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

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***Exercise Physiology Investigation Validation***

***Part B***

**Total Mark: /**

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

**Question 1 (9 marks)**

Ariarne Titmus is the women’s national 400m swimming champion. To win the gold medal, she completed the race in 4 minutes and 1 second. During the race, Ariarne will make use of all 3 energy systems. Identify each of the energy systems and explain how each will contribute to her energy output and her performance during the race.

**Question 2 (12 marks)**

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.  
  
  
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)**

**Question 3 (15 marks)**

1. Explain the role that carbohydrates, fats and proteins play in an athlete’s diet.

(9 Marks)

1. Suggest three improvements that Josie could make to her diet, providing reasons for your choices. (6 marks)

***MARKING KEY***

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

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***Exercise Physiology Lab & Investigation***

***Part B***

**Total Mark: /**

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

**Question 1 (9 marks)**

Ariarne Titmus is the women’s national 400m swimming champion. To win the gold medal, she completed the race in 4 minutes and 1 second. During the race, Ariarne will make use of all 3 energy systems. Identify each of the energy systems and explain how each will contribute to her energy output and her performance during the race.

|  |  |
| --- | --- |
| **Max 9 marks**  **No marks for identification**  **3 marks for application** | ***ATP-PC system:***   * Begins to resynthesise ATP immediately once Ariarne dives from the blocks * Is the predominant energy system for the first 10 seconds * Fuels high intensity and explosive start off the blocks * Fatigues very quickly all used by 10-15 second mark   ***Lactic Acid system***   * Gradually increases ATP resynthesise as the race progresses * Is the predominant energy system from the 10sec point to 150 sec depending on training adaptations * High intensity work rate for the first 100-150m * Will be used during tumble turn to get back up to speed * Fatigues due to lactic acid production   ***Aerobic System***   * Gradually increase ATP resynthesise as the race progresses * Is the predominant energy system from the 150 sec depending on training adaptations * Moderate to high intensity work rate for the final 2 minutes of the race * Performance/speed will slow under the aerobic energy system * Will not fatigue in this race * Uses oxygen efficiently in producing energy |

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)**

|  |  |
| --- | --- |
| **Max 3 marks per adaptation** | ***Long-Term Adaptations***   * Increased Cardiac Output – Amount of total blood circulation per minute will increase to higher levels during exercise so higher intensity activity can be sustained for longer * Lower Resting Heart Rate –Heart will beat less times per minute due to more efficient heart (higher stroke volume) * Decreased Blood Pressure – Less pressure on the walls of arteries due to more elastic artery walls * Increased Blood Volume/Haemoglobin – Training leads to an increase in plasma volume and haemoglobin concentration leading to better temperature regulation and oxygen transport * Stroke Volume – Training creates a stronger cardiac contraction therefore more blood ejected per beat * Maximum Oxygen Uptake (VO2 max) – Training leads to an improved ability to process and utilise oxygen during aerobic exercise * Increased Capillarisation – More capillaries around the muscles and lungs to increase speed and efficiency of diffusion of O2 and CO2 * Ventilation – Increased tidal volume and lung capacity during exercise to allow more air to be inspired and expired with each breath * Oxygen Exchange – training increases the utilisation of all alveoli to increase the surface area for gaseous exchange * Increased Flexibility – regular training/stretching/explosive movements increase the range of motion at particular joints * Increased Aerobic & Anaerobic Capacity –Training improves the capacity of both aerobic and anaerobic energy systems to resynthesise ATP |

6. a) Explain the role that carbohydrates, fats and proteins play in an athlete’s diet.   
 **(9 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  
  
Suggest three improvements that Josie could make to her diet, providing reasons for your choices. (6 marks)

Student can discuss any **three** improvements with appropriate reason. Examples include:

* More carbohydrates for breakfast, as this will be main fuel source during activity
* Eat at least three hours before the game for adequate fuel to be available.
* If required, eat small snack one hour before the game to top up fuel stores.
* Replace recovery meal with protein and more energy dense carbohydrates to replace fuel lost.
* Drink more water the night before OR after the match for adequate re/hydration (can only mention one, not both)