MARKER CODE				

STUDENT ENROLMENT NUMBER (SEN)									

TONGA FORM SIX CERTIFICATE

2021

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	21
TWO	GENETICS	14
THREE	ORGANISM LEVEL BIOLOGY	19
FOUR	ENVIRONMETAL BIOLOGY	16
	TOTAL	**70**

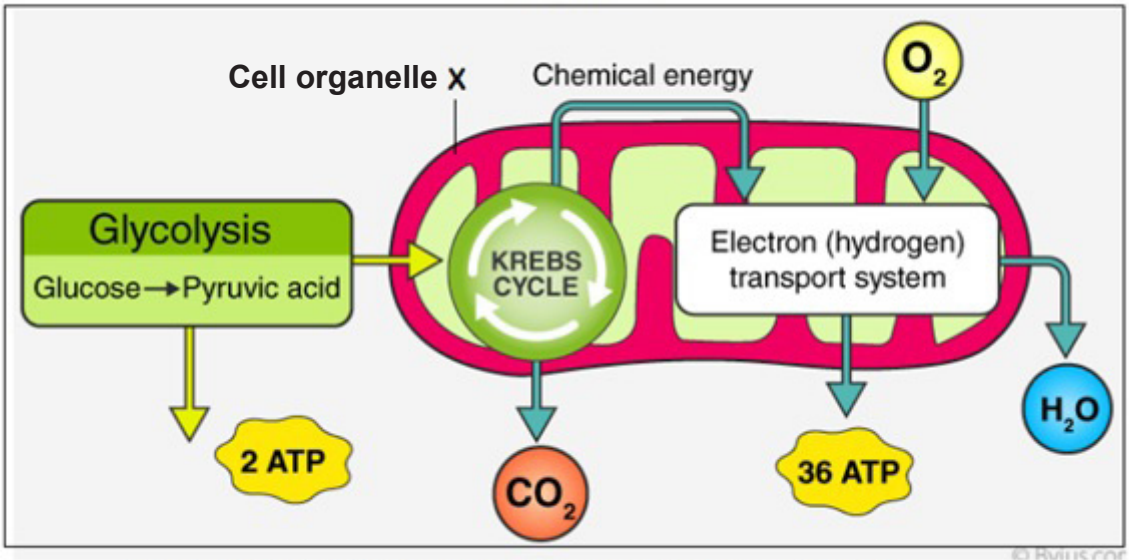
3. Answer ALL QUESTIONS. Write your answers in the spaces provided in this booklet.
4. Use a **BLUE** or **BLACK** ball point pen only for writing. Use a pencil for drawing if required.
5. If you need more space for answers, ask the supervisor for extra paper. Write your **Student Enrolment Number (SEN)** on each additional sheet, number the questions clearly and insert them in the appropriate places in this booklet.
6. Check that this booklet contains pages **2 - 23** in the correct order and that pages 22 - 23 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. **Figure 1.1** below show stages of the Respiration Process.

Figure 1.1



Source: https://byjus.com/biology/aerobic-respiration/

Skill level 1	
1	
0	
NR	

a. Identify cell organelle **X**.

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b. Relate the structure of organelle **X** to its function in cells.

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Skill level 3	
3	
2	
1	
0	
NR	

c. Describe the process of **Glycolysis**.

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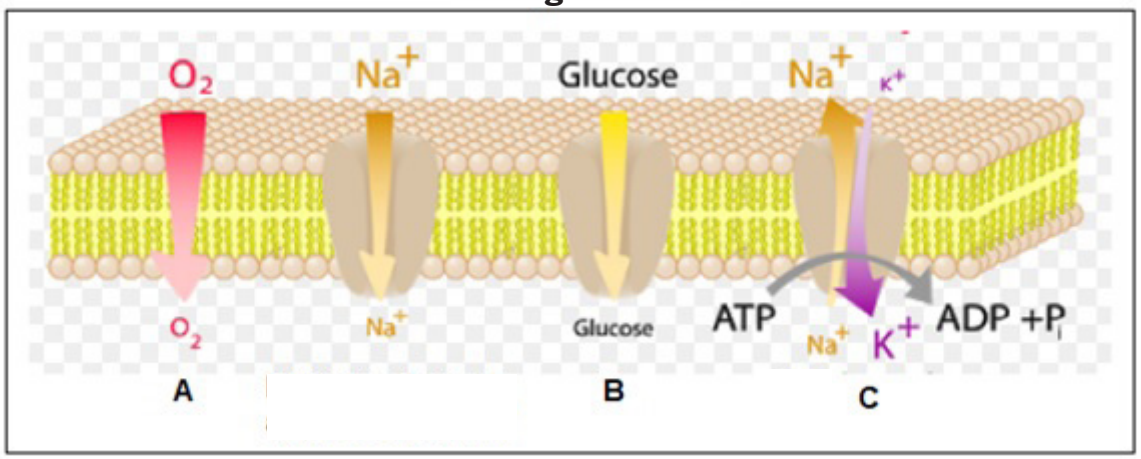
Skill level 2	
2	
1	
0	
NR	

2. **Figure 1.2** shows the different types of transport processes in cells.

Figure 1.2



Source: http://hyperphysics.phy-astr.gsu.edu/hbase/Biology/actran.html

a. Study **Figure 1.2** carefully and then identify the transport process demonstrated in:

i. **A**

_____

Skill level 1	
1	
0	
NR	

ii. **B**

_____

Skill level 1	
1	
0	
NR	

iii. **C**

_____

Skill level 1	
1	
0	
NR	

b. Compare transport **process A** and transport **process C**.

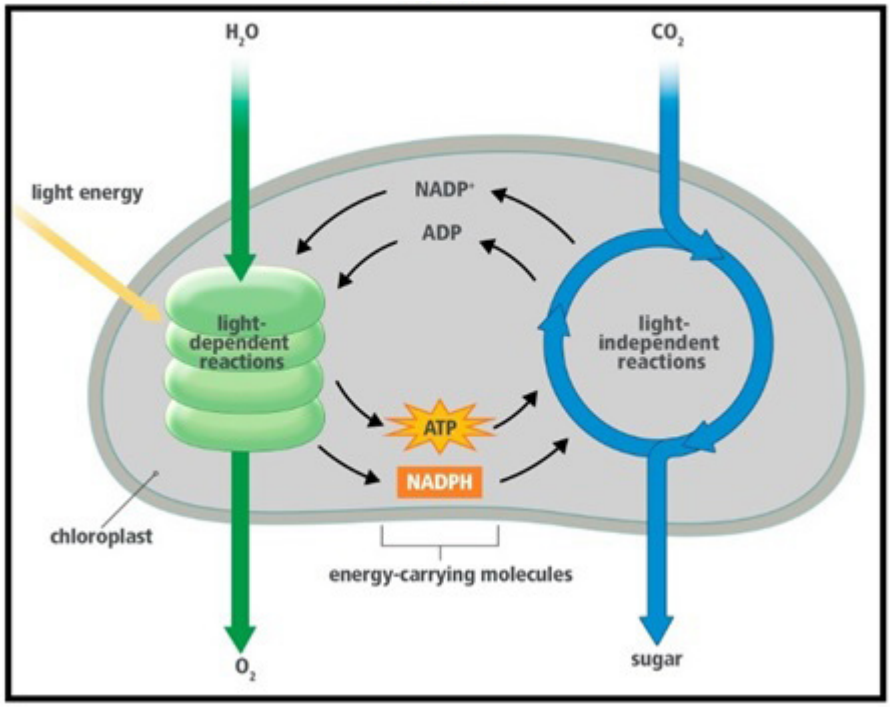
Skill level	
3	
2	
1	
0	
NR	

c. Explain the importance of **surface area-to-volume (SA:V) ratio** to transport processes using one biological system as an example.

Skill level	
3	
2	
1	
0	
NR	

3. **Figure 1.3** shows part of the photosynthesis process.

Figure 1.3



Source: https://quizlet.com

a. Define **photosynthesis** as a process.

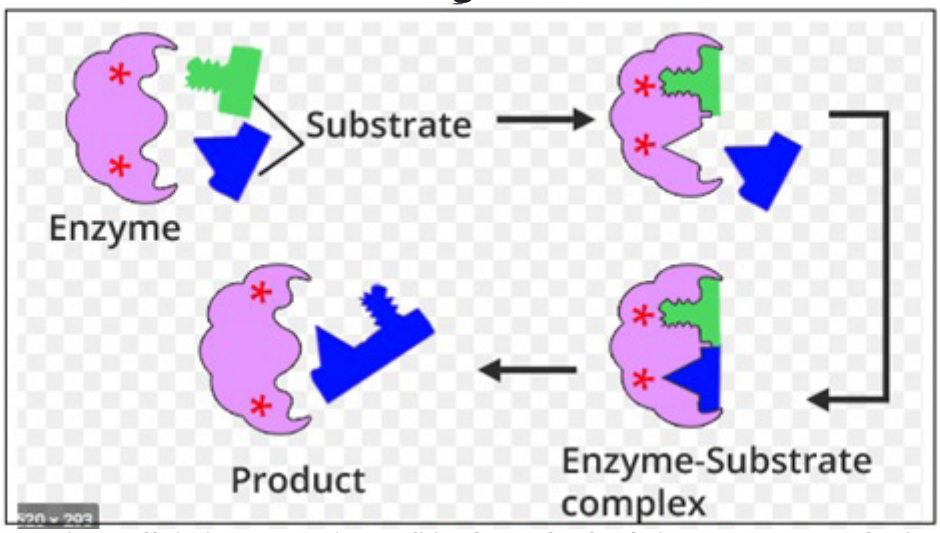
Skill level 1	
1	
0	
NR	

b. Describe what happens in the **Light Independent phase**.

Skill level 2	
2	
1	
0	
NR	

c. Use **Figure 1.4** below to explain enzyme-substrate activity using the ***Induced Fit Model***.

Figure 1.4



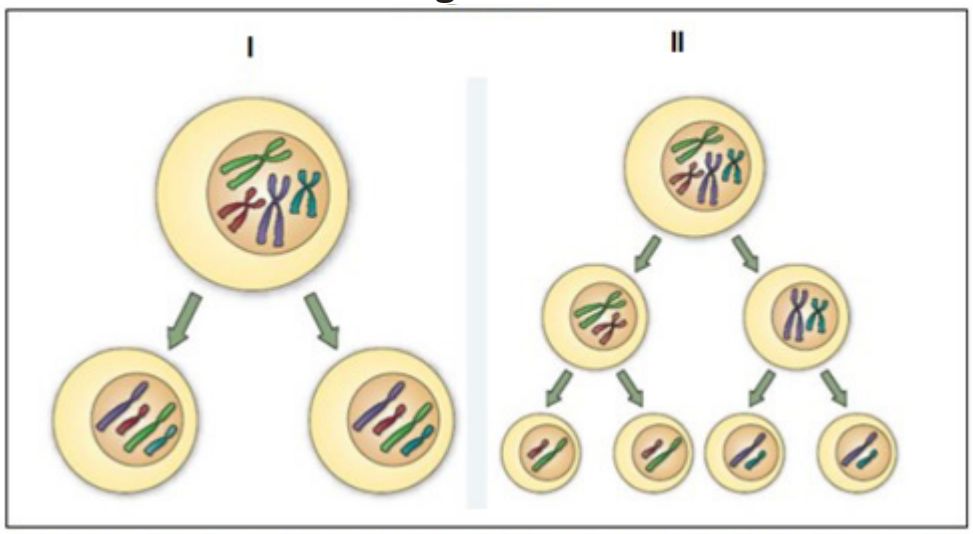
Source: https://aksharaontech.com/blog/2020/12/23/what-are-enzymes/index.html

Skill level	
3	
2	
1	
0	
NR	

SECTION TWO: GENETICS

1. **Figure 2.1** shows two different types of cell division. Study it carefully to answer the questions that follow.

Figure 2.1



Source: https://iqbroker.com/land/start-trading/en/?aff=63016&&afftract=16164684_A15w

Skill level 1	
1	
0	
NR	

a. Identify the type of cell division shown in **II** above.

_____

b. Explain how **crossing over** of chromosomes contribute to genetic variation.

_____
_____
_____
_____
_____
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_____

Skill level	
3	
2	
1	
0	
NR	

2. Use the information in **Figure 2.2** below to answer the questions that follow.

Figure 2.2

An individual is heterozygous for 2 genes; **ear size** and **eye type**. The gene for big ear size is dominant (AA or Aa) to small ears (aa) whereas the gene for buggy eyes (BB and Bb) is dominant to normal eyes(bb). A test cross is required to find the resulting genotypes and phenotypes.

a. Define **test-cross**.

Skill level 1	
1	
0	
NR	

b. Explain how a test cross is used to determine the genotype of an individual. (*Use punnet squares to assist with your answer*).

Skill level 3	
3	
2	
1	
0	
NR	

3. a. Define **genetic modification**.

Skill level 1	
1	
0	
NR	

b. Discuss the advantages and disadvantages of using genetic modification to produce new vaccine for the treatment of COVID-19.

Skill level 4	
4	
3	
2	
1	
0	
NR	

4. Define **selective breeding**.

Skill level 1	
1	
0	
NR	

_____

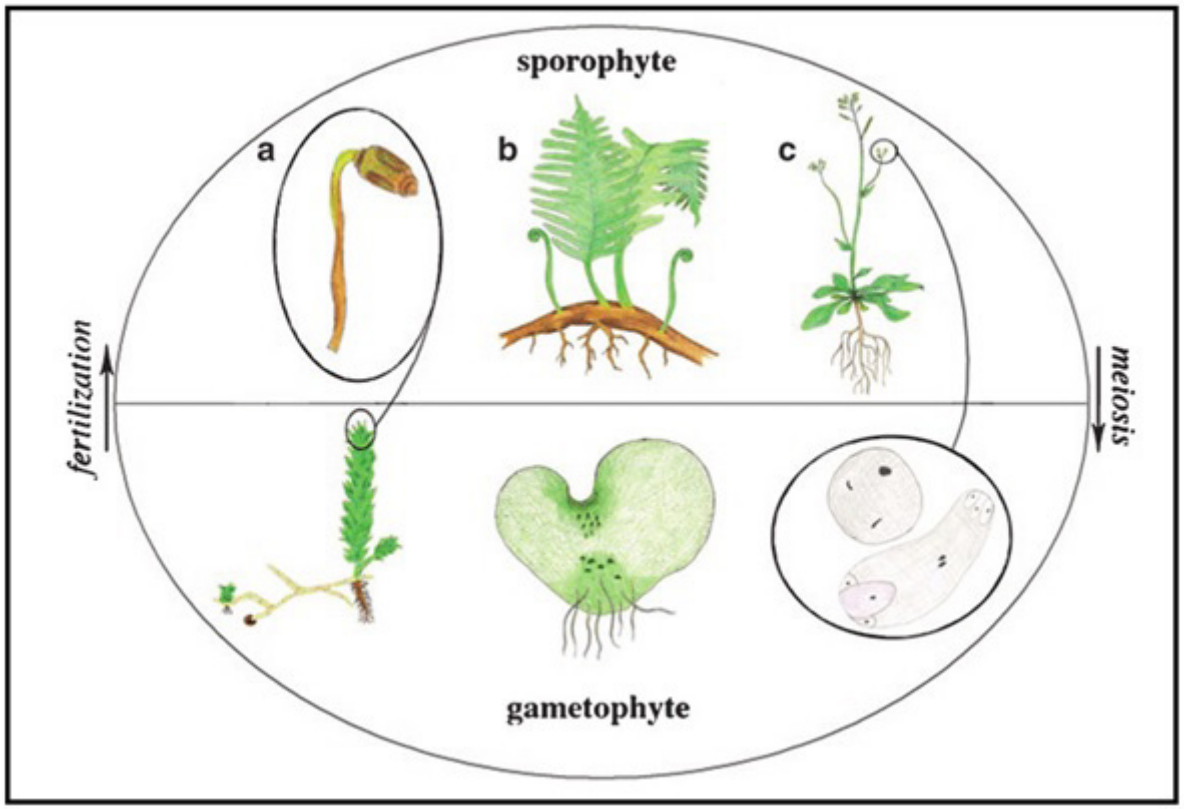
_____

_____

SECTION THREE **ORGANISM LEVEL BIOLOGY**

1. Use **Figure 3.1** below and your own knowledge to answer the questions that follow.

Figure 3.1



Source: https://www.researchgate.net

a. Define **alternation of generation**.

Skill level 1	
1	
0	
NR	

b. State the **TWO (2)** modes of reproduction.

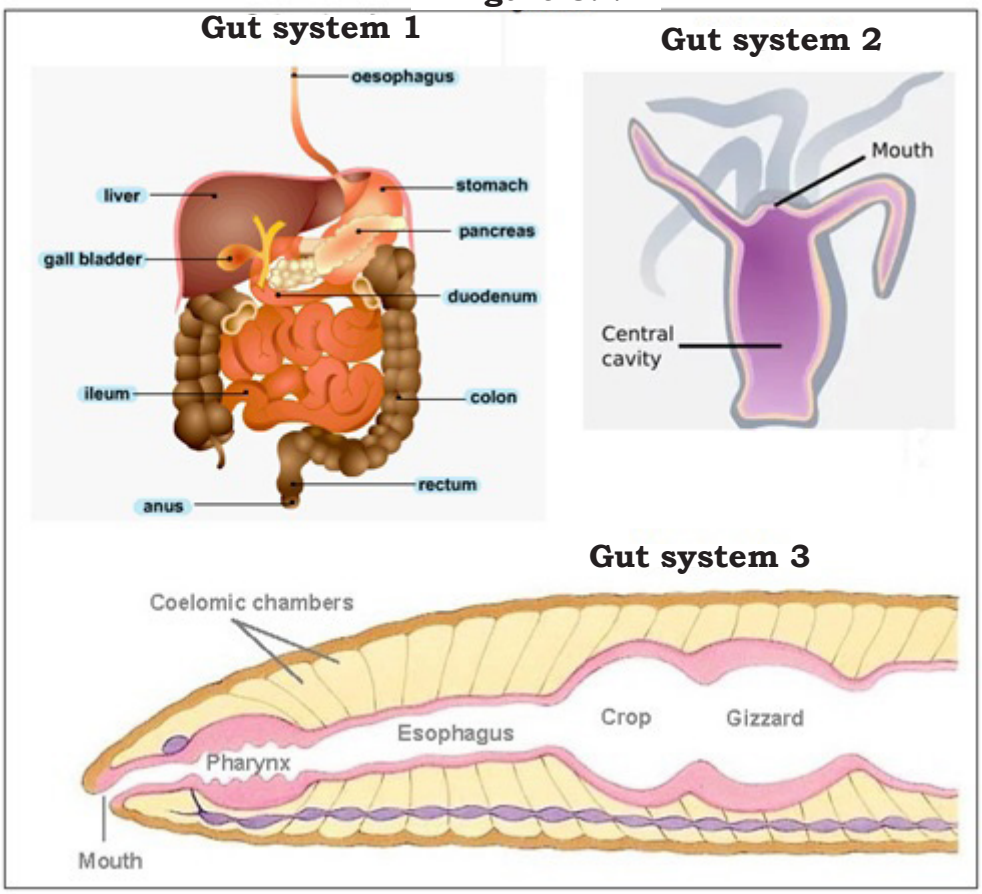
Skill level 1	
1	
0	
NR	

c. Explain the difference between the gametophyte generation and the sporophyte generation.

Skill level 3	
3	
2	
1	
0	
NR	

2. Use **Figure 3.2** below and your own knowledge to answer the questions that follow.

Figure 3.2



a. Identify the type of gut system illustrated in **Figure 3.2** above.

i. **1.** _____

ii. **2.** _____

iii. **3.** _____

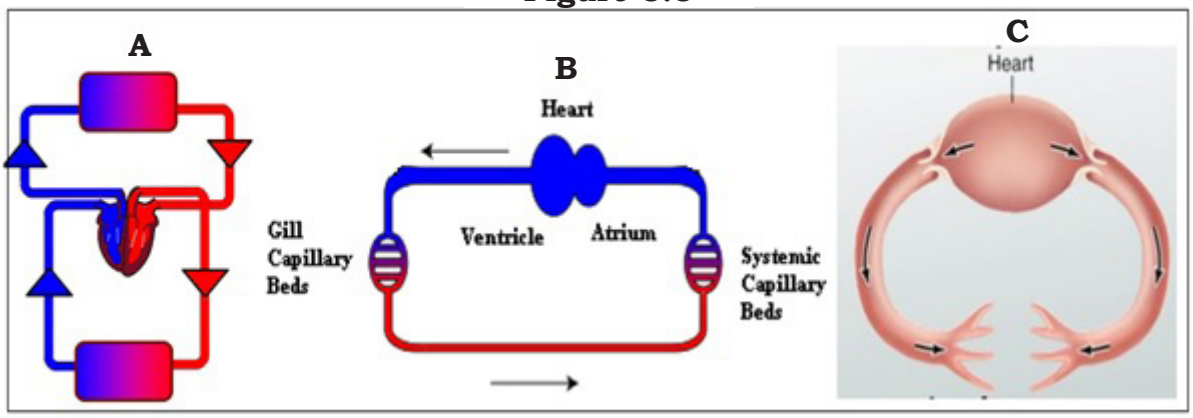
Skill level 1	i.	ii.	iii.
1			
0			
NR			

b. Explain how the structure of **Gut system 3** is related to its habitat and way of life.

Skill level 3	
3	
2	
1	
0	
NR	

3. Use **Figure 3.3** below and your own knowledge of the animal circulatory systems to answer the questions that follow.

Figure 3.3



a. Identify each type of circulatory system shown in.

i. **A** _____

ii. **B** _____

iii. **C** _____

Skill level 1	i	ii	iii
1			
0			
NR			

b. Describe the structure of circulatory system **B**.

_____

_____

_____

_____

_____

_____

_____

Skill level 2	
2	
1	
0	
NR	

c. Explain how smoking cigarettes contribute to heart diseases.

Skill level 3	
3	
2	
1	
0	
NR	

SECTION FOUR **ENVIRONMENTAL BIOLOGY**

1. **Figure 4.1** below shows the adaptations of a cactus plant.

Figure 4.1

Cactus are found to survive in deserts. One of its adaptations is having spines. These help to reduce water loss during evaporation. They absorb and reflect light to keep the plant cool.

a. Define **adaptive features**.

_____

_____

_____

Skill level 1	
1	
0	
NR	

b. Use the information given above to describe structural adaptation.

_____

_____

_____

_____

_____

_____

_____

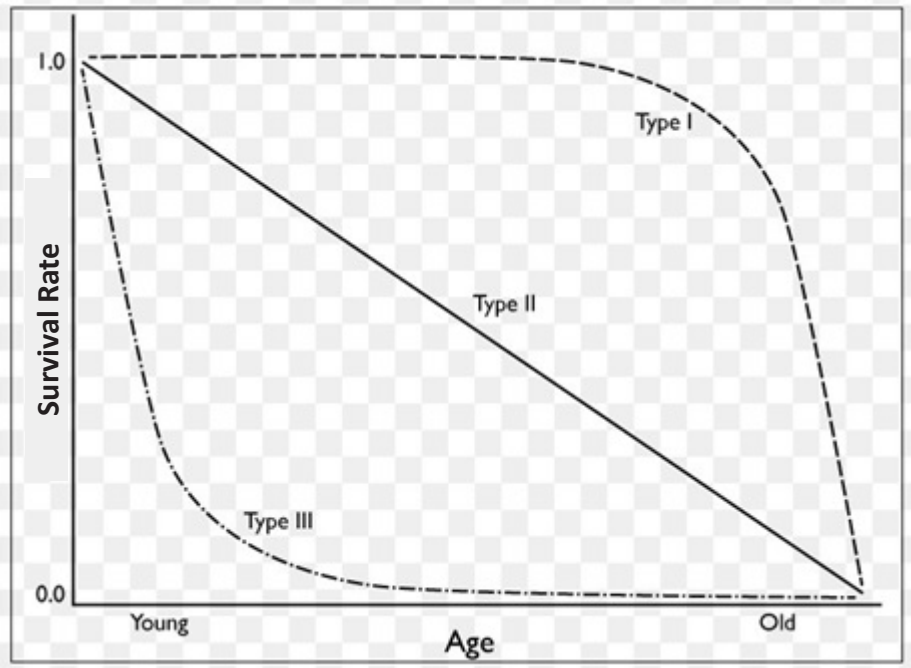
Skill level 2	
2	
1	
0	
NR	

2. Explain how the adaptation of an organism is related to Gauze's Principle.

Skill level 3	
3	
2	
1	
0	
NR	

3. Use the survivorship curve given below and your own knowledge to answer the questions that follow.

Figure 4.2



a. Define **natality**.

Skill level 1	
1	
0	
NR	

b. Describe the effect of natality in a population size.

Skill level 2	
2	
1	
0	
NR	

c. Interpret the above survivorship curve in relation to natality and mortality.

Skill level 3	
3	
2	
1	
0	
NR	

4. Use a local environment issue to discuss the implications that the issue has for the long term survival of the ecosystem with reference to a specific characteristic of the ecosystem.

Skill level 4	
4	
3	
2	
1	
0	
NR	

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