The affects that exercise has on the cardiovascular and respiratory systems.

Background information for exercise experiment

Definition of Homeostasis

"Homeostasis" means balance or equilibrium. How your body works to maintain equilibrium is reflected in how your vital signs vary with activity. Heart rate, blood pressure and respiration are lowest during periods of rest and sleep. During exercise, blood pressure, pulse and respiration increase to meet the increased demand for oxygen and nutrients by your musculoskeletal system. The adjustment of vital signs to match your body's level of physical activity is an example of homeostasis in action.

Homeostasis and Blood Flow

The total amount of blood in a human body remains the same during exercise. To maintain homeostasis, your body redistributes blood flow. During exercise, blood flow to the nervous system, gastrointestinal tract, kidneys, brain and spleen decreases, while blood flow to the musculoskeletal system increases.

Temperature Homeostasis

Metabolic processes generate heat. The cardiovascular system helps to maintain homeostasis with respect to body temperature. An increased heart rate increases the delivery of blood to your skin. Increased blood flow to your skin and sweating causes dissipation of heat, and body temperature remains within normal limits.

You can view further information related to the topic here:

http://www.livestrong.com/article/286312-increased-heart-rate-during-exercise-maintaining-homeostasis/

The Task:

Using the **experimental planner** design and carry out an experiment that details the affects that exercise has on the cardiovascular and respiratory systems.

You will find an electronic copy of the **experimental planner** in the year 11 Biology folder. H:\Science\YR11biology

- Please write a detailed introduction which introduces the concepts behind your experimental question. Gather, analyse and evaluate data from a range of valid and reliable biological sources. Use this information to discuss the concepts behind your investigation

- The experimental planner is set out based around the scientific method. Follow the guide lines with each step to design and carry out your experiment.

- When writing your conclusion and discussion use your Biology text, scientific papers and other Biology books to explain the results from your experiment. Make links between your question, the hypothesis, data and results of your experiment and relevant biological sources to draw conclusions related to the theoretical concepts.

- When writing your discussion provide ways of improving the experiment. Outline what effect you think these improvements would have on the experiment. Link these improvements to the theoretical concepts

- You must use the referencing style out lined in your school diary to cite these references and attach this to the end of your experiment.

Hint: A lot of marks are allocated to the introduction, conclusion and discussion so it is worthwhile spending time researching the effects that exercise has on the cardiovascular and respiratory systems to explain your findings

A couple of example questions:

On average do females have a higher heart rate (BPM) then males before and after exercise?

How does taking caffeine affect athletic performance?

Does exercising result in an increase in body temperature?

An example physical test for your experiment

One option you could use for the test during your experiment is the step test (see below).

Physical Fitness Step Test.

The subject should do the Step Test in the following way:

1. The subject steps at a rate of 25 steps per minute for 3 minutes total. The other team members should spot for the subject in case the subject stumbles during the test.

2. After exercise, the subject remains standing. (If a heart rate monitor is available record the reading after 5 seconds.) Wait 5 seconds (find the pulse during this time) and then begin counting a 15 second heart rate count at the radial artery (as before). The students should be prepared to count quickly because the rate will be faster than before! Also have someone count the number of breaths in one minute (wait the 5 seconds and count the breaths for the next 60 seconds). Record the exercise data on the chart. After this have the subject sit down and record the blood pressure values

3. You may modify the step test to fit your particular situation. For example, we have done the step test using building steps. If the step test is not feasible, an alternate exercise can be substituted.

Useful Websites

http://www.livestrong.com/article/286312-increased-heart-rate-during-exercise-maintaining-homeostasis/

Gatorade Sports Science Institute
http://www.gssiweb.com/

http://www.brianmac.co.uk/physiolc.htm

http://www.wildcatanesthesia.com/Lippincott%20Interactive%20CD/text/al/al010.htm

Experiment Planner

My question (highlight what you will measure. This is your effect)

Identify causes and effects (highlight your IV and DV)

Causes What factors can influence your effect? (IVs and CVs)	**Effects** How can you measure your effect? (DVs)

COWS **Change something** *Independent Variable*		
MOO **Measure something** *Dependent Variable*		
SOFTLY **Keep all else the Same** *Controlled Variables*	**What?**	**How?**

Hypothesis

IF… *Mention IV, what you're changing OR what's different*	
THEN… *Mention DV, what you're measuring*	
BECAUSE… *Why I think it will happen*	

Research Question

Materials and Equipment

What did you use? How many? How much?	

Method

List the steps you will use to test your hypothesis. Include/mention variables, materials and the number of times the test will be conducted.	

Safety Audit

How can we work safely? How can we prevent damage to people, place and property?	
Risk	**Management**

Results

Design a table to record your results. Graph your data where appropriate.

DV Y-axis

IV	X-axis

Conclusion

What was your hypothesis? Do the results support your hypothesis? Can you explain the relationships, patterns or trends in your results? Use scientific ideas to help explain what happened.

Discussion

How could your experiment be improved (for fairness, accuracy, safety)? Give 3 ways and explain. *AND/OR* *How could your experiment be modified to test another hypothesis?*

Designed by Harry Kanasa

Year 11 Extended Experimental Investigation Criteria Sheet

	Standard A	Standard B	Standard C	Standard D	Standard E
Understanding Biology	The student communicates their understanding by: making links between related ideas concepts, principals and theories to reveal meaningful interrelationships between exercise, the cardiovascular system and the respiratory system	The student communicates their understanding by: Explaining ideas, concepts, principals and theories related to exercise and the cardiovascular and respiratory systems and describing interrelationships between them	The student communicates their understanding by: Defining and describing ideas, concepts, principals and theories, and identifying interrelationships between exercise and the cardiovascular and respiratory systems	The student communicates their understanding by stating ideas and using terminology relevant to exercise the cardiovascular and respiratory systems and recalls interrelationships	The student stats terminology and ideas relevant to exercise the cardiovascular and respiratory systems
Investigating Biology	The student communicates investigative processes by: • formulating justified researchable questions • designing, modifying and implementing an investigation about exercise and the cardiovascular and respiratory systems • collecting and organising data to identify trends and interrelationships • interpreting and critically analysing results with links to theoretical concepts to draw conclusions relating to the question • evaluating the design of the investigation and reflecting on the adequacy of the data collected and proposing refinements.	The student communicates investigative processes by: • formulating researchable questions • selecting, modifying and implementing investigations about exercise and the respiratory and cardiovascular systems • collecting and organising data to identify trends • interpreting results and drawing conclusions relating to the question • evaluating the design of the investigation and the adequacy of the data collected	The student communicates investigative processes by: • identifying researchable questions • selecting an implementing investigation related to exercise and the cardiovascular and respiratory systems • collecting and organising data • discussing results and drawing conclusions.	The student communicates investigative process by: • following instructions to collect and organise data • using data to answer questions	The student communicates investigative processes by following instructions to collect and organise data

Evaluating biological issues	The student communicates by • gathering, critically analysing and evaluating information and data from a variety of valid and reliable sources • integrating the information and data to make justified and responsible decisions related to exercise the cardiovascular and respiratory systems	The student communicates by: • gathering, analysing and evaluating information and data from a variety of valid and reliable sources • integrating the information and data to make supported decisions related to exercise the cardiovascular and respiratory systems	The student communicates by: • gathering information and data from a variety of sources and referencing appropriately • selecting relevant information and data to make plausible decisions and predictions related to exercise the cardiovascular and respiratory systems	The student communicates by: • gathering and using biological information to make statements • recognising that a given biological issue has biological implications	The student communicates by using supplied information to make statements.