[Google Doc version](https://docs.google.com/document/d/15Y41y_qketlCNSKez_c8fhEq8GvmMLsVpxiVP1DH_UA/edit?usp=sharing): Sign in with your Google account, then click “File > Make a copy” to duplicate this document so you can edit it. Make sure the share setting is “Anyone with a link can view.”

**Laboratory report: The cardiovascular system: Structured inquiry**

**Title of the experiment/investigation:**

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| How does exercise affect heart rate? |

**Start date:**

**End date:**

**Project members:**

**Teacher’s name:**

**Problem/purpose:** Why are you doing this experiment? What do you hope to find out? Explain your purpose. (One to two paragraphs minimum.)

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| The human body is composed of 11 organ systems. Together, they help maintain *homeostasis*, a relatively stable internal environment. A major organ system of the human body is the *cardiovascular system*, which is composed of the heart, blood vessels, and blood. The beating heart provides the force to move blood throughout the e human body via the circulatory system. The circulatory system is the vascular highway, composed of arteries, veins, and capillaries. Together, the cardiovascular system helps provide cells with their basic needs. Nutrients, gases, and hormones are delivered to the other cells of the body and wastes are taken away via the circulatory system. For example, once the respiratory system brings oxygen into the body, the blood traveling within the circulatory system distributes the oxygen to all of the body’s tissues and picks up carbon dioxide. The carbon dioxide is then taken back to the lungs (via the circulatory system) and exhaled.  Because humans are so diverse (e.g., age, gender, diets exercise, genetics), this investigation focuses on pulse rates.   * Research questions:   + How does exercise affect the circulation of blood within a body? |

**Hypothesis:** State your *hypothesis* here. It is the prediction of the outcome of your experiment or your prediction of the relationship between the variables. Use the information from your background research to support why you made the prediction that you did. See some examples below.

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| If a person exercises, then his or her heart rate will increase because the heart needs to pump more oxygen to the muscles to prevent muscle fatigue. |

***If*** we [change the independent variable], ***then*** we should observe [change in the dependent variable], ***because*** [these relationships within our model].

Example:***If*** *I limit the amount of Sun (reactant) needed by a plant,* ***then*** *photosynthesis will not occur at its optimal level and the plant will not grow (when compared to the control plant),* ***because*** *the Sun affects the germination and growth of a plant.*

**Materials and Resources:** List any and all materials and resources needed to conduct this investigation in detail. Include any websites and the dates you accessed them. Include any technologies used.

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| Use the form your teacher designed to record your pulse at various time during a day. |

**Design the experiment/investigation:** What is the control group? What is the experimental group? What variables are you measuring?

Independent variable: What you will test in this experiment?

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| Body activity |

Dependent variable: What you will measure in the experiment? Include units.

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| Pulse rate |

Control group: This is the group that is untreated or not tested to be used for comparison with tested groups.

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Constants: These are the variables to be kept constant throughout the whole experiment so it does not affect the outcome of your experiment.

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**Procedure/methods:** State in a clear and logical order the steps taken to complete the experiment. List each step, thoroughly describing the experiment from beginning to end. This section should allow another student to repeat the same experiment precisely the way you did it. Include detailed and labeled diagrams where appropriate. Include detailed safety tips and guidelines in the steps to prevent problems or mistakes. All variables from the design above are identified and controlled for.

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| 1. Hold your hand palm-up, find your pulse, and count the number of beats you feel in 60 seconds (your pulse rate per minute). 2. Record your pulse rate per minute at different times throughout a day. 3. Record your data. Use the form the teacher created. 4. Analyze the data and reflect on your findings. |

**Data:** Data are accurate and units are labeled. Data are represented in an organized table or chart, graphs, illustrations, and images. Observations are detailed and complete. Calculations are shown when appropriate. You can create a link to the Google Sheet to show the numerical data. Make sure you publish the spreadsheet as a public web page first.

**Figures and graphs:**

**Images:**

**Video:**

**Results:** In this section, you will summarize results, identifying trends in and making observations about your data. You do not need to explain results here. Explanations are for the conclusion section.

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**Conclusions:** Explain what you have learned. Was your hypothesis was supported by the data?

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| Claim: Write a statement or conclusion that answers the original question/problem.  Evidence: Describe the scientific data that support your claim. The data must be appropriate and sufficient to support the claim.  Reasoning: Explain why your evidence supports your claim. Describe why the data count as evidence by using appropriate and sufficient scientific principles. |

Briefly restate your results, then explain and interpret the results. You should draw your own conclusion based on the results, findings, and facts learned from this investigation, as well as from background research. You should draw together all results, findings, and opinions and make a summary of the experiment/investigation. Reflect on what you have learned. Make connections to the real world: How does this experiment apply to your everyday life? You should determine if your hypothesis is accepted or rejected.

**Suggestions for improvement:** What could you have changed to make the experiment better? Explain any sources of error and how they may have affected your outcome.

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Add errors and inconsistencies that arose throughout the experiment/investigation. Did the experiment/investigation proceed as expected or did anything unexpected occur? How did errors affect your data?

**Suggestions for further study:** What other experiments can you develop? What other questions would you like to investigate from the results of this study?

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If you have more questions, add them to this section. What will you do next? Would any follow-up experiment/investigation further clarify the results?

**References:** Cite any sources of information here. This includes someone else’s work. List source of any images used.

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