## Stage 1 Biology: Investigation Folio Task

Topic 2: Infectious Diseases

**Science as a Human Endeavour Task**

**Introduction and Purpose of task:**

Infectious diseases worldwide are still the leading cause of death of children and adolescents, and one of the leading causes in adults. Recent outbreaks and epidemics of infectious diseases, like bird flu, Ebola or SARS demonstrate the need for effective disease control processes. Most of those who contract infectious diseases are from developing countries where access to the latest treatments or to medicines that prevent infection is limited, often due to cost and availability or cultural issues.

In this task you will have the opportunity to investigate the economic, ethical and social implications of the spread and control of disease and the role of science and scientists. You will use this information to recommend a disease control strategy to a fictitious town in Australia, which has been infected with a potentially destructive infectious disease outbreak.

You will use and acknowledge a variety of relevant sources to find data and information to support your suggested disease control strategy.

You may choose to present your research findings in any suitable format. Your research and report should have a focus on at least one of the following key concepts of Science as a Human Endeavour:

**Influence**

* The acceptance and use of scientific knowledge can be influenced by social, economic, cultural, and ethical considerations.

**Application and Limitation**

* Scientific knowledge, understanding, and inquiry can enable scientists to develop solutions, make discoveries, design action for sustainability, evaluate economic, social, and environmental impacts, offer valid explanations, and make reliable predictions.
* The use of scientific knowledge may have beneficial or unexpected consequences; this requires monitoring, assessment, and evaluation of risk, and provides opportunities for innovation.

**Part A: Read the Scenario**

A "mysterious" disease began silently spreading in a small town in Victoria on 26 December 2015. It was later identified as an outbreak of Disease X.

The first patients who contracted Disease X developed an illness characterized by fever, black stools, and vomiting. All of these patients succumbed to the disease. The exact source of these infections has not been identified but likely involved one of the patients having had contact with wild animals when they visited Africa. The other victims contracted the disease through contact with this patient.

By the second week of January 2016, several members of the immediate families had developed a similar illness followed by rapid death. A number of health staff, including doctors and nurses, also succumbed to the same illness.

People in surrounding towns, where also starting to show these same signs of illness. Not all patients died, but the mortality rate was high.

The first symptoms where similar to those of the disease, cholera. Microscopic examination of patient samples showed bacteria, again supporting the conclusion that the unknown disease was likely cholera. However, treatments for cholera were not overly successful.

In a matter of weeks, the disease was carried into a larger neighbouring town, by an infected individual. This patient was treated in a hospital where, as doctors did not yet suspect Disease X, no measures were taken to protect staff and other patients. The number of individuals being infected by the disease was steadily increasing. An epidemic was underway.

The Department of Health, has written to you, as an expert in disease control to investigate the outbreak and develop a Disease Control Strategy to prevent further infections, with the suspected disease agent, Disease X.

You quickly had a number of patient samples sent to the Institute Pasteur in Lyon, France, a World Health Organisation collaborating centre, and confirmed that the causative agent of the outbreak was Disease X, a virus closely related to the Ebola family. Disease X, although different to Ebola, has the same biology.

**Part A: Information Search**

Use the internet and other sources of information to do an initial search related to how humans affect the control and spread of disease. Consider the economic, ethical, environmental and social implications of disease control. Investigate the biology of Ebola and recent work that scientists are undertaking to control its spread.

Search for articles, data or other information that you could use to support your strategy for the control of Disease X. Record the resources in a reference list use Harvard Referencing, for future reference.

**Part B: Plan the Strategy:**

Search for any further information that will enable you to provide a comprehensive and detailed report, with highly relevant biology that links to the chosen SHE key concept.

Record the resources in a reference list use Harvard Referencing.

Part A and B are not included in the word count.

**Part C: Report**

Use the information gathered to report on your strategy to effectively control the disease outbreak.

Your report *could* include information related to:

* Reference to the similarity Disease X has with Ebola, consider what scientists know about the nature of the infectious disease and the conditions of the outbreak
* The possible methods that can be used to control the spread of the disease, consider the limitations or unexpected consequences of these methods
* Society’s possible acceptance or rejection of the strategy for the spread and control of infectious diseases
* Economic, ethical or social barriers to the research and use of treatments and preventive medicines, vaccines, medical specialists and other professionals

Your report *must* include:

* An introduction, which links the strategy to the SHE key concept(s) chosen
* Relevant biology concepts and background information
* A detailed strategy, to control the disease outbreak, with reasoning and evidence for how it would work in this scenario and showing the interaction between science and society
* A conclusion. You must include how the SHE focus has been addressed.
* In text referencing and Reference list using Harvard Referencing

**Assessment Conditions:**

3 weeks to complete. Class time provided for research and support.

Students may submit one draft for feedback. This does not include the checkpoints and plan.

Word Count: maximum of 1000 words for Part C or 6 minutes for an oral presentation.

**Assessment Design Criteria**

Knowledge and Application: KA1, 3, 4

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|  | Investigation, Analysis and Evaluation | Knowledge and Application |
| A | Critically deconstructs a problem and designs a logical and coherent biological investigation with detailed justification.  Obtains, records, and represents data, using appropriate conventions and formats accurately and highly effectively.  Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.  Critically and logically evaluates procedures and their effect on data. | Demonstrates deep and broad knowledge and understanding of a range of biological concepts.  Applies biological concepts highly effectively in new and familiar contexts.  Critically explores and understands in depth the interaction between science and society.  Communicates knowledge and understanding of biology coherently, with highly effective use of appropriate terms, conventions, and representations. |
| B | Logically deconstructs a problem and designs a well-considered and clear biological investigation with reasonable justification.  Obtains, records, and represents data, using appropriate conventions and formats mostly accurately and effectively.  Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.  Logically evaluates procedures and their effect on data. | Demonstrates some depth and breadth of knowledge and understanding of a range of biological concepts.  Applies biological concepts mostly effectively in new and familiar contexts.  Logically explores and understands in some depth the interaction between science and society.  Communicates knowledge and understanding of biology mostly coherently, with effective use of appropriate terms, conventions, and representations. |
| C | Deconstructs a problem and designs a considered and generally clear biological investigation with some justification.  Obtains, records, and represents data, using generally appropriate conventions and formats, with some errors but generally accurately and effectively.  Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.  Evaluates procedures and some of their effect on data. | Demonstrates knowledge and understanding of a general range of biological concepts.  Applies biological concepts generally effectively in new or familiar contexts.  Explores and understands aspects of the interaction between science and society.  Communicates knowledge and understanding of biology generally effectively, using some appropriate terms, conventions, and representations. |
| D | Prepares a basic deconstruction of a problem and an outline of a biological investigation.  Obtains, records, and represents data, using conventions and formats inconsistently, with occasional accuracy and effectiveness.  Describes data and undertakes some basic interpretation to formulate a basic conclusion.  Attempts to evaluate procedures or suggest an effect on data. | Demonstrates some basic knowledge and partial understanding of biological concepts.  Applies some biological concepts in familiar contexts.  Partially explores and recognises aspects of the interaction between science and society.  Communicates basic biological information, using some appropriate terms, conventions, and/or representations. |
| E | Attempts a simple deconstruction of a problem and a procedure for a biological investigation.  Attempts to record and represent some data, with limited accuracy or effectiveness.  Attempts to describe results and/or interpret data to formulate a basic conclusion.  Acknowledges that procedures affect data. | Demonstrates limited recognition and awareness of biological concepts.  Attempts to apply biological concepts in familiar contexts.  Attempts to explore and identify an aspect of the interaction between science and society.  Attempts to communicate information about biology. |