**EXERCISE PHYSIOLOGY INVESTIGATION**

**UNIT 3 and 4   
PHYSICAL EDUCATION STUDIES**

Investigate elite cycling, in particular the Tour de France.

The 2019 Tour de France is made up of 21 stages and 2 rest days including 2 time trials (sprint). Riders will be covering roughly 3,500km in total and as much as 217km on some days with many of these being through the Pyrenees Mountains and French Alps. The tour de France was first organised in 1903 and has been held every year with the exception of world wars. Starting predominantly as a French field of riders it is now one of the premier world class cycling events attracting riders from all over the world and a global audience.

**Your task is broken down into 2 parts, the first is to research the tour and make notes in preparation for an in-class investigation the second is to design a 6 month periodised plan assuming that the Tour de France is the only major competition the rider will be participating in.**

**The research topics to cover are:**

* **Nutritional considerations, energy demands and nutritional requirements**
* **Exercising in extreme conditions (heat, clod and altitude)**
* **Training programs and periodised plans**
* **Performance enhancing substances**
* **Recovery strategies**

**Periodised plan due Friday 16th August – week 4 – 10 marks**

**In-class investigation – Friday 16th August – week 4 - 50marks**

**In-class investigation**

**Question 1 (8 marks)**

Many athletes competing at international cycling events such as the Tour de France have been identified as drug cheats even as far back as the 1890’s. Before performance enhancing drugs became illegal in cycling in the 1960’s, early competitors in the race made use of ‘La Moutarde’ a concoction of cocaine solutions in water and ‘la bomba’ an amphetamine mix. In 2005 WADA removed caffeine from the banned list.

1. In your response outline four negative side effects from the use of stimulants and two physiological responses of the body to suggest why a cyclist would use these substances in a race. (6 marks)
2. Discuss why caffeine may have been removed from the banned list of substances

(2 marks)

4 marks for negative side effects can be

* Addiction and dependence
* Increased BP
* Increased stroke risk
* Increased heart risk
* Liver problems
* Risk of injury – lack of coordination, confusion, paranoia and delusions
* Restless
* Insomnia
* Seizure
* Dehydration

2 marks for performance enhancement

* Increase alertness
* Decrease fatigue
* Increased arousal

2 marks for discussion of caffeine include

* Present in many foods and drinks such as cola, chocolate, coffee tea etc
* hard to police usage
* Very high amounts required to make it illegal – 8 espresso

**Question 2**

Discuss the elements of periodisation that coaches would apply to a training program in the lead up to a major cycling event such as the Tour de France (10 marks)

1 mark macro cycle 6-12 month

1 mark micro cycle – typically a week

1-2 marks discussion of ‘off season’

Maintain level of fitness, rehab and recover injury, review season, mental break

1-3 marks pre-season

General - build aerobic base lot of low intensity long duration rides

Specific – prepare for specific demands of competition, mountains, sprints etc, team strategy and tactics, aclimitisation – altitude and heat

1-3 marks ‘in-season’/competition phase discussion

3 weeks of tour, refining strategy, taper in the week before event starts

Stage 16 of the 2019 Tour de France was a 177km ‘flat’ stage won by young Australian Calen Ewan who finished in a time of 3 hours and 57 minutes. This stage was completed in the middle of the French summer as temperatures reached over 35 degrees Celsius. On stage 17 riders will undertake a 200km race through ‘hilly’ terrain followed by stage 18, 208km through the mountains.

1. Riders set off from the start of stage 16 at 10am, the main peloton finishing in just over 4 hours. Discuss the nutritional considerations an athlete on the tour would consider pre-, during and post stage 16. (15 marks)

1 mark for a dot point identified under each section (min 1 point for each section)

Before race

• Carbohydrate loading maximises athletes muscle glycogen stores prior to race.

• Carbohydrate loading is used in conjunction with tapering.

• Low GI foods/carbohydrate are used to carbohydrate load.

• Low GI foods/carbohydrate release glucose slowly into the blood stream.

• Athletes should consume 10 – 12 g of carbohydrate per kg of body mass to carbohydrate load effectively.

• Pre-performance meal of low GI food/carbohydrate should be eaten 2-4 hours before race.

• Immediately before the race the athlete can consume high GI food to top up blood glucose.

• Avoid high fibre foods and/or avoid high fat foods.

• Athlete needs to be hydrated/athlete drinks 200 – 600ml before event/up to 1l an hour before race.

During race

• Glycogen stores become depleted during the event and need to be replenished.

• Athlete should consume 30 - 60 g carbohydrate per hour.

• Carbohydrate should be high GI.

• Avoid high fibre foods and/or avoid high fat foods.

• ‘Carbohydration’ as the practice meeting the refuelling requirements outlined above and at the same time replaces any fluids lost through sweat.

• Ingest electrolytes to decrease cramps/dehydration.

• Athletes need to maintain hydration by consuming 500 - 1000 ml of fluid per hour (200-300 ml every 15-20 mins).

After the race

• Athlete must consume carbohydrate immediately after the event or be within 30 mins of completion.

• Carbohydrate should be high GI.

• Low GI meal should be consumed 4-6 hours after event to further replenish glycogen stores.

• Protein needs to be consumed to aid in the repair of muscle tissue.

• Ingest electrolytes to replace essential minerals and assist recovery

• Athlete replaces lost fluid.

1. Identify and explain 2 recovery strategies riders may employ to ensure they are able to race at their best on the following day’s stages. (4 marks)

1 mark for naming of each strategy

1 mark for explanation of each strategy.



Cyclists do this to prevent their bodies from overheating. Explain the body’s cooling mechanisms and state why this is an effective strategy. (5 marks)

1 mark evaporation

1 mark convection

1 mark radiation

1 mark conduction

1 mark by unzipping evaporation and convection increased as more of skin exposed to air causing more effective cooling

1. Athletes spend time acclimatising to altitude to ensure they are adequately prepared for the mountainous stages of the Tour. Identify **four** physiological adaptations of riders that have been acclimatised to altitude and how the physiological adaptations would be an advantage to performance in the mountain stages. (8 marks)

2 marks per adaptation -1 mark for identification 1 mark for advantage

* Increased caplillarisation – increased ability to supply O2
* Increased mitochondria – allows higher intensity aerobic respiration
* Increased red blood cell – allows more O2 to be carried in bllod
* Increased aerobic enzymes - increases the body’s ability to use oxygen to create energy
* Increased myoglobin – increased diffusion of oxygen across cells or improves oxygen transportation
* Increased haemoglobin concentration – increased O2 carrying capacity

**Periodised plan 10 marks**

1 mark – macrocycle identifiable

1 mark microcycles identifiable

1 mark taper in week prior to event starting 8+

1 mark for use of progressive overload

1 mark use of recovery weeks/sessions (reduction in training volume)

1 mark use of pre-season

1 mark specific and general pre-season

1 mark use of in season or competition

1 mark off season

1 mark acclimatisation to heat and altitude 2 weeks prior to event or regular altitude training/use of O2 tents