

Q. What are Viruses? Give an account of the structure of some important viruses.

Ans: The ~~virus~~ viruses are ultra microscopic organisms which were discovered from the first time by Russian scientist Ivanowski 1892. He studied the plants of Tobacco which were infected with T.M.V. The worker discover that juice of infected Tobacco leaves was capable of producing disease symptoms. Since then a number of plant and animal viruses have been brought to notice by a number of biologist. Some common plant and animal viruses include TMV, bacteriophage, influenza virus, Vaccinia virus, yellow mosaic virus, mosaic of papaya and others.

The word virus means poison. These organisms show both living and non-living properties. The chief properties of viruses are the followings -

- (i) **Simple structure** → The viruses are very simple in their organisms. They are composed of proteins and DNA or RNA.
- (ii) **No metabolism** → The viruses lack their own metabolism. They require the metabolic activities of host cells for their activities.
- (iii) **Parasite Nature** → These organisms behave as true parasite.
- (iv) **Crystallisation** → They can be made into crystals. Hence they behave as non-living organisms outside the host cells. They also multiply only inside the host cells.
- (v) **Pathogenic nature** → The viruses are pathogenic.

in nature. They caused dreaded diseases in both plants and animals.

Structure of viruses → They are several times of viruses of diverse shape and size. The structure of viruses can be studied under the following headings -

(a) structure of TMV

(b) structure of Bacteriophage.

(a) Structure of TMV →

(1) This was the first virus discovered by the Russian scientist Ivanowski 1892.

(2) This was made into crystals by Stanley 1935 from the infected juice of the Tobacco leaves.

(3) The ultra microscopic structure of TMV was made through X-ray crystallography by ~~William~~ Wilkins and Franklin 1953.

(4) The viruses is rod shaped with length of  $3000 \text{ \AA}$  and a diameter of  $170 \text{ \AA}$ .

(5) There is a protein coat consist of several monomers arranged helically manner.

(6) There is a protein coat and the RNA in the structure of viruses.

(7) There are 49 monomers in three turn of the helix.

(8) Total monomers in the protein coat is 2130.

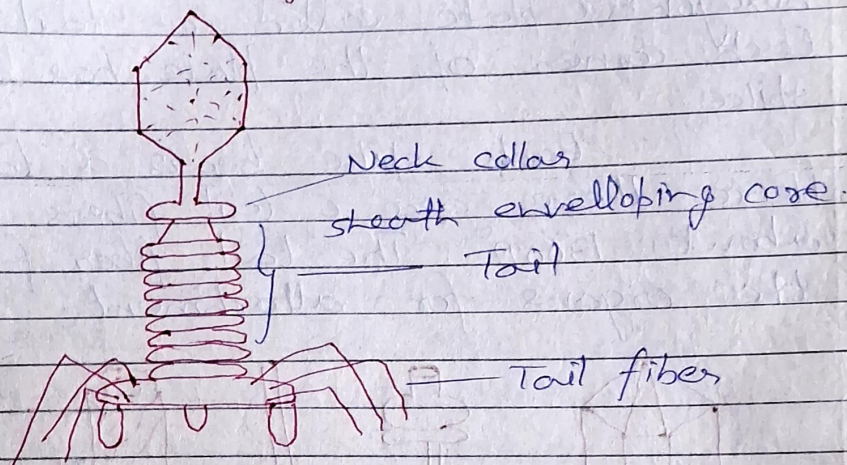
(9) Each monomers consists of 158 amino acids.

(10) The molecular weight of each monomers 17500 daltons.

(11) The helical coiling of the monomers

result in the formation of a cavity of  $20\text{\AA}$ .  
② The cavity contains highly coiled RNA of  $53\text{\AA}$  length.

③ Structure of Bacteriophage  $\rightarrow$



It is a virus of complex symmetry which uses the Bacterium *E. coli* as host. The virus shape appears like a tadpole. It shows the following features.

① Head

② Tail

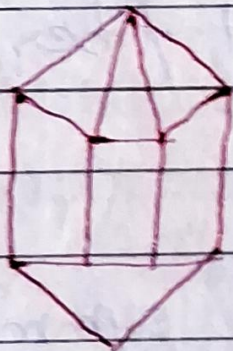
① Head  $\rightarrow$  The head is hexagonal in shape. It has a coat of protein which consists of monomers. There are about 2,000 monomers in the protein coat of Bacteriophage. The cavity of the head contains highly coiled DNA. It is circular in measure  $1\text{ }\mu\text{m}$  in length.

② Tail  $\rightarrow$  The lower, cylindrical portion of the virus is called as Tail. It is radially symmetrical. The tail has a covering of protein monomers called tail sheath. The monomers are arranged in 24 tiers.

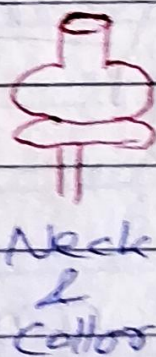
each trier has 6 monomers. Hence the tail sheath has 144 monomers.

The upper portion of the tail has a circular disc called collar. Similarly, the base of the tail has a hexagonal plate called as tail plate. Each corner of the plate has a pin or spike.

Each spike bears a tail fiber. Hence there are 6 tail fibers measuring about  $1300 \text{ \AA}$ . The tail fiber function as the organs for attachment.



Head



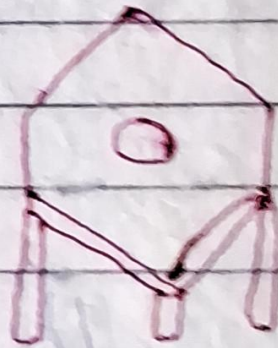
Neck  
&  
Collar



Core



Sheath



End plate  
with spike