## Stage 1 Biology: Investigation Folio Task

## Topic 3: Multicellular Organisms

## Deconstruct and Design Task: Effect of exercise on heart rate

**Introduction and Purpose of Task:**

Exercise is needed for a healthy lifestyle. Other factors like nutrition and minimising environmental factors are also essential for humans to maintain their health.

Exercise, in all of its forms, may have various effects on the different systems of the human body. The heart, an organ made up of muscle in the human body, benefits from exercise. In addition, it can be detrimental to heart function if exercise is not undertaken.

In Part A of this task, students individually design a method to investigate how exercise affects heart rate, or any other factor/measurable physiological event. The design may not be performed. The teacher will decide on the method which will be used for Part B.

In Part C, students individually report on their investigation and then individually explore and deconstruct the question “Does what a person is wearing during exercise affect their heart rate?”

**Part A: Design your own investigation**

When designing this investigation consider all the factors that would need to be taken into account to undertake a fair test. Keep a record of your thinking. As you make decisions about how you will investigate how exercise affects heart rate, make notes to justify, for example, what factors you will control, how, and why.

You may do research to find methods that could give you some ideas for the design of your experiment. These methods should be referenced appropriately.

Design your experiment *individually* to test the effect of exercise on heart rate or other factor/physiological event. In your design include all details required to undertake a reliable and valid experiment. You must also consider the safety aspects and ethical considerations of this experiment.

**Make sure you annotate your design to justify why you have made decisions about controlled variable, quantities, materials, measurements etc.**

Submit your design to your teacher. Use no more than 3 sides of an A4 page.

Include the following:

* aim and hypothesis
* variables, factors that must be controlled, cannot be controlled
* safety and other risks,
* ethical considerations if applicable
* detailed method
* suggest what the results would be if the hypothesis was supported
* appropriate results table to display data

**Part B: Experiment**

In defined groups, students in consultation with the teacher will select one method to perform and to collect data. The teacher may provide a method to perform if student designs are not suitable.

**Part C: Report and Deconstruct a Problem**

Individually write a practical report related to Part B

In addition, at the **end of the report**, on no more than 4 sides of an A4 page:

Consider the following question: “Does what a person is wearing during exercise affect their heart rate?”

**Deconstruct** the problem, and explore the various factors that would need to be considered to investigate this question, fairly and ethically. Keep a record of your thinking. As you make decisions about how you will investigate one aspect of the question, make notes to justify, for example, what factors you will control, how, and why.

Indicate how and provide reasons for why you would modify the method used in Part B to try to answer the question. Alternatively, you may design a different method to test an aspect of this problem.

The Investigation Report must include:

**An appropriate introduction – introduces the theory behind the practical**

**Aim: what is the purpose of the experiment?**

Hypothesis, Identification of all the variables

Materials used and Method followed (insert exact Materials and Method actually used in the investigation)

Results Table(s) and Graph(s)

**Discussion- includes analysis of the data and evaluation of the method**

**Conclusion with justification- consider the limitations of any conclusions supported by the data**

Deconstruction of the question: “Does what a person is wearing during exercise affect their heart rate?”

Reference List.

**Assessment Conditions for this task:**

Class time will be given for students to individually design the investigation question/hypothesis prior to undertaking the investigation and to deconstruct the question after the investigation has been completed.

A double lesson to undertake the practical in a group will be allocated.

Each student to submit a practical report.

Students may submit one draft for feedback, due one week after the experiment is completed.

Word Count for the investigation report is a maximum of 1000 words or 6 minutes for an oral presentation for the **introduction, analysis, evaluation and conclusion** sections of the report.

The design section should be on no more than 3 single sided A4 sheets of paper.

The deconstruct and design section should be on no more than 4 single sided A4 sheets of paper.

Final copy, which includes Part A and C is due 2 weeks after the experiment is completed.

**Assessment Design Criteria**

Investigation, Analysis and Evaluation: IAE 1, 2, 3, 4 Knowledge and Application: KA1, 4

**Guidelines for how to address the Performance Standards in the report:**

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| **Section of the Report** | **Requirements/Indicators** | **Performance Standards** |
| **Deconstruction** | **Explores the various aspects of the problem and this links to the aim, hypothesis and method. Justifies decisions made for design.** | **IAE1** |
| **Introduction** | **Relevant biological Information presented that relates specifically to the practical being investigated.**  **The information relates to the aim of the experiment.** | **KA1** |
| **Aim** | **Has the correct format**  **Indicates the purpose of the experiment**  **Independent and dependent variables are identifiable.** | **KA1** |
| **Hypothesis** | **Has the correct format- is not in the form of a question**  **Links the independent and dependent variable and is a prediction.** | **IAE1** |
| **Method** | **Describes how the independent variable is changed, is detailed and describes how the dependent variable is measured.**  **All variables should be identified.** | **IAE1** |
| **Results** | **Table has the correct format**  **Data is represented in an appropriate manner- all data is shown**  **Significant figures are correct**  **Graphs are drawn appropriately- axis are labelled, appropriate scale used, title, size, correct format** | **IAE2** |
| **Discussion** | **Explains all the data obtained. Trends are identified and related to relevant biological concepts.**  **Provides reasoning based on the data for supporting or rejecting the hypothesis**  **Evaluates the experimental method**  **Identifies potential sources of random and systematic error specifically and effect on data**  **Discusses the data’s reliability, precision, accuracy and validity** | **KA1,**  **IAE3**  **IAE4** |
| **Conclusion** | **Indicates whether the aim of the experiment has been met and restates the overall trend of the experiment.**  **Provides justification and discusses any limitations of the experiment and the conclusion drawn.** | **IAE3** |
| **Safety Audit** | **Detailed analysis of the potential risks, hazards and how they are managed and the precautions taken in the classroom** | **IAE1**  **IAE2** |
| **Communication** | **Use of appropriate biological terms and conventions** | **KA4** |
| **Reference List** | **Harvard Referencing Used**  **Sources correctly cited.**  **Bibliography provided** | **KA4** |

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|  | Investigation, Analysis and Evaluation | Knowledge and Application |
| A | Critically deconstructs a problem and designs a logical, coherent, and detailed biological investigation.  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.  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.  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 deconstruction and 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. |