**Year 12 ATAR Biology**

Unit 4: Modelling disease outbreak.

Assessment type: Investigation (Total marks 30)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Models are tools used by epidemiologists to predict the impact of different factors (variables) on the spread and outcome of a disease epidemic. The disease lab simulator can be used to modify various disease characteristics.

Explore the interactive referring to the information given about the different scenarios, factors that can be changed and the data that can be obtained.

<http://www.learner.org/courses/envsci/interactives/disease/disease_help.php>

**You should plan and conduct an investigation using this interactive to determine the effect of changing two factors on the spread and outcomes of two different disease epidemics.**

Time allowed:

* 2 lessons to plan and collect data.
* Homework to complete questions 1-4.
* 50 minutes validation test on Graphing results, Discussion and Conclusions and the effectiveness of computer modelling to simulate disease outbreaks (16 marks)

**Part 1: Planning and conducting (14 marks)**

1. Aim of the investigation. (1 mark)

Outline the aim of their investigation saying for 2 diseases, using an interactive model, spread and outcomes

1. Hypotheses. (2 marks)

Two hypothesis referring to the dependent and independent variables, one for each of the two diseases, must name each disease (1 each)

1. Identify the dependent, independent and controlled variables for each scenario. (5 marks)

1 mark for each column, except controlled variables (2), must match the above hypotheses

(1) (1) (1) (2)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Dependent | independent | Controlled variables |
| Scenario 1  Disease name | Correctly identifies the dependent variables-  Deaths or Number of contagious or immune or at risk | Correctly identifies the independent variables-  Pop density or pop mixing or vaccination rate (must give level) | Identifies at least two control variables- settings kept the same for each trial  Levels must be stated or 0 (1) |
| Scenario 2  Disease name | Correctly identifies the dependent variables  Deaths or Number of contagious or immune or at risk | Correctly identifies the independent variables- Pop density or pop mixing or vaccination rate (must give level) | Identifies at least two control variables- settings kept the same for each trial  Levels must be stated or 0 (1) |

1. Collect, record and record data in appropriate tables demonstrating **necessary calculations.**

(6 marks)

* Titles on tables- Dep/ Indep/ Disease name, spelling correct (1)
* Columns labelled neatly with title and units and lines across (2)
* Data recorded neatly (1)
* Calculations such as Death %, sick days per capita, averages (2)

**Part 2: Validation Test (50 minutes in class, under test conditions) 16 marks**

1. Represent your data in the form of a graph/s. (6 marks)

Depending on the investigation planned students may produce two graphs or four graphs to represent the data.

* Title relating dependent and independent variables (2)
* Axes labels and units (2)
* Points plotted correctly with straight lines(1)
* Key for sets of data plotted on the same graph (1)

1. Describe the results of the two simulations and your **conclusions** (6 marks)

Scenario 1 Scenario 2

* Describe trend (1) Describe Trend (1)
* Quote two data points (1) Quote two data points (1)
* Conclusions relate to hypothesis(1) Conclusions relate to hypothesis(1)

1. Outline two benefits of using modelling to predict the outcome of epidemics. (2 marks)

Any 2 of the following

* Characteristics of a disease are well known therefore these can be pre-set depending upon a scenario to predict the outcome of a disease
* Don’t need to use real data so preventing deaths occurring
* Allows epidemiologists to put control measures in place such as vaccination programs

1. Describe two limitations of using computer simulation models in this way.

Any 2 of the following (2 marks)

* Cannot set population size
* Doesn’t account for susceptibility of particular age groups/sections of society
* Environmental factors such as humidity, temperature (climate not adequate)
* Only 3 settings for high, medium, low mixing
* Doesn’t account for natural immunity of the population at the onset of the outbreak.