SECTION A (ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS)

QUESTION ONE

a) Describe the replication cycle of either Tobacco mosaic virus (TMV) or Cauliflower mosaic virus (CaMV). Indicate clearly the stages during which the different protein products are produced. State the function of each protein product.

b) Explain with the aid of diagrams how the virus you choose in (a) moves from the initial sites of replication to the plasmodesmata and then between adjacent plant cells.

QUESTION TWO

Describe how you would use the following tests to confirm the presence of Tomato spotted wilt virus (TSWV) in a diseased sample of tomato (Lycopersicon esculentum Mill.) plants.

a) Polymerase chain reaction (PCR)

b) Serologically specific Electron Microscopy (ISEM)

c) Electron microscopy
QUESTION THREE

a) Describe how you would purify one plant virus from a mixed infection with two different viruses. (5)

b) Describe the important features of:
   i) Non-persistent virus transmission (5)
   ii) Persistent virus transmission

c) Name a plant-infecting virus belonging to each of the following families: Geminiviridae, Rhabdoviridae, Bromoviridae, Potyviridae and Bunyaviridae. For each virus you name, state the following properties:
   i) Nucleic acid and polarity
   ii) Vector
   iii) Genome organization (10)

QUESTION FOUR

With the aid of well labelled diagrams, explain how plant viruses make proteins using the following strategies:

i) Ambisense

ii) Sub-genomic RNAs

iii) Multipartite genome

iv) Read-through (20)
SECTION B (ANSWER QUESTION ONE AND ANY OTHER QUESTION)

QUESTION ONE

Crop adaptation can be improved by breeding for host plant resistance using marker-assisted selection. In the process, plant breeders use specific DNA marker alleles as diagnostic tools to identify plants carrying the resistant genes.

Using an example(s), discuss the advantages and disadvantages of marker-assisted breeding compared to classical approaches in improving crop resistance to diseases. (20)

QUESTION TWO

a) Discuss the importance of Bt crops and those plants which have the trait of herbicide resistance/tolerance in present day agriculture. (12)

b) Discuss the strategies that are used to properly manage Bt crops in order to avoid selecting for Bt resistant insects. (3)

c) Briefly describe the production of vaccines in plants using transient gene expression. (5)

QUESTION THREE

a) Discuss the factors that are considered in the molecular characterisation of plants derived from modern biotechnology. (15)

b) Explain why it is necessary to molecularly characterize plants developed using recombinant DNA technology. (5)