Genetics of Virus

- **Obligate intracellular parasites** that depend on host cell for:
  - Enzymes for metabolic processes such as DNA replication such as DNA polymerases
  - Machinery for protein synthesis such as ribosomes
  - Building blocks such as amino acids and nucleotides due to lack of means of nutrition
  - ATP as a form of energy due to inability to carry out cellular respiration

- Can only reproduce within a **living host cell**
- Termed as **virions** in extracellular states
  - Metabolically inert, does not carry out respiratory/biosynthetic functions
  - Structure by which the virus genome is carried from one cell to another
- Viruses are **infectious particles** which are **active** as **intracellular virus** state, or **inactive** as extracellular **virion** state, as opposed to living or non-living

Are viruses living or non-living?

**Living:**
- Viruses can reproduce
  - They have genetic material (DNA/RNA)
  - Encoding genes necessary for reproduction
  - In intracellular states within compatible host cells
- Viruses can evolve with their host
  - Viruses acquire genes from host cell
  - Genetic recombination and horizontal gene transfers result in changing viral genomes
- Viruses can react to environmental stimuli (such as radiation, chemicals and heat)

**Non-Living:**
- Able to exist in a metabolically inert state for extended periods of time
- Lack protoplasm and organelles
- Extracellular state: do not grow, obtain nutrition, respire, reproduce, synthesise proteins or excrete

**Basic Structure:**
- **Genome** comprising of RNA or DNA
- **Capsid** comprising of protein subunits, capsomeres (protein coat)
- **Envelope** (in envelope viruses) comprising phospholipids from host cell

| Structure | • Either DNA or RNA, but not both  
|------------------------|----------------------------------|
| Viral Genome | • Can be **circular, linear, single-stranded** or **double-stranded**  
| | • Contain genes for:  
| | o **Synthesising** viral capsid and genetic material |