of viruses



Living
characters

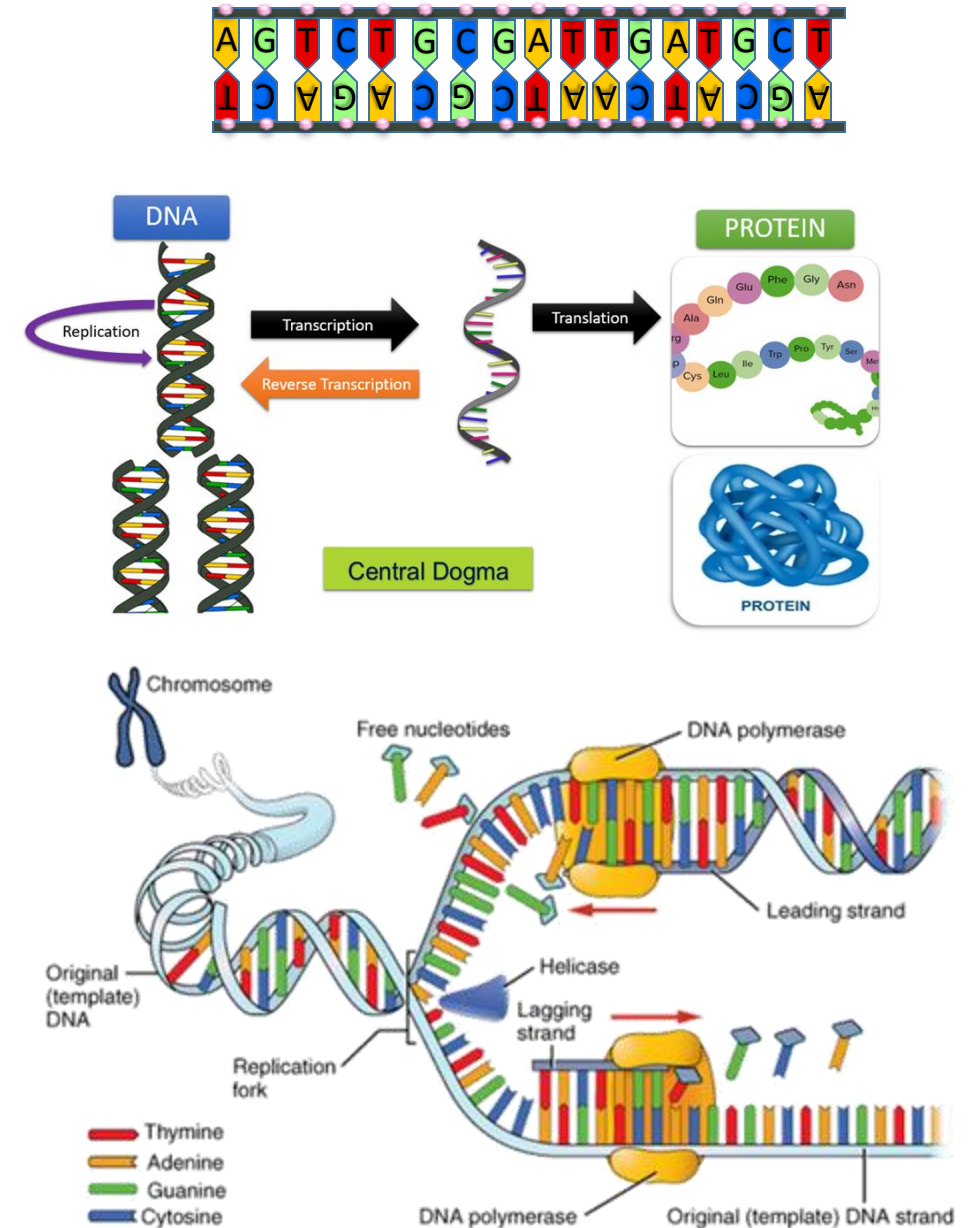
Presence of nucleic acid and protein

- ▶ All viruses contain nucleic acid- **DNA/ RNA**
- ▶ Cannot synthesize proteins - lack ribosomes
- ▶ Use ribosomes of their host cells-translate viral mRNA to viral proteins



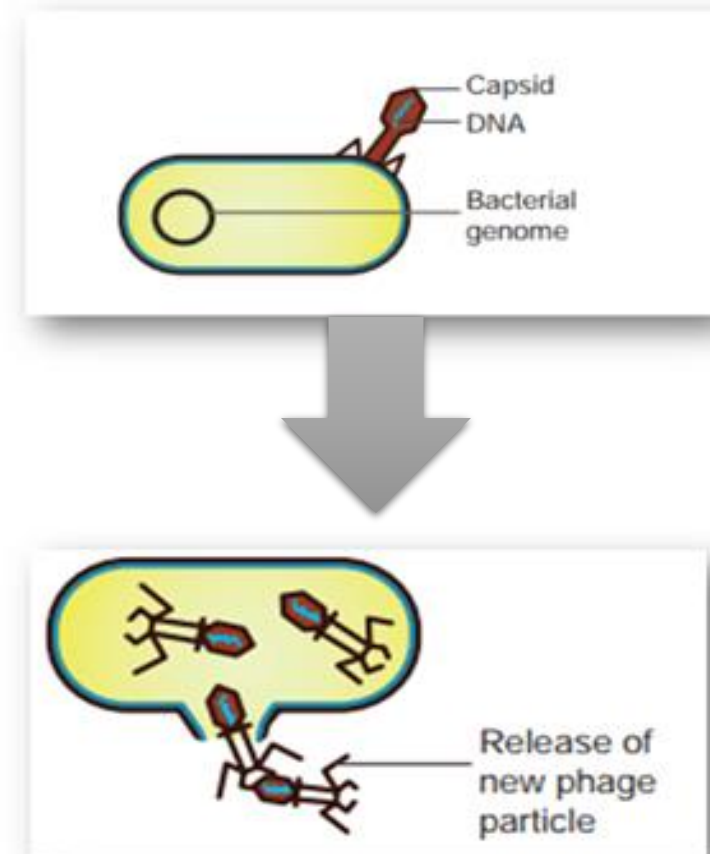
Capable of mutation

- ▶ **Mutation** is change in the sequence of bases of DNA or RNA in a genome
- ▶ occurs during **replication** of the genome
- ▶ Due to errors made by **polymerase enzyme**
- ▶ RNA Viruses acquire mutations faster than DNA Viruses
- ▶ RNA polymerase prone to errors- "**not capable of proofreading**".
- ▶ RNA-based viruses can **quickly evolve resistance** to antiviral drugs



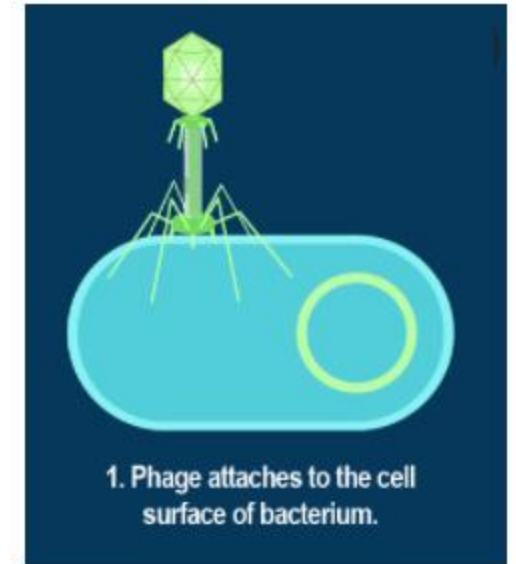
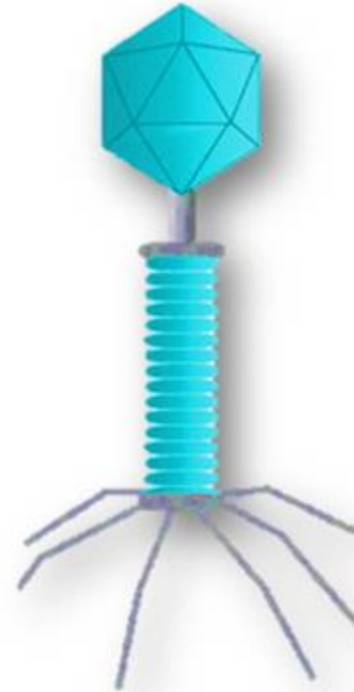
Ability to multiply within living cells

- ▶ Tiny **infectious agents** that **rely on living cells** to multiply
- ▶ Use animal, plant or bacteria host to survive and reproduce.
- ▶ Infect cells and use components of the host cell to make copies of themselves



Able to infect and cause disease in living beings

- ▶ **Like hijackers-** Invade living cells and use cell's machinery to multiply and survive
- ▶ **In humans-** “the flu” influenza virus
- ▶ **In plants-** “Tobacco mosaic virus” infecting tobacco plants
- ▶ **In bacteria-** “Bacteriophages” virus infecting bacteria

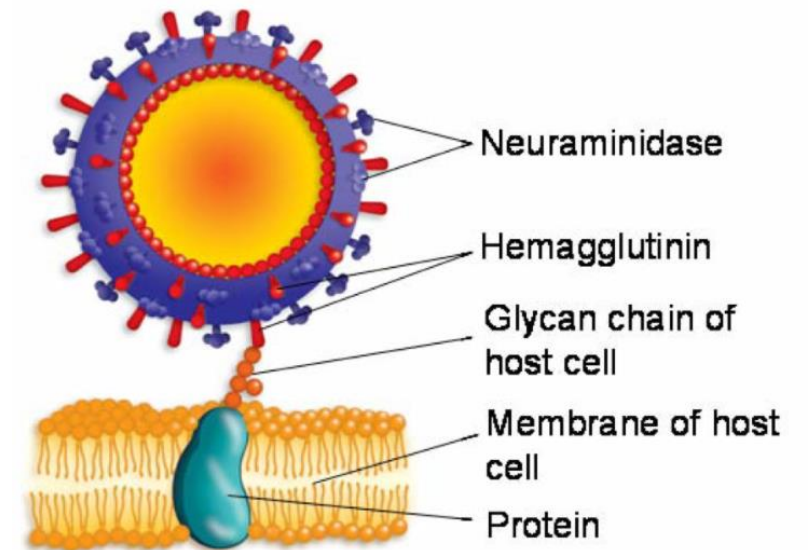
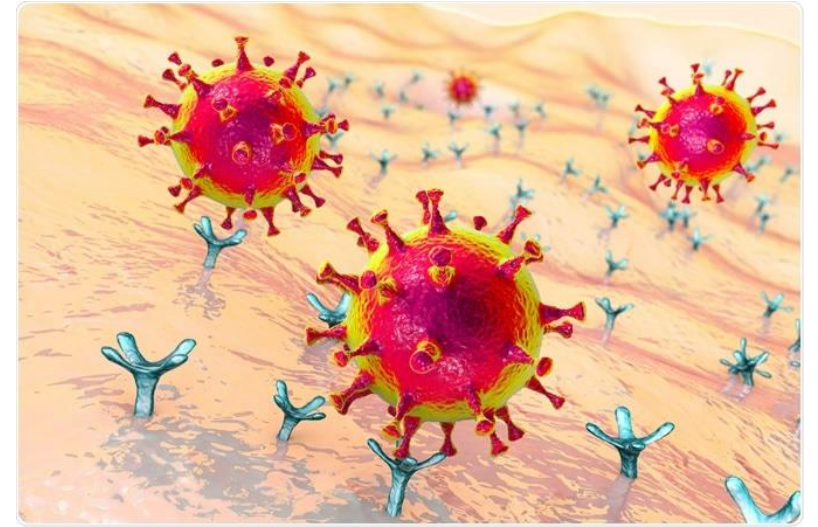


Show irritability

- ▶ They interact with the cells they infect
- ▶ Bind to receptors on cells, infect their genetic material in to the cell

Host-specific

- ▶ Virus attacks the host cell by first **attaching to a specific receptor** site-on the membrane of the **host cell**.
- ▶ Cells that a virus may use to replicate are called **permissive**.
- ▶ Eg: **Adenovirus**- animal virus-causes respiratory illnesses in humans.



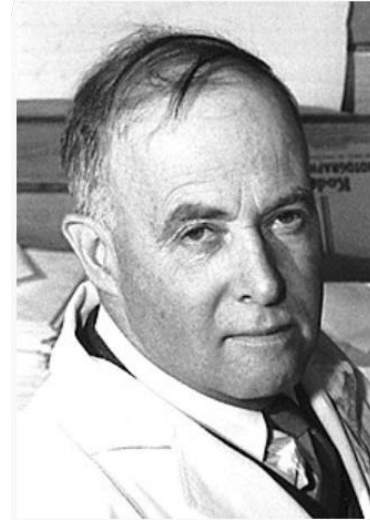


Non-Living
characters

Can be crystallized

- ▶ Transformation of viral components into organized solid particles – **crystallization**
- ▶ **Inactive form** of virus
- ▶ In 1946 **3 Americans** shared the Noble prize for chemistry-
- ▶ **James sumner**-discovered enzymes can be crystallized
- ▶ **John northrop- & Wendell Meredith Stanley**- preparation of enzymes and virus proteins in a pure form
- ▶ 1935 **Wendell Meredith Stanley** crystallized tobacco mosaic virus

James B. Sumner



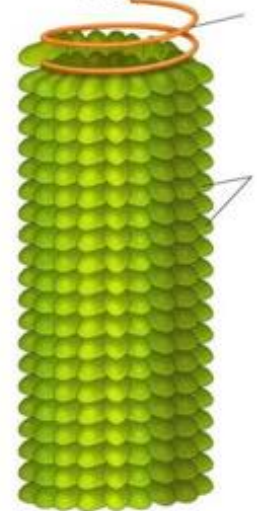
John Howard Northrop



Wendell Meredith Stanley



Tobacco Mosaic Virus



Absence of metabolism

- ▶ **Viruses can't metabolize food to release energy or grow**
- ▶ **They don't need any energy, when they are outside of a cell**
- ▶ **Viruses induce the host metabolic pathways for replication, virion production and spread**
- ▶ **Research has identified that- A better understanding of the metabolic pathway alterations required for virus replication is needed.**
- ▶ **Novel therapeutic approaches through targeted inhibition of cellular metabolic pathways.**

Inactive outside the host

- ▶ Viruses generally retains infecting ability for longer on **stainless steel and plastic**.

Do not show functional autonomy

- ▶ **Functional autonomy**- ability to perform independently the various tasks
- ▶ Viruses **resemble seeds**, they are not cells have no cytoplasm or cellular organelles and does not carry out metabolism on their own

Energy producing enzymes system is absent

- ▶ Viruses are non-living entities do not have their own metabolism
- ▶ Don't need any energy when they are outside of a cell
- ▶ They steal the energy from the cells they infect
- ▶ They cannot generate or store energy in the form of ATP

Let's summarize

- **Viral Genome**
- **Basic concepts of DNA and RNA**
- **Central dogma**
- **Characteristic features of virus**
- **Living characteristics**
- **Non-living characteristics**

Thanks
for watching