QUESTION ONE – must be answered by all students!!

A local potato farmer who has little knowledge on diseases of cabbages approached you as a consulting Plant Pathologist to investigate his cabbage crop. You discovered upon investigation that the crop is infected with black rot disease of cabbage. As a consulting Plant Pathologist, write a report including the following information:

Name and Taxonomy (Kingdom, Division, Class, Genus and species) of the organism (2)
Isolation techniques and identification characteristics (6)
Symptoms of the disease (9)
Disease cycle and infection process (9)
How the disease is spread (5)
Host range and Overwintering strategies (4)
Control options/disease management practices (9)

[45]

QUESTION TWO

(a) Define the term “Epidemiology”. (1)

(b) Discuss and show graphically the difference between an epidemic and an endemic disease. Epidemic diseases fall into two (2) main classes. Define these classes, given an example of each. (12)

(c) Explain Vanderplank’s correction factor and when would you use it? (4)
(d) A third year Plant Pathology student from University of KwaZulu-Natal monitoring powdery mildew on baby marrows in 2004 collected the following data:

<table>
<thead>
<tr>
<th>Date</th>
<th>% Leaf Area Infected</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1</td>
<td>0.005</td>
</tr>
<tr>
<td>July 8</td>
<td>0.07</td>
</tr>
<tr>
<td>July 15</td>
<td>4.5</td>
</tr>
<tr>
<td>July 22</td>
<td>32.0</td>
</tr>
<tr>
<td>July 29</td>
<td>75.0</td>
</tr>
</tbody>
</table>

The latent period is 7 days and there is an infection period of 7 days. Calculate the Logistic, Basic and Corrected Basic Infection rates for the overall epidemic. (12)

(e) List and show in a graphical form the three stages of an epidemic. (4)

(f) Discuss the differences between the Logarithmic, Logistic, Basic infection and the Corrected Basic infection equations. (12)

QUESTION THREE

(a) Define the following term. Include diagrams where appropriate.
   (i) Vertical Resistance (3)
   (ii) Horizontal Resistance (4)
   (iii) Boom and bust cycle of cultivar production (4)
   (iv) Stabilizing selection pressure (3)
   (v) Directional selection pressure (3)
   (vi) Allo- and Auto-infections (6)

(b) Discuss and show graphically the differences between an epidemic and an endemic disease. Epidemic diseases fall into two (2) main classes. Define these classes given examples of each. (12)

(c) (d) If rust on geraniums is at 0.5% leaf area infected on 1st April, and 35% on the 30th April, what is the rate of disease progress? (5)

(d) What is a compound interest disease and what is the equation used for calculating Compound Interest disease progress? Give an example of a Compound Interest disease. (5)
QUESTION FOUR

(a) What are the useful aspects of the Logistic transformation, and what are its limitations? (6)

(b) Describe how one would breed for VR and HR. (14)

(c) Discuss the advantages and disadvantages of VR and HR. (16)

(e) What is Vertifolia effect? Discuss the underlying genetics in terms of selection pressure and genetic load. Why is it a problem with VR but not with HR breeding programmes? (9)

QUESTION FIVE

(a) The continued adaptations in terms of Vertical Resistance in the host and Vertical Virulence in the pathogen have been likened to a “military arms race”. Discuss this analogy in terms of the mechanisms for normal vertical resistance, the options available to the pathogen to overcome this resistance, and how the host plant can respond to the changes in the pathogen to re-establish resistance. Diagrams can be used to illustrate your answer. (30)

(b) Describe how one would breed for horizontal resistance. What are the advantages and disadvantages of this form of resistance? (15)