

CHAPTER 5

LONG QUESTIONS

Q.1: Define Taxonomy and classification.

→ **What is a need of classification, give the unit of classification.**

→ **On which bases biologists classified living organism?**

Ans. TAXONOMY

It is defined as,

“It is branch of biology, which deals with identification, naming and classification of organisms.”

CLASSIFICATION

It is defined as,

“Arrangement of organisms into groups and subgroups on the basis of similarities is called classification.”

Need of Classification

- Over **One and half million species of animals** and over **half million species of plants** are known. To deal with such a large collection of dissimilar forms, certainly there was a need of system by which species can be classified in a reasonable way.
- By classification, we can find relationship between organisms. All organisms are related to one another at some point in their evolutionary histories. However, some organisms are more closely related than others. For example sparrows are more closely related to pigeon than either to the insects.

Base of Classification

Initially the classification was based on the appearance or morphology of plants and animals. Now classification is based on **relationship amongst individuals**, that is, similarity in form or structure.

Biologists have classified all living thing into groups showing similarities, based upon **homologies, comparative biochemistry, cytology and genetics**.

Units of Classification

In classification, larger groups are divided into smaller groups upto species level. Units of classification (**Taxa**) are given below;

(i) **Kingdom**

Kingdom is the **largest unit** of classification. All living things are divided into two kingdoms i.e. plants and animals.

(ii) **Phylum**

Each kingdom is divided into smaller groups called phyla (divisions of plants, algae and fungi).

(iii) **Class**

A phylum is divided into classes.

Q. Give biological classification of corn plant. (FBD-GI-2014: SGD-GI-16)

Q. Give the Biological Classification of

(iv) Order

A class is divided into different orders.

(v) Family

An order is further divided into families. A family contains related genera.

(vi) Genus

A genus is composed of one or more species.

(vii) Species

Species is the **basic unit** of classification. A species is defined as "A species is a group of natural population which can interbreed freely among themselves and produce offsprings, but are reproductively isolated from all other groups in nature".

Q. Define species.

(SWL-G1)-14,
(LHR-G2)-15

- ★ Interbreeding cannot be used as a criterion for species recognition, among predominantly asexually reproducing organisms.
- ★ Each species possesses its own distinct structural, ecological and behavioral characteristics.
- ★ These are independent evolutionary units.
- ★ Different species do not exchange genes between them.

On the contrary, the organism are grouped into larger, more inclusive categories (taxa), each category is more general than the one below it and has emergent properties.

Example of Classification

The taxonomic categories from species to kingdom form a hierarchy as described in the classification of corn.

Kingdom -----Plantae
Division (Phylum) -----Anthophyta (Tracheophyta)
Class -----Monocotyledonae
Order -----Poales
Family -----Poaceae
Genus -----Zea
Species -----mays

Q. Give biological classification of corn.
(GUJ-G1,2)-14, (DGK-G1)-15
(BWP-G1)-16

Members of lower category resemble one another more than do the members of a higher taxon.

NOMENCLATURE

Q.2: What is the need of binomial nomenclature?

- Give features of binomial nomenclature.
- Define binomial nomenclature also writes its rules.

Ans. NOMENCLATURE

Naming of organisms is called nomenclature. From the earliest times plants and animals have been given common names by the people.

Binomial Nomenclature

Naming of an organism which two words is called binomial nomenclature. It is also called as **two- word system** of naming organisms.

Presentation

During 18th century, **Carlous Linnaeus** (1707-1778), a Swedish botanist, devised a system for naming and classifying organisms. His system is used today internationally. He discarded the common names of plants and gave each one scientific name. His system spread rapidly and become so popular that he used it later on in naming animals and published his list in 1758.

Q. Describe Linnaeus system of Binomial nomenclature in detail.
(RWP-G1-2015: LHR-13GI, 15GII)

Q. Define binomial nomenclature. Give its rules.
(LHR-G1)-14,
(GUJ-G1)-15, (DGK-G2)-16, (LHR-G2)-17

Need of Binomial Nomenclature.

Following points show the need of binomial nomenclature;

- (i) Common names produce confusion.
- (ii) Since no system was used in choosing common names, in many cases, various regions had their own names for the same plant or animals.
For example, if we take onion, its common Urdu name is 'piyaz' but in different regions of Pakistan it is also known as 'ganda' or 'bassal' or 'vassal'. In different countries, it has another set of names. Similarly 'amaltas', 'gurmala', 'golden shower' and 'purging cassia', are common name for the same plant.
- (iii) In some cases, a single name refers to several different plants and animals. For example dozen of plants with bell shaped flowers come under same common name of Blue bells. Similar the word 'black bird' would mean a crow as well as a raven.
- (iv) Common names have no scientific basis. To a biologist a fish is a vertebrate animal with a backbone, fins and gills. But 'silver fish' is an insect and a 'Cray fish'; 'jelly fish' and 'starfish' do not fit the biologist's definition of a fish.

Features of Binomial Nomenclature

Different features are described as;

- (i) Scientific names are usually taken from Latin.
- (ii) Usually the name is referred to some characteristic of the organisms or the person who collected it
- (iii) Scientific name comprises of two words.
- (iv) The first name refers to the genus and is called generic name and always begins with a capital letter.
- (v) Second name represents the species name and is written with small letters.
- (vi) Every species has only one scientific name all over the world.

Examples

- ★ Scientific name for onion is *Allium cepa*, for amaltas is *Cassia fistula* and for man is *Homo sapiens*.
- ★ Botanical name for potato is *Solanum tuberosum* and for brinjal is *Solanum melangena*. The same generic name for potato and brinjal reflects close relationship between these two species.

Every species has only one scientific name the world over. Initially the classification was based on the appearance or morphology of plant and animals but with advancement in the knowledge of cytology, physiology, genetics and molecular biology the classification of organisms has been modified.

TWO TO FIVE KINGDOM CLASSIFICATION SYSTEMS

Q.3: Discuss two to five kingdom classification systems?

→ **What is the base of classification of five kingdom of classification system?**

Ans. Different classification systems recognize two to five kingdoms.

Two kingdom classification

Living organisms for centuries have been classified into two system i.e. Plants and animals.

- ★ **Plants** can prepare their own food from simple inorganic material and store energy (**Autotrophs**) bacteria were included in plants.
- ★ **Animals** cannot synthesize their own food from simple inorganic material and depend for their food either on autotrophy or on decaying organic matter (**heterotrophs**)

Three kingdom classification

Some scientists found two kingdom classification unworkable for many unicellular organisms like *Euglena* that have both plant like (presence of chlorophyll) and animal like (lack of cell wall) characters and also because it ignores the difference between prokaryotic and eukaryotic cells. In 1886 **Ernst Haeckel** proposed a third kingdom **protista** to accommodate *Euglena* like organisms and bacteria.

Two kingdoms By E-Kingdom

In 1937, E. Chatton suggested differentiating terms.

- ★ **Procariotique** (from Greek pro meaning before and karyon meaning 'nucleus') used to describe bacteria and blue green algae.
- ★ **Eu- cariotique** (from Greek 'eu' meaning true and karyon meaning nucleus) to describe animal and plant cells

Fungi as Fourth kingdom

Some biologists disagree about the classification of fungi, such as bread mold, yeast and mushrooms, which resemble plants in many ways but are not autotrophs.

Fungi are special forms of heterotrophs that obtain energy and structural material by breaking down (decomposing) and absorbing food substances from the surroundings, and possess chitin as major structural component in their cell wall.

Five kingdom Classification by Robert Whittaker

Recent classification which is used now days was proposed by Robert Whittaker in 1969. This system of classification is based on three different levels of cellular organization associated with three principle modes of nutrition i.e.

- ★ Photosynthesis
- ★ Absorption
- ★ Ingestion

Q. Explain five kingdom system of Classification.

(SGD-GII, GUJ-GI-2016)

Q. Describe five kingdom classifications. (LHR-2010)

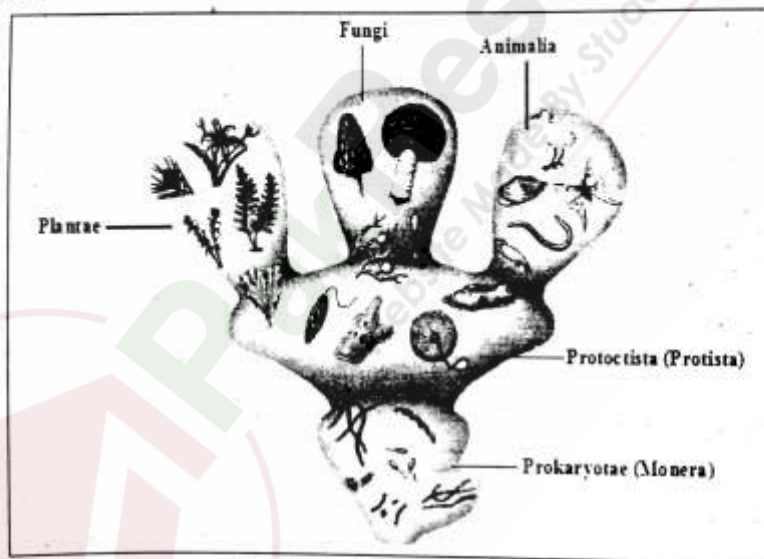


Fig: Relationship of Five Kingdom

The five kingdoms proposed by Robert Whittaker are:

(1) **Kingdom Monera**

It consists of prokaryotic unicellular organisms such as bacteria.

(2) **Kingdom Protista**

It consists of eukaryotic predominantly unicellular organisms. Most protists are unicellular forms but kingdom also includes relatively simple multicellular organisms that are believed to be direct descendants of unicellular protists such as *Euglena* and *Amoeba*.

(3) **Kingdom Plantae**

It consists of eukaryotic multicellular autotrophs.

Plants are autotrophic in nutritional mode, making their own food by photosynthesis such as mosses and flowering plants.

(4) **Kingdom Fungi**

It consists of eukaryotic multicellular reducers such as mushrooms.

- ★ Fungi are heterotrophic with absorptive mode of nutrition.
- ★ Mostly are decomposers that live on organic material, secrete digestive enzymes and absorb small organic molecules, which are produced by digestion.

(5) **Kingdom Animalia**

It consists of eukaryotic multicellular consumers e.g reptiles, birds etc.

- ★ Animals live mostly by ingesting food and digesting it within special cavities.
- ★ They lack cellulose.
- ★ They show movements.

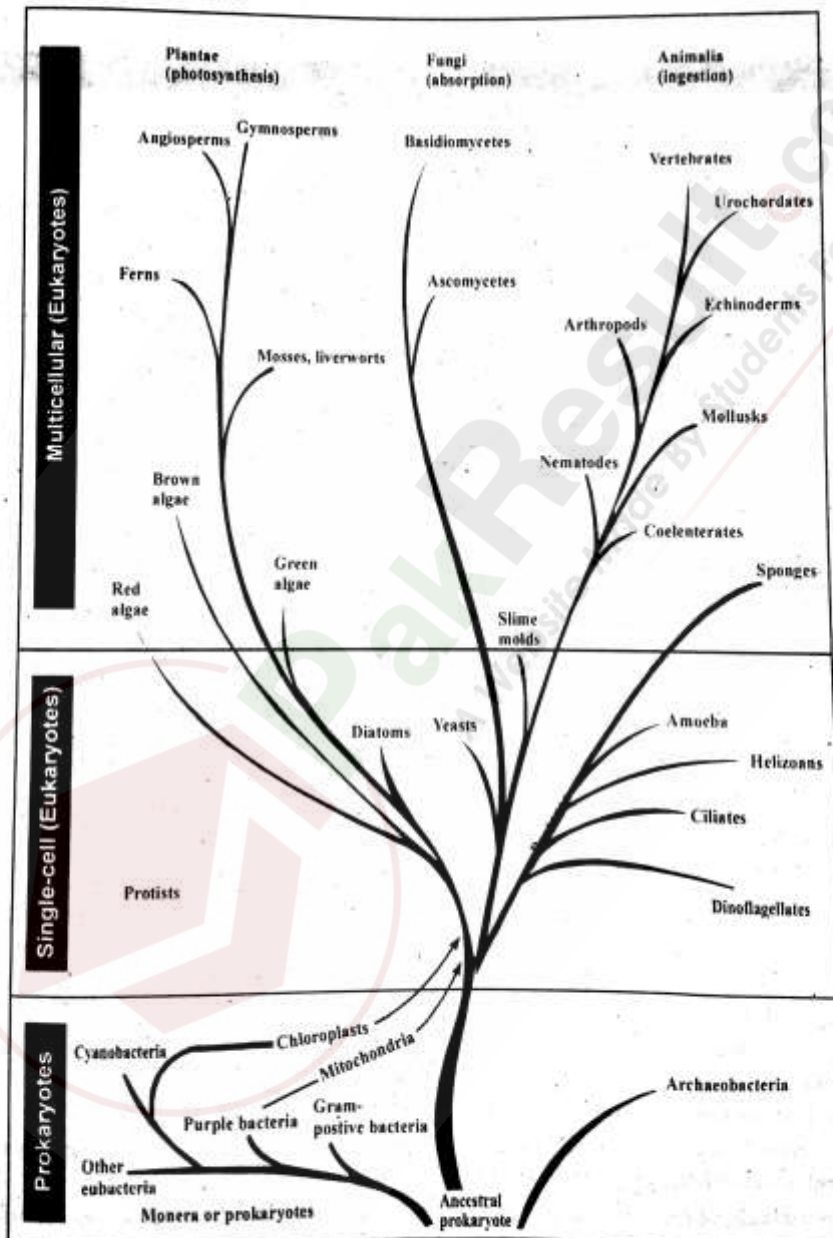


Fig. Five kingdom classification by Whittaker

Modifications by Margulis and Schwartz

Lynn Margulis and Karlene Schwartz in 1988 modified five kingdom classification of Whittaker considering.

- | | |
|--|---------------------|
| ★ Cellular organization | ★ Mode of nutrition |
| ★ Cytology | ★ Genetics |
| ★ Organelles of symbiotic origin (Mitochondria, chloroplast) | |

The five kingdoms are

- | | |
|---------------------------------|-----------------------------------|
| (i) Prokaryotae (Monera) | (ii) Protocista (Protists) |
| (iii) Plantae (Plants) | (iv) Animalia (Animals) |
| (v) Fungi | |

VIRUSES

Q.4: Define virus, give brief history of discovery of virus?

→ **Give characteristics of viruses.**

Ans. Meaning

The word virus is derived from Latin word, *venome*, meaning 'poisonous fluid'.

Definition

It can be defined as,

"Non-cellular infectious entities, which contain either RNA or DNA, normally encased in proteinaceous coat, and reproduce only inside living cells."

Viruses utilize the biosynthetic machinery of the host for its own synthesis and then transfer themselves efficiently to other cells.

Virology

The branch, which deals with the study of viruses, is known as virology.

HISTORY OF DISCOVERY OF VIRUS

(i) **Early period**

Some viral diseases have been known for centuries. About a century ago at the time of Louis Pasteur (1822- 1895) and Robert Koch (1843- 1910), the word virus was generally referred to as a poison associated with disease and death. The present notion of virus is entirely different. Now viruses are recognized as particles of nucleic acid often with protein coat. They replicate in living cells and cause many diseases e.g. influenza, hepatitis, small pox and AIDS.

(ii) **Work of Edward Jenner**

Viral disease was the first infectious disease whose preventive method was introduced. Edward Jenner the scientist who first time vaccinated an 8 years old boy with material removed from cowpox lesion on the hand of milkmaid in 1796. After six weeks the boy was inoculated with pus from a small pox victim, but he did not develop the disease. Later he successfully vaccinated 23 persons.

(iii) **Work of Louis Pasteur**

Louis Pasteur was the scientist who first time used the word vaccination (derived from Latin word *vaccinus* which means cow)

(iv) **Work of Charles Chamberland**

In 1884, Charles Chamberland (one of Pasteur's associates), found that bacteria cannot pass through porcelain filters, while agent responsible for rabies can pass through these filters.

(Rabies is a disease, which is transferred to humans by bites of rabid dogs, foxes, cats, bats, and other animals) As in those days the word virus was loosely used to describe any toxic substance that caused disease, those unfilterable agents of disease were described as filterable viruses.

Q. What is mean by venome.

(DGK-G1)-13

Q. Write a note on structure of viruses.

(RWP, MTN-G1-2016)

Q. Write a note on any four viral diseases.

(MTN-G2)-12

Q. Give classification of virus.

(FBD-G1)-15

(v) **Work of Ivanowski**

In 1892, Ivanowski discovered that agent causing tobacco mosaic disease was filterable. He obtained bacteria free filtrate from ground up infected plants. When he placed this bacteria free filtrate on leaves of healthy tobacco, it became diseased, same procedure was repeated on different plants and in all cases result was same.

Similar filter passing agents were seen in patients of foot and mouth disease (1898) and yellow fever (1901).

(vi) **Work of Stanley**

The filterable agents were first purified in 1935, when Stanley successfully crystallized the tobacco mosaic virus. Chemical analysis of these particles showed that they contained only nucleic acid and protein. This suggested that, unlike other forms, viruses are of simple chemical composition.

(vii) **Work of Twort And D. Herelle**

Bacteriophages (viruses that infect bacteria) were discovered independently by Twort in 1915 and D. Herelle in 1917.

- ★ In 1915, Twort observed that bacteria colonies sometimes undergo lysis and that this lysis can be transferred from one colony to another. Even highly diluted filtrate can also cause lysis but this property is lost by heating. From these observations he concluded that lytic agent might be a virus.
- ★ In 1917 D. Herelle rediscovered this phenomenon and used the word bacteriophages meaning "bacteria eater".

CHARACTERISTICS OF VIRUSES

Some of the characteristics of viruses are described below;

(i) **Size**

Viruses are extremely small infectious agents, which can only be seen under an electron microscope. They range in size from **250 nm of poxviruses to 20 nm of parvovirus**

They are **10 to 1000 times smaller than most bacteria**, so they can pass through the pores of filter, from which bacteria cannot pass.

(ii) **Reproduction**

Viruses cannot be grown on artificial media. They can reproduce only in animal and plant cells or in microorganisms, where they reproduce by **replication** (a process by which many copies or replicas of virus are formed). During reproduction in the host cells, viruses may cause disease.

(iii) **Mode of life**

Viruses are **obligate intracellular parasites**. Viruses lack metabolic machinery for the synthesis of their own nucleic acid and protein. They depend on the host cell to carry out these vital functions.

Q. Viruses are intra cellular obligate parasite comments. (SGD-G1)-15

(iv) **Resistance**

All viruses are generally resistant to broad range of available antibiotics such as penicillin, streptomycin and others.

Q.5: Discuss structure and shape of viruses?**→ Discuss life-cycle of bacteriophages.****Ans. STRUCTURE OF VIRUSES**

The complete, mature and infectious particle is known as **Virion**.

The virions are composed of;

(i) **Nucleic Acid**

There is central core of nucleic acid, either DNA or RNA, which is also known as the **genome**.

Q. What are capsomeres? (SWL-G1)-16

Q. Define capsid. (SWL-G1)-14,

(SGD-G2)-16

(ii) **Capsid**

It is **protein coat**, which surrounds the nucleic acid. It gives definite shape to virion.

Capsid is made up of protein subunits known as **capsomeres**. The number of capsomeres is characteristic of a particular virus. For example **162 capsomeres** are present in the capsid of **herpes virus** and **252** in the capsid of **adenovirus** which cause some common colds.

(iii) **Envelope**

In some animal viruses the **nucleocapsid** (nucleic acid and capsid) is covered by another membrane derived from the host cell, the envelope. Non-envelope viruses are known as **naked virions**.

SHAPE OF VIRUSES

Animal and plant viruses may be polyhedron (many sides), helical (spiral), enveloped or complex.

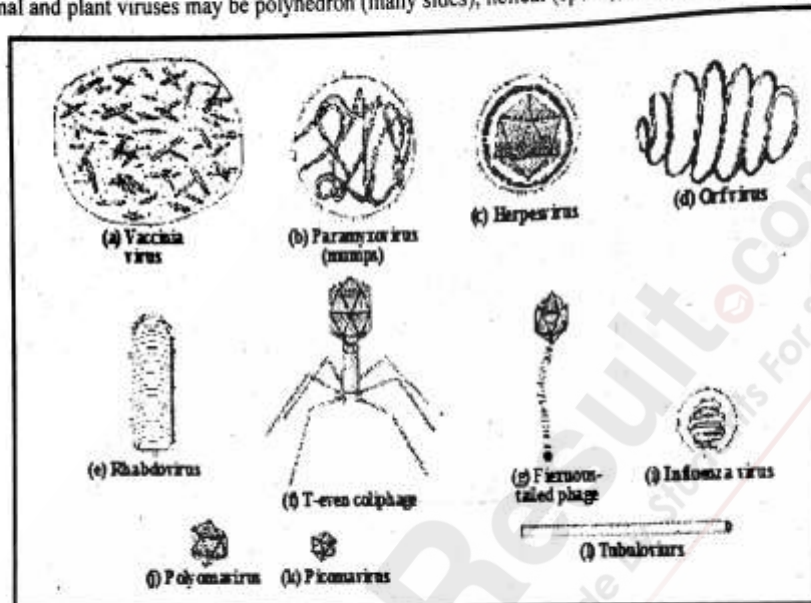


Fig: Types of viruses

PRIONS

The most recently discovered (1983) and least understood microorganisms are the **prions**, which may be infectious proteins. Their nature is very controversial. They are composed of protein only that contains the information that codes for their own replication. All other organisms contain their genetic information in nucleic acid (DNA or RNA). Prions are responsible for mad cow infection and mysterious brain infection in man.

BACTERIOPHAGES

Such type of viruses, which attack on bacteria are called bacteriophages or phage viruses.

Structure

(i) Bacteriophages occur in two structural forms.

- ★ **Cubical phages** having cubical symmetry, which are regular solid or icosahedral (having 20 faces).
- ★ **Helical phages** having helical symmetry, which are rod shaped.

(ii) Many phages consist of head and tail. In those case heads are **polyhedral** but tails are rod shapes. Morphology of some viruses and bacteriophages are shown in above fig.

LIFE CYCLE OF BACTERIOPHAGES

Earlier research on bacteriophages was limited to those phages that infect *Escherichia coli*. Of these the best known phages are T phages (T for type). Among T phages, the T_2 and T_4 phages are mainly used in phage studies.

Structure of T_4

Electron microscopy of T_4 shows its resemblance with tadpole consisting of head and tail. Volume of phage is about 1/1000 of the host.

Q. How vision differ from prions.

(MTN-G1)-17

(a) **Head**

Head is an elongated pyramidal (having two triangular structures with common base), hexagonal, prism-shaped structure, to which straight tail is attached. Within the head double stranded DNA molecule is present.

(b) **Tail**

Structure of phage tail is more complex than head.

- ★ A layer of distinct protein forms the **inner tube** or core.
- ★ Core is enclosed in **sheath** made up of another type of protein. On one side of sheath is collar and on other side is **end plate**. To end plate six **tail fibers** are attached, which are structures for attachment.

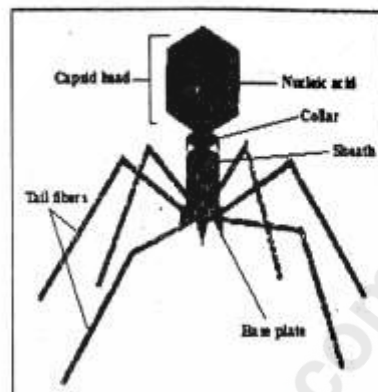


Fig: A Bacteriophage

LIFE CYCLE (REPLICATION)

The bacteriophage replicates only inside the bacterial cell. Different steps in its replication are described below.

(1) **Attachment (Adsorption)**

First step in replication of a bacteriophage is its attachment (adsorption) to host cell at receptor site on the cell wall of bacterium. During attachment, weak chemical union between virion and receptor site takes place.

(2) **Penetration**

During penetration, the tail sheath releases the enzyme **lysozyme** to dissolve a portion of a bacterial cell wall. The tail sheath contracts and tail core is forced into the cell through cell wall and cell membrane.

(3) **Injection**

After penetration, virus injects its DNA into the cell just as the syringe is used to inject the vaccine. The protein coat, which forms the phage head and tail structure of virus remains outside the cell. Many animal viruses, however enter the host cell as a whole.



Fig: A phage injecting its DNA in to host

(4) **Start of lytic or lysogenic cycle**

After injecting viral DNA, bacteria may undergo two different cycles.

(a) The phage which causes lysis of the host cell is known as **lytic or virulent phage**.

- ★ Immediately after entering the host cell, the viral nucleic acid takes the control of the host's biosynthetic machinery.
- ★ Induces the host cell to synthesize necessary viral components (DNA, proteins)
- ★ It starts multiplying.
- ★ About 25 minutes after initial infection, approximately 200 new bacteriophages are formed.
- ★ Bacterial cell bursts or lysis and newly formed phages are released to infect the bacteria and another cycle, the lytic cycle begins.

(b) **Lysogenic Cycle**

The phage that does not cause immediate lysis is known as **temperate (lysogenic) phage**. OR the phage which causes lysogeny is called temperate (lysogenic) phage.

- ★ Viral DNA, instead of taking over the control of host's machinery, becomes incorporated into the bacterial chromosome. Phage in this state is called **prophage** and this process is called **lysogeny**.
- ★ Bacterium continues to live and reproduce normally. Viral DNA being the part of bacterial chromosome passes to each daughter cell in all successive generations.
- ★ Sometimes, the viral DNA gets detached from the host's chromosome and lytic cycle starts. This process is known as **induction**. Lysogenic bacterial are resistant to infection by the same or related phages.

Q. Describe Life Cycle of a Bacteriophage. (BWP-GI-2014, 15, 16; LHR-GI-08,14; MTN-GI-13,15; SGD-GI-14; DGK-GII-15; AJK-GI-15; GUJ-GI-16; SWL-GI-13; RWP-14)

Q. Discuss the life cycle of phage inside bacterial cells. (LHR-GI-2015)

Q. Describe various steps of lytic cycle of phage virus (bacteriophage). (SWL-GI-2016)

Q. Describe the Lytic Life Cycle of Bacteriophage. (MTN-GI-2010, 11; GUJ-GI-2012)

Q. Describe lytic cycle of bacteriophage. Show your answer with diagram. (LHR-GI-2012)

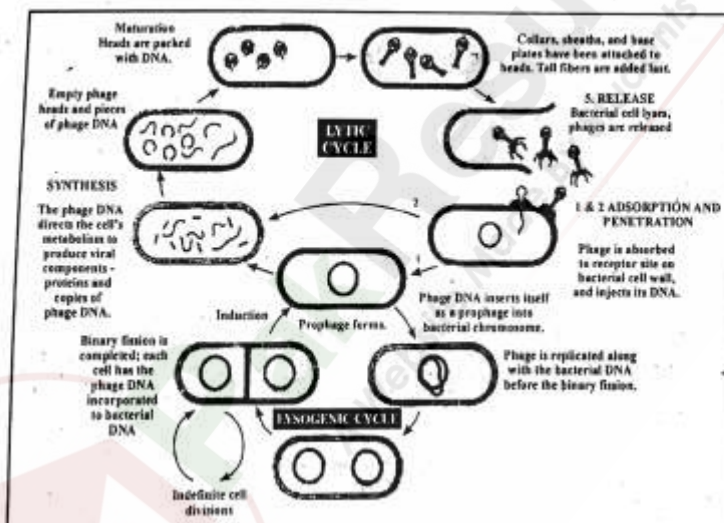


Fig. Replication of a bacteriophage. After adsorption and penetration, the virus undergoes prophage formation (1) In the lysogenic cycle, phages can exist harmlessly as a prophage with in the host cell for long periods of time. Each time the bacterial chromosome is replicated, the prophage also is replicated, all daughter bacterial cell are "infected" with the prophage. Induction involves either a spontaneous or environmentally induced excision of the prophage from the bacterial chromosome. (2) A typical lytic cycle, involves synthesis and maturation of phage and new phages are released.

Q.6: **Discuss Classification of viruses?**

→ **Discuss important viral diseases in Pakistan.**

Ans. **CLASSIFICATION OF VIRUSES**

Base of Classification

Virus morphology and nucleic acid properties are most important for classifying plant, animal and bacterial viruses.

Types

- ★ **On base of genetic material**, viruses may be DNA or RNA virus, naked or enveloped virus or complex virus.
- ★ **On base of morphology** they are classified into rod shaped (Tobacco Mosaic Virus (T.M.V), spherical (Poliovirus) and tadpole like bacteriophage viruses etc.

Q. Discuss any two disease caused by viruses. (LHR, FBD-GI-2016)

Q. Give some viral diseases, which are common in Pakistan. (LHR-GII-16)

IMPORTANT VIRAL DISEASES

There are many diseases, which are caused by viruses. Some are described below.

SMALL POX

Introduction

Small pox, which is caused by **pox viruses** (the DNA enveloped virus) is an ancient disease that is known to have occurred as epidemic in China as early as twelfth century B.C. until early twentieth century, it was a common disease throughout the world.

Features of disease

In small pox, raised fluid-filled vesicles are formed on the body, which become pustules later on and form pitted scars, the **pocks**.

Control

Small pox is prevented by. In 1950's immunization and other control measures had largely decreased the danger, but it is still present in third world countries where many people are affected. In 1980, it was declared by World Health Organization that small pox has been eradicated from the world.

HERPES SIMPLEX

Introduction

Herpes virus (DNA virus) is responsible for this disease. It is naturally occurring disease of mankind.

Features of disease

In this disease, vascular lesions in the epithelial layers of ectodermal tissues are formed. Most commonly this disease occurs in the mouth, on the lips and at other skin sites.

INFLUENZA

Influenza viruses are enveloped RNA viruses. Influenza is widespread disease in man and occurs in epidemic forms.

MUMPS

Mumps virus belongs to group **paramyxoviruses**, which are large, enveloped RNA viruses. Mumps is highly contagious, widespread, but seldom fatal. About 60% of adults are immune to it.

MEASLES

Measles virus belongs to group **paramyxoviruses**, It is one of the commonest disease of the childhood and adult human population is equally susceptible the world over. This disease develops immunity in its victim.

POLIOMYELITIS

It is caused by poliovirus and is found all over the world. The polioviruses are the smallest know viruses and contain RNA in spherical capsid.

It occurs mostly in childhood. The age at which primary infection occurs varies with social and economic factors.

Q. What are small pox? (LHR-G1)-16

Q. What is herpes simplex.(AJK-G1)-14

Q. Write name of four human viral of diseases. (LHR-G1)-16, (GUJ-G1)-17



Fig: Some common human viral diseases

RETROVIRUSES

Introduction

These are RNA viruses, which are able to control of host cells in reverse.

RNA tumor viruses have been known for many years. These viruses are widely distributed in nature and are associated with tumor production in a number of animal species, such as fowl, rodent and cats.

Example

The most familiar retrovirus is the human immunodeficiency virus (HIV) which causes acquired immunodeficiency syndrome (AIDS)

Structure

The single stranded RNA tumor viruses and retroviruses (oncoviruses) are spherical in form, about 100nm in diameter and enveloped by host plasma membrane.

Host

A few retroviruses are nonspecific i.e. they can infect any cell but most of them can infect only in the case of AIDS virus, the host cell possesses a receptor that allows the viral adsorption and penetration of several types of leukocytes (WBC) and tissue cells.

Mechanism of infection

The retroviruses have a special enzyme called **reverse transcriptase**, which can convert a single-stranded RNA genome into double stranded viral DNA. This DNA infects host cell and enters into host genome as **provirus** that can be passed on to progeny cells. In this way some of retroviruses can convert normal cells into cancer cells.

ACQUIRED IMMUNO DEFICIENCY SYNDROME (AIDS)

Discovery of Disease

The AIDS was reported by some physicians in early 1980's in young males having one or more of complex symptoms such as severe pneumonia, a rare vascular cancer, sudden weight loss, swollen lymph nodes and general loss of immune functions. All these young patients were homosexuals. Soon after the disease was discovered in nonhomosexual patients who were given blood (blood transfusion) or blood products.

Q. What is reverse transcripts?
(RWP-G1)-15, (FBD-G1)-16, (LHR-G2)-17

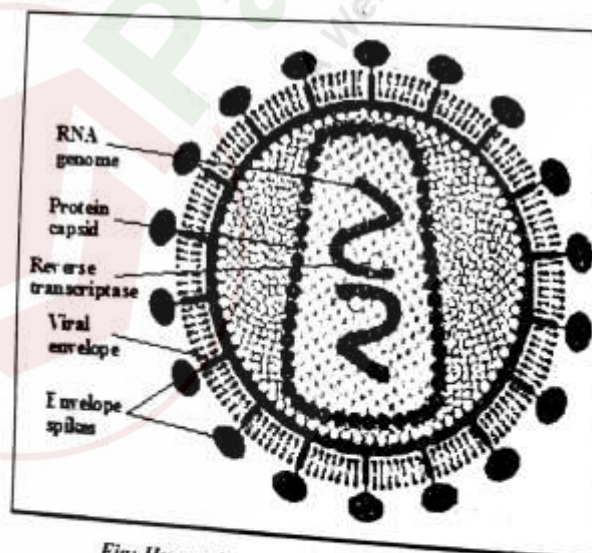


Fig: Human immunodeficiency virus (HIV)

Discovery of Virus

In 1984, the agent causing the disease was identified by research team from Pasteur Institute in France and National Institute of Health in USA. In 1986, the virus was named as human immunodeficiency virus (HIV).

Recent studies on HIV reveal that the virus infects and multiplies in monkey but does not cause disease in them, which means that HIV is host specific.

Mechanism of infection

- ★ The major cell infected by HIV is the helper T- lymphocyte, which is major component of immune system.
- ★ Due to continuous infection of HIV in host, decrease of helper T- lymphocytes result in failure of the immune system and the infected person is susceptible to other diseases.
- ★ Cells in central nervous system can also be infected by HIV.

Q. Draw and label infection cycle of HIV.

(GUJ-2014GI, 18GI: LHR-10)

Q. How HIV is transmitted?

(MTN-GI, II-2014: BWP-GI-15, 16)

Q. Give a sketch of infection cycle of HIV.

(GUJ-GII-2014: AJK, DGK-GI-16)

Q. What is AIDS? How is it transmitted?

(LHR-GII-2015)

Q. Give an account of AIDS.

(LHR-2006: DGK-GI-14GI, 16GI)

Q. How HIV is transmitted? Sketch its infections cycle.

(DGK-GI-2015)

Q. Explain about Retroviruses.

(SWL-GII-2014)

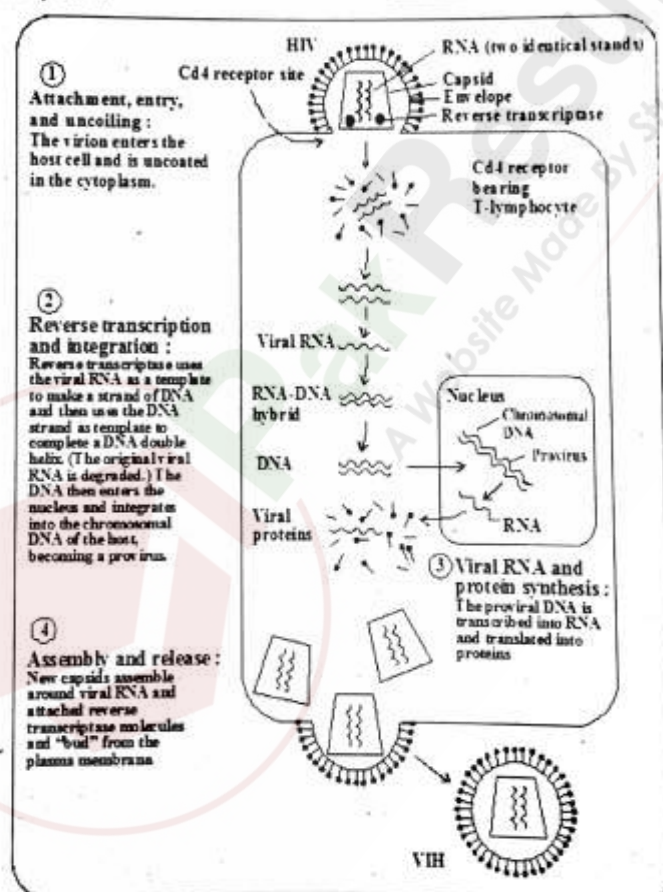


Fig: Infection cycle of HIV

Discovery of Virus

In 1984, the agent causing the disease was identified by research team from Pasteur Institute in France and National Institute of Health in USA. In 1986, the virus was named as human immunodeficiency virus (HIV).

Recent studies on HIV reveal that the virus infects and multiplies in monkey but does not cause disease in them, which means that HIV is host specific.

Mechanism of infection

- ★ The major cell infected by HIV is the helper T- lymphocyte, which is major component of immune system.
- ★ Due to continuous infection of HIV in host, decrease of helper T- lymphocytes result in failure of the immune system and the infected person is susceptible to other diseases.
- ★ Cells in central nervous system can also be infected by HIV.

Q. Draw and label infection cycle of HIV.

(GUJ-2014GI, 16GII: LHR-10)

Q. How HIV is transmitted?

(MTN-GI, II-2014: BWP-GI-15, 16)

Q. Give a sketch of infection cycle of HIV.

(GUJ-GII-2014: AJK, DGK-GI-16)

Q. What is AIDS? How is it transmitted?

(LHR-GII-2015)

Q. Give an account of AIDS.

(LHR-2006: DGK-GI-14GI, 16GII)

Q. How HIV is transmitted? Sketch its infections cycle.

(DGK-GI-2015)

Q. Explain about Retroviruses.

(SWL-GII-2014)

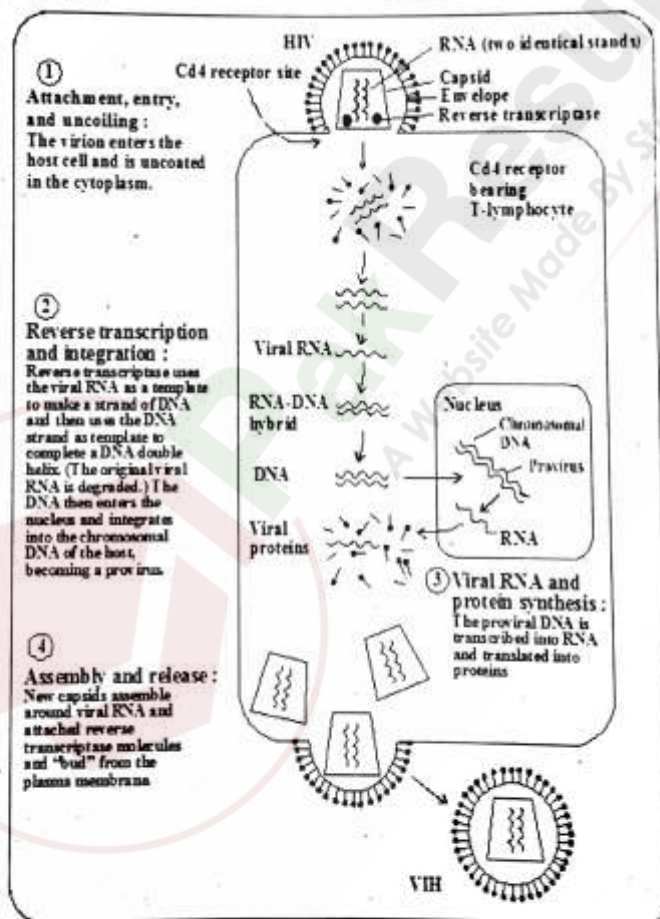


Fig: Infection cycle of HIV

Mode of Transmission

The HIV is transmitted by intimate sexual contact, contact with blood and breast-feeding. Healthcare workers can also acquire HIV during professional activity.

Control

- ★ Avoiding the direct contact with HIV is important measure for preventing the disease.
- ★ Prevention of intravenous drugs with common syringes and use of sterile needles/ syringes and is important.
- ★ Now vaccine against HIV has been synthesized and its experimental administration in humans started in early 2001 in South Africa.

HEPATITIS**Introduction**

Hepatitis is an inflammation of liver. It is usually caused by viral infection, toxic agents or drugs.

Features

It is characterized by jaundice, abdominal pain, liver enlargement, fatigue and sometime fever. It can be acute or can be chronic and can lead to liver cancer.

Type of Hepatitis

(1)	Hepatitis A	(2)	Hepatitis B	(3)	Hepatitis C	(4)	Hepatitis D
(5)	Hepatitis E	(6)	Hepatitis F	(7)	Hepatitis G		

(1) Hepatitis A

- ★ It was formerly called as **infectious hepatitis**.
- ★ Hepatitis A virus (HAV) is an RNA virus (non- enveloped), which causes mild, short term and less virulent disease.
- ★ It is transmitted by contact with faeces from infected individuals.

(2) Hepatitis B

- ★ It is known as serum hepatitis.
- ★ It is the second major form of hepatitis.
- ★ It is caused by DNA virus (HBV). This is very common in Asia, China, Philippines, Africa and the Middle East.
- ★ It is transmitted by the exchange of body fluids e.g. blood serum, breast milk and saliva, from mother to child during birth or afterward and by sexual contact.
- ★ During acute attacks of Hepatitis B fatigue, loss of appetite and jaundice are reported. Infected person can recover completely and become immune to the virus.
- ★ People with chronic infection are at risk of liver damage.

(3) Hepatitis C

- ★ It was formerly called as **non -A, non- B hepatitis**.
- ★ Hepatitis C virus (HCV) is RNA virus (enveloped) causes infection hepatitis, which is less severe than Hepatitis A and B but often leads to chronic liver disease.
- ★ It is transmitted through blood, from mother to child during pregnancy and by sexual contact.

(4) Hepatitis D

- ★ It is also called as **delta hepatitis**.

(5) Hepatitis E

- ★ HEV is transmitted through the faeces of an infected person.
- ★ Most recent work of Halbur and coworkers (2001) reveal that pig could be the source of infection hepatitis E.

Q. What is Hepatitis? Enlist the symptoms and discuss its different types in detail.

(SWL-G1)-15, (GUJ-G1)-14,
(GUJ-G2)-15

Q. Define Hepatitis Describe its causes and different types.

(FBD-G1)-2015

Q. Write a note on Hepatitis.

(MTN-G2)-14

(6) **Hepatitis F & G**

- ★ Their viruses are still unidentified.

Control of Hepatitis

Hepatitis can be controlled by adopting hygienic measures, with routine vaccination and screening of blood/ tissue/ organ of the donor.

Genetically engineered vaccine is available for HBV and also HAV but not for HCV.

VIRAL DISEASE AND CAUSATIVE AGENT

Viral Disease	Causative Agent
AIDS	HIV (Human Immunodeficiency Viruses)
Hepatitis B	HBV (Hepatitis B Virus)
Tobacco mosaic Disease	TMV (Tobacco mosaic Virus)
Hepatitis C	HCV (Hepatitis Virus)

