MARKER CODE				

STUDENT ENROLMENT NUMBER (SEN)									

TONGA FORM SIX CERTIFICATE

2024

BIOLOGY

QUESTION AND ANSWER BOOKLET

Time allowed: 3 Hours

INSTRUCTIONS:

1. Write your **Student Enrolment Number (SEN)** on the top right-hand corner of this page.
2. This paper consists of **FOUR SECTIONS** and is out of 70 weighted scores.

SECTION	STRANDS	TOTAL SKILL LEVEL
ONE	CELLULAR BIOLOGY	14
TWO	GENETICS	13
THREE	ORGANISM LEVEL BIOLOGY	24
FOUR	ENVIRONMENTAL BIOLOGY	19
	TOTAL	70

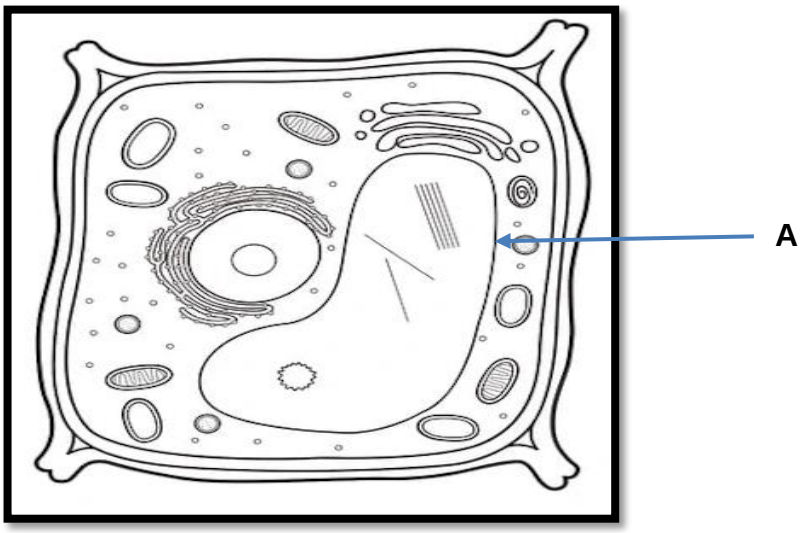
3. Answer ALL QUESTIONS. Write your answers in the spaces provided in this booklet.
4. Use a **BLUE** or **BLACK** ball point pen only for writing. Use a pencil for drawing if required.
5. If you need more space for answers, ask the supervisor for extra paper. Write your **Student Enrolment Number (SEN)** on each additional sheet, number the questions clearly and insert them in the appropriate places in this booklet.
6. Check that this booklet contain pages 2-19 in the correct order and that pages 18-19 have been deliberately left blank.

YOU MUST HAND IN THIS BOOKLET TO THE SUPERVISOR BEFORE YOU LEAVE THE EXAMINATION ROOM.

SECTION ONE: CELLULAR BIOLOGY

1. Examine the cell diagram in **Figure 1.1**.

Figure 1.1 Cell Diagram



Source: https://www.researchgate.net/figure/

a. Identify cell organelle **A**.

A: _____

Skill level 1	
1	
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NR	

b. State the function of cell organelle **A**.

_____

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Skill level 1	
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NR	

c. Identify the cell in **Figure 1.1** as either an animal cell or a plant cell.

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Skill level 1	
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d. Justify your answer to (c) above by comparing a plant cell to an animal cell.

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3	
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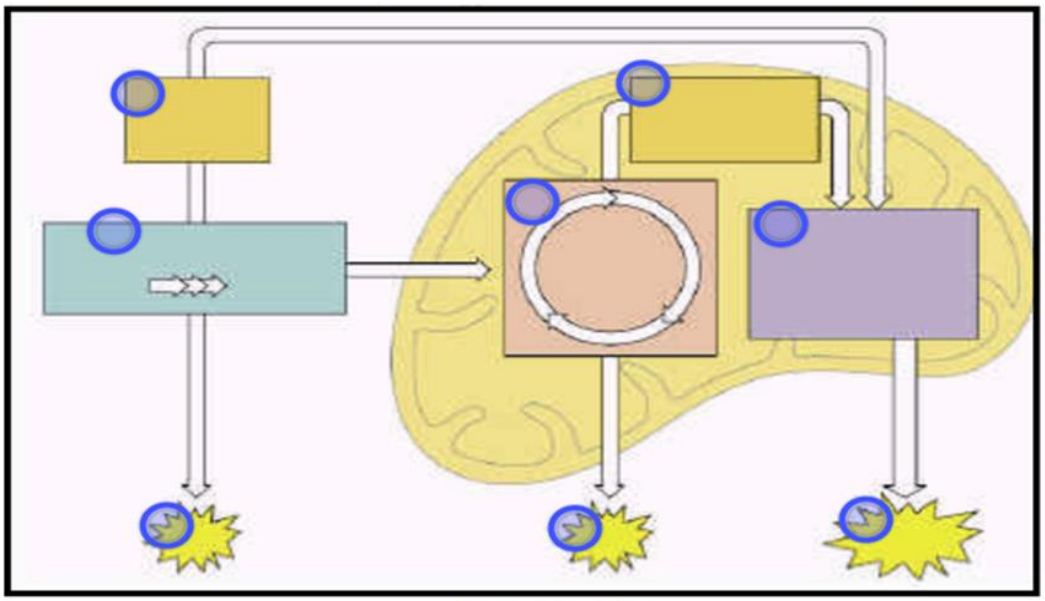
2. Use **Figure 1.2** to connect visual information with the key concepts you've learned to answer the questions that follow.

Figure 1.2 Respiration



Source: https://quizlet.com

a. Define **cellular respiration** process.

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Skill level 1	
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b. Write a **balanced chemical equation** for the **aerobic** respiration of glucose.

Skill level 2	
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c. Describe the **"Glycolysis"** stage of aerobic respiration.

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Skill level 2	
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d. Explain the importance of anaerobic respiration in everyday life.

Skill level 3	
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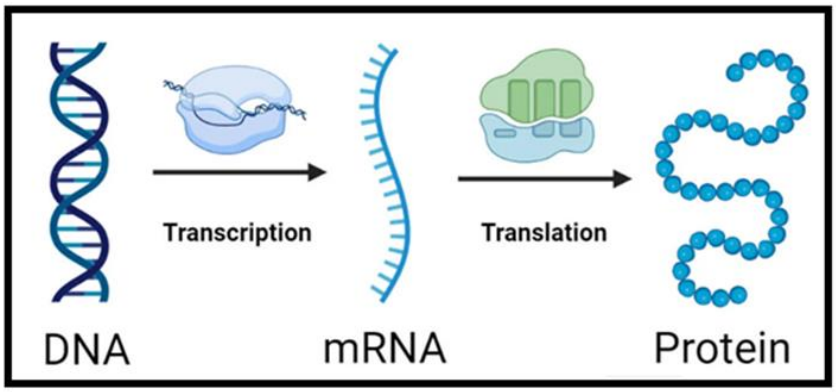
SECTION TWO: GENETICS

1. **Figure 2.1** below represents the process that takes place to express a gene, highlighting key stages and structures.

Figure 2.1: Gene Expression



Source: https://microbenotes.com/gene-expression/

a. Define **gene**.

Skill level 1	
1	
0	
NR	

b. Discuss the process of **protein synthesis**.
Include the major steps of transcription and translation as well as the roles of DNA, mRNA, tRNA, and ribosomes in your discussion.

Skill level 4	
4	
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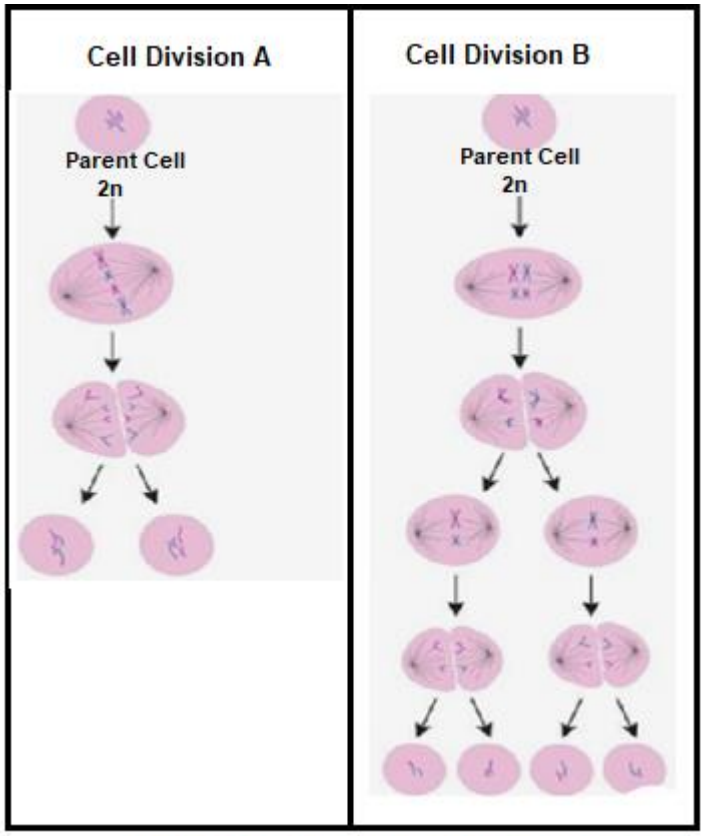
2. **Figure 2.2** illustrates the stages of 2 types of cell divisions, namely both mitosis and meiosis.
Use the diagram and your own knowledge to answer the questions that follow.

Figure 2.2: Cell Division



Source: https://www.freepik.com/premium-vector/

a. Identify **Cell Division A** above.

Cell Division A: _____

Skill level 1	
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b. Explain how the process of **crossing over** contributes to variation.

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Skill level 3	
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3. Suppose you have a pea plant that exhibits the dominant trait of tall height (T). However, you do not know whether the plant is homozygous dominant (TT) or heterozygous (Tt) for this trait.

Explain how a <u>test-cross</u> is used to determine the genotype of the pea plant.

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Skill level 3	
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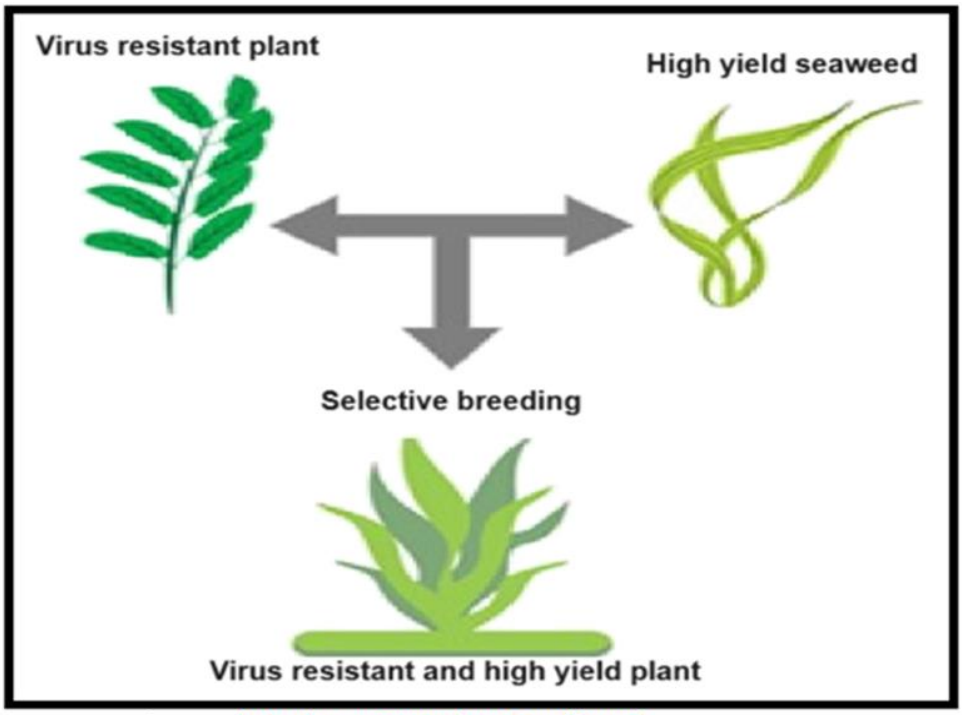
4. Use the illustration of Selective breeding in plants shown in **Figure 2.3** to answer the question below.

Figure 2.3: Selective Breeding



Source: https://www.researchgate.net/figure/

Define **Selective breeding.**

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Skill level 1	
1	
0	
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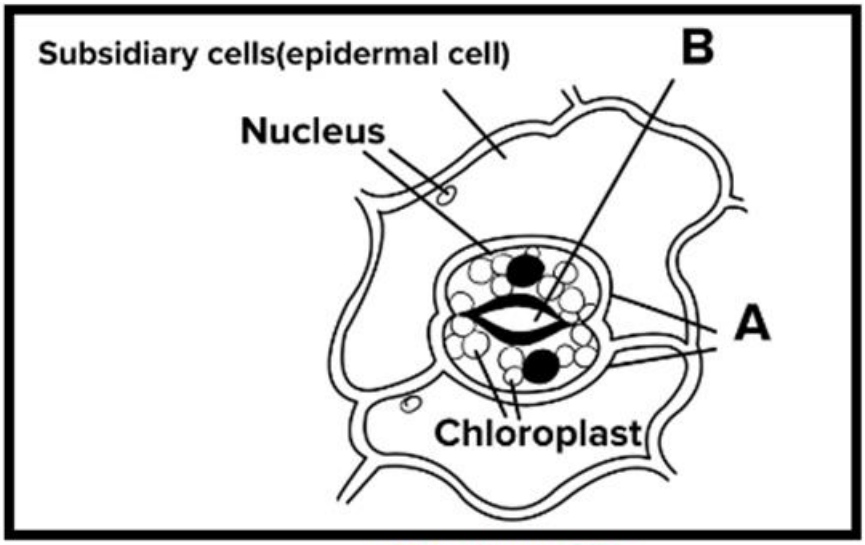
SECTION THREE: ORGANISM LEVEL BIOLOGY

1. The diagram below illustrates a plant cell from a leaf. Use **Figure 3.1** and your own knowledge to answer the questions that follow.

Figure 3.1: Structure found in a leaf



Source: https://byjus.com

a. In Figure 3.1, the lines indicate specific structures labeled with letters. State the letter that correctly labels the **stomata**.

Skill level 1	
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b. Explain how the **guard cells** regulate the movement of gases.

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Skill level 3	
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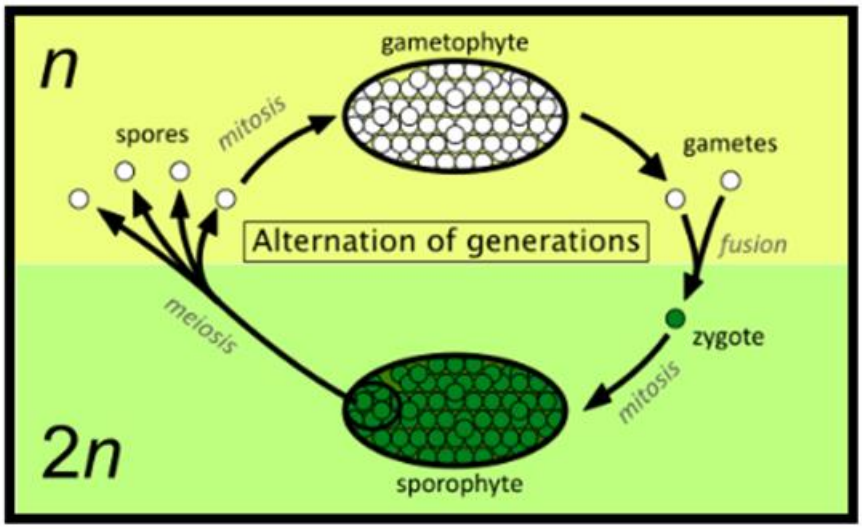
2. In the life cycle of plants, alternation of generations is a fundamental concept. Use **Figure 3.2** and your own knowledge to answer the questions that follow.

Figure 3.2: Alternation of generations



Source: ***https://en.wikipedia.org/wiki/Alternation_of_generations***

a. Define **alternation of generations** in plants.

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Skill level 1	
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b. Compare the alternation of generations in **Ferns to those in Angiosperms** in terms of the <u>interdependence between the sporophyte and gametophyte generations</u>.

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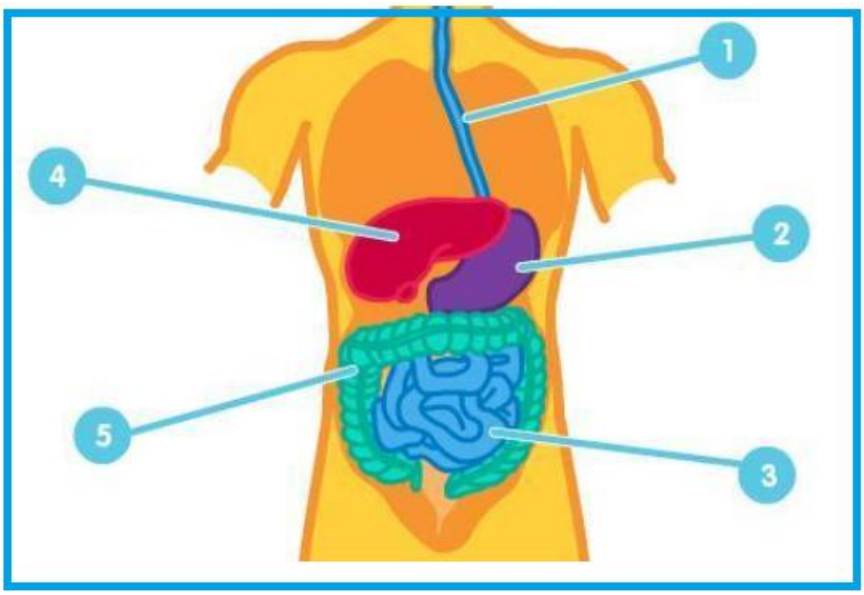
Skill level 3	
3	
2	
1	
0	
NR	

3. **Figure 3.3** show major organs that are involved in the process of digestion.

Figure 3.3: Digestive System



Source: ***https://brainly.com/question/30809513***

a. State the number that represents the liver.

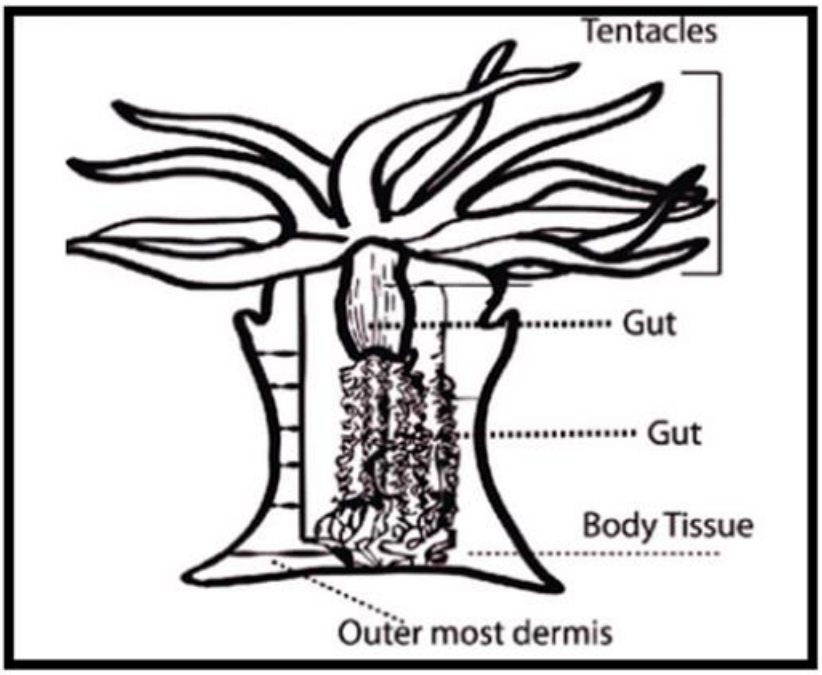
Skill level 1	
1	
0	
NR	

b. Explain the function of the liver in maintaining blood sugar levels to avoid diabetes.

Skill level 3	
3	
2	
1	
0	
NR	

4. Sea anemones, like other cnidarians, possess a simple yet effective gut system that allows them to digest food and absorb nutrients.

Figure 3.4: Gut system of a sea anemone



Source: https://www.researchgate.net

a. Given the above information and the diagram, identify the type of gut system found in sea anemone.

Skill level 1	
1	
0	
NR	

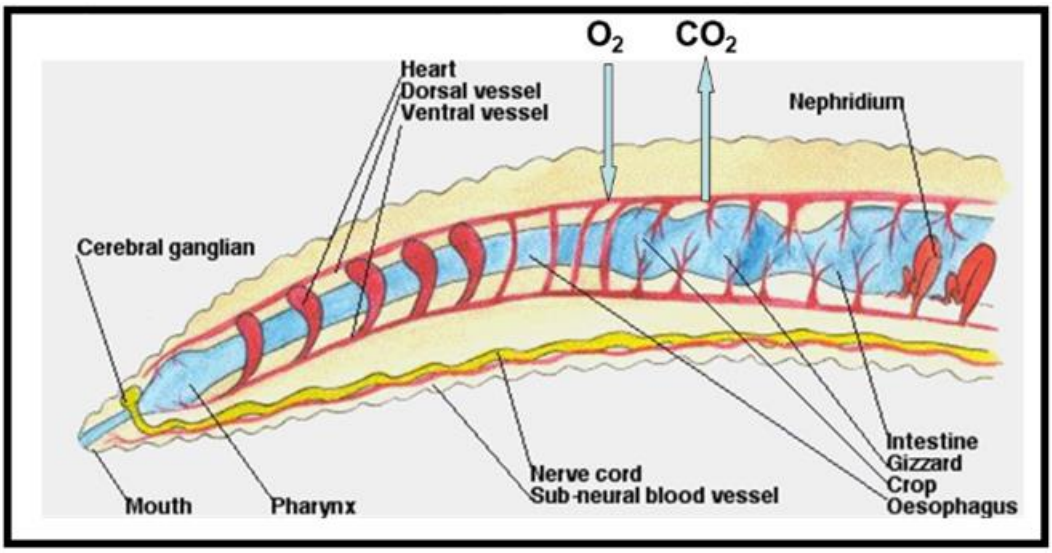
b. Explain how the structure of the gut system in **Figure 3.4** is related to the sea anemone's habitat and way of life.

Skill level 3	
3	
2	
1	
0	
NR	

5. Earthworms have a unique way of breathing.

Use **Figure 3.5** and your own knowledge to answer the questions that follow.

Figure 3.5: Gas Exchange System of earthworms



Source: https://slideplayer.com/slide/

a. Define the process of **Gas Exchange** as it occurs in organisms.

_____

_____

_____

Skill level 1	
1	
0	
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b. Explain how the structure of the gas exchange system of an earthworm is related to its habitat and way of life.

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Skill level 3	
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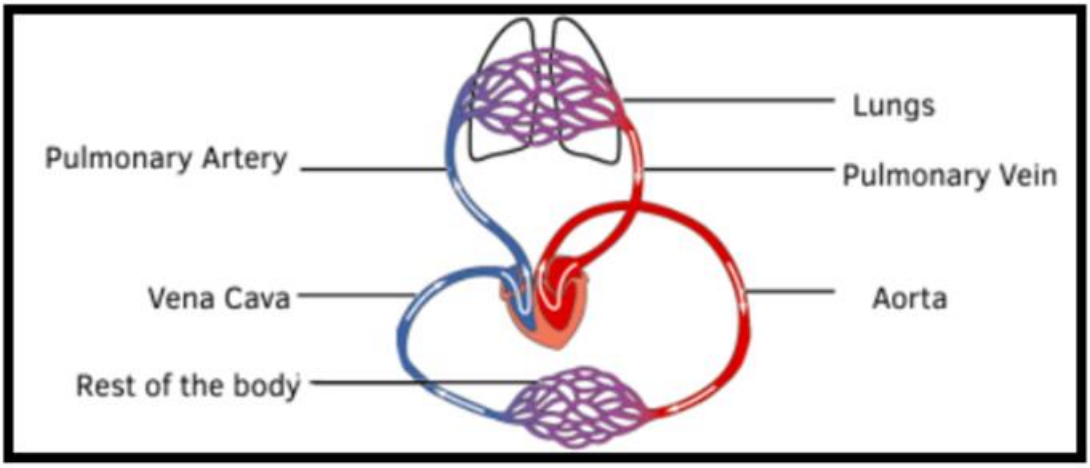
6. The human circulatory system is a complex network responsible for transporting blood, nutrients, oxygen, and waste products throughout the body.

Use this information, **Figure 3.6** and your own knowledge to answer the questions that follow.

Figure 3.6: Circulatory System



Source: ***https://studymind.co.uk/notes/***

a. State the <u>type of circulatory system</u> humans have.

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Skill level 1	
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b. Give an example of a heart disease.

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Skill level 1	
1	
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c. Heart diseases can have significant effects on the circulatory system.

Describe how heart diseases impact the circulatory system.

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Skill level 2	
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SECTION FOUR: ENVIRONMENTAL BIOLOGY

1. Biodiversity is essential for the functioning of ecosystems.

   a. Define **biodiversity**.

Skill level 1	
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NR	

   b. Explain how biodiversity affects ecosystem stability and continuity of life on earth.

Skill level 3	
3	
2	
1	
0	
NR	

2. Gause's Principle, also known as the competitive exclusion principle, highlights an important concept in ecology.

   a. State **Gause's Principle**.

Skill level 1	
1	
0	
NR	

   b. Explain how the **adaptation** of an organism is related to the Gause Principle.

Skill level 3	
3	
2	
1	
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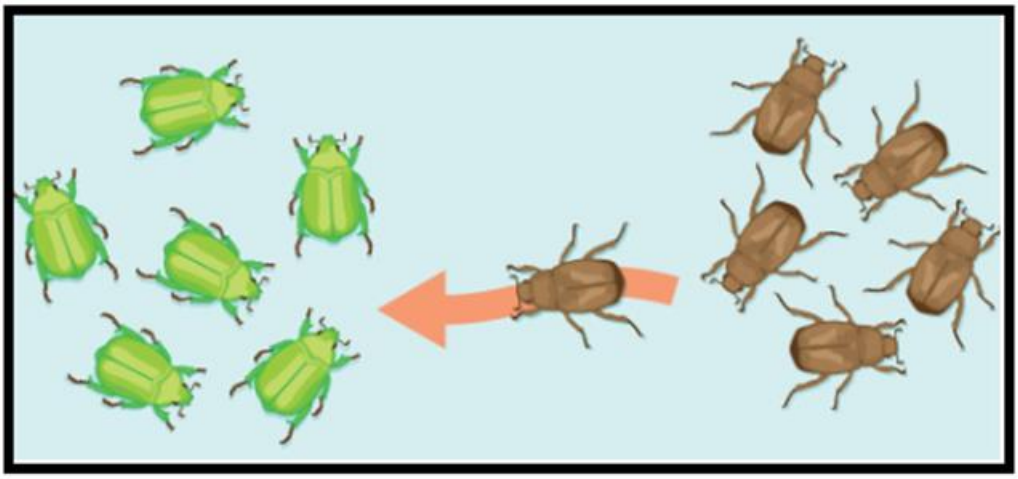
3. Genetic variation is a key factor that influences the traits and characteristics within a population.

Figure 4.1: Genetic variation



Source: https://courses.lumenlearning.com/

a. Define **genetic variation**.

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Skill level 1	
1	
0	
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b. Describe the effect of genetic variation in the nature of a population.

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Skill level 2	
2	
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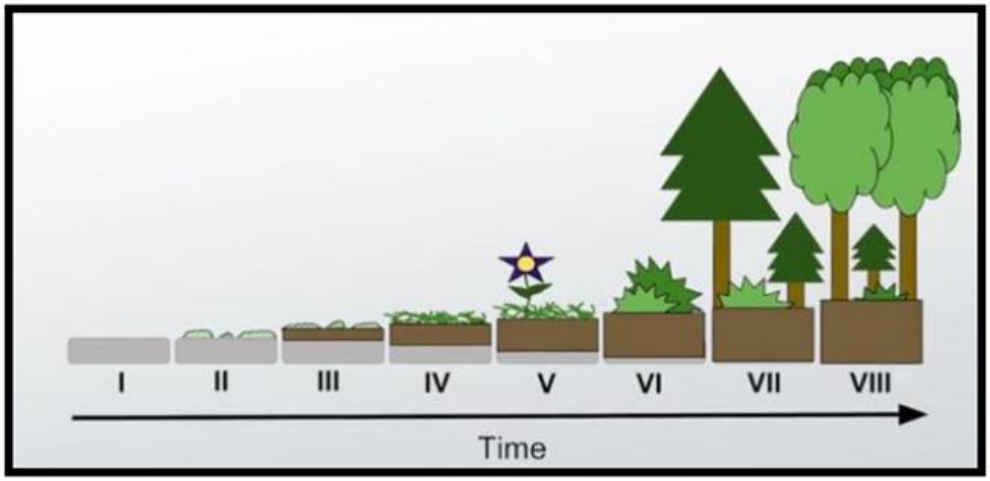
4. Ecological succession is the process through which ecosystems change and develop over time that involves pioneer species.

Figure 4.2: Ecological Succession



Source: ***https://study.com/academy/lesson/***

a. Define **Pioneer species**.

_____

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Skill level 1	
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b. Describe the role of a pioneer species.

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Skill level 2	
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5. In the natural world, living organisms do not exist in isolation.

a. Define an **ecosystem**.

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Skill level 1	
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0	
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b. In Tonga, one significant local environmental issue is **coastal erosion**, which affects many of the country's coastal ecosystems.

Considering the specific characteristics of Tonga's coastal ecosystems, discuss the implications of coastal erosion for the long-term survival of these ecosystems.

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