**GENERAL HUMAN BIOLOGY – YEAR 12**

**TASK 2 – SCIENTIFIC METHOD EXERCISE PRACTICAL**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ WEIGHTING: 4%**

**DATE: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ MARK: \_\_\_\_\_ / = 48**

Part One [37 Marks]

***BACKGROUND INFORMATION***

Your physical work capacity is a measure of your ability to do physical work. You determine it by measuring your cardiovascular fitness. You can think of your cardiovascular fitness as the sum of the heart muscle fitness, blood vessel efficiency and ventilator muscle fitness. You can improve cardiovascular fitness with a regular exercise program.

The cardiovascular system circulates blood throughout the body, which supplies muscles with oxygen and other nutrients whilst removing waste products. Each time the heart beats; blood is either pumped out of the heart to the body or to the lungs with waste products.

Heart rate refers to the number of times the heart beats per minute to supply oxygen to muscles and remove waste products by taking them to the lungs via the heart. The number of beats is directly related to the workload being placed on the heart and their cardiovascular fitness. For adults 18 and older, a normal resting heart rate is between 60 and 100 beats per minute (bpm), depending on the person’s physical condition and age.

The Harvard step test is a type of cardiac stress test for detecting and diagnosing cardiovascular disease. It also is a good measurement of fitness and a person's ability to recover after a strenuous exercise. The more quickly the heart rate returns to resting, the better shape the person is in.

***AIM***

To determine the effect of exercise on a subject’s heart rate over time.

***MATERIALS***

* A bench or chair
* Stopwatch
* Heart rate monitor

***PROCEDURE***

**WARNING:** If at any stage during the exercise period the subject experiences any discomfort, stop the activity immediately and tell the teacher

1. Collect the resting heart rate of the test subject for 20 seconds. Record what the heart rate would be for one minute in the table.

2. Test subject is to use bench or chair to complete step-ups and step-downs for 5 minutes.  
Experimenter is to keep chair/bench stable. Subject is to maintain a consistent beat (1-2-3-4) (**see diagram one on next page**).

3. At end of 5 minutes, test subject is to sit and rest for 60 seconds.

4. After 60 seconds, experimenter is to find the test subject’s heart rate and count the rate for 20 second. Result to be multiplied to equal the beats in one minute then recorded in table.

5. Test subject is to rest for another 30 seconds.

6. Find the test subject’s heart rate.

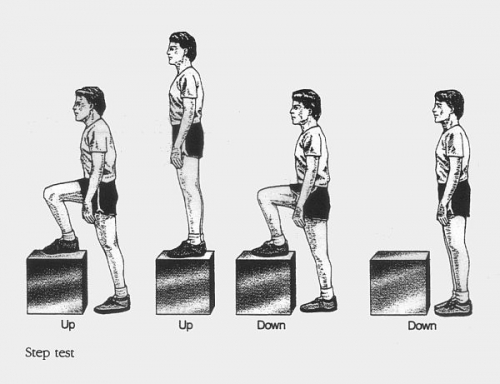
7. Repeat steps 5 and 6 until the test subject’s heart rate returns to the resting heart rate.

8. Record the number of minutes it takes for this to occur.

9. Once completed, experimenter must get the results of four more test subjects. Record in table.

10. Test subject must also receive a copy of these results and the four other test subjects from the experimenter.

11. Find the mean heart rates and minutes of exercise for the class.

**Diagram 1**: Picture showing one cycle of the step test.

***RESULTS & DISCUSSION***

1. Fill in your results in the table below [4 marks]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Test Subject | Resting Heart Rate  (beats/min) | Minutes of Exercise | Post Exercise Heart Rate  (beats/min) | Time for Heart Rate to return to resting heart rate level (beats/min) | Fitness Score | Fitness Rating |
| 1 |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |
| Average/ Mean |  |  |  |  |  |  |

Below is a table showing Duration of Exercise and Post Exercise Heart Rate

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Duration of Exercise (min) | Post Exercise Heart Rate | | | | | | | | | | | | |
| 40-44 | 45-49 | | 50-54 | 55-59 | 60-64 | 65-69 | 70-74 | 75-79 | 80-84 | 85-89 | 90-94 | 95-99 |
| Fitness Score (Arbitrary Units) | | | | | | | | | | | | |
| 0-0.5 | 6 | | 6 | 5 | 5 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 |
| 0.5-1 | 20 | | 18 | 16 | 15 | 13 | 13 | 12 | 11 | 10 | 10 | 9 | 9 |
| 1-1.5 | 33 | | 30 | 27 | 25 | 23 | 21 | 20 | 19 | 17 | 17 | 16 | 15 |
| 1.5-2 | 47 | | 43 | 38 | 35 | 32 | 30 | 28 | 26 | 24 | 23 | 22 | 21 |
| 2-2.5 | 61 | | 55 | 49 | 45 | 41 | 39 | 36 | 34 | 31 | 30 | 28 | 27 |
| 2.5-3 | 74 | | 67 | 61 | 56 | 51 | 47 | 44 | 41 | 39 | 37 | 35 | 32 |
| 3-3.5 | 88 | | 79 | 72 | 66 | 60 | 56 | 52 | 49 | 46 | 44 | 41 | 38 |
| 3.5-4 | 102 | | 92 | 83 | 76 | 69 | 65 | 60 | 56 | 53 | 50 | 47 | 44 |
| 4-4.5 | 115 | | 104 | 94 | 86 | 79 | 73 | 68 | 64 | 60 | 57 | 54 | 50 |
| 4.5-5 Ideal | 129 | | 116 | 105 | 96 | 88 | 82 | 76 | 71 | 67 | 64 | 60 | 56 |

2. Using this table determine the fitness score of your test subjects and the class mean. Add this to your table.

3. Using the score and the table below, determine the fitness rating of all subjects and the class mean.

|  |  |
| --- | --- |
| Fitness Score | Fitness Rating |
| < 50 | Poor |
| 50 to ≤ 70 | Average |
| 70 to ≤ 90 | Good |
| > 90 | Excellent |

4. Graph the resting heart rate and post exercise heart rate of all participants on a separate piece of graph paper. [5 marks]

5. State a possible hypothesis for this experiment. [2 marks]

6. Determine the following - [2 marks]

INDEPENDENT VARIABLE:

DEPENDENTVARIABLE:

7. Suggest three possible variables that would have been controlled for the study to be a fair test. [3 marks]

8. Why is it important for the test subject to maintain the correct rate of exercise (1-2-3-4) during the experiment you carried out? [2 marks]

9. What was the purpose of taking the resting heart rate at the start of the experiment? [2 marks]

10. Suggest one way in which the study could be modified to increase its - [2 marks]

RELIABILITY:

VALIDITY:

11. Determine the median values of your data set for the following: [1 mark]

a) Resting heart rate:

b) Post Exercise heart rate:

12. a) Is there a relationship between the Post Exercise Heart Rate, Time taken for heart rate to return to resting levels and Fitness Score? [1 mark]

b) Using whole sentences, write a summary/discussion of your results in relation to the time taken for heart rate to return to resting heart rate levels and fitness score. [6 marks]

13. What functions/processes does heart rate indicate are occurring within the body? [2 marks]

***Conclusion***

14. Write a conclusion for the experiment you undertook. Remember to link the hypothesis with specific data in your response. [3 marks]

15. If someone else wanted to do a similar experiment, what suggestions could you recommend so that they can continue the research on the effect of exercise on heart rate? [2 marks]

Part Two [11 Marks]

You read the following hypothesis in an advertisement “A regular exercise program will increase cardiovascular fitness.”

After reading this you decide to design an experiment to test this hypothesis.

16. Over how many weeks will you run your experiment? [1 mark]

17. What form/s or type of exercise will your test subjects complete? [2 marks]

18. How frequently will subjects exercise and for what duration? [2 marks]

19. How many participants will there be? [1 mark]

20. Are there any particular characteristics that must be considered when selecting participants?

[3 marks]

21. What results do you think you will get? [2 marks]

***End of Assessment***