**A2 Environmental Factors and Physical Performance**

**A2.1 Explain the relationship between cellular metabolism and the production of heat in the human body.**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 175-176
* **Complete the flowchart below**

* **Muscle contraction is about 20% efficient. Explain what happens to the remaining 80%.**

**…………………………………………………………………………………………………………………………………………………….…………………………………………………………...…………………………………………………………………………………………….….……………………………………………………………………………………………………….………………………………………….….……………………………………………………………………………………………………….………………………………………….**

* **A2.1 Past Paper Question Practice (May 2011)**

**Explain the relationship between cellular metabolism and the production of heat in the human body during rest and exercise (2).**

**…………………………………………………………………………………………………………………………………………………….…………………………………………………………………………………………………………………………………………………….…………………………………………………………………………………………………………………………………………………….…………………………………………………………………………………………………………………………………………………….………..**

**A2.2 State the normal physiological range for core body temperature.**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 176-177
* **State the differences between core body temperature and shell temperature.**

**…………………………………………………………………………………………………………………………………………………….……………………………………………………….…………………………………………………………………………………………….…………………………………………………………………………………………………………………………………………………….……………………………………………………………………………………………………………………………………………………….………**

* **State the normal physiological range for core body temperature.**

**………………………………………………………………………………………………………**

* **A2.2 Past paper exam question practice**

**(May 2009) See figure below**

****

**State the core temperature of the Group B athletes at the time when Group A athletes enter the danger zone (1)**

**………………………………………………………………………………………………………**

**(November 2011) See figure below**

****

**State, to the nearest 0.5 degrees celsius, the core body temperature of athletes at the start of cold-water immersion (CWI) (1).**

**………………………………………………………………………………………………………**

**(May 2013) See figure below**

****

1. **State, with appropriate unites, the core temperature of group A at the beginning of the cold environment test (1).**

**………………………………………………………………………………………………………**

1. **State what happens to the core temperature for group B during the 20 minute rest period (1).**

**………………………………………………………………………………………………………**

1. **Compare the core temperature for both groups during exercise (3).**

**…………………………………………………………………………………………………………………………………………………….…………………………………………………………………………………………………………………………………………………….…………………………………………………………………………………………………………………………………………………….…………………………………………………………………………………………………………………………………………………….………………………………………………………………………………………………………………………**

**A2.3 Outline how the body thermoregulates in hot and cold environments**

**Resources :**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 176-178
* Vella, C and Kravitz, L. *Staying cool when your body is hot*  - use link on GOMLC under A.2.3
* **Draw a picture illustrating the potential avenues of heat exchange during exercise. Make sure you cover: Conduction, Convection, Radiation and Evaporation.**

Thermoregulation is the balance between heat production and heat loss in the body. Heat increases the need for heat dissipation and sweating. Heat in the body is moved to the skin (via blood) and transferred to the environment by any of the following four mechanisms.

* **Define these terms below.**

|  |  |
| --- | --- |
|  **Conduction** |  |
| **Convection** |  |
| **Radiation** |  |
| **Evaporation** |  |

* **State which avenue for loss of body heat is most important for controlling body temperature during exercise and explain why?**

**…………………………………………………………………………………………………………………………………………………….………………………………………………………..…………………………………………..…………………………………………..**

* **Define hyperthermia and outline how it occurs.**

**…………………………………………………………………………………………………………………………………………………….…………………………………………………………………………………………………..…………………………………………..**

* **A2.3 Past paper exam question practice**

**(May 2010)**

**Identify one physiological response, other than evaporation of sweat, that the body uses to regulate temperature in a hot environment (1).**

**…………………………………………………………………………………………………………………………………………………..**

**(November 2013)**

**Outline how the body thermoregulates in hot environments (2).**

**…………………………………………………………………………………………………………………………………………………….…………………………………………………………………………………………………..…………………………………………..**

**A2.4 Discuss the significance of humidity and wind in relation to body heat loss.**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 178
* **Discuss the significance of humidity and wind in relation to body heat loss.**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

* **A2.4 Exam Past Paper Question Practice**

 **(May 2010)**

**Discuss the impact of windy and humid conditions on body heat loss during a half marathon in a hot environment (4).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**(May 2014)**

**Outline the significance of humidity when playing soccer in a hot environment (3).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**A2.5 Describe the formation of sweat and the sweat response.**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 179-180
* **Describe the formation of sweat and the sweat response.**

**………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

**A2.5 Exam Past Paper Question Practice.**

**(May 2011)**

**Describe the formation of sweat during exercise in hot, dry environments (2).**

**…………………………………………………………………………………………………………………………………………………..………………………………………………………………………………………………………………………………………………..……………………………………………………………………………………………………………………………………………….………………**

**(May 2012)**

**Outline how the evaporation of sweat cools an athlete’s body during exercise (3).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..………**

**A2.6 Discuss the physiological responses that occur during prolonged exercise in the heat.**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 179-180
* **Describe the physiological responses below when an athlete is exposed to prolonged exercise in the heat.**

Cardiovascular response (cardiovascular drift)

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

Energy metabolism

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………**

Sweating

**…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..……………**

**A2.7 Discuss the health risks associated with exercising in the heat**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 180-182
* **List 3 types of heat illness and give one cause and one symptom for each.**

Illness …………………………………. Cause……………………………………………Symptom……………………………….

Illness …………………………………. Cause……………………………………………Symptom………………………………

.

Illness …………………………………. Cause……………………………………………Symptom……………………………….

* **A2.7 Exam Question Practice**

**(May 2009)**

**Discuss one physiological response to prolonged exercise in the heat (3).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

**(November 2011)**

**Discuss two health risks associated with exercising in the heat (4).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**(May 2014)**

**The Marathon des Sables is a six-day endurance running race across the Sahara desert. Describe two health risks associated with exercising in the heat (3).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**A2.8 Outline what steps should be taken to prevent and to subsequently treat heat-related disorders**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 181
* **In the boxes below, list six ways of preventing/treating heat-related disorders.**

.

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |

* **A2.8 Exam Question Practice**

**(May 2011)**

**Outline two steps than an individual can take to prevent heat-related disorders during sports competition in hot, dry environments (2)**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..……**

**A2.9 Describe how an athlete should acclimatize to heat stress**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 179
* **Briefly describe the process of heat acclimatization.**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

* **Discuss the signs of heat acclimatization. Include chronic adaptations.**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

* **A2.9 Exam Question Practice**

**(May 2010)**

**Describe two steps an athlete preparing for an event in a hot environment might take to acclimatize prior to competition (2).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

**A2.10 Discuss the physiological and metabolic adaptations that occur with heat acclimatization.**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 179
* **List the chronic adaptations to exercise that can improve exercise performance in the heat.**

 1…………………………….. 2……………………………...

 3…………………………….. 4……………………………..

 5……………………………..

* **A2.10 Exam Question Practice**

**(November 2013)**

**Discuss the physiological adaptations that occur with heat acclimatization in soccer players over a two-week period (3).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

**………………………………………………………………………………………………………………………………………………………**

**A2.11 Outline the principle means by which the body maintains core temperature in cold environments**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 182-183
* **Outline three ways in which the body maintains core temperature in cold environments.**
1. Shivering:

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..…………**

1. Non shivering thermogenesis:

**…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..………**

1. Peripheral vaso-constriction:

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..…………………**

* **A2.11 Exam Question Practice**

**(November 2011)**

**Outline two principles of body thermoregulation in cold environments (2).**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..…………………………………**

**A2.12 Explain why the body surface area-to-body mass ratio is important for heat preservation**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 184
* **Briefly explain why body surface area is an important factor in heat preservation.**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..…………………………**

* **Explain why a child is more susceptible to hypothermia than an adult.**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..…………**

* **Which of the following is more advantageous in a warm environment?**
1. Larger surface area to body mass ratio
2. Smaller surface area to body mass ratio
* **A2.12 Exam Question Practice**

**(May 2011)**

**Explain why the body surface area-to- body mass ratio is important in terms of thermoregulation during exercise (3).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**A2.13 Outline the importance of wind-chill in relation to body heat loss**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 184
* **List two factors that influence the coldness of an environment.**
1. **…………………………………………………**
2. **……………………………………………………**
* **Describe two avenues of heat exchange by which wind increases the rate of heat loss.**

**…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..………**

**………………………………………………………………………………………………………………………………………………………**

* **List two ways in which an individual could reduce wind chill effects.**
1. **……………………………………………**
2. **……………………………………………**

**A2.14 Explain why swimming in cold water represents a particular challenge to the body’s ability to thermoregulate**

**Resource: Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 187**

* **List three immediate responses of the body during cold water immersion.**
1. …………………………………………………………………………………………………………………………….
2. …………………………………………………………………………………………………………………………….
3. …………………………………………………………………………………………………………………………….
* **Which principle of thermoregulation has the biggest influence on the body’s struggle to thermoregulate?**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**A2.15 Discuss the physiological responses to exercise in the cold**

* **Research the physiological responses and discuss below.**

Metabolic function

**……………………………………………………………………………………………………………………………………………………………………………………………………………...……………………………………………………………………………………………………………………………………………………………..…………………………………………..……**

Metabolic rate

**……………………………………………………………………………………………………………………………………………………………………………………………………………...………………………………………………………………………………………………………………………………………………………..…………………………………………..…………**

**A2.16 Describe the health risks of exercising in the cold, including cold water**

**Resources:**

* Sproule, J (2012)  *Sport, Exercise and Health Science.* PP. 184
* **Work with a partner to research and complete the tables below.**

|  |
| --- |
| **Hypothermia** |
| **Definition** |  |
| **Symptoms** |  |
| **Treatment** |  |
| **Prevention** |  |

|  |
| --- |
| **Frostbite** |
| **Definition** |  |
| **Symptoms** |  |
| **Treatment** |  |
| **Prevention** |  |

* **A2.16 Exam question practice**

**May 2013**

**Outline one health risk of exercising in the cold (2).**

**………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………**

**A2.17 Discuss the precautions that should be taken when exercising in the cold**

* **Work with a partner to create a brainstorm of precautions that should be taken when exercising in the cold. Include clothing, insulation, dehydration, inhaling cold air and avoid overdressing. In your brainstorm, provide detail that discusses these precautions.**
* **A2.17 Past paper exam question practice**

**(May 2014)**

**Describe the precautions that should be taken during distance running in the extreme cold (2).**

**……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..…………………………………………..…………………………………………..**