LIFE SCIENCES **ASSIGNMENT: ANSWERS** **12 AUGUST 2021**
Time: 1hr 40min

Homeostasis

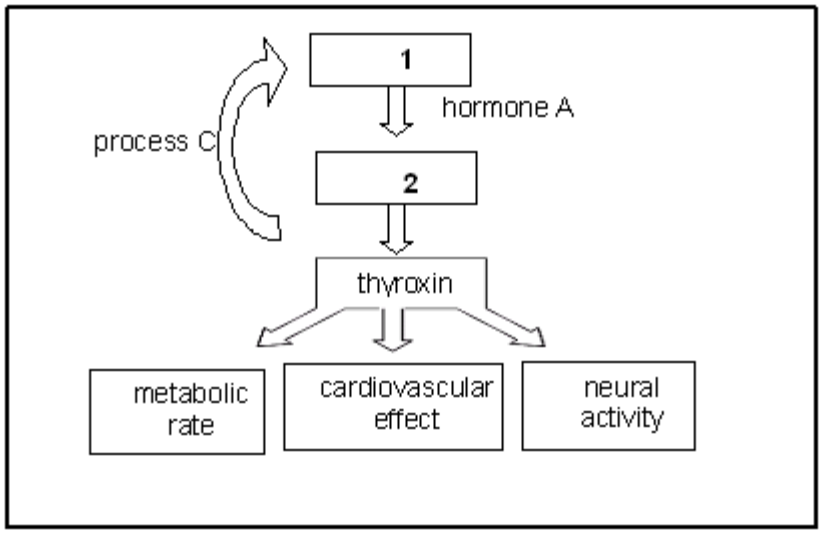
Grade 12 **Marks: 50**

INSTRUCTIONS

This assignment is an individual task that must be written under examination conditions. No books, internet access or cell phones can be used. No group work is allowed.

QUESTION 1

1.1 Study the diagram below and answer the questions that follow.



1.1.1 Give labels for the glands numbered 1 and 2**.**

1 - Pitiutary gland ✓
2 - Thyroid gland✓ (2)

1.1.2 Name hormone A.
Thyroid stimulating hormone/TSH (1)

1.1.3 Describe the negative feedback mechanism that operates when the thyroxin level in the blood is too high, as indicated by process C. (4)

- **High thyroxin concentration in the blood**✓ **will stimulate the pituitary gland to secrete less TSH.** ✓
- **The lower level of TSH**✓ **will make the thyroid gland to secrete less thyroxin which will decrease the level of thyroxin in the blood**✓

(7)

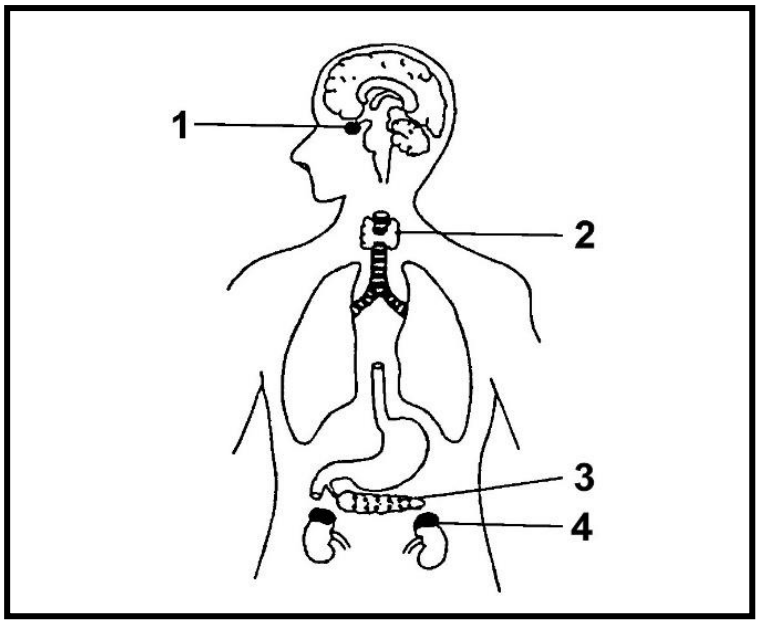
QUESTION 2

2.1 Describe how the principle of negative feedback operates in controlling the excess glucose concentration of the blood in a normal healthy person.

When abnormal levels of glucose are detected✓
- by the pancreas✓,
- the Islets of Langerhans✓ secretes hormones
- into the bloodstream✓

When blood glucose level rises✓
- **Insulin✓is secreted**
- **to decrease the blood glucose level✓**
- **back to normal✓**
- insulin secretion is then inhibit (Any 7) **(7)**

2.2. Study the diagram below and answer the questions that follow.



2.2.1 Write down only the NUMBER of the gland from the above diagram that:

(a) Produces a hormone that is involved in the re-absorption of some salts by the kidneys **4**✓
(b) Produces a hormone that controls the growth of long bones **1**✓
(c) Produces the hormone glucagon **3**✓
(d) Produces an iodine-containing hormone **2** ✓ (4)

2.2.2 State TWO similarities between hormones and nerves with regard to their functions (2)

- **They respond to internal and/or external stimuli✓**
- **They protect organisms✓**

(6)

[13]

QUESTION 3

3.1 Describe the role of the hypothalamus in bringing about changes to the blood vessels of the human skin on a cold day**.**

Hypothalamus

- The change in temperature is detected✓ by the thermo-receptors ✓in the skin
- Stimulus converted to nerve impulse✓
- Transmitted to the hypothalamus ✓
- Hypothalamus sends impulses to the muscle layer in the arterioles ✓of the skin
max 3 (3)

On a cold day
- the arterioles close to the surface constrict✓/vaso-constriction occurs
- less blood✓ flows to capillaries close to the surface
- sweat production decreases✓ / less sweat is lost
- less heat is radiated from the body✓/less heat is lost **max 2** (2)
[5]

3.2. Study the following diagrams and answer the questions that follow.

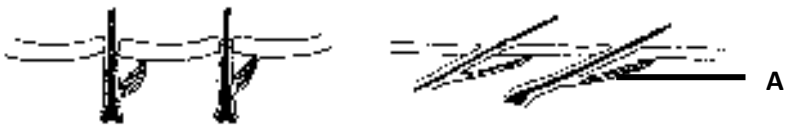


Diagram 1

Diagram 2

Diagram 3

Diagrams showing processes involved in thermoregulation in mammals

3.2.1 In which diagram (1 or 2) will:

(a) The skin be pale if the person is lighted-skinned (1)
Diagram 1✓

(b) The sweat glands produce more sweat (1)
Diagram 2✓

3.2.2 Explain your answer in QUESTION 3.2.1 (a). (2)
- Blood vessels in skin constrict to conserve heat in cold weather✓
- hence less blood reaches the skin✓

3.2.3 Diagram 3 shows a response to a particular environmental temperature. Which diagram (1 or 2) shows a response of a human to the same environmental temperature? Explain your answer (3)

Diagram 2
- Panting takes place in hot weather✓
- and hairs lie flat in hot weather✓
- to facilitate loss of body heat✓

3.2.4 Describe how the process illustrated in diagram 3 helps in the regulation of the body temperature of the dog (3)

Body heat used
- to bring about evaporation of liquid from tongue✓
- also warm liquid leaves body✓
- thus cooling down body✓

(10)
[15]

QUESTION 4

4.1 Study the table below that shows the volume of urine produce by six different people on a hot day and on a cold day. Answer the questions that follow:

Person	Volume of urine produced in cm^3	
	Hot day	Cold day
1	430	890
2	350	1 060
3	270	930
4	560	1 280
5	400	680
6	390	1 160
Average		1 000

4.1.1 Calculate the average volume of urine in cm^3 produced on a hot day. Show all your workings. (2)
Average volume of on hot day = (430 + 350 + 270 + 560 + 400 + 390)/6✓
= 400✓

4.1.2 What can you deduce from the difference from the average volume of urine produced on the hot day and the average volume of urine produced on the cold day? (2)
600 cm^3 ✓ more urine is produced on the cold day✓

4.1.3 The composition (make-up) of urine depends on several factors. Name TWO factors that would affect composition of urine. (2)
- water content of the blood (over-hydrated or dehydrated)
- salt content of the blood

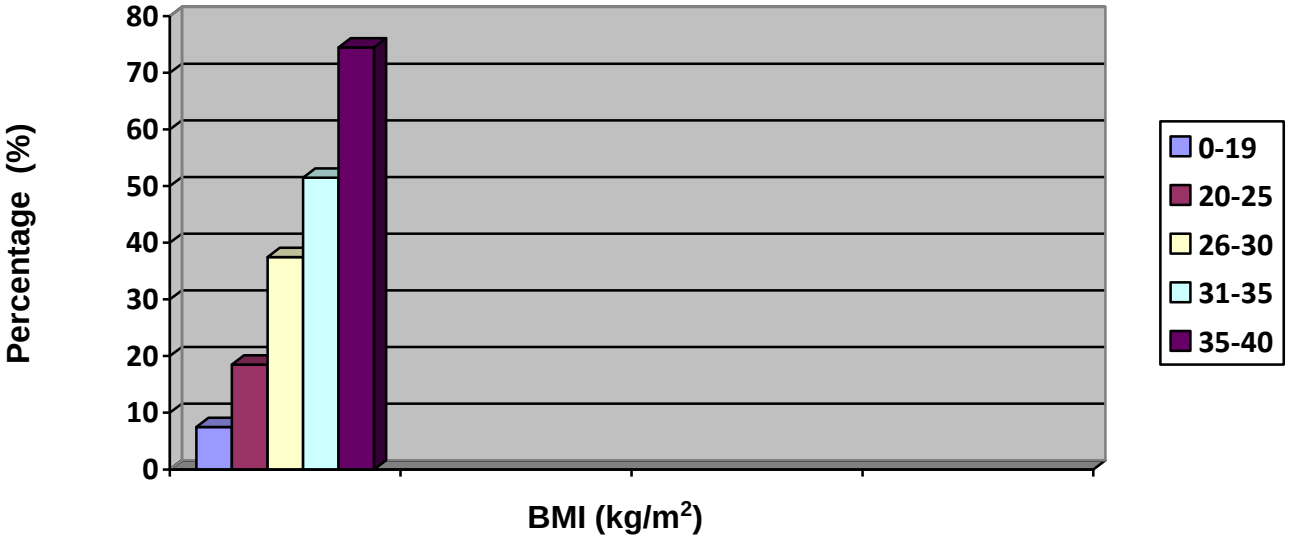
[6]

4.2 Type 2 diabetes is often linked to body mass index (BMI). The higher the BMI the greater your chances of developing Type 2 diabetes. The table below shows the results of an investigation into the BMI of women and their risk of developing diabetes (statistics from the American Diabetes Association).

BMI(mass /height) (kg/m^2)	Relative risk of developing diabetes in females (%)
0-19	7,5
20-25	18,5
26-30	37,5
31-35	57,5
36-40	74,5

4.2.1 Draw a histogram using the data in the table (6)

Effect of BMI on risks of developing diabetes in females



Rubric for assessing the histogram:

Description	Mark allocation
Caption	1
Type of the graph	1
x-axis: correct scale and label	1
y-axis: correct scale and label	1
Plotting: 1 – 4 correct bars All (5) correct bars	1 2

4.2.2 Which hormone is deficient in a person with diabetes? (1)

- Insulin✓

4.2.3 Write your own conclusion from the data given in the table and the histogram drawn (2)

-The higher the BMI, the higher the risk of developing diabetes✓✓

(9)

[15]

GRAND TOTAL: 50