

MARKER CODE				



STUDENT ENROLMENT NUMBER (SEN)									

TONGA FORM SIX CERTIFICATE

2019

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 QUESTIONS** and is out of 75 Weighted scores.

QUESTIONS	TOPICS	TOTAL SKILL LEVEL
ONE	CELLULAR BIOLOGY	21
TWO	GENETICS	10
THREE	ORGANISM LEVEL BIOLOGY	22
FOUR	ENVIRONMENTAL BIOLOGY	22
	TOTAL	75

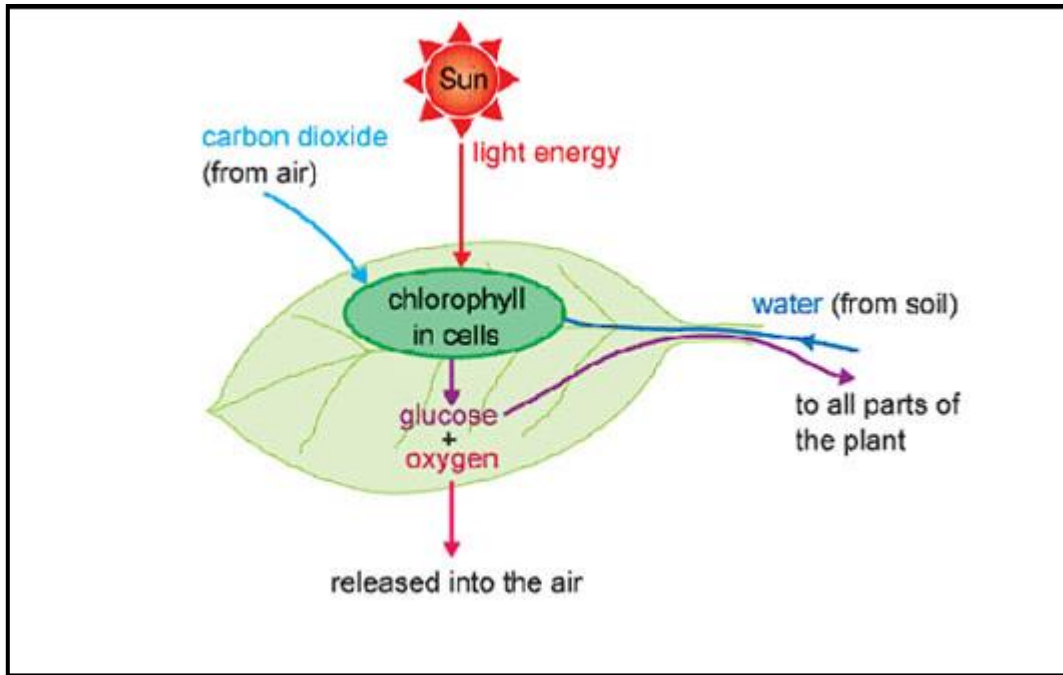
3. Answer ALL QUESTIONS. Write your answers in the spaces provided in this booklet.
4. Use a **BLUE** or **BLACK** ball point pen only for writing. Use a pencil for drawing if required.
5. If you need more spaces for answers, ask the supervisor for extra paper. Write your **Student Enrolment Number (SEN)** on each additional sheet, number the questions clearly and insert them in the appropriate places in this booklet.
6. Check that this booklet contains pages **2-23** in the correct order and that pages 21-23 has been deliberately left blank.

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

QUESTION ONE: CELLULAR BIOLOGY

1. The diagram shown in **Figure 1** below summarizes the process of photosynthesis as it occurs in plants.

Figure 1: Process of Photosynthesis



- a. Define **photosynthesis**.

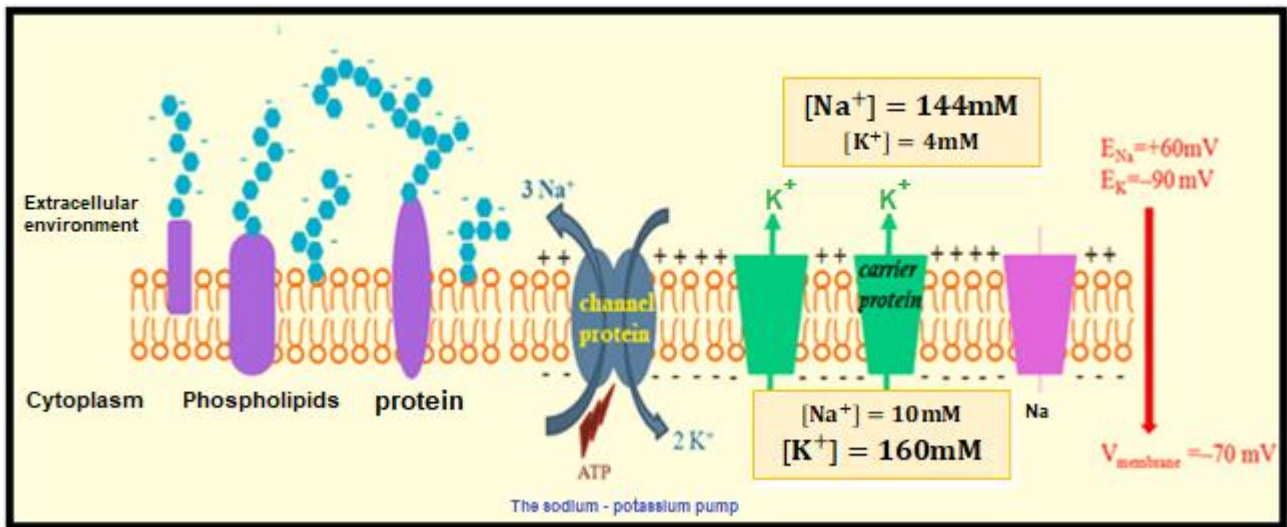
Skill level 1	
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- b. Write a **balanced chemical equation** for photosynthesis using the information provided in **Figure 1**.

Skill level 2	
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2. **Figure 2** below represents part of a cell. Study **Figure 2** carefully then answer the questions that follow.

Figure 2: Part of a cell



- a. Name the part of the cell represented by **Figure 2**.

Skill level 1	
1	
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- b. Identify the type of transport whereby Potassium ions (K⁺) is transported across **Figure 2**.

Skill level 1	
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- c. Describe the features of the organelle shown in **Figure 2** that facilitates the transport of sodium ions into the cell.

Skill level 2	
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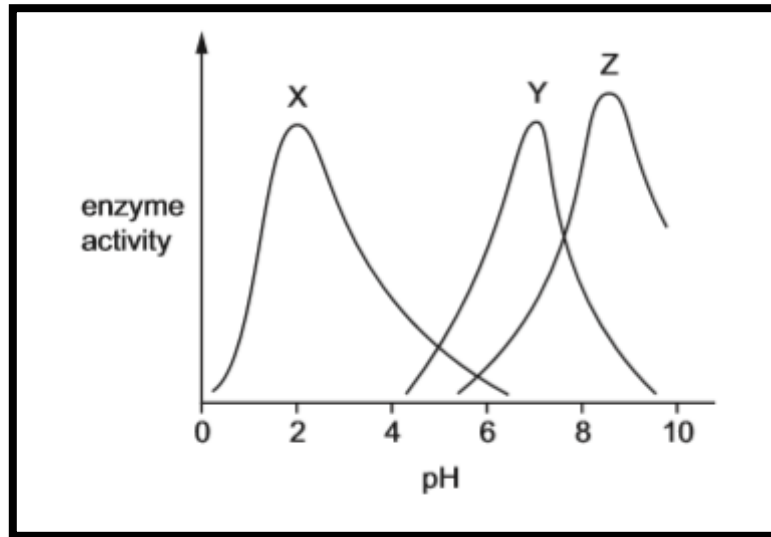
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Skill level 3	
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5. **Graph 1** shows the effect of pH on the activity of three different enzymes – **X**, **Y** and **Z**.

Graph 1



Enzymes **X**, **Y** and **Z** functions at different optimum *pH*.

- a. Define **optimum pH**.

Skill level 1	
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- b. Explain how the environmental conditions of the stomach affect the activity of **Enzyme X**.

Skill level 3	
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6. Discuss the common domestic applications of anaerobic respiration in plants.

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Skill level 4	
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QUESTION TWO: GENETICS

In rabbits, some have black or brown phenotypes for coat colour. The gene for Black coat colour (**B**) is dominant over brown (**b**). Short hair (**S**) is dominant over long hair (**s**).

1. A cross between a homozygous black short-haired male and a brown homozygous long-haired female produced 10 kittens (baby rabbits).

- a. Define the term **phenotype**.

Skill level 1	
1	
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- b. Draw a Punnet square to work out the phenotype (s) of the kittens.

Phenotype (s) of the kittens: _____

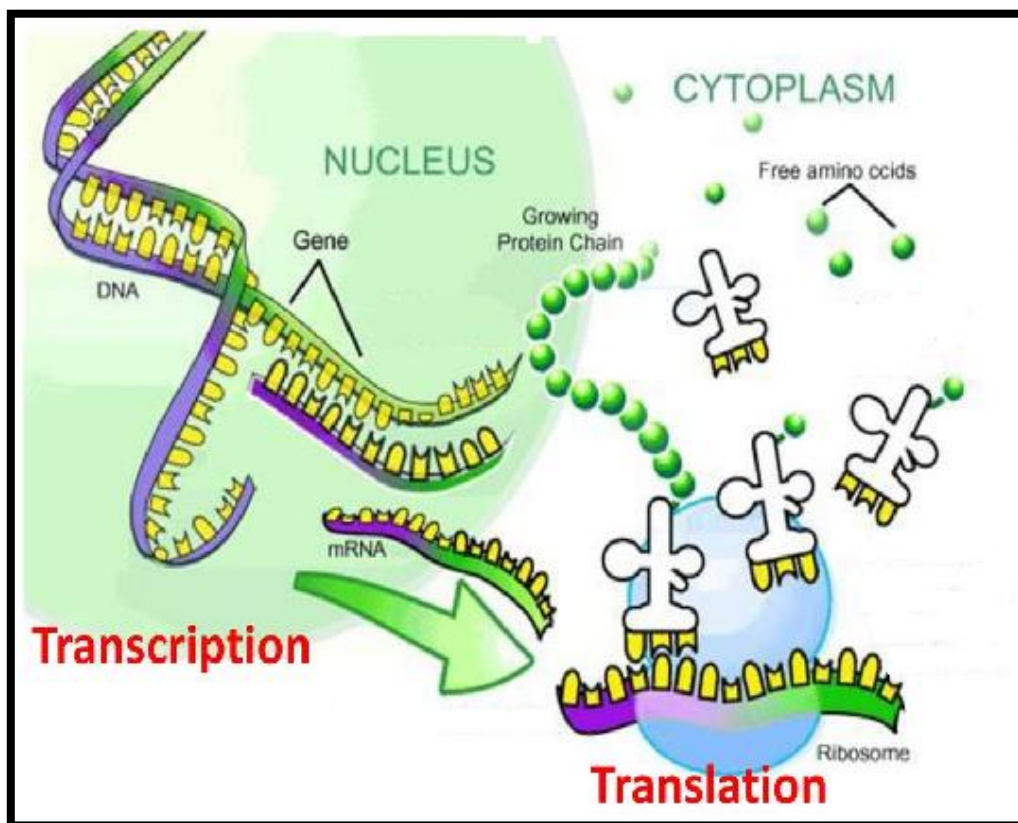
Skill level 2	
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- c. Explain how a test-cross can be used to confirm the genotype of the kittens.

Skill level 3	
3	
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Study carefully the diagram shown below in **Figure 3** that represents the key processes of protein synthesis. Use it to answer the question that follows.

Figure 3: Protein Synthesis



- d. With reference to the diagram on page 8, discuss completely the concept of protein synthesis in the formation of proteins by relating the processes of transcription and translation; specifying the roles of DNA, mRNA and tRNA.

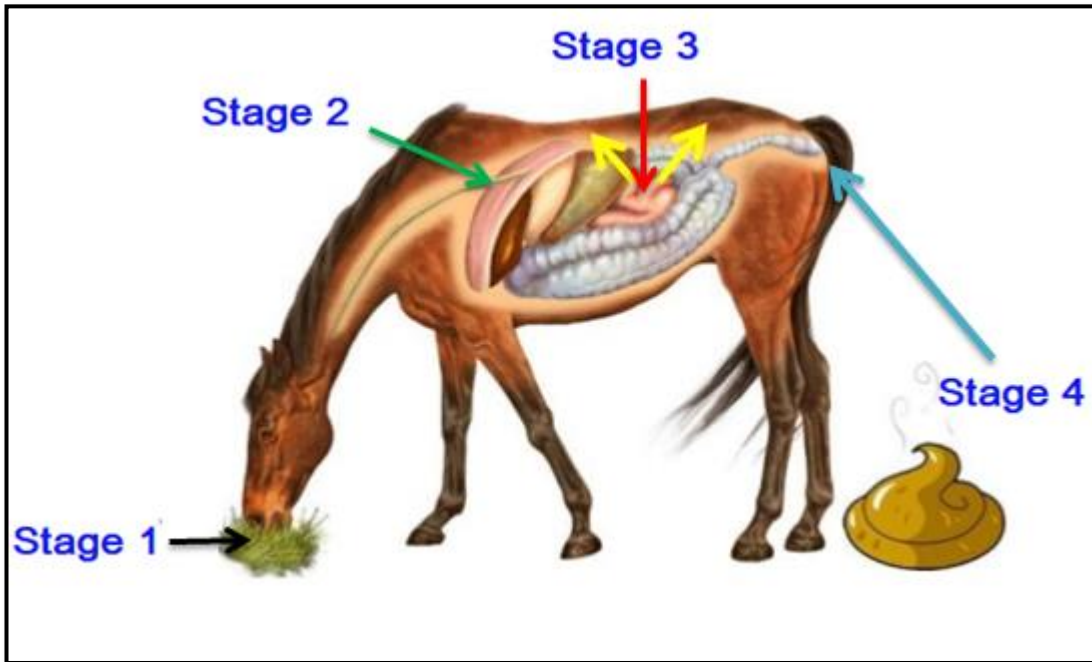
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Skill level 4	
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QUESTION THREE: ORGANISM LEVEL BIOLOGY

Figure 4 below shows the four key stages of animal nutrition. Study the diagram carefully to answer the questions that follow.

Figure 4: Stages of animal nutrition.



1. State the **biological term** that defines correctly the processes in animal nutrition that are represented by stages 1 – 4.

a. Stage 1: _____

b. Stage 2: _____

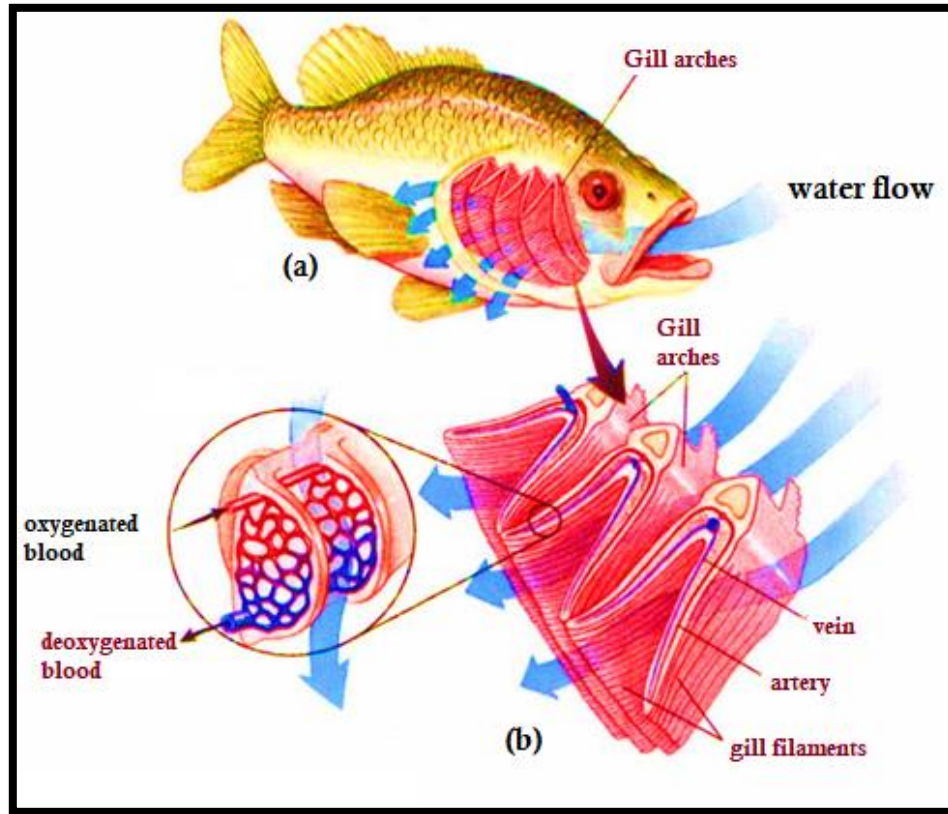
c. Stage 3: _____

d. Stage 4: _____

Skill level 1				
	a.	b.	c.	d.
1				
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2. The diagram in **Figure 5** below represents the structure of the gas exchange system in fish.

Figure 5: The gills of Fish



- a. Describe the differences between the process of **ventilation** (breathing) and **gas exchange** in fish.

Skill level 2	
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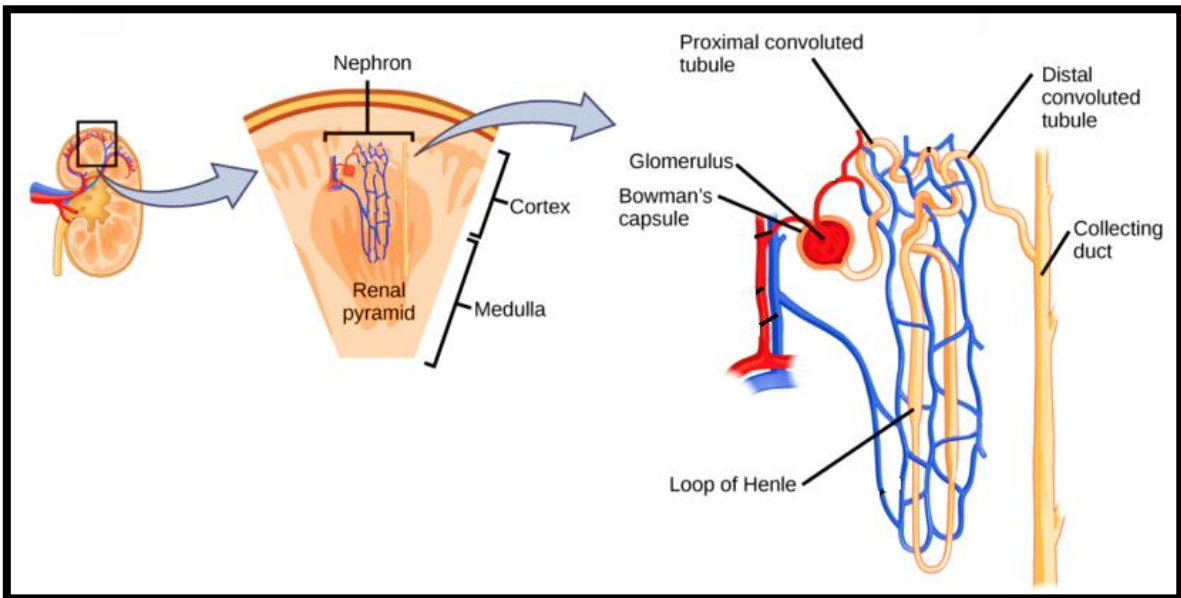
Oxygen concentrations are much higher in air, which is about 21% oxygen, than in water, which is a tiny fraction of 1% oxygen.

- b. Explain how the structure of the gills in fish functions to facilitate gas exchange in its habitat.

Skill level 3	
3	
2	
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3. The human kidney shown in **Figure 6** below is where the excretion process serves to remove waste products, normalize water and ions in the human body.

Figure 6: The human kidney



- a. Define **excretion**.

Skill level 1	
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- b. Identify the type of nitrogenous waste produced in the kidney to be excreted from the human body.

Skill level 1	
1	
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- c. Describe the important role of blood in the excretion process that occurs in the nephron.

Skill level 2	
2	
1	
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NR	

- d. Explain **how** the basic structure of the human kidney (i.e the nephron) functions to remove waste products, normalize ions and water in the human body.

Skill level 3	
3	
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QUESTION FOUR: ENVIRONMENTAL BIOLOGY

1. **Table 1** below shows two examples of taxonomic ranking; one for human and buttercups.

Table 1: Taxonomy of human and buttercup



Animalia	Kingdom	Plantae
Chordata	Phylum	Angiospermophyta
Mammalia	Class	Eudicotidae
Primate	Order	Ranunculales
Hominidae	Family	Ranunculaceae
<i>Homo</i>	Genus	<i>Ranunculus</i>
<i>sapiens</i>	Species	<i>acris</i>
Human	Common Name	Buttercup



- a. Define **taxonomy**.

Skill level 1	
1	
0	
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- b. Use the *Linnaean binomial nomenclature* to identify the **scientific name** for buttercups.

Skill level 1	
1	
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- c. Name Linnaeus' seven taxonomic categories from the **least** to **most** number of species.

Least: _____, _____, _____,
 _____, _____, _____,
 _____ **Most**

Skill level 1	
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2. **Figure 9** below shows four terrestrial organisms that have been classified into one group.

Figure 9: Terrestrial Organisms



- a. Name the phylum in which the four terrestrial organisms belong.

Skill level 1	
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- b. Define **adaptive features**.

Skill level 1	
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- c. Describe the **structural** and **physiological adaptation** of one of the organisms in **Figure 9** above.

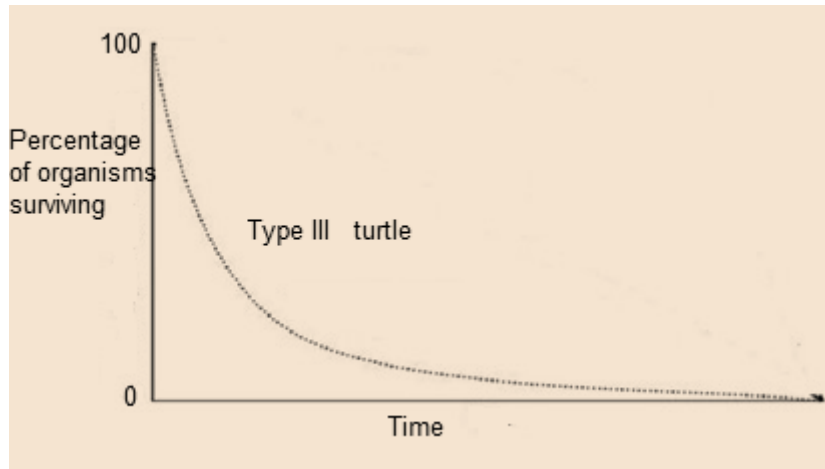
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- d. Name the principle that states that “*in competition between species that seek the same ecological niche, one species survives while the other expires under a given set of environmental conditions*”.

Skill level 1	
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3. The graph below shows the survivorship curve of turtles.

Graph 2: Survivorship curve



- a. Describe the characteristics curve of the turtle population as shown on the graph.

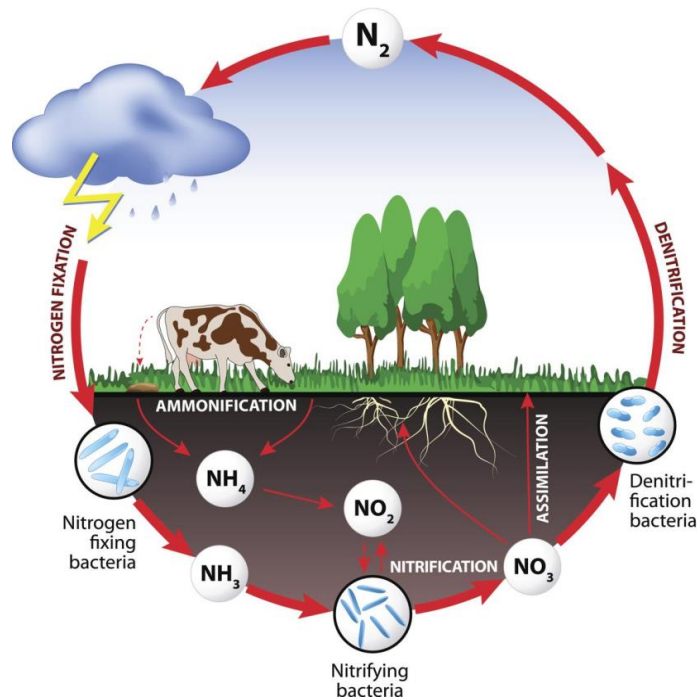
Skill level 2	
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- b. Explain the survivorship of turtles in terms of its natality and mortality rate.

Skill level 3	
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4. The diagram below illustrates the Nitrogen Cycle.

Figure 10: The Nitrogen Cycle



a. Describe the important roles of **two** bacteria in the Nitrogen Cycle.

Skill level 2	
2	
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NR	

b. Explain how competition for nitrogen nutrients in soil affects relationships in a community.

Skill level 3	
3	
2	
1	
0	
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5. With reference to a local environmental issue studied this year, discuss its causes, effects and implications on the long-term survival of the ecosystem.
References can be made to specific characteristics of the ecosystem.

State the environmental issue: _____

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