CHAPTER 5 : ACELLULAR LIFE

REVIEW EXERCISE : SHORT QUESTION AND ANSWER

Q1. What are living and non-living characteristics of viruses ?

Ans. **Living Characteristics of Viruses:**

1. **Variety in Forms**: Viruses come in different shapes and types.
2. **Genetic Material**: They have either DNA or RNA, which can mutate.
3. **Reproduction:** Viruses reproduce by using the host cell's machinery.
4. **Infectivity:** They enter and infect living cells, causing diseases.
5. **Sensitivity to UV Light**: Viruses can be destroyed by ultraviolet rays.

Non-living Characteristics of Viruses

1. **Lack of Cellular Structure:** They do not have cell structures like cytoplasm or organelles.
2. **No Metabolism:** Viruses cannot produce energy or perform metabolic processes outside a host.
3. **Storage:** They can be crystallized and stored for long periods.
4. **No Respiration:** Viruses do not breath or respire.
5. **Inactive Outside a Host:** Viruses only become active when inside a host organism.

Q2. Give classification of viruses based on their host.

Ans. Viruses can infect specific types of hosts, and based on this, they can be divided into three main categories:

- Bacteriophages (Viruses that infect Bacteria)
- Plant Viruses
- Animal Viruses

→ **Bacteriophages** are viruses that specifically infect bacterial cells. They play a significant role in controlling bacterial populations in various environments.

→ **Plant viruses** infect plant cells and are responsible for a variety of diseases in crops, causing significant agricultural damage. There are over 2,000 known types of plant viruses.

→ **Animal viruses** infect animal cells, including those of humans and other mammals, often causing diseases. These viruses can attack different tissues and organs in the body

Q3. What are the parasitic natures of virus ?

Ans. Viruses exhibit a parasitic nature as they depend entirely on a host cell for survival and reproduction. They lack the machinery needed for independent metabolic activities, so they invade host cells and hijack their resources to produce new virus particles. This often harms or destroys the host cell. Viruses attach to specific host cells, insert their genetic material, and reprogram the host's cellular processes to make copies of themselves, spreading the infection to neighboring cells.

→ OR WE CAN ALSO SAY

All viruses are obligate parasites; that is, they lack metabolic machinery of their own to generate energy or to synthesize proteins, so they depend on host cells to carry out these vital functions.

Q4. Justify why a virus must have a host cell to parasitize in order to complete its life cycle ?

Ans. Viruses lack the cellular machinery needed for metabolism and reproduction, which is why they require a host cell to complete their life cycle. They rely on the host's cellular structures to replicate their genetic material and produce viral proteins. By hijacking the host's processes, viruses can assemble new virus particles and propagate themselves. Without a host, viruses cannot reproduce or sustain their existence.

surveillance is limited. Some viruses can also alter the host's immune responses or interfere with signaling pathways to avoid detection. This all is done Via cytotoxic cells.

Q6. Determine a method a virus employs to survive / pass over unfavorable conditions when it does not have a host to complete its life cycle ?

Ans. Viruses can survive under unfavorable conditions by forming protective structures known as viral capsids or, in some cases, envelopes. These structures shield the viral genetic material from environmental stresses, such as temperature fluctuations and desiccation. Some viruses can also enter or inactive state, allowing them to endure harsh conditions until a suitable host becomes available for infection.

Q7. Reason out the specificity of HIV on its host cell ?

Ans. The HIV virus only attack a specific host cell that is CD4 T cells because the cells carries on its surface a special protein called CD4 and HIV recognize it's host through that protein. Its spikes are only capable of attaching to particular cell. The spikes on surface of the virus particle stick to the CD4 and allows the viral envelope to fuse with the cell membrane.

Q9. Explain opportunistic disease that may attack an AIDS victim ?

Ans. HIV does not directly cause any specific disease. Instead, it weakens the immune system by destroying T-cells, which are crucial for immune defense. When someone has AIDS, their weakened immune system makes them vulnerable to various opportunistic diseases. Common examples include:

1) Skin cancer 2) Fungal infections 3) Viral infections 4) Digestive system diseases 5) Respiratory diseases 6)Nervous system 7) eye diseases

Q10. What are common control measures against transmission of HIV

Ans. Here are some key measures to prevent the spread of HIV:

1. Never use or share used syringes or needles.
2. Ensure blood is tested for HIV before any transfusion.
3. Avoid sharing toothbrushes, blades, and towels.
4. Barber shops and beauty salons should use properly sterilized tools.
5. Since HIV is mainly spread through sexual contact, practicing safe and responsible behaviors is essential.
6. HIV-positive mothers should avoid breastfeeding their babies.

Q11. What do you mean by AIDS, HIV, ART, CLCuD and TMV ?

Ans.

→ **HIV (Human Immunodeficiency Virus)** is a virus that attacks the immune system, specifically CD4+ T cells, leading to immunodeficiency.
→ **AIDS (Acquired Immunodeficiency Syndrome)** is the advanced stage of HIV infection, characterized by severe immune system damage and opportunistic infections.
→ **ART (Antiretroviral Therapy)** is a treatment regimen that helps manage HIV infection and prolongs life by suppressing the virus.
→ **CLCuD (Cucumber Leaf Curl Disease)** affecting cucumber plants, highlighting the diverse impact of viruses across different organisms. It is a plat disease.
→ **TMV (Tobacco Mosaic Virus)** are examples of plant viruses, with TMV causing a mosaic pattern on tobacco leaves. It is a plant disease.

Q12. Describe the structure of viroid and name the diseases caused by them ?

Ans.

5.8.2 Viroids

Viroids are pathogens that consist of a short, circular, single-stranded RNA without a protein coat or envelope. Viroid RNA does not code for any protein. The replication mechanism involves an enzyme RNA polymerase II, which synthesizes new RNA using the viroid's RNA as template. Some viroids are ribozymes, having catalytic properties which allow self-cleavage. The only human disease known to be caused by a viroid is **hepatitis D**. Viroids cause several plant diseases, e.g., **potato spindle tuber disease, cucumber pale fruit disease**, etc. Viroids spread via mechanical damage, seed, pollen, or biological vectors.

Q13. Describe the structure of prions and name the diseases caused by them ?

Ans.

5.8.1 Prions

Prions are infectious protein particles, smaller than viruses, that contain no nucleic acids (neither DNA nor RNA). Prions are much **more resistant** to inactivation by ultraviolet light and heat than are viruses. Prions are composed of a single protein. This protein is encoded by a **single cellular gene**. Prion proteins on brain cells cause clumping, memory loss, neurodegeneration and permanent damage.

Fatal neurodegenerative diseases, such as **Kuru** in humans and in cattle **mad cow disease** were shown to be transmitted by prions. Prions spread through body fluids, direct and indirect contact. There is no treatment or cure of prion diseases.