***Year 11 ATAR  
Physical Education Studies***

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***Task 6***

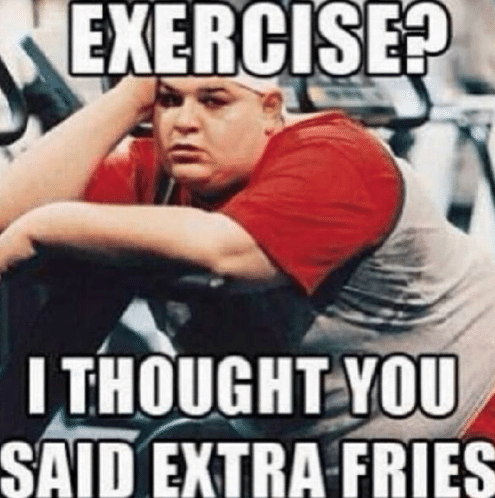
***Exercise Physiology Lab & Investigation***

***Weighting: 7.5%***

**Total Mark: /50**

**Percentage: %**

***STUDENT NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***



**INVESTIGATING PHYSIOLOGICAL RESPONSES TO EXERCISE**  
Investigate and report on the bodies short-term and long-term responses to physical activity.  
  
**Laboratory**  
Working with a partner, choose one person to participate in the Beep test and one person to record results.  
  
Your aim is to discover the immediate physiological responses to exercise, and explain why these responses are occurring.

Fill in the attached table by recording the following:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Heart Rate**  **BPM** | **Perceived Exhaustion Rate**  **Rating 1-10** | **Sweating**  **Rating 1-10** |
| **Level 1** |  |  |  |
| **Level 3** |  |  |  |
| **Level 5** |  |  |  |
| **Level 7** |  |  |  |
| **Level 8** |  |  |  |
| **Level 9** |  |  |  |
| **Level 10** |  |  |  |
| **Level 11** |  |  |  |
| **Level 12** |  |  |  |
| **Level 13** |  |  |  |
| **Level 14** |  |  |  |
| **Level 15** |  |  |  |
| **Level 16** |  |  |  |

**Blood Pressure**

Pre-test:

Post-test:

ANSWERS DEPENDENT ON TEST   
  
 **(4 Marks)**  
**Investigation Questions  
  
Part A**   
1. Looking at your results, explain the pattern you noticed with regard to the subject’s heart rate. Why do you think this occurred? Did it plateau? **(3 Marks)**  
  
- Immediate response to exercise should increase the subjects heart rate  
- Psychological factors can affect the heart rate – such as stress at the beginning  
- Once the athlete begins the test, the heart rate should stabilise and then steadily increase throughout the duration of the levels/test  
- Heart rate is directly proportionate to workload, as the workload increases, the working muscles require more oxygen in order to perform at a more demanding level, as well as the removal of carbon dioxide   
  
2. What was the difference between the subject’s blood pressure before and after the test? Why do you think this occurred? **(3 Marks)**  
  
Dependent of results, however it is likely:  
- Blood pressure increases in response to exercise   
- The heart begins to pump harder and faster to meet the demands of the workload and provide oxygen supply to the working muscles  
- Result of blood being pumped by the heart with greater force resulting in more pressure being applied to the artery walls  
  
3. Look at your results with regards to how much your subjected sweated throughout the test. Explain these results in relation to the concept of temperature regulation. **(3 Marks)**  
- Working muscles increase heat production in the body during exercise  
- To avoid overheating, the blood acts as a temperature regulator, taking heat from within the body to the skin surface, where evaporation of sweat assists in cooling the body.  
  
4. Think about the test your subject completed, and look at the results to determine what would have been happening to their body. Explain how each of the following would have changed as an immediate response to exercise and why? **(10 Marks)**  
  
a) Stroke Volume  
- The total amount of blood the heart pumps with each beat  
- During exercise, the body's demand for oxygen increases and as a result, Cardiac Output, Heart Rate and Stroke Volume all increase proportionally to cater for this.  
  
b) Heart Rate  
- Number of times heart beats per min  
- To provide more rapid supply of fuel and energy to the muscles, heart rate increases during exercise  
- This increase is directly proportional to the workload  
- During exercise, the body's demand for oxygen increases and as a result, Cardiac Output, Heart Rate and Stroke Volume all increase proportionally to cater for this.  
  
  
c) Selective Redistribution of Blood  
- During exercise, arteries open up and contract to allow more or less blood to reach certain areas of the body.  
- Arteries taking blood to working muscles will open up (dilate) to allow more blood flow to the muscle whilst arteries taking blood to non-active areas of the body contract to reduce blood flow.   
- This increases the amount of blood available to the working muscles.  
  
  
d) Oxygen Uptake (Oxygen Debt, VO2 Max, Oxygen Deficit)   
- Oxygen uptake increases dramatically during first few minutes of exercise **(oxygen deficit)** as the anaerobic energy system is the dominant energy provider  
- Once steady state is reached oxygen demand is met by oxygen supply - At this point an increase in exercise intensity is met by an increase in oxygen consumption  
- When an increase in exercise intensity no longer leads to an increase in oxygen consumption, the athlete has reached a point known as there **VO2 MAX**- As a result, athletes are forced to rely on their anaerobic (without O2) energy system to supply energy to the working muscles  
- At the completion of exercise, oxygen consumption remains high **(oxygen deficit)** to assist with the recovery process  
  
e) Tidal Volume- Tidal volume refers to the amount of air inhaled and exhaled during normal respiration  
- The increased need for oxygen and the removal of carbon dioxide during exercise results in an increased tidal volume.  
- At rest, tidal volume is approx 500-600ml–During exercise, it increases up to 3L/min  
  
**Part B**  
The Tour de France is an annual men's multiple stage bicycle race primarily held in France. It consists of 21 days of cycling separated into stages covering 3,500km in total.  
  
  
5. Prior to completing the Tour De France, a cyclist must endure many months, if not years of constant training. Explain **four** key adaptations that would occur as a result of long-term training. **(12 Marks)**

Any four suitable long-term (acute) adaptations

6. a) Explain the role that carbohydrates, fats and proteins play in an athlete’s diet.   
 **(6 Marks)**   
Protein  
- Approx 15% of an athletes diet  
- Growth of muscle tissue   
- Repair of muscle tissue  
- Production of red blood cells, hormones and antibodies  
- Contributes to ATP production when carbohydrate and fats stores are depleted. This may occur in extreme circumstances such as starvation or during ultra endurance events such as the Hawaiian Ironman.  
  
Fats  
- Make up 20-30% of an athletes diet   
- Fats are the major energy source during rest (60%) & light to moderate exercise but have little input during intense exercise – this is because fats take a longer about of time to break down  
- Trained athletes can break down fats faster and therefore do use them as a secondary source of energy when needed  
  
Carbohydrates  
- Make up the majority of an athletes diet  
- First converted to blood glucose leading to a rise in insulin levels  
- Excess blood glucose converted to glycogen  
- Glycogen is stored in the muscle and liver for future use   
- High, Mid and low GI foods – effect on blood glucose levels  
  
6. b) Considering the strenuous requirements of the Tour De France, what would be your recommendation for a pre-stage meal, nutrition during and nutrition immediately after the race? Explain. (You only have to focus on one ‘stage’, not the whole 3,500km!) **(9 Marks)**Pre  
- Think about food preferences and digestibility of food  
- Carbohydrate loading the night before each stage – Low GI - glycogen storage and slower release of energy  
- High Carbohydrate, low fat, low protein – fill up glycogen stores in the body  
- Hydrate with 1L water, and then another 300ml just before and avoid caffeine as it is a diuretic   
- Drink high carb drinks such as Lucozade while carb loading as they are extremely high carb (not suitable for during exercise)  
  
During  
- High GI Carbohydrates – keep up the supply of glucose and fast release of energy  
- Consume water every 15 - 20 minutes (approx. 200ml) to replace lost fluids   
- Also consume other drinks such as sports drinks which contain carbohydrates   
  
After   
- High GI foods recommended within 30 minutes of finishing as this is when body is most responsive to topping up glycogen stores   
- Consumer lower GI foods later on in the 24 hours post exercise to replace liver glycogen stores  
- Consume protein and fats to replenish lost stores   
  
Fluids:   
- You want to replenish back to pre-exercise weight

- For every 1L of fluid loss, you must replace with 1.5L as you will urinate some of this out

- Need slightly salty fluid to keep osmolality higher so you don’t urinate as much

- Avoid alcohol and caffeine due to their diuretic effect