

MARKER CODE				



STUDENT ENROLMENT NUMBER (SEN)									

TONGA FORM SIX CERTIFICATE

2022

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 82 weighted scores.

SECTION	STRANDS	TOTAL SKILL LEVEL
ONE	CELLULAR BIOLOGY	29
TWO	GENETICS	23
THREE	ORGANISM LEVEL BIOLOGY	15
FOUR	ENVIRONMENTAL BIOLOGY	15
	TOTAL	82

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- 19** in the correct order and that none of the pages is blank.

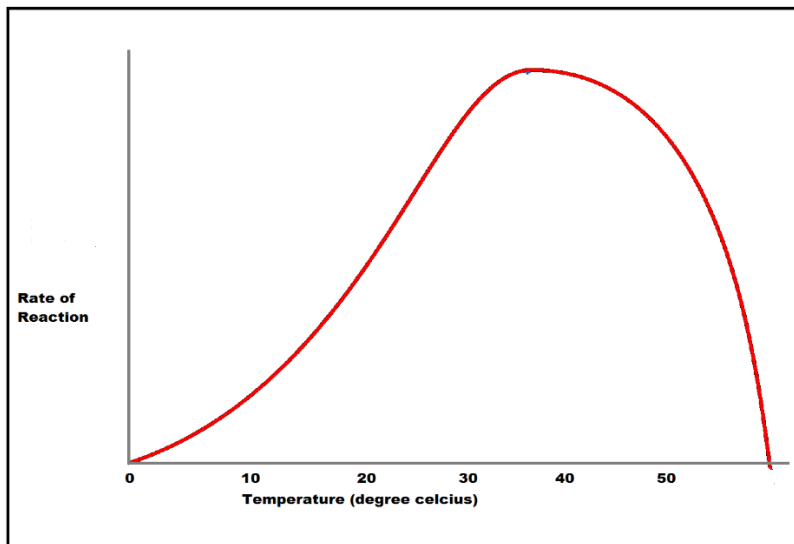
YOU MUST HAND IN THIS BOOKLET TO THE SUPERVISOR BEFORE YOU LEAVE THE EXAMINATION ROOM.

SECTION ONE:

CELLULAR BIOLOGY

1. The graph below shows the activity of an enzyme.

Figure 1: Graph showing rate of reaction of enzyme



Source: *Effect of Temperature on Enzymatic Reaction - Creative Enzymes (creative-enzymes.com)*

- a. Define **enzyme**.

Skill level 1	
1	
0	
NR	

- b. State the factor that affects the rate of enzyme activity, as shown in **Figure 1**.

Skill level 1	
1	
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- c. Explain how the factor named above in b. affects enzyme activity.

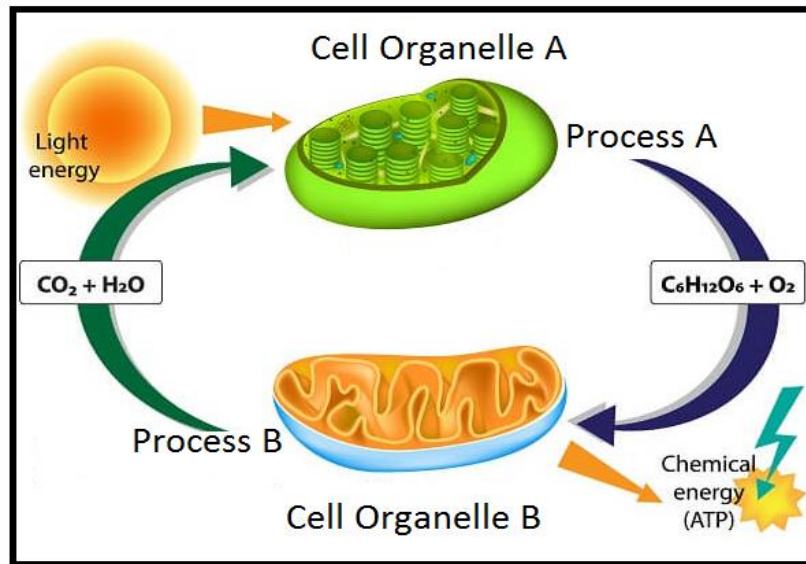
Skill level 3	
3	
2	
1	
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- d. Define **optimum temperature**.

Skill level 1	
1	
0	
NR	

2. Study the diagram below and use it to answer the questions that follow:

Figure 2: Diagram showing Energy flow, through from the sun and eventually to processes in the cell



Source: *Origins of Cell Compartmentalization* | AP Biology | Biology Dictionary

- a. State the function of **Cell Organelle A** in **Figure 2**.

Skill level 1	
1	
0	
NR	

- b. Describe the structure of the **Cell Organelle A** shown in **Figure 2**.

Skill level 2	
2	
1	
0	
NR	

- c. Write a balance chemical equation for photosynthesis.

Skill level 2	
2	
1	
0	
NR	

- d. Describe the role of chlorophyll in photosynthesis.

Skill level 2	
2	
1	
0	
NR	

- e. Explain the importance of oxygen in **Process B**.

Skill level 3	
3	
2	
1	
0	
NR	

- f. Identify the products produced by **Process B** with Oxygen.

Skill level 2	
2	
1	
0	
NR	

Skill level 3	
3	
2	
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NR	

-
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Skill level 4	
4	
3	
2	
1	
0	
NR	

Stoma closed

Stoma open

Nucleus

Chloroplasts

Vacuole

Guard cell

Cell wall

Stoma

Discuss the transport processes involved in guard cells to open and close the stomata.

[illegible]

Skill level 4	
4	
3	
2	
1	
0	
NR	

SECTION TWO:

GENETICS

1. Nucleic Acids are composed of nucleotide monomers linked together.

a. Name the monomers of nucleic acids.

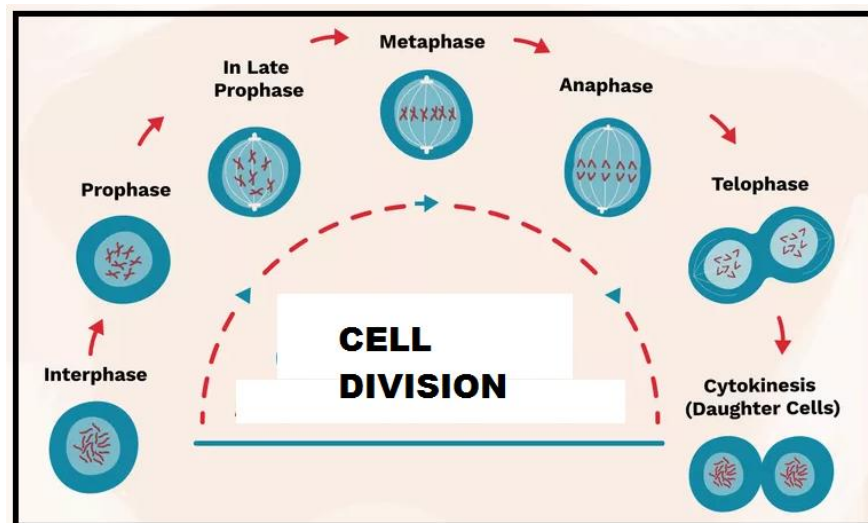
Skill level 1	
1	
0	
NR	

b. Compare the structures of DNA and RNA. Explain their main differences.

Skill level 3	
3	
2	
1	
0	
NR	

2. Study the diagram of the cell division below and use it to answer the questions that follow:

Figure 4: Type of cell division



Source: *The Stages of Mitosis and Cell Division* (thoughtco.com)

a. Identify the type of cell division shown in **Figure 4**.

Skill level 1	
1	
0	
NR	

Skill level 2	
2	
1	
0	
NR	

- [illegible]

Skill level 4	
4	
3	
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NR	

3. The genes for seed shape in pea plants exist in two forms; one allele for round shape (**R**) and the other for wrinkled seed shape (**r**).

a. Define **dominant allele**.

Skill level 1	
1	
0	
NR	

b. Define **recessive allele**.

Skill level 1	
1	
0	
NR	

c. Define **phenotype**.

Skill level 1	
1	
0	
NR	

- d. In pea plants that are heterozygous for seed shape, the genotype is (**Rr**). The round seed shape is dominant over the wrinkled seed shape.

Define **heterozygous genotype**.

Skill level 1	
1	
0	
NR	

4. Define **genetic modification**.

Skill level 1	
1	
0	
NR	

- Multiple alleles is a type of non-Mendelian inheritance pattern that involves more than just the typical two alleles that usually code for a certain characteristic in a species.

Explain the inheritance of blood type in humans as an example of multiple alleles.

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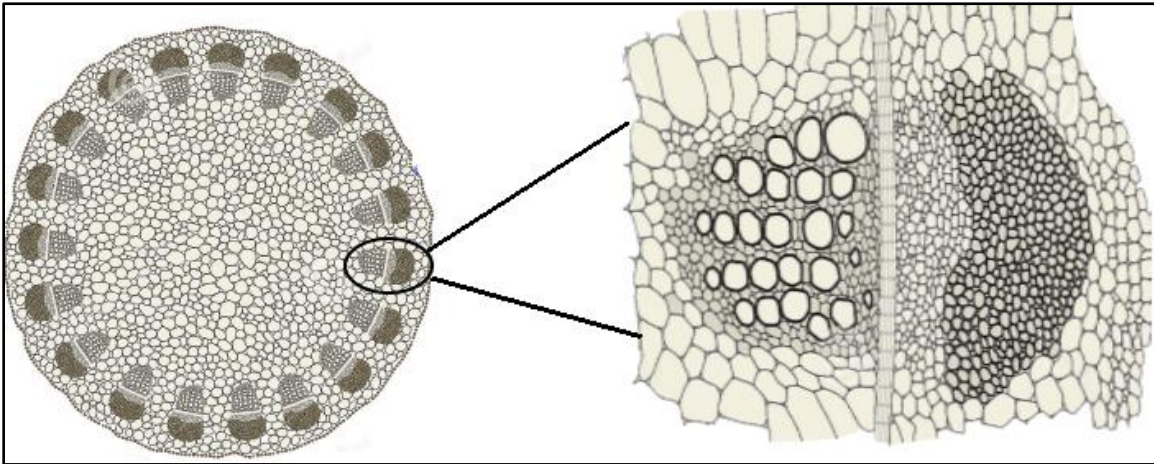
Skill level 3	
3	
2	
1	
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NR	

- [illegible]

SECTION THREE:**ORGANISM LEVEL BIOLOGY**

1. Study the diagram below and use it to answer the question that follows:

Figure 5: Cross-section of a Dicot stem



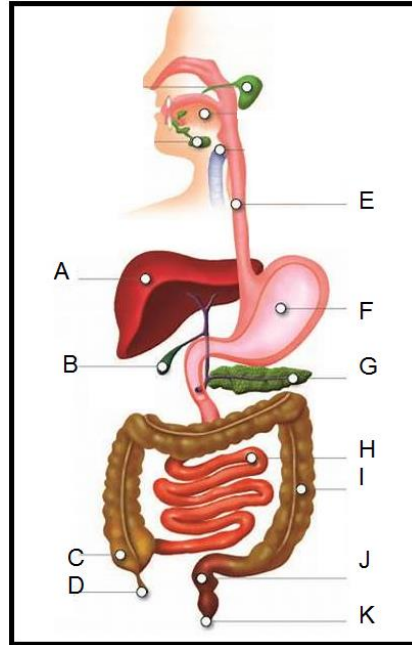
Source: [Dicot Stem Anatomy \(plantscience4u.com\)](http://plantscience4u.com)

Describe the vascular bundles in the stem.

Skill level 2	
2	
1	
0	
NR	

2. The diagram in **Figure 6** below shows the human digestive system. Use it to answer the questions that follow:

Figure 6: The human digestive system



Source: [IBCLC \(pinterest.com\)](https://www.pinterest.com/IBCLC/)

- a. Identify the letter in **Figure 6** that represents the liver.

- b. Explain the causes and effects of gallstones on the normal functioning of the digestive system.

Skill level 1	
1	
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NR	

Skill level 3	
3	
2	
1	
0	
NR	



a. Identify the gas exchange system of an earthworm.

Skill level 1	
1	
0	
NR	

- [illegible]

Skill level 3	
3	
2	
1	
0	
NR	

4. Excretion is an essential process in all forms of life.

a. Describe the differences between **excretion** and **egestion**.

		Skill level 2	
		2	
		1	
		0	
		NR	

b. Explain the importance of removing metabolic waste from cells and the organism.

		Skill level 3	
		3	
		2	
		1	
		0	
		NR	

SECTION FOUR: ENVIRONMENTAL BIOLOGY

1. The South West Australia Ecoregion (SWAE) is Australia's only Global Biodiversity Hotspot. Although it only covers 5% of the Australian land mass, SWAE contains about 8,000 plant species - more than one-third of Australia's known flowering plants.

- a. Define **biodiversity**.

Skill level 1	
1	
0	
NR	

- b. Explain how biodiversity affects ecosystem stability and continuity of life in South West Australia.

Skill level 3	
3	
2	
1	
0	
NR	

A photograph of a dark brown horse and a light brown donkey standing together in a grassy field. The horse is on the left, and the donkey is on the right, facing the horse. The background is a bright green field under a blue sky with some clouds.

A young brown and white foal is captured in mid-stride, running across a green grassy field. The foal has a dark brown coat with white markings on its lower legs and belly. Its mane and tail are dark and slightly flowing. The background is a soft-focus green landscape with trees and a fence line.

a. Considering the disparity of the parental chromosomes, define **genetic isolation** experienced by the mule.

Skill level 1	
1	
0	
NR	

- b. Explain the disadvantage of this postzygotic isolating mechanism for the survival of the mule population.

[illegible]

Skill level 3	
3	
2	
1	
0	
NR	

3. The picture below shows part the Amazon rainforest fires in South America. The fires are a result of illegal forest clearing to make more farms.

Figure 10: Rainforest lost due to fire



Source: *We've already lost 17% of the Amazon Rainforest to fires* (leadingedgeenergy.com.au)

- a. Define **community**.

Skill level 1	
1	
0	
NR	

- b. When the fire destroyed the existing forest community, the area where the forest community previously existed is colonized by pioneer species.

Describe the role of a colonizing or pioneer species.

Skill level 2	
2	
1	
0	
NR	

4. The picture below shows a butterfly feeding from the nectar of a hibiscus flower. As the butterfly feeds, its wings are rubbed on the pollens of the hibiscus flower. When the butterfly flies to another hibiscus flower, the pollens of the hibiscus flower is pollinated by the butterfly.

Figure 11: Butterfly feeding from a hibiscus flower



Source: *Beauty Squared: Butterfly on Hibiscus Flower* — SteemKR

- a. Identify the type of interspecific relationship shown by the butterfly and the hibiscus flower.

Skill level 1	
1	
0	
NR	

- b. Differentiate between intraspecific competition and interspecific competition.

Skill level 3	
3	
2	
1	
0	
NR	
