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**Directorate: Curriculum FET**

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**TELEMATICS 2018**

**LIFE SCIENCES**

**Additional resources**

**Grade 11**

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**HOMEOSTATIC CONTROL OF BLOOD SUGAR, BREATHING, WATER AND SALTS.**

1.1 Study the flow diagram below of a homeostatic mechanism used to regulate the concentration of salts in the human body.

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* + 1. Define homeostasis.
		2. Give the name of the following:
1. Organ A
2. Gland B
3. Hormone C
	* 1. Describe the response by the effector at D.

1.2 The graph below shows the blood glucose concentration in a normal person and in a person with diabetes mellitus. Both persons ingested 100 mℓ of glucose solution at 30 minutes.

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1.2.1 What is the blood glucose concentration (g/cm3) of the person with diabetes mellitus at 90 minutes?

1.2.2 How many minutes after the ingestion of glucose did the glucose concentration reach its highest level in the normal person?

1.2.3 Describe TWO differences in the pattern of the blood glucose concentration for the person with diabetes mellitus and a normal person.

1.2.4 Explain the reason for the differences mentioned in QUESTION 1.2.3.

1.3 Study the flow diagram below showing the response of an endocrine gland to changes in the amount of glucose found in the blood.



1.3.1 Identify:

1. Hormone 1
2. Hormone 2

1.3.2 Name the gland that releases hormone 1 and hormone 2.

1.3.3 Explain the consequences for a person if the gland mentioned in QUESTION 1.3.2 fails to release hormone 1.

1.4 The diagram below represents one part of the negative feedback response that occurs when a person is dehydrated.

The decrease in blood volume, as a result of the excessive loss of water, is detected by the brain.



1.4.1 Identify the:

1. Hormone X
2. Endocrine gland that secretes hormone X
3. Target organ

1.4.2 Describe the response that occurs when a person is dehydrated, after it has been detected by the brain.

1.5 Some people with type I diabetes cannot produce insulin and therefore need to inject themselves regularly (insulin-dependent).

An investigation was done to determine the action of two types of insulin (**A** and **B**). The glucose uptake rate of cells, when using each type of insulin, was measured over time.



1.5.1 Name the human organ that produces insulin.

1.5.2 Using the information in the graph, state TWO differences in the functioning of insulin **A** and **B**.

1.6 The table below shows the change in the concentration of carbon dioxide (CO2) in a person's veins, as exercise levels increase.

The person in the investigation was asked to ride a bicycle which generated electricity, measured in watts. The faster the person cycled, the more watts he generated.



1.6.1 What is a normal carbon dioxide concentration in the venous blood for this person?

1.6.2 Explain the significance of measuring the carbon dioxide concentration in the blood when the person is not doing any exercise.

1.6.3 Explain why the carbon dioxide concentration in the veins increased during strenuous exercise.

1.6.4 Describe the homeostatic response that takes place in the body to reduce the carbon dioxide concentration when exercising between 200 and 250 watts.

**Possible answers**

1.1.1 The process by which the human body is able to maintain a constantinternal environment

1.1.2

(a) Kidney

(b) Adrenalgland

(c) Aldosterone

1.1.3

- Walls of renal tubules 

- become more permeable

- allowing for a greater re-absorption of sodium ions

- from the filtrate/into the blood capillaries

1.2.1 0.25g.cm3

1.2.2 15 minutes

1.2.3 Blood glucose level of a person with diabetes mellitus is higherthan that of a normal person at all times

There is a greater increase in the blood glucose level of a person with diabetes mellitus after ingestion of glucose compared to the normal person

It takes longer for the blood glucose level to stabilise for the person with diabetes mellitus compared to a normal

1.2.4 Because the person with diabetes mellitus does not produce insulin/is insulin resistant

And therefore blood glucose is not converted to glycogen

1.3.1

(a) Insulin

(b) Glucagon

1.3.2 Pancreas/Islets of Langerhans

1.3.3

- There will be NO conversion of glucose into glycogen

- in liver/muscles

- No absorption of glucose by cells

- The blood glucose levels will stay high

- and may lead to diabetes/any example of symptoms

1.4.1

(a) ADH/antidiuretic hormone

(b) Hypothalamus/Pituitary gland

(c) Kidneys

1.4.2

- An increase in ADH causes the walls of the kidney tubules

- to become more permeableto water

- More water is reabsorbed

- and the blood volume increases

- Less urine is produced

- and the urine is more concentrated

1.5.1 Pancreas

1.5.2



1.6.1 0,50 mol/mℓ

1.6.2

To establish a baseline/minimum CO2 in the blood

To allow a comparison with results

**OR**

 Acts as a control

To determine if the results obtained are caused by the exercise/independent variable.

1.6.3 - Body’s metabolic rate increases

- this means that the rate of cellular respiration increases

- to produce more energy/ ATP

- and therefore releases more CO2

1.6.4

CO2 levels in the blood increase above normal levels:

- Receptor cells in the carotid artery in the neck are stimulated

- To send impulses to the medulla oblongatain the brain

- Medulla oblongata stimulates breathing muscles/(intercostal muscles and diaphragm)

- and heart

- Breathing muscles contract more actively

- increasing the rate of breathing

- and depth of breathing

- The heart beats faster

- More CO2 is taken to and exhaled from the lungs

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