

**LIFE SCIENCES 2024**

**GRADE 12**

**Assignment Term 3: Endocrine system, homeostasis and plant response to the environment**

**TOTAL: 50 TIME: 60 minutes**

**INSTRUCTIONS AND INFORMATION**

**Read the following instructions carefully before answering the questions.**

1. This is a formal SBA task and needs to be done under supervised conditions in the classroom.
2. Each learner completes this task on his/her own (under test conditions).
3. Present your answers per the instructions of each question.
4. Draw all diagrams in pencil and label in blue ink.
5. The diagrams in this task may NOT be drawn to scale.

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| **QUESTION 1** |  |
| An investigation was conducted to determine the effect of different amounts of thyroxin on the metabolic rate.**The procedure was as follows:**• Nine healthy adult male rats were used.• They were divided into three groups of three rats each: **A, B** and **C**.• All three groups were kept in the same environment in three separate cages.• Each group received the same amount of water.• Each group was given a different diet.**DIET X**: Food containing all the essential nutrients**DIET Y**: Food containing all the essential nutrients and an extract of thyroxin**DIET Z**: Food containing all the essential nutrients and a chemical that inhibits the  effect of thyroxin* Their initial mass was taken.

• Three weeks later their mass was taken again* Their oxygen consumption was also measured.
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| **GROUP** | **DIET (X,Y or Z)** | **Mass of rats (g)** | **Average Oxygen consumption (ml/kg/min)** |
| **Initial** | **After 3 weeks** |
| **Average mass of the three rats (g)** | **RAT 1 (g)** | **RAT 2 (g)** | **RAT 3 (g)** | **Average mass of rats (g)** |
| **A** | **Diet X** | 319 | 320 | 322 | 322 | **(i)** | 4 |
| **B** | **?** | 320 | 305 | 315 | 308 | **(ii)** | 10 |
| **C** | **?** | 318 | 345 | 338 | 337 | **(iii)** | 2,7 |

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| 1.1 |  | State the sample size of this investigation.  | (1) |
| 1.2 |  | Calculate the average mass of **(i), (ii)** and **(iii)**.  | (3) |
| 1.3 |  | Which group has the highest average: |  |
|  | a) | Oxygen consumption | (1) |
|  | b) | Average mass after three weeks. | (1) |
| 1.4 |  | What effect does an increase in thyroxin have on oxygen consumption?  | (1) |
| 1.5 |  | Which group (**A, B** or **C**) is the control in this investigation?  | (1) |
| 1.6 |  | Identify the diet (**X, Y** or **Z**) used for:  |  |
|  | a) | Group **B** | (1) |
|  | b) | Group **C** | (1) |
|  |  |  | **(10)** |

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| **QUESTION 2** |  |
| The table below shows the results of the average rate of blood flow to the skin at different environmental temperatures. |  |
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| **ENVIRONMENTAL TEMPERATURE (ºC)** | **AVERAGE RATE OF BLOOD FLOW TO THE SKIN** **(mℓ/100 mℓ tissue/min)** |
| 0 | 2,5 |
| 5 | 4 |
| 20 | 4,5 |
| 35 | 11 |
| 45 | 18 |
| 50 | 19 |

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| 2.1 | Identify the environmental temperature with the lowest average rate of blood flow to the skin. |  (1) |
| 2.2 | State ONE conclusion that can be drawn from the results. | (2) |
| 2.3 | Calculate the percentage increase in blood flow to the skin between 5 ºC and 35 ºC. Show ALL your working. | (3) |
| 2.4 | “Frostbite is a condition where long term exposure to extremely cold conditions (0 ºC or less) leads to death of tissue in areas like the hands and feet.”Use the data from the above table to explain why tissue may die. | (2) |
| 2.5 | Draw a line graph to illustrate the results shown in the above table. | (6) |
|  |  | **(14)** |

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| **QUESTION 3** |  |
| Read the following information on insulin resistance. |  |
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|  | Insulin resistance is a complex condition in which your body does not respond as it should to insulin. One of the causes is over-eating of carbohydrates. This will lead to body cells resisting the action of insulin, therefore leaving the glucose in the bloodstream to be stored as fat and to not be available for energy in the cells. Over time, chronic insulin resistance can lead to prediabetes and then Type 2 diabetes if it’s not treated. |  |
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| 3.1 | Name the cells in the pancreas which secrete insulin. | (1) |
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| 3.2 | Give ONE symptom of insulin resistance from the information given.  | (1) |
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| 3.3 | State ONE lifestyle factor, mentioned in the above extract, which causes insulin resistance.  | (1) |
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| 3.4 | Explain why a person with untreated insulin resistance will feel tired. | (2) |
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| 3.5 | Explain why the insulin levels in the blood will remain high in a person who is insulin resistant. | (2) |
|  |  | **(7)** |

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| **QUESTION 4** |  |
| A learner carried out an investigation to determine the effects of two plant growth hormones on apical dominance. * The apical buds of 9 pea plants were removed.
* These plants were then divided equally into three groups.
* The plants were all grown under the same conditions in the laboratory.
* In each group the cut surface of the remaining shoot (growing stem) of the pea plants was treated in one of the following ways:

**Group 1:** Coated with a paste containing gibberellins of the same concentration **Group 2:** Coated with a paste containing auxins of the same concentration **Group 3:** Coated with a paste only (containing no plant growth hormones) * The hormones diffuse into the plant until no more hormones remain in the paste.
* The length of the lateral branches of each plant was measured every two days for a period of 12 days.
* Measurements were taken at the same time for all treated plants and the average for each group was calculated.

The results of the investigation are shown in the graph below.  |  |
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| 4.1 | Identify:a) the independent variable b) the dependent variable  | (1)(1) |
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| 4.2 | Calculate the difference in the average length of the lateral branches between the plants treated with gibberellins and the plants treated with the paste only on the 8th day after the treatment. Show ALL working.  | (2) |
| 4.3 | Provide TWO ways to ensure reliability of this investigation.  | (2) |
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| 4.4 | State TWO ways that ensured the validity of this investigation. | (2) |
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| 4.5 | Explain the importance of group 3 in this investigation. | (2) |
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| 4.6 | Explain the effect of auxins on the growth of the lateral branches using the results shown in the graph. | (3) |
|  |  | **(13)** |
| **QUESTION 5** |  |
|  The Two Oceans Marathon is a 56 kilometres ultramarathon held annually in Cape Town. The marathon starts in Newlands and ends at the University of Cape Town. Athletes run up to 7 hours continually to complete the race. Runners train for many months by partaking in smaller marathons to build their stamina.  |
| 5.1 | State what effect running for long periods of time will have on the carbon dioxide levels in the blood. | (1) |
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| 5.2 | Describe the homeostatic process the body will undergo during the race to restore the carbon dioxide levels back to normal. | (5) |
|  |  | **(6)** |

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|  |  | **[50]** |