**Scientific Communication Task 3**

**Relating evidence to ideas**

# Purpose

This task assesses paraphrasing and referencing and is the learning task for the Discussion section of the Scientific Report.

## Introduction

The Australian Women’s Olympic Cycling Team have received your analysis of the results into the effects of competing at different temperatures on their cyclists’ heart rate with great interest.

The results are summarised in Figure 1 below.

Figure 1. Changes in mean heart rate of 10 subjects cycling at different environmental temperatures for 60 minutes.

The Olympic Cycling Team’s hypothesis for this experiment was: **The higher the environmental temperature, the greater the increase in heart rate while exercising.**

In light of these results, the Olympic Cycling Team are revising their knowledge of thermoregulation and the effects of exercise at different environmental temperatures on heart rates. They have asked you to help them better understand the scientific knowledge and previous studies that have looked at this phenomenon.

The Olympic Cycling Team are particularly interested in understanding how the body regulates its temperature and why strenuous physical exercise at 31°C results in a higher heart rate compared to the same exercise being undertaken at temperatures of 4°C, 11°C and 21°C.

## Your task

Scientific Communication Task 3 is divided into three sections which model the tasks required in the Discussion section of the Scientific Report:

* The first section requires **paraphrasing** the accepted scientific knowledge, to **describe** and **explain** the role played by the integumentary system in thermoregulation during exercise.
* The second section involves **describing** the results of the experiment provided in **Figure 1** above.
* The third section requires the use of scientific knowledge to **explain** how thermoregulation involving the integumentary system during exercise in a hot environment results in the higher heart rate seen in Figure 1 above.

Write your response to the tasks for each section of this assignment as a single, properly structured paragraph that includes a topic sentence and in-text citations. Note that the tasks don’t have to be responded to in the order they are given.

NO FURTHER RESEARCH IS REQUIRED TO COMPLETE THIS ASSIGNMENT. Only paraphrase information from the sources provided in the **Background Knowledge Sheet** on Learnline to complete this assignment.

NO DIRECT QUOTES SHOULD BE USED. In scientific writing everything needs to be expressed in your own words to demonstrate your paraphrasing skills.

NOTE THAT IF **IN-TEXT CITATIONS AND/OR A REFERENCE LIST** ARE NOT INCLUDED, THIS ASSIGNMENT MUST BE RESUBMITTED AND IT WILL BE MARKED ON A PASS/FAIL BASIS ONLY. STUDENTS THAT DO NOT RESUBMIT THEIR ASSIGNMENT WILL RECEIVE 0 MARKS.

All answers must be written in your own words in an academic style. This includes not using any personal pronouns. Your assignment must also be proofread before submission. Proof reading means carefully going through your assignment to find and correct mistakes in your grammar, spelling and written expression.

**Section 1 – Only use the sources provided to describe the accepted scientific explanation behind the concept being tested.**

Write a single, properly structured paragraph that includes responses to all four tasks below, by paraphrasing information from the three sources provided in the Background Knowledge Sheet, for **Section 1** **only**, including information from **Figure A**. **Do not use any other sources.**

A topic sentence **MUST** be included as well as in-text citations formatted following the CDU APA Referencing Style to acknowledge the information sources used.

Direct quotes should **NOT** be used.

This paragraph should be approximately 200 words in length and is worth 13 marks.

1. **Describe** how heat production in the body changes during exercise.
2. **Identify** the **two** mechanisms used by the skin (integumentary system) to **remove** excess heat from the body.
3. **Describe** **ALL** the steps in the homeostatic feedback loop shown in **Figure A** of the Background Knowledge Sheet to explain how these **two heat loss mechanisms** are activated and reduce the stimulus.
4. **Explain** how these two heat loss mechanisms remove heat from the body.

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| During exercise, as the skeletal muscles contracts the body produces heat. The heat production in the body rapidly increases only at the beginning of an intense exercise. But, as the exercise continues at a steady rate, the heat production still increases but at a reduced speed (Gonzalez-Alonso, 2012). There are two mechanisms used by the integumentary system to remove excess heat from the body. These are producing sweat and heat dissipation (Betts et al., 2013). Figure A displays the process of thermoregulation. When the stimulus is triggered, it sends signals to the hypothalamus, via the peripheral and central receptors. The signals are sent to the sympathetic nervous system which will stimulate the sweat glands to produce large amounts of sweat (Kuht., & Farmery, 2018). Additionally, the redness in the skin that people experience when exercising is the result of the arterioles in the dermis dilating, because the heat dissipate through the skin carried by the blood. The body’s temperature is then cooled and decreases as the sweat and the heat evaporates through the skin (Betts et al., 2013). |

**Section 2 – Describe the results given in Figure 1 on the first page above.**

Write a single, properly structured paragraph that describes the results shown in **Figure 1** on the first page above.

Your description of the results should have enough detail so that someone else could draw a *roughly accurate* sketch of the **trends** shown by mean heart rate at each temperature in **Figure 1** from just your description.

No references or in-text citations are needed in this section since it is your own interpretation.

This paragraph should be approximately 100 words in length and is worth 6 marks.

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| Figure 1 showed that all the heart rate increased enormously from all temperatures from 0-5 minutes, starting from 70 beats per minute (bpm) to 145 bpm and had a constant increasing trend throughout the 60 minutes of exercise. From 5 -60 minutes the results had stayed constant, increasing steadily up to 160 bpm at the end of the exercise for the three temperatures, except for the 31°C. 31°C had a constant increasing trend throughout the 5-60 minutes of exercise, increasing up to 175bpm, compared to the cooler temperatures. At the end of the 60 minutes of exercise, 31°C increased the heart rate by 105bpm from 70 bpms whereas, the rest of the temperature increased the heart rate by 90 bpm. Compared to the cooler temperatures 31°C had a heart rate mean results of 15bpm higher that the cooler temperatures. |

**Section 3 – Only use the sources provided to explain the results given in Figure 1 on the first page above.**

Write a single, properly structured paragraph that includes your responses to the tasks below, by paraphrasing information from the two sources provided in the Background Knowledge Sheet for **Section 3 only**. **Do not use any other sources**.

A topic sentence **MUST** be included as well as in-text citations formatted following the CDU APA Referencing Style to acknowledge the information sources used.

Direct quotes should **NOT** be used.

This paragraph should be no more than 250 words in length and is worth 8 marks.

1. **Explain** why the **two heat loss mechanisms** identified in Section 1 are less efficient in a hot environment compared to a cool environment.
2. Heat loss mechanisms are less effective in hot environments. Use the two sources provided for Section 3 as well as your own **reasoning** and **deduction** to **explain** why this causes heart rate to increase more while exercising in a hot environment compared to a cool environment as shown in Figure 1.

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| Evaporation and radiation are heat loss mechanisms that the body uses to cool down, but these are less effective in hot environments compared to cool environments. Sweat evaporates which takes the heat away from the body. In cool environments, more heat is used to produce sweat, which leaves the body and cools it (Lohner, 2017). Evaporation is less effective in hot environments because the liquid on the skin is already hot. In radiation, the body radiates heat more in cooler environments compared to hot environments. This is because the heat can be transferred into the cool air outside. Whereas in hot environment there is less heat that can be radiated out in the air, as the heat does not move to hotter places (Harvard Health, 2019). Results in Figure 1 shows that heart rate increases more in hot environment compared to cooler environments. This is because when the body is trying to pump blood to the working muscles, it is also trying to keep cool. The heart rate increases more in hot environments because blood needs to get circulated more to keep the body cool. Whereas in cool environments, the blood does not need to get circulated as much because the heat evaporates and radiates more easily to cool down the body. The effect of hot environment causes the heart rate to increase more because the heart needs to pump more blood into the skin to dissipate the heat produced. |

## References

Two of the five references used for this assignment are provided below.

Create a reference list for the **first** **three** sources listed in the Background Knowledge Sheet used in Scientific Communication Task 3. The reference list must be formatted following the CDU APA 7th Referencing Style. All information required for creating the reference list is provided in the Background Knowledge Sheet.

IF **IN-TEXT CITATIONS AND/OR A REFERENCE LIST ARE MISSING**, THIS ASSIGNMENT MUST BE RESUBMITTED AND IT WILL BE MARKED ON A PASS/FAIL BASIS ONLY. STUDENTS WHO DO NOT RESUBMIT THEIR ASSIGNMENT WILL RECEIVE 0 MARKS

González-Alonso, J. (2012). Human thermoregulation and the cardiovascular system. *Experimental Physiology, 97*(3), 340-346. <https://doi.org/10.1113/expphysiol.2011.058701>

Harvard Health Publishing Staff. (2019, November 5). Heat is hard on the heart; simple precautions can ease the strain. *Harvard Health Publishing*. <https://www.health.harvard.edu/blog/heat-is-hard-on-the-heart-simple-precautions-can-ease-the-strain-201107223180>

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| Betts, J. G., Young, K.A., Wise, J.A., Johnson, E., Poe, B., Kruse, D.H., Korol, O., Johnson, J.E., Mark Womble, & DeSaix, P. (2013). *Anatomy and physiology.* OpenStax. <https://openstax.org/books/anatomy-and-physiology/pages/1-introduction>  Kuht, J., & Farmery, A.D. (2018). Body temperature and its regulation. *Anaesthesia & Intensive Care Medicine, 19*(9), 507-512. <https://doi.org/10.1016/j.mpaic.2018.06.003>  Lohner, S. (2017, September 14). *Chilling science: evaporative cooling with liquids.* Scientific American. <https://www.scientificamerican.com/article/chilling-science-evaporativecooling-with-liquids/> |

## Marking Rubric

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| **45 Marks Total** | |
| **Practical 6 completed (2 marks)** | **Practical 7 completed (2 marks)** |

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| **Knowledge & Understanding**  Assignment written entirely in own words. All academic conventions for summarising/paraphrasing followed.  Original meaning of sources retained.  Each task fully completed, and graph fully described.  Good understanding of thermoregulation shown. | **Knowledge & Understanding:**  Assignment partly written in own words. Most academic conventions for summarising/paraphrasing followed, but assignment may be too similar to source materials in places.  Original meaning of sources not always retained.  Some tasks incomplete. Graph described but may be missing some details.  Sound understanding of thermoregulation shown. | **Knowledge & Understanding:**  Assignment not written using own words. Academic conventions for summarising/paraphrasing not followed leaving assignment too similar to source materials.  Original meaning of sources not retained.  Many tasks incomplete. Graph poorly described.  Limited understanding of thermoregulation shown. |
| **Excellent: 21 - 27** | **Satisfactory: 14 - 20** | **Needs improvement: 13 or less** |
| **In-text citations**  In-text citations for all compulsory sources included.  In-text citations properly integrated and correctly formatted following CDU APA 7th Referencing Style. | **In-text citations**  In-text citations for all compulsory sources included.  Some in-text citations not properly integrated and/or not formatted correctly following CDU APA 7th Referencing Style. | **In-text citations**  In-text citations for all compulsory sources not included or entirely absent.  No in-text citations properly integrated and/or formatted correctly following CDU APA 7th Referencing Style. |
| **Excellent: 3** | **Satisfactory: 2** | **Needs improvement: 1 or less** |
| **Language usage**  Written in an academic style.  Sentence structures consistently logical and clear. Topic sentences included.  Writing with few or no errors in spelling, grammar, punctuation and capitalisation which enhanced readability.  Scientific terms and language used correctly. | **Language usage**  Mostly written in an academic style.  Sentence structures generally logical and clear. Topic sentences mostly included.  Writing with some errors in spelling, grammar, punctuation and capitalisation. Errors may start to affect readability.  Scientific terms and language mostly used correctly. | **Language usage**  Not written in an academic style.  Sentence structures often illogical and unclear. Topic sentences not included.  Writing with numerous errors in spelling, grammar, punctuation and capitalisation that affects readability.  Scientific terms and language not used correctly. |
| **Excellent: 4 - 5** | **Satisfactory: 2.5 - 3.5** | **Needs improvement: 2 or less** |
| **Reference list**  Reference list complete, includes all compulsory sources.  References correctly formatted following CDU APA 7th Referencing Style. | **Reference list**  Reference list complete, includes all compulsory sources.  References have been mostly formatted correctly following CDU APA 7th Referencing Style. | **Reference list**  Reference list incomplete or missing. No compulsory sources included.  Reference list not formatted following CDU APA 7th Referencing Style. |
| **Excellent: 5 - 6** | **Satisfactory: 3 - 4** | **Needs improvement: 2 or less** |