SECTION A

QUESTION ONE

a) Name a plant infecting virus belonging to each of the following families:
   Geminiviridae, Bunyaviridae, Potyviridae, Comoviridae and Closteroviridae.
   For each virus you name, state the following properties:

   i) Nucleic acid and polarity
   ii) Genome organization
   iii) Transmission vector
   (10)

b) Describe how you would separate two viruses in a mixed infection
   (5)

c) Explain how you would use the knowledge of the mode of transmission of a virus in deciding to use chemicals to control the vector responsible for transmitting it.
   (5)

QUESTION TWO

Assume you are a plant virologist working in a well-equipped laboratory. A farmer brings to your laboratory a plant suspected to be infected with Tomato spotted wilt virus (TSWV). Describe in detail how you would use the following tests to confirm the presence/absence of the virus in the sample:

   a) Polymerase chain reaction (PCR)          (10)
   b) Double antibody sandwich ELISA (DAS-ELISA)  (10)
QUESTION THREE

Describe in detail the different strategies that can be used to manage/control diseases caused by viruses in plants. (20)

QUESTION FOUR

a) Describe in detail all the procedures you would follow to set up a cross-protection programme in a citrus orchard infected with Citrus tristeza virus (CTV). (10)

b) Describe the proposed mechanism of how cross-protection works, i.e. how does the cross-protected plant become resistant to infection by the challenging virus strain. (10)

SECTION B

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) Describe how you would clone a gene using a plasmid vector. All procedures including confirmation of whether the cloning was successful must be clearly explained. (10)

b) Describe the processes involved in developing a transgenic tomato plant with resistance to Potato virus Y (PVY). (10)
QUESTION THREE

Using concrete examples, discuss how the agriculture industry can benefit/is benefitting from modern day biotechnology.  (20)