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**RAJARATA UNIVERSITY OF SRI LANKA  
FACULTY OF APPLIED SCIENCES**

**Bachelor of Science Honours in Microbiology  
Third Year – Semester I Examination – July/ August 2023**

**MIB3203 – VIROLOGY**

**Index no.: .....**

**Time: Two (02) hours**

**Answer ALL questions.**

**1. Underline the most appropriate response for the each of following parts (a to r). (100 marks)**

a) Name the scientist who showed that the disease agent of tobacco mosaic disease is filterable.

- i. Pasteur
- ii. Mayer
- iii. Iwanowsky
- iv. Beijerinck
- v. d'Herelle

b) Viruses survive outside their host cells always as

- i. naked viruses.
- ii. enveloped viruses.
- iii. prophages.
- iv. virions.
- v. virusoids.

c) What is the group of viruses that represents the largest known viruses?

- i. Poxviruses
- ii. Mimivirus
- iii. Megaviruses
- iv. Coronaviruses
- v. Pandoravirus

d) An infectious ssRNA molecule that requires a helper virus for transmission is called a

- i. prophage.
- ii. virusoid.
- iii. virion.
- iv. prion.
- v. viroid.

e) Mad cow disease is caused by

- i. prophages.
- ii. virusoids.
- iii. virions.
- iv. prions.
- v. viroids.

- f) Select the **incorrect** response regarding the RNA molecule of viroids from the following.
- They are single stranded.
  - They do not code for capsid proteins.
  - They are protected by protein coats of other viruses.
  - They are highly folded structures.
  - They cause diseases only in plants.
- g) Select the correct statement regarding lysogens.
- Corynebacterium diphtheriae* produces diphtheria toxin only when it is lysogenized by the  $\beta$  phage.
  - Lysogens cannot switch to the lytic cycle in viral replication.
  - Bacterial cells do not acquire super infection immunity when they are lysogenized.
  - Lysogenized bacteria do not undergo binary fission.
  - Bacteria are killed once they are lysogenized.
- h) Select the correct statement regarding human-virus interactions.
- Viruses are not part of the normal microbiota of the human body.
  - Bacteriophages are used to break biofilm formation.
  - GB virus C speeds up the progression of AIDS in people with HIV.
  - Oncolytic viruses kill both cancer cells and healthy cells.
  - The FDA issued its first gene therapy approval in 1990.
- j) The correct order of events in the life cycle of animal viruses is
- attachment, penetration, un-coating, replication, assembly, maturation, release.
  - attachment, un-coating, penetration, replication, assembly, maturation, release.
  - attachment, un-coating, penetration, maturation, replication, assembly, release.
  - attachment, penetration, un-coating, replication, maturation, assembly, release.
  - attachment, penetration, un-coating, replication, assembly, release, maturation.
- k) The type of viral genome that translates directly to proteins by ribosomes is
- double-stranded DNA viruses.
  - single-stranded DNA viruses.
  - double-stranded RNA viruses.
  - positive-sense RNA viruses.
  - negative-sense RNA viruses.
- l) Which of the following is true regarding the "Baltimore classification" of viruses?
- Positive sense ssRNA viruses directly use their RNA for the translation step.
  - Mutations during replication are minimal in negative sense ssRNA viruses.
  - Synthesis of mRNA from dsDNA viruses mostly occurs in the host cytoplasm.
  - Hepatitis B virus does not have a RNA intermediate for DNA replication.
  - ds RNA viruses have non-segmented genomes.
- m) Which of the following statement is true regarding HIV?
- Its nuclear material is DNA.
  - It is a non-enveloped virus.
  - It has reverse transcriptase enzyme.
  - Primary target cell is CD8<sup>+</sup> lymphocytes.
  - env* region of the viral genome codes for viral enzyme complex.

- n) Which of the following statements is true regarding the life cycle and transmission of HIV?
- i. The pro-viral state does not confer permanent infection to the host.
  - ii. The number of virion particles produced during the asymptomatic phase of infection is low.
  - iii. Typical progressor usually progresses into AIDS in less than three years.
  - iv. Seroconversion for HIV occurs following the primary infection.
  - v. The breast milk of a HIV positive mother does not carry a risk of transmission to the baby.
- o) Which of the following statements is true regarding the diagnosis of HIV infection?
- i. Reactive ELISA assay is used to confirm the HIV infection.
  - ii. The window period of 4<sup>th</sup> generation ELISA assay is more than the previous generations.
  - iii. Western blot is considered as a confirmatory test for HIV.
  - iv. Determination of viral copy number is not used to guide the efficacy of the treatment.
  - v. Particle agglutination assay is superior to ELISA in diagnosis of HIV infection.
- p) Prion molecules are propagated by
- i. spontaneous misfolding of existing protein molecules.
  - ii. replication of existing prions.
  - iii. misfolding of existing protein molecules by existing prions.
  - iv. expression of mutated DNA.
  - v. interaction of existing protein molecules with DNA.
- q) Select the **incorrect statement** on the ecological services of bacteriophages.
- i. Bacteriophages help maintain the balance of bacterial populations in natural microbial communities.
  - ii. Bacteriophages lyse bacterial cells, facilitating nutrient cycling.
  - iii. Bacteriophages increase genetic diversity of bacteria.
  - iv. Bacteriophages facilitate horizontal gene transfer from bacteria to plants.
  - v. Bacteriophages are important as biocontrol agents of plant and animal diseases as they can reduce pathogenic bacterial populations.
- r) Enveloped viruses
- i. may escape the immune system of the host more easily than a naked virus.
  - ii. may have spikes projecting from the membrane.
  - iii. always have host proteins in the membrane.
  - iv. are recognized by the immune system of the host by the antigens on the membrane.
  - v. are more virulent than non-enveloped viruses, because enveloped viruses exit by lysis.

2. Answer all parts (a – g) in the space provided.

(100 marks)

- a) What are the characteristic features of viruses that distinguish them from bacteria, but shared with rickettsias and chlamydias?

(15 marks)

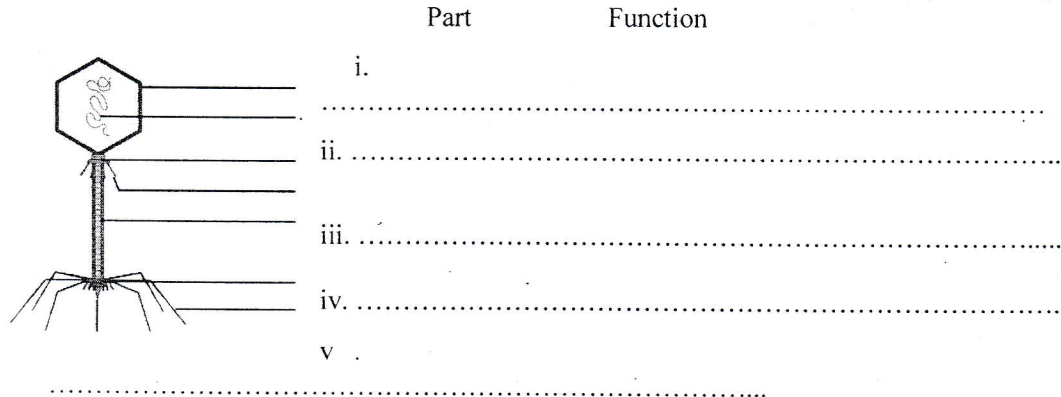
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- b) Identify the parts (i to v) of the following diagram of a T4 phage and state their respective function.

(25 marks)



- c) Retrotransposons resemble the genomes of retroviruses. How do they differ from viruses?

(10 marks)

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- d) Name a bacteriophage that contains ssDNA in its capsid.

(05 marks)

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- e) List the events that take place after a retrovirus becomes uncoated in an animal cell to release of new virions.

(15 marks)

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Part	Function
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f) Name **five (05)** emerging viral infections.

(15 marks)

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g) List **three (03)** biotechnological applications of viruses.

(15 marks)

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3. Explain how an emerging viral infection becomes a public health threat. Write your answer based on your experiences and knowledge on the COVID-19 pandemic. (100 marks)

4. Discuss the importance of aligning of molecular events in successful completion of the lytic cycle of a bacteriophage, using the case of Lambda as an example. (100 marks)

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