MARKER CODE				

STUDENT ENROLMENT NUMBER (SEN)									

TONGA FORM SIX CERTIFICATE

2018

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 Skill Level.

QUESTIONS	TOPICS	TOTAL SKILL LEVEL
ONE	CELLULAR BIOLOGY	18
TWO	GENETICS	15
THREE	ORGANISM LEVEL OF BIOLOGY	25
FOUR	ENVIRONMENTAL BIOLOGY	17
	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 2-27 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.

QUESTION ONE: CELLULAR BIOLOGY

MULTIPLE CHOICE

Circle the **LETTER** of the BEST answer for questions 1 - 4.

Table 1 *below lists the products of "Anaerobic Respiration" in animal cells that undergoes fermentation chemical pathway.*

1. Identify the feature that best describes each product.

Table 1:

	Lactic Produced	Amount of Energy Released	Releases Carbon Dioxide	Chemical Pathway
A	high	high	always	always
B	high	low	always	always
C	low	high	sometimes	sometimes
D	low	low	sometimes	sometimes

Skill level 1	
1	
0	
NR	

2. Define *'cellular respiration'.*

A. Oxidation of organic compounds to produce glucose and CO_2 for cellular processes.

B. Process of cell catabolism in which cells turn CO_2 into usable energy in the form of ATP.

C. Series of metabolic processes that converts chemical energy to conserve adenosine triphosphate energy.

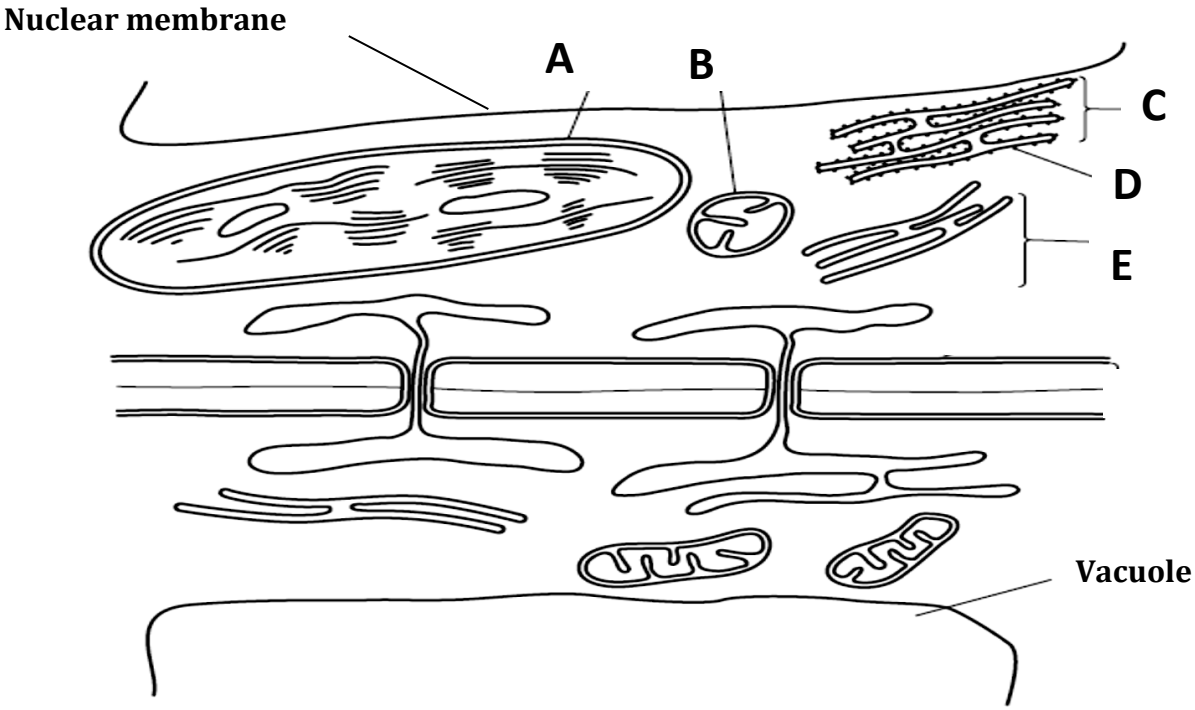
D. Reactions of enzyme to form pyruvate molecules and oxidized ethanol.

Skill level 1	
1	
0	
NR	

Figure 1 *illustrates cell organelles in part of a Plant Cell.*

Use ***Figure1*** *to answer questions 3 and 4.*

Figure 1



3. Name *organelles* ***A*** *,* ***B*** *and* ***D***

	Organelle A	**Organelle B**	**Organelle D**
A.	chloroplast	vesicle	ribosomes
B.	chloroplast	golgi apparatus	starch granules
C.	mitochondria	vesicle	ribosomes
D.	mitochondria	golgi apparatus	starch granules

Skill level 1	
1	
0	
NR	

4. ***Organelle C*** *and* ***E*** both play a similar function within a Eukaryotic cell. Identify which system (**A to D**) that would best describes this function.

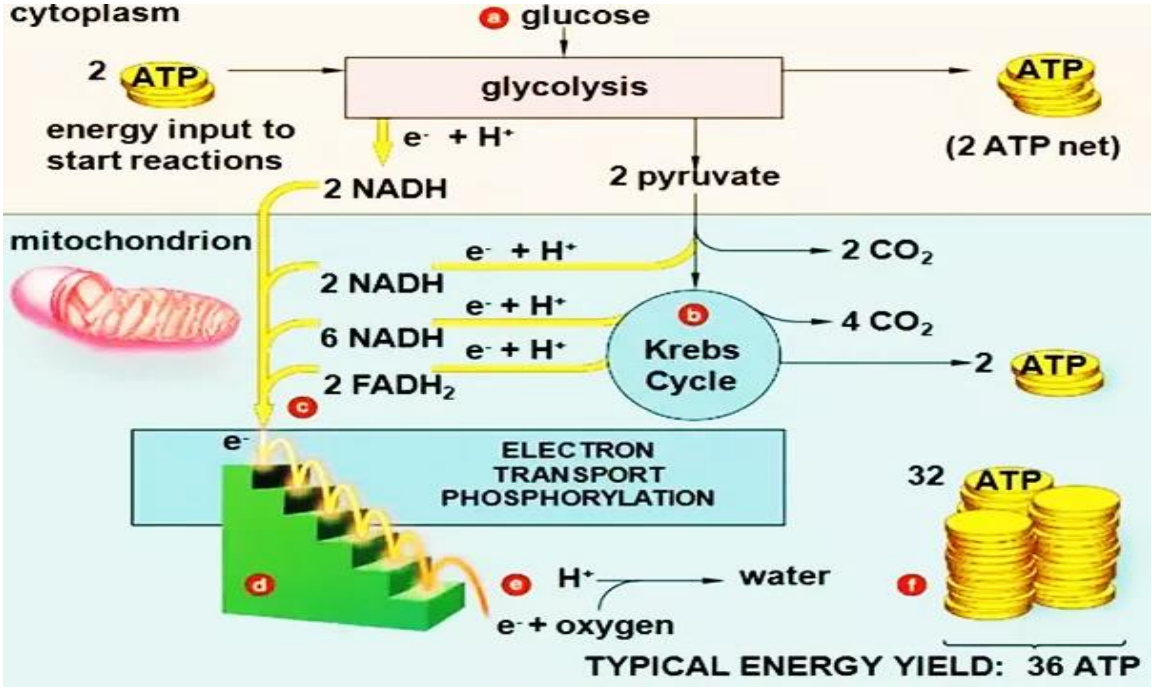
A. Transaction
B. Translocation
C. Transportation
D. Transpiration

Skill level 1	
1	
0	
NR	

Figure 2 *illustrates detailed processes of Respiration reaction in the cytoplasm and mitochondria of a cell.*

Use ***Figure 2*** *to answer question 5.*

Figure 2



The 3rd stage is the Electron Transport Phosphorylation or Electron Transport Chain (ETP).

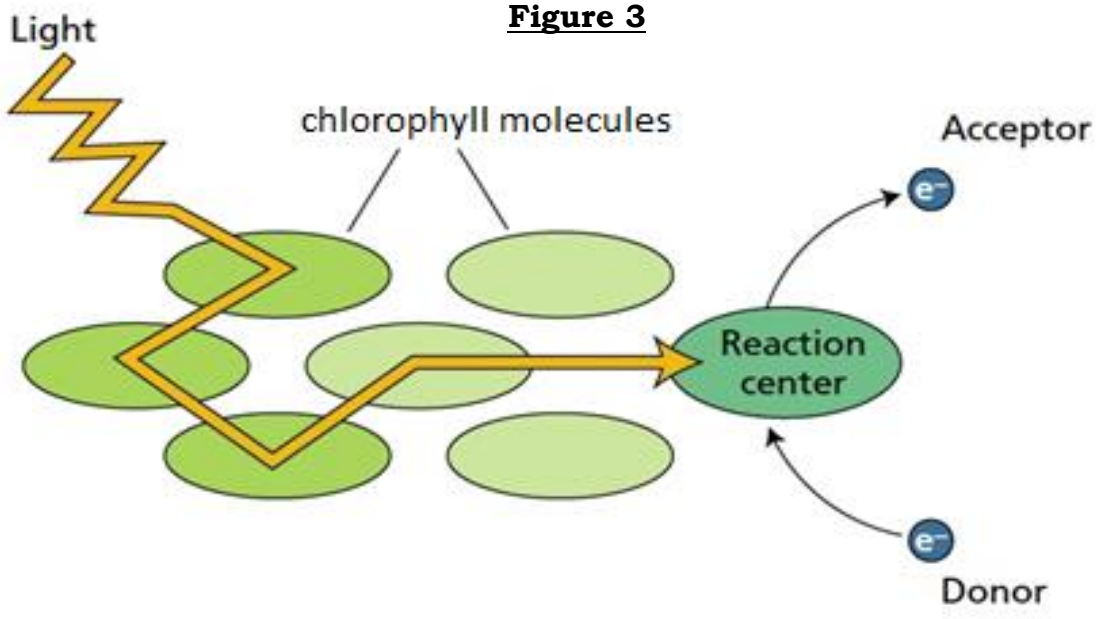
5. Briefly describe the reactants and products of the reaction, resulting in the synthesis of 36 ATP energy.

Skill level 2	
2	
1	
0	
NR	

Figure 3 *represents a partial process Photosynthesis in plants.*

Use ***Figure 3*** *to answer question 6*

Figure 3



6. Describe the role of chlorophyll molecules to the reaction center.

_____

_____

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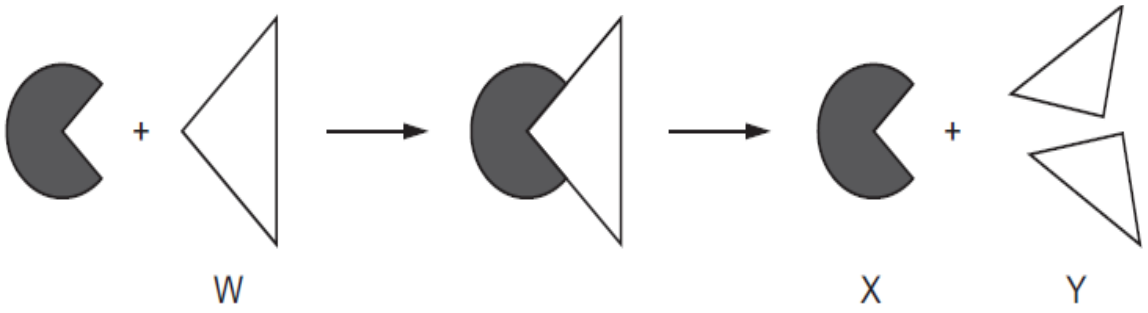
Skill level 2	
2	
1	
0	
NR	

Figure 4 *shows a simple Induced –Fit Model.*

Use ***Figure 4*** *to answer question 7.*

Figure 4



7. Explain the ***enzyme –substrate activity*** using the model in **Figure 4**.
(Include in your answer the names of structures W, X and Y and the rate of activity)

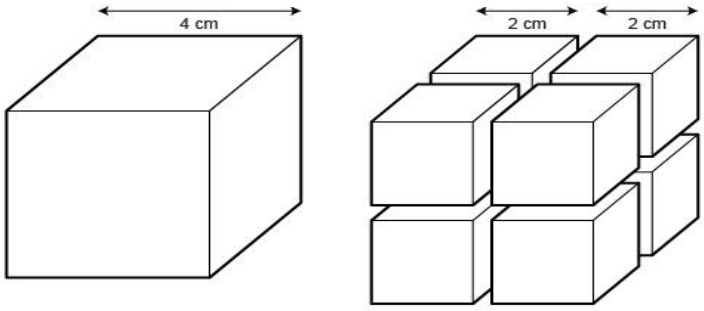
Skill level 3	
3	
2	
1	
0	
NR	

Figure 5 *illustrates the simple theory of Cell Size Vs. Rate of Diffusion.*

[Hint: Cell Size = Surface Area to Volume Size (SA:VS)]

Use ***Figure 5*** *to answer question 8.*

Figure 5



Cube A **Cube B**

8. Explain how the size of Cube A and Cube B influence the Rate of Diffusion in cells.

Skill level 3	
3	
2	
1	
0	
NR	

9. Discuss the common commercial applications of anaerobic respiration in both plants and animals.

Skill level 4	
4	
3	
2	
1	
0	
NR	

QUESTION TWO: **GENETICS**

MULTIPLE CHOICE

Circle the **LETTER** of the BEST answer for question 1.

1. A dominant allele;
   A. causes only harmful genotypic characteristics.
   B. is responsible for the heterozygous male XY chromosomes.
   C. never undergoes a homozygous recessive allele mutation.
   D. produces the same phenotype in heterozygotes and homozygotes.

Skill level 1	
1	
0	
NR	

*Suppose you conducted a dihybrid cross in mice between an agouti mouse **(symbol A)** and white mice with gene **C**. Some mice were tested to have homozygous **cc** that is grey and some have the pigments that produce fur that is black (**A**) or brown (**a**). If the parent mice were both heterozygous, what would be the expected offspring?*

Use this information to answer questions 2 – 4.

2. Use the punnet square below to work out the phenotypic result of the dihybrid cross in RATIO.

X				

Skill level 2	
2	
1	
0	
NR	

3. Expected phenotypic ratio of offspring: _____

_____

Skill level 1	
1	
0	
NR	

4. Homozygous **cc** is a recessive allele. Define the term recessive allele.

Skill level 1	
1	
0	
NR	

_____

_____

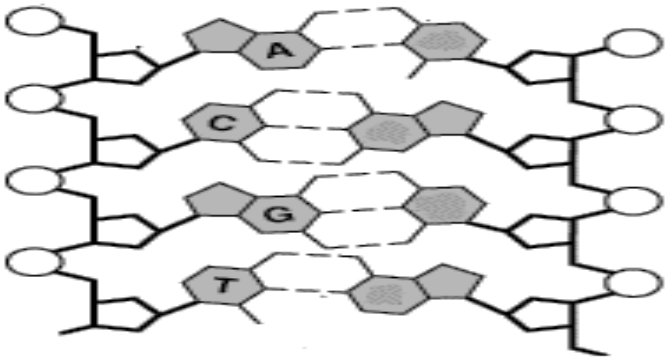
_____

DNA and RNA are important biological molecules that are involved in the production of polypeptides.

Figure 6 *below represents part of the DNA* ***only*** *not a RNA.*

Use ***Figure 6*** *to answer question 5.*

Figure 6



5. Justify why this is not an RNA molecule in comparison to the building block components. *(i.e : Bases and Base Pairing , Sugar , Structure and types of RNA)* .

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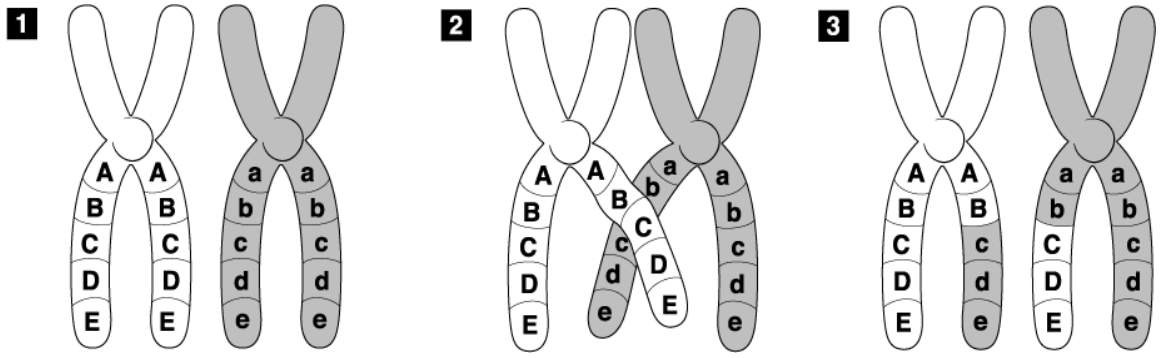
Skill level 3	
3	
2	
1	
0	
NR	

Figure 7 *shows one significant stage of the meiosis cell division.*

Use ***Figure 7*** *to answer question 6.*

Figure 7

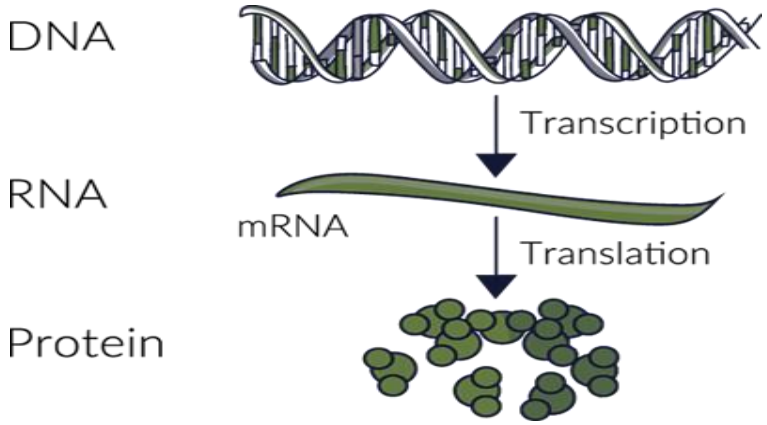


6. Explain how diagrams **1** to **3** supports the formation of genetic variations in offspring's. *(Include in your explanation appropriate biological terms and examples.)*

Skill level 3	
3	
2	
1	
0	
NR	

7. With the assistance of the **Figure 8** below, discuss how the processes of transcription, translation and the roles of DNA, mRNA and ribosomes function in the formation of protein.

Figure 8



Skill level 4	
4	
3	
2	
1	
0	
NR	

QUESTION THREE: ORGANISM LEVEL OF BIOLOGY

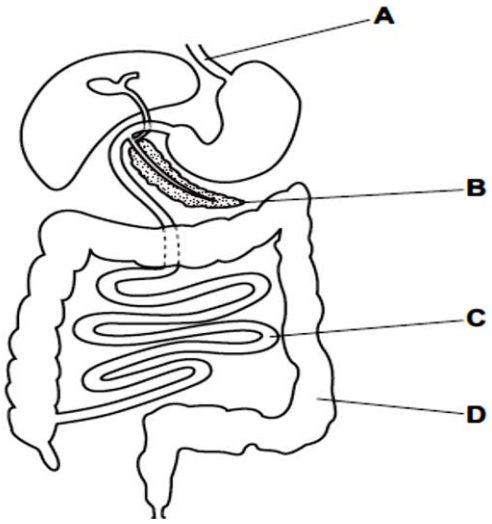
MULTIPLE CHOICE

Circle the **LETTER** of the BEST answer for questions 1 - 3.

Figure 9 *shows the human digestive system and associated organs.*

Use ***Figure 9*** *to answer questions 1 and 2.*

Figure 9



1. Identify by which process do chyme food leaves organ **A** and mixes with enzymatic juice in organ **B** to be released by organ **C** to body cells.

   A. Absorption
   B. Assimilation
   C. Digestion
   D. Egestion

Skill level 1	
1	
0	
NR	

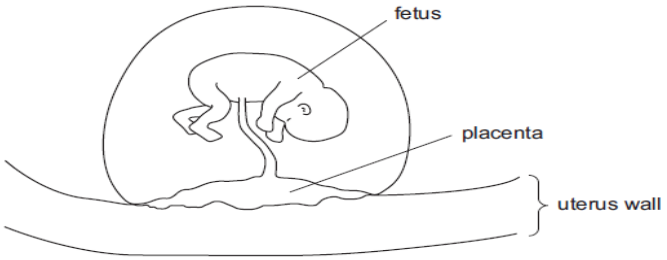
2. State by which process do bolus food leave organ **A** to reach organ **D** and after.

   A. Absorption
   B. Assimilation
   C. Digestion
   D. Egestion

Skill level 1	
1	
0	
NR	

Figure 10 *shows a fetus attached by the placenta to the uterus wall of the mother.*

Figure 10



3. Identify which materials are released as wastes by the fetus to the mother in **Figure 10**.

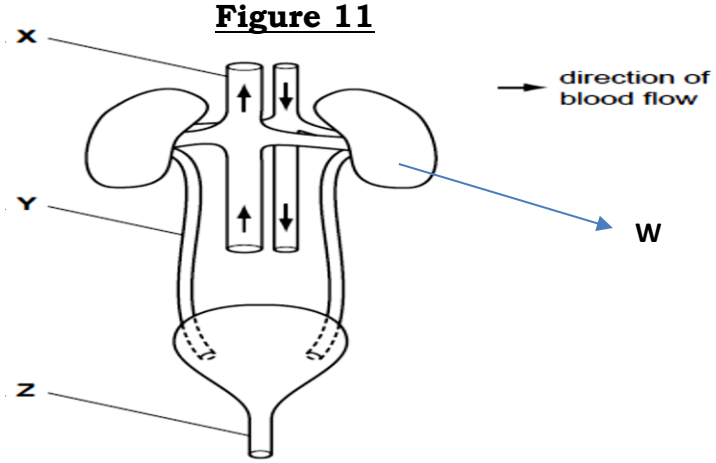
A. Ammonia and urine
B. Ammonia and urea
C. Carbon dioxide and urea
D. Carbon dioxide and urine

Skill level 1	
1	
0	
NR	

Figure 11 *illustrates a urinary system and blood supply in human.*

Use ***Figure 11*** *to answer question 4 and 5.*

Figure 11



4. Describe in details the biological concept of '**excretion'** from structure **W** to **Z**. (Use **Figure 11** and include in your answer the names of structures **W**, **Y** and **Z**.)

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_____

_____

_____

Skill level 2	
2	
1	
0	
NR	

5. Name the type of nitrogenous waste produce by fish.

_____

_____

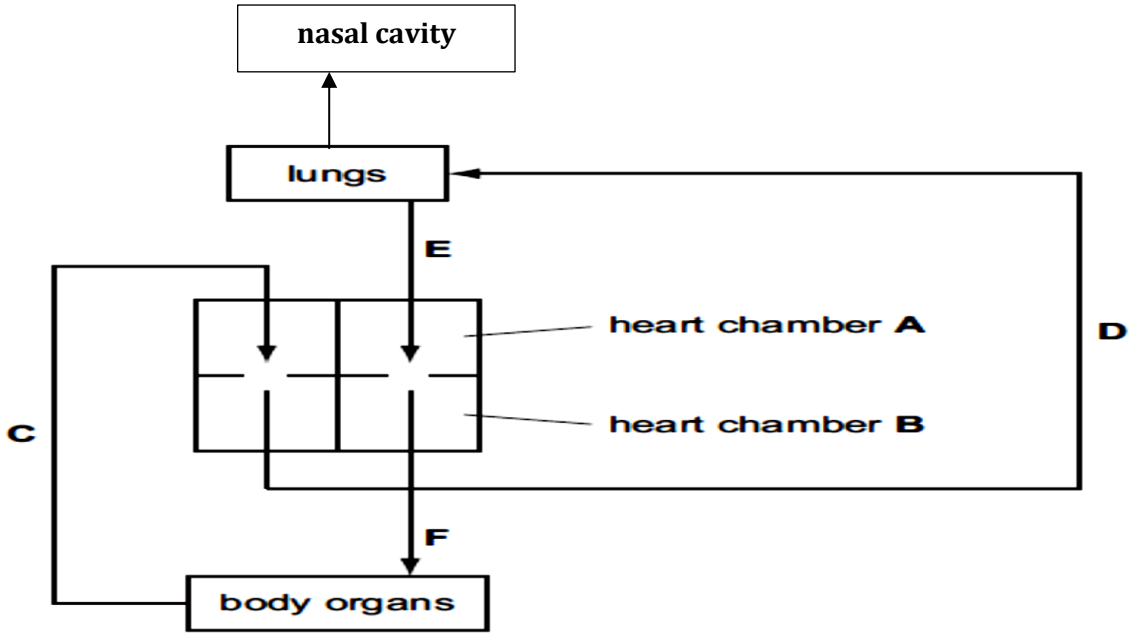
_____

Skill level 1	
1	
0	
NR	

Figure 12 *illustrates the* ***route*** *taken by blood around a mammal.*

Use ***Figure 12*** *to answer questions 6 and 7.*

Figure 12



6. Describe the important role of blood in the circulatory system.

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Skill level 2	
2	
1	
0	
NR	

Gas exchange, Respiration and Breathing contributes to how blood circulates around the body of the mammal in ***Figure 12****.*

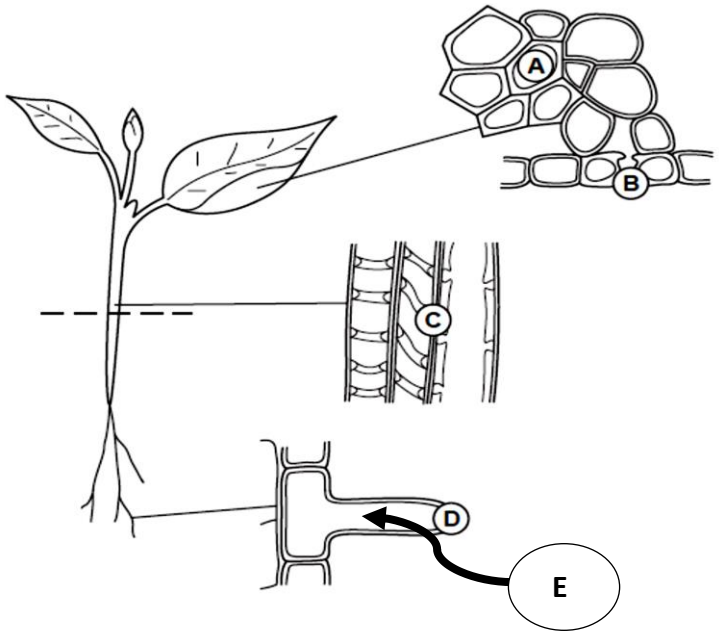
7. Describe their differences in terms of where the process occurs.

Skill level 2	
2	
1	
0	
NR	

Figure 13 *shows the stages in the passage of water through a plant. The circles are the starting points for the arrow in showing the direction in which the water moves.*

Use ***Figure 13*** *to answer question 8 – 10.*

Figure 13



8. State the role of structure **B**.

Skill level 1	
1	
0	
NR	

9. Explain how structure **D** is related to its role in transporting of substance **E** to reach point **A** and **B**. *(Include in your explanation names of structures **A** to **E** and processes involved in this transport system)*

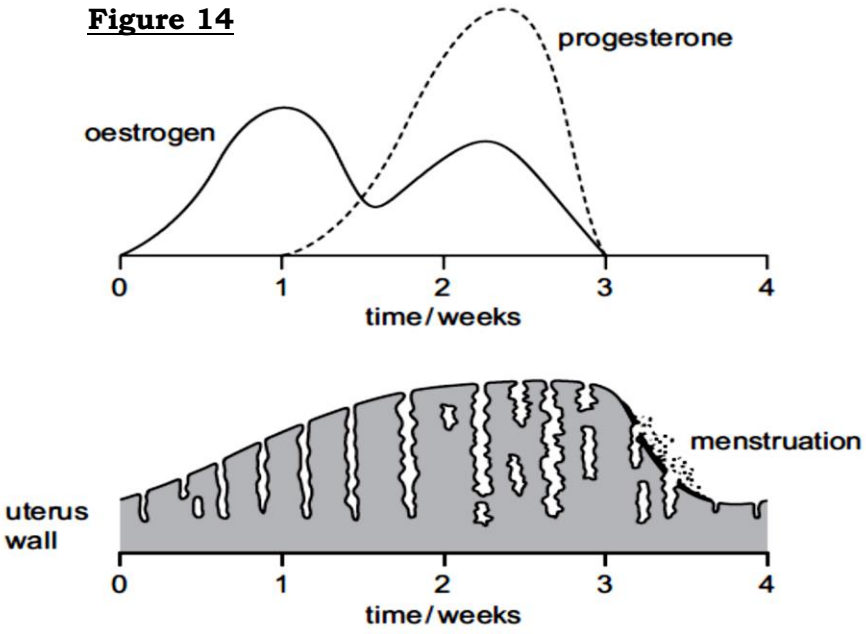
Skill level 3	
3	
2	
1	
0	
NR	

10. Suppose **Figure 13** is a dicotyledonous plant, describe how structure **C** and related conducting tissues of a vascular bundle is arranged in this plant.

Skill level 2	
2	
1	
0	
NR	

Figure 14 *shows the changes which take place during a woman's menstrual cycle from week 1 to week 4.*

Figure 14



11. Explain the effects of estrogen and progesterone in EACH week.
(Hint: effects refer to increase or decrease of each hormone in the cycle and why)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

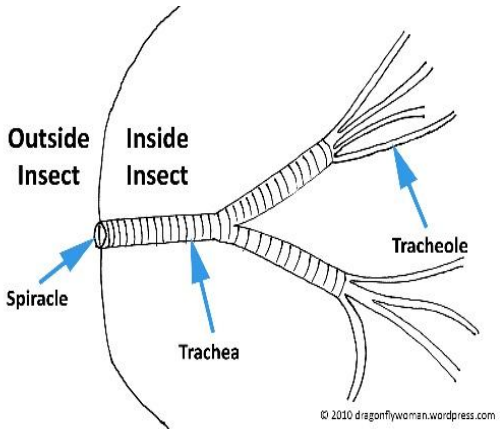
_____

Skill level 3	
3	
2	
1	
0	
NR	

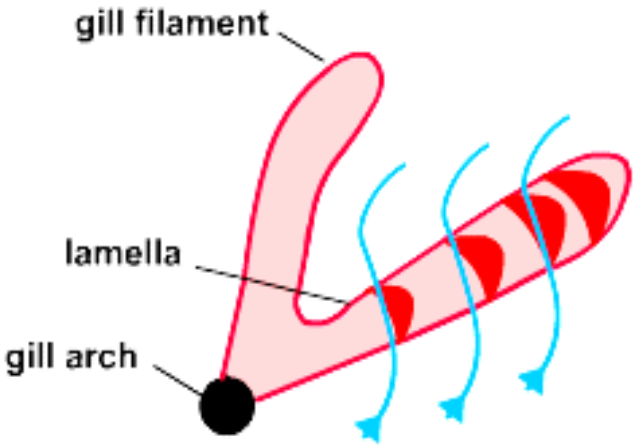
Figure 15 *illustrates two simple Gas Exchange surfaces and related tissues involved in this important process.*

Figure 15

A



B



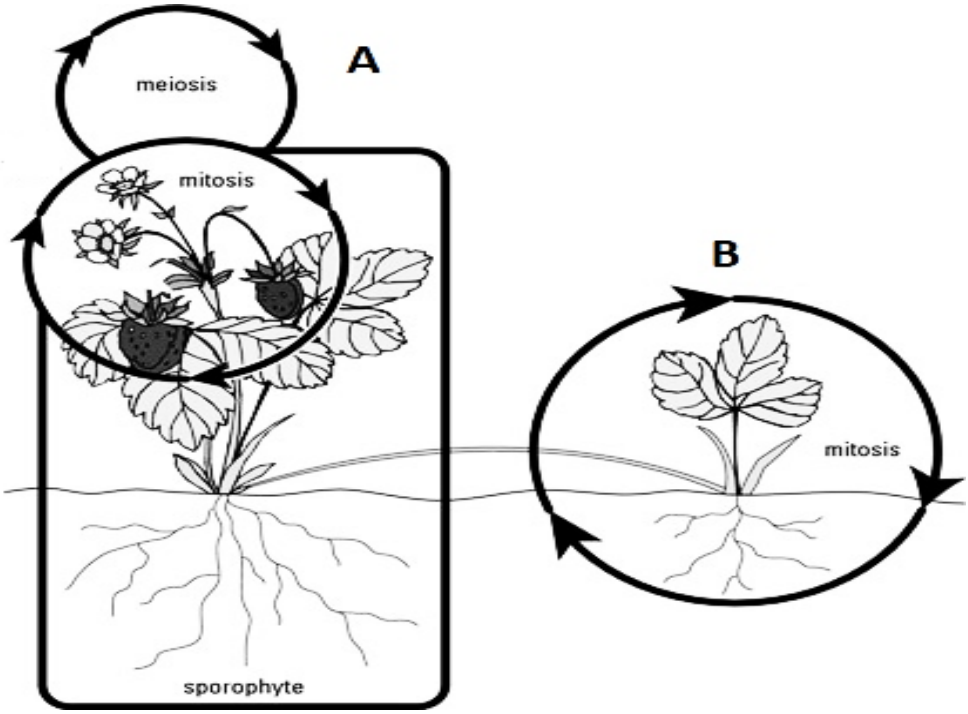
Organism A is an insect and Organism B is a Fish.

12. Explain how the features of each organism are related to its way of life and habitat.

Skill level 3	
3	
2	
1	
0	
NR	

Figure 16 *illustrates a plant undergoing both asexual and sexual reproduction.*

Figure 16



13. Distinguish between the two modes of reproduction.

Skill level 3	
3	
2	
1	
0	
NR	

QUESTION FOUR: ENVIRONMENTAL BIOLOGY

MULTIPLE CHOICE

Circle the **LETTER** of the BEST answer for questions 1 - 4.

1. The science of naming, describing and classifying organisms is known as:

Skill level 1	
1	
0	
NR	

A. Taxonomy Key
B. Taxonomists Name
C. Taxonomy System
D. Taxonomy Tool

Figure 17 *show a common pet seen in our villages.*

Figure 17

2. By applying the binomial nomenclature system, state a name for this species.

Skill level 1	
1	
0	
NR	

A. *Felis*
B. *Felis catus*
C. *Domestic cat*
D. *Canivora felidae catus*

Figure 18 *shows an Arthropod animal.*

Figure 18

3. Identify the features that justifies that this animal is an example of Arthropods.

Skill level 1	
1	
0	
NR	

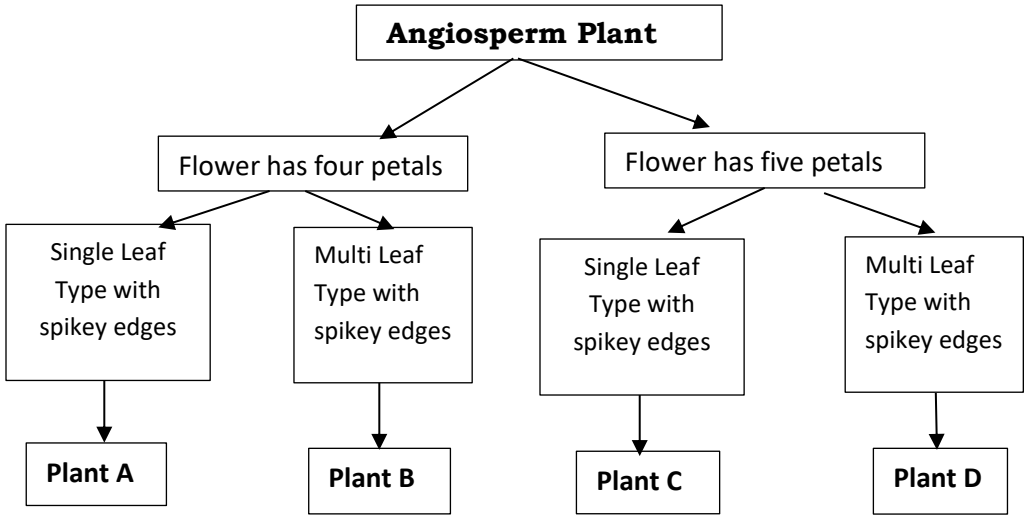
A. Jointed legs and segmented body
B. Jointed legs and thorax body
C. Segmented body and wings
D. Segmented body and thorax

Figure 19 *shows an Angiosperm plant species.*

Figure 19

4. Use the dichotomous key given below in **Figure 20** to identify whether the species in **Figure 19** is **Plant A**, **B**, ***C*** *or* ***D***.

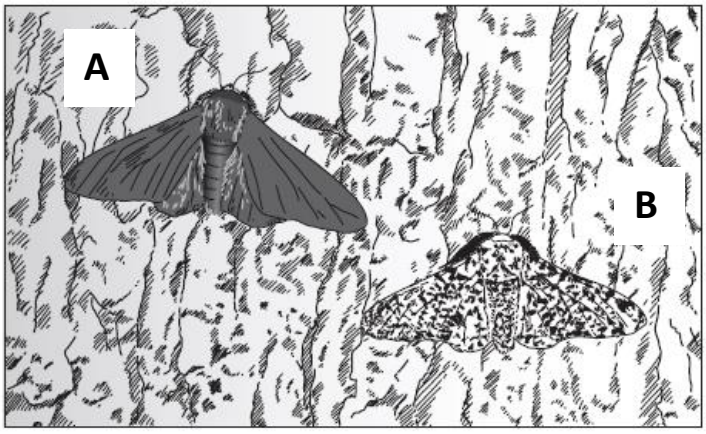
Figure 20



Skill level 1	
1	
0	
NR	

5. With supporting evidence from **Figure 21** below, describe the behavioral adaptation of the butterfly species (**A** & **B**).

Figure 21



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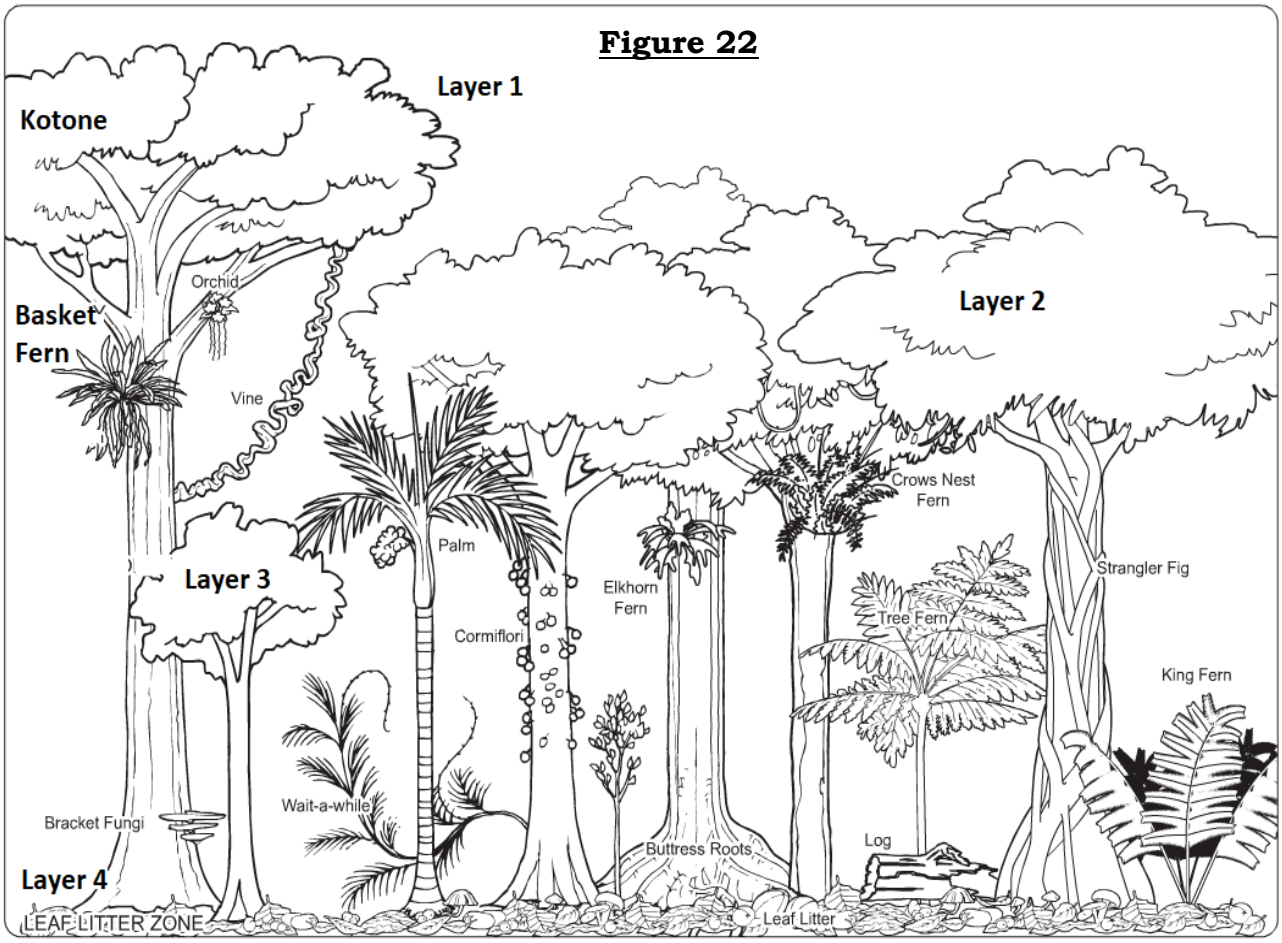
Skill level 2	
2	
1	
0	
NR	

*Let's imagine that **Figure 22** is the Toloa Rainforest Conservation Park.*

*Use **Figure 22** to answer questions 6 – 8.*

Figure 22



Wet Tropics Management Authority - Rainforest Explorer

6. Describe the characteristic of the community pattern illustrated in **Figure 22**.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Skill level 2	
2	
1	
0	
NR	

7. Identify as to what type of relationship does the basket fern plant and the Kotone tree a good example of.

_____
_____
_____
_____

Skill level 1	
1	
0	
NR	

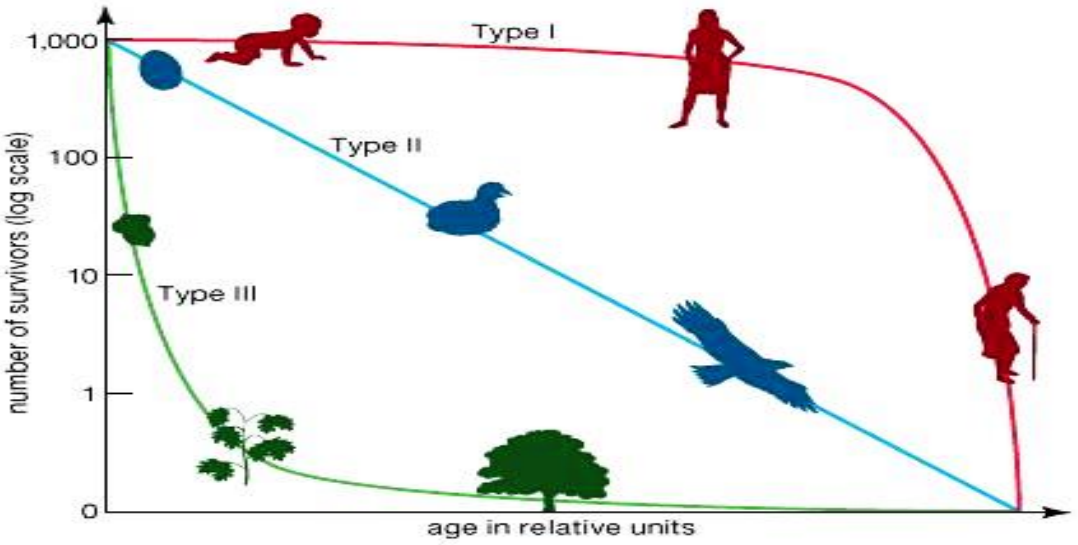
8. In terms of population distribution, name the type of population distribution in **Figure 22**.

_____
_____
_____
_____

Skill level 1	
1	
0	
NR	

Figure 23 *illustrates a survivorship curve of the following species.*

Figure 23



9. Examine **Figure 23** and explain the Survival Rate of organisms given in the ***Type I, II and III*** graphs. *(Hint: survival rate in terms of natality and mortality)*

Skill level 3	
3	
2	
1	
0	
NR	

10. Use a local environmental issue to discuss the implications issue for the long term survival of the ecosystem with reference to specific characteristics of the ecosystem.

Skill level 4	
4	
3	
2	
1	
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NR	