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Student Personal Identification Number

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Solomon Islands National Form Six School Certificate

BIOLOGY

2019

QUESTION AND ANSWER BOOKLET

TUESDAY 5th NOVEMBER 9:00 AM TIME: 3 Hours Plus 10 Minutes Reading Time.

INSTRUCTIONS

1. There are three sections to the paper. **ALL SECTIONS ARE COMPULSORY.** Answer **ALL** questions.

Recommended time allowances for each section:

Section A: Multiple Choice Questions	45 minutes	40 marks
Section B: Short Answer Questions	105 minutes	147 marks
Section C: Extended Response Questions	<u>30 minutes</u>	<u>20 marks</u>
	3 hours	207 marks

2. Write your answers to **Section A** on the Answer Sheet on the **BACK-FLAP** on the last page. Write your answers to **Sections B** and **C** in the spaces provided in this booklet.
3. Write your **Student Personal Identification Number (SPIN)** in the box on the top right-hand corner of this page and on the **back-flap**.
4. If you use extra sheets of paper(s), be sure to write clearly the number of the question being answered. Write your SPIN on the top right hand corner of each sheet, and tie it securely at the appropriate place in this booklet.
5. Do NOT use correction fluid.
6. Mobile phones are NOT allowed in the Examination room.

NOTE: You may not have seen or studied any of the organisms used as examples in this paper. You are expected to apply the principles and knowledge learned during your Biology course to the question(s).

Check that this booklet contains pages **2 - 40** in the correct order and that none of these pages are blank. Pages **39** have been left blank deliberately.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

SECTION A: MULTIPLE CHOICE

(40 MARKS)

Answer all the questions in this section. Write the **LETTER** of the best answer in the boxes on the back-flap. If you change your answer, put a line through the first answer and write your new choice beside the box.
Each question is worth two (2) marks each.

1. Hydrogen peroxide is a toxic by-product of cell metabolism. The enzyme that breaks down the hydrogen peroxide to a less toxic compounds is call catalase. The **ideal temperature** for catalase to work BEST at is;

A. 10°C
B. 20°C
C. 37°C
D. 70°C

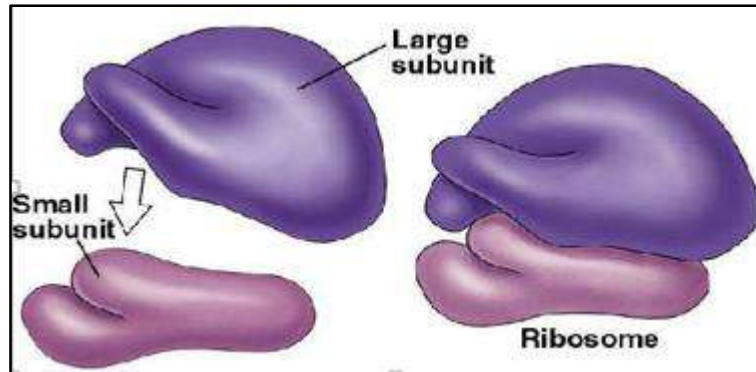
2. Photosynthesis has two phases, the light reaction and the dark reaction. The **MAIN** products of light reaction are:

A. ATP and glucose
B. Starch and FAD
C. ATP and NADPH
D. Electron Acceptors

3. The **Calvin cycle** in the process of photosynthesis is also known as the;

A. dark reaction.
B. light reaction.
C. anaerobic reaction.
D. electron transport chain.

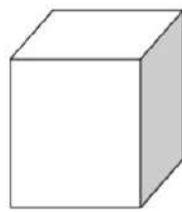
Below is a diagram that shows one of the organelles in both plant and animal cells.



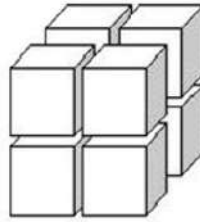
4. The MAIN function of the organelle above is;
 - A. making protein.
 - B. storage of glycogen.
 - C. packaging of protein.
 - D. carrying out metabolism of glucose.

5. DNA and RNA are macromolecules in living organisms. Their MAIN function is for;
 - A. heredity.
 - B. hormone metabolism.
 - C. providing energy for the cell.
 - D. transport and communication.

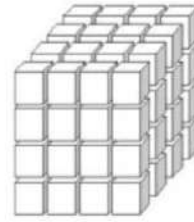
The cubes in the diagram below represent living cells. Cell A, tissue B, and tissue C all have the same volume.



Cell A



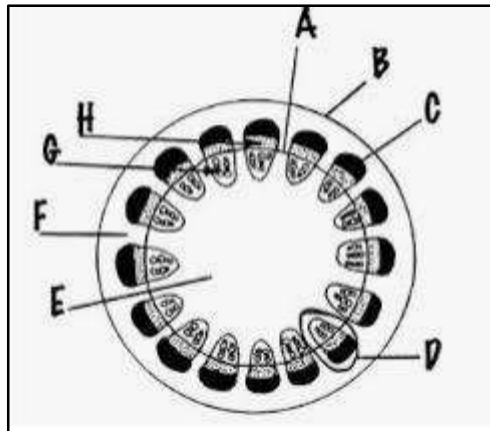
Tissue B



Tissue C

6. Which of the following statement is CORRECT?
- A. Cell A has larger surface area than tissue B.
 - B. Cell A has larger surface area than tissue C.
 - C. Tissue C has larger surface area than both Cell A and Tissue B.
 - D. Tissue C has larger surface area than cell A, but smaller than Tissue B.
7. The **phenotype ratio** of the offspring in the F1 generation of a **test cross** between a **heterozygous dominant** red flower to a **homozygous recessive** white flower is;
- A. 25% red flower: 75% white flower.
 - B. 50% red flower: 50% white flower.
 - C. 75% red flower: 25% white flower.
 - D. 100% red flower: 0% white flower.
8. A baby born at the National Referral Hospital (NRH) in Honiara has blood type AB. Her mother's blood type is B. Therefore the **alleles** for father's blood is;
- A. OO
 - B. BB
 - C. BO
 - D. OA

Below is a diagram that shows the cross section of stem of dicot plant.



9. The part of the plant that is responsible for the transportation of **glucose** throughout the plant is labeled;

- A. B
- B. C
- C. G
- D. H

10. Rate of transpiration is high when the;

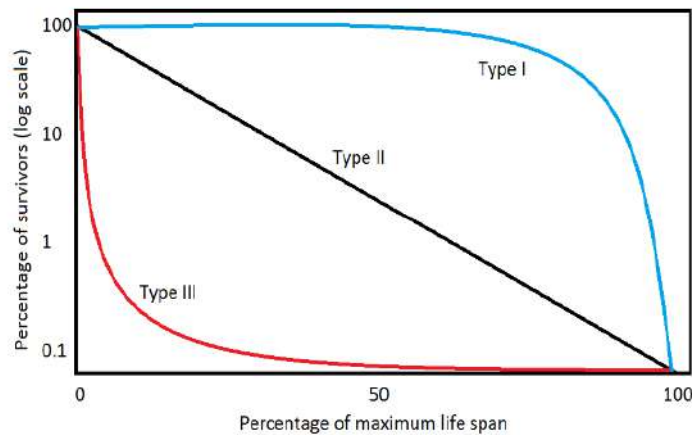
- A. humidity is low.
- B. humidity is high.
- C. temperature is low.
- D. wind speed is reduced.

11. **Open circulatory system** is only suitable for organism such as;

- A. dogs.
- B. whale.
- C. dolphin.
- D. grasshopper.

12. In order for gas exchange to take place effectively, the **alveoli** must be closely associated with;
- A. villi.
 - B. veins.
 - C. arteries.
 - D. capillaries.
13. People who smoke have high level of deposit from cigarette smoke that usually interfere with the normal functioning of cilia in the;
- A. pharynx.
 - B. trachea.
 - C. esophagus.
 - D. bronchioles.
14. The MAIN sources of **nitrogenous waste** in our bodies comes from;
- A. glucose.
 - B. vitamins.
 - C. proteins.
 - D. fatty acids.
15. The **nitrogenous waste** excreted by fish is in the form of;
- A. urea.
 - B. uric acid.
 - C. ammonia.
 - D. carbon dioxide.
16. A scientist wants to change the DNA of a **sexually reproducing** organism and have the DNA present in every cell of the organism.
In order to do that the scientist must insert the DNA after fertilization into the;
- A. placenta.
 - B. the zygote.
 - C. father's testes.
 - D. ovaries of the mother.

The graph below shows 3 different types of survivorship curves. Type I, II and III.



17. Which of the following species would possess **type III survivorship curve**?

- A. A mammal that has 1 to 2 offspring per lifetime.
- B. Birds that lay few eggs during summer season.
- C. A rat that has several offspring per annual reproductive event.
- D. A fish that produces many offspring per annual reproductive event.

18. The MAIN cause of **genetic variation** in a population is;

- A. gene isolation.
- B. population increase.
- C. migration of organism.
- D. chromosome crossing over.

19. A behavior common in African giant snail is aggregation. Therefore the BEST **method** to estimate the population of African giant snail is;

- A. transect method.
- B. individual counting.
- C. random sampling.
- D. capture and recapture method.

20. The relationship in which an organism (host) depends entirely on another organism for its survival without any benefit from the other organism is called;
- A. predation.
 - B. parasitism.
 - C. mutualism.
 - D. commensalism.

Sect A:	
Q1-20	
Total marks	40

SECTION B: SHORT ANSWER QUESTIONS**(147 MARKS)**

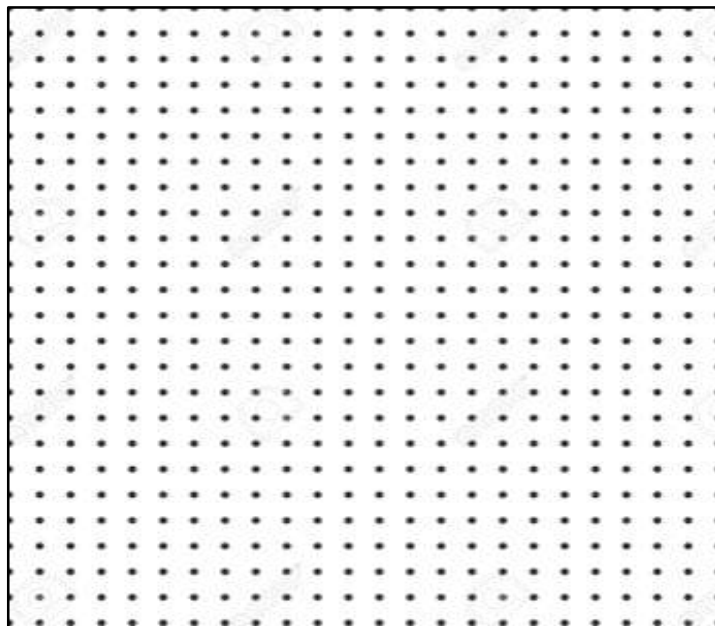
Answer All Questions in this Section. Write your answer in the space provided.

Q.21. The combination of two compounds X and Y to produce a third substance Z is accelerated by an enzyme that can be isolated from a species of microbe. The activity of the enzyme at various temperature was investigated in test-tube conditions (in-vitro). The amount of activity was determined by the yield of the substance Z in grams.

The results are shown in the table below.

Temperature °C.	In vitro conditions Yield of Z grams
0	1
10	5
20	17
30	32
40	?
50	75
60	58
70	0

- i. Use the data from the table above, plot a graph on the grid provided below. *Label your axis (X and Y).*



(4 marks)

ii. Estimate the **yield** at 40°C under in-vitro condition.

(1 mark)

iii. Describe the relationship between temperature and the activity of the isolated enzyme in the in-vitro conditions.

(2 marks)

iv. Explain the **effect** of temperature on enzyme activity.

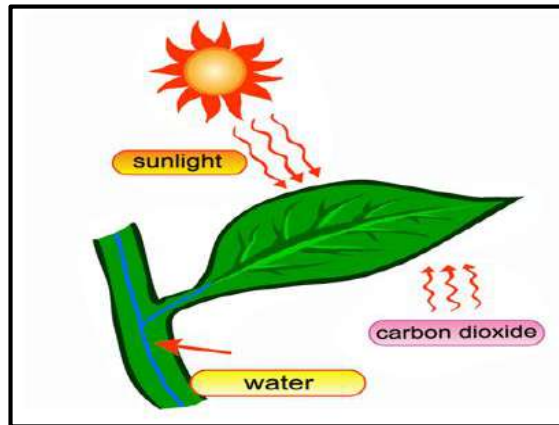
(2 marks)

v. State what happened to the enzyme at 70°C.

(1 mark)

Sect B:	
Q.21.	
Total marks	10

Q.22. A. Below is a diagram that shows the process of photosynthesis.



i. Write a **balance equation** for the process of photosynthesis.

(2 marks)

ii. Describe the process where water and air is taken up to the leaves (chloroplast) for the process of photosynthesis.

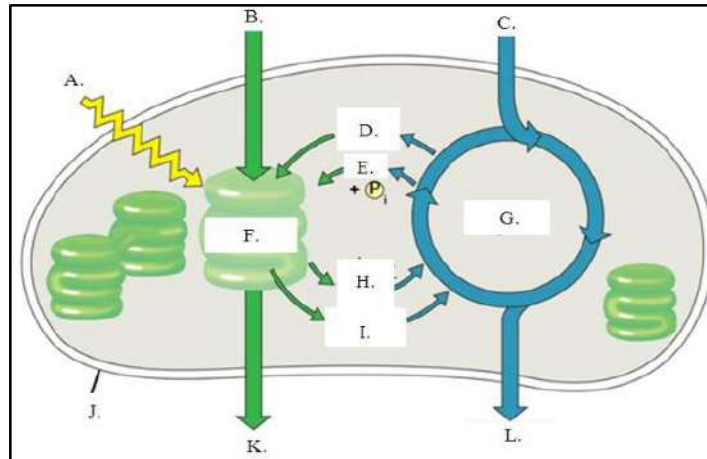
a. Water

(1 mark)

b. Oxygen

(1 mark)

B. Below is a diagram that shows the process of photosynthesis in the chloroplast.



Use the diagram above to answer questions (i – iii) that follow.

i. Name the processes in F and G.

F: _____

G: _____

(2 marks)

ii. Explain the **role** of process F in photosynthesis.

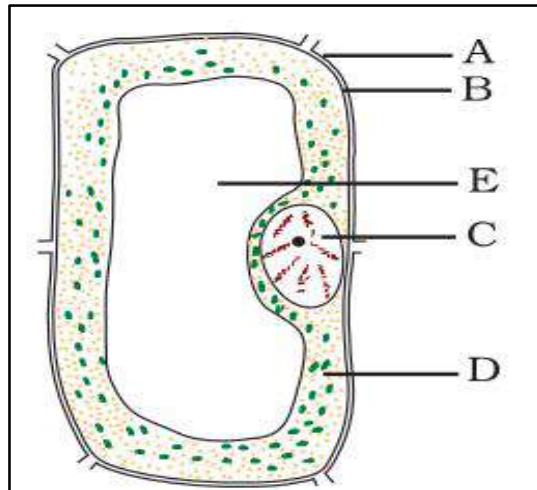
(2 marks)

iii. Explain how the **absence** of the part labelled A will affect the process of photosynthesis in the above diagram.

(2 marks)

Sect B:	
Q.22.	
Total marks	10

Q.23. A. Below is a diagram of a typical cell.



Study the cell structure above and answer questions (i – iii) that follow.

i. Describe the function of the **part labelled C** in the above cell structure.

(2 marks)

ii. Describe the movement of water across the cell membrane, if the cell is placed in a beaker with **isotonic solution**.

(2 marks)

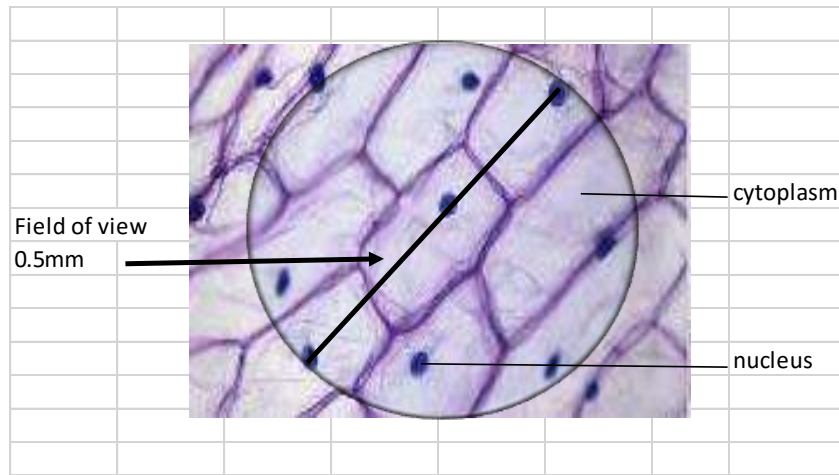
iii. Suggest **TWO (2)** reasons why the cell in the diagram above is a plant cell and **NOT** an animal cell.

1.

2.

(2 marks)

- B. The diagram below shows labelled onion cells observed under a light microscope at X40 magnification.



- i. Use the measurement of the **field of view** of the microscope to estimate the actual size of a **single cell**.

(2 marks)

- ii. Iodine solution is used as a stain in the preparation of the onion cells. Explain the **purpose** of the iodine solution.

(2 marks)

Sect B:	
Q.23.	
Total marks	10

Q.24. A scientist carries out a dihybrid cross for pig's **hair color and toughness**. The alleles are described in the box below.

- i. **Black hair is dominant (BB), to recessive white hair (bb)**
- ii. **Rough hair is dominant (RR), to recessive smooth hair (rr)**

Use the information above to answer questions (i – iii) that follow.

i. What is the genotype ratio of a cross between a **male heterozygous black, rough hair (pig)** with a **homozygous white, smooth hair female (pig)**?

a. Write their alleles in the space below.

1. Male pig alleles _____

2. Female pig alleles _____

(2 marks)

b. Use the punnet square below to show the possible **genotypes** of the cross between male and female pigs for the above mentioned traits.

2. Female ➔ 1. Male ⬇				

(10 marks)

ii. What are the possible **genotype ratio** of black, smooth hair off-springs?

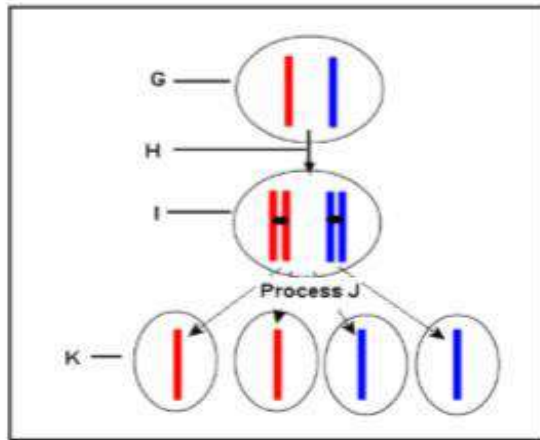
(2 marks)

- iii. If there are 20 piglets all together, the possible number of pigs that is likely to have the character above (black smooth hair) is;

(2 marks)

Sect B:	
Q.24.	
Total marks	16

Q.25. A. The diagram below shows the process of meiosis. Answer questions (i – v) that follow.



i. With reference to the diagram above, explain why **meiosis** is referred to as a reduction division.

(2 marks)

ii. Describe what happens to the chromosome in **stage H**.

(2 marks)

iii. With reference to the above diagram describe the process that occurs in **stage J**.

(2 marks)

iv. Explain the role of **meiosis**.

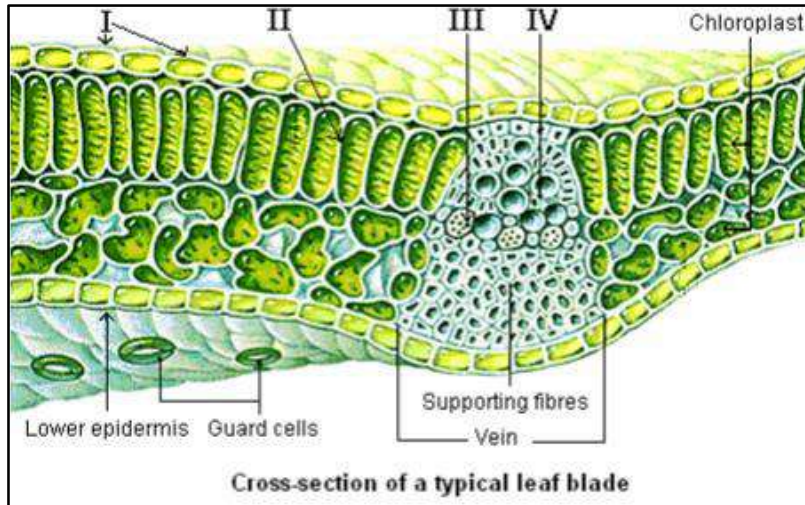
(2 marks)

v. Assuming the cell undergoes mitosis. Explain the role of **mitosis**.

(2 marks)

Sect B:	
Q.25.	
Total marks	10

Q.26. The diagram below shows the structure of a plant's leaf.



Use the diagram above to answer questions (i – iv) that follow.

i. Explain the role of guard cells.

(2 marks)

ii. Name the **parts labelled I and III** and give their MAIN functions.

a. Part I _____

b. Part III _____

c. Part I function _____

d. Part III function _____

(4 marks)

iii. Explain how water from the roots is able to travel up to the leaves of trees against the force of gravity.

(2 marks)

iv. Describe ONE (1) factor that affects the rate of transpiration in leaves.

(2 marks)

Sect B:	
Q.26.	
Total marks	10

Q.27. The picture below shows a mature fern plant.



Use the picture above to answer questions (i – iii) that follow.

i. Name the **stage** of a matured fern (as shown above) in its life cycle.

(1 mark)

ii. State the structures in the mature fern tree above where meiosis and mitosis take place.

a. Meiosis _____

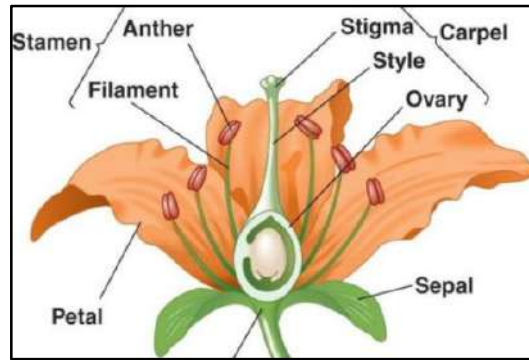
b. Mitosis _____

(2 marks)

iii. Suggest why it is necessary for ferns to grow in moist areas.

(2 marks)

B. Below is a structure of a flower.



Use the above diagram to answer questions (i – iii) that follow.

- i. Justify the **mode of pollination** for a plant that bears the type of flower as in the picture above.

(2 marks)

- ii. What is the **stage** in the life cycle of a plant as shown in the above diagram?

(1 mark)

- iii. Name two parts of the flower in the diagram above, if removed would not affect the reproduction of the plant.

1. _____

2. _____

(2 marks)

Sect B:	
Q.27.	
Total marks	10

28. A. Exercise and having a balance diet is very important for our health.

i. Suggest the **4 main food types** that must be contained in a balanced diet meal.

a. _____

b. _____

c. _____

d. _____

(4 marks)

ii. Cellulose cannot be digested by humans, but it's very important in our diet, explain.

(2 marks)

B. The role of liver in controlling glucose level in our body is very important.

i. Compare how the liver works in controlling the glucose level of a person (A), who have just eaten a plate of rice to a person (B) working hard in his taro plantation.

Person (A) _____

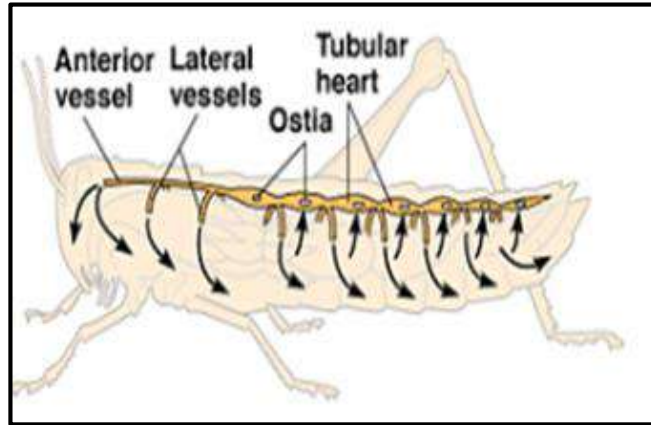
(3 marks)

Person (B) _____

(3 marks)

Sect B:	
Q.28.	
Total marks	12

29. The diagram below shows **gas exchange system** of a grasshopper.



Use the above diagram to answer questions (i – iii) that follow.

i. Discuss the **gas exchange system** of a grasshopper in the above diagram.

(4 marks)

- ii. Grasshoppers like some insects possessed a particular circulatory system, and such animals are often smaller in size. Discuss the reasons.

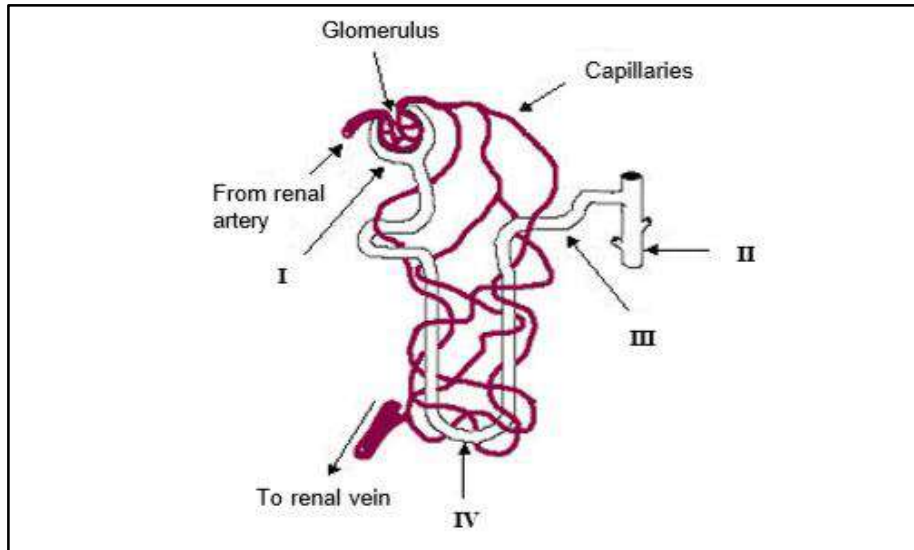
(4 marks)

- iii. Explain why the **structure of gas exchange system (alvioli)** of large animals is folded many times.

(2 marks)

Sect B:	
Q.29.	
Total marks	10

Q.30. A. The diagram below shows the structure of human kidney.



Use the above diagram to answer questions (i – iii) that follow.

i. Name parts **labelled II** and **III**.

II. _____

III. _____

(2 marks)

ii. With help of the diagram above, explain what happens to the blood at **point I** and **IV**.

I. _____

(2 marks)

IV. _____

(2 marks)

iii. Describe a **problem** that may occur to the kidney if a person does not drink enough water daily.

(2 marks)

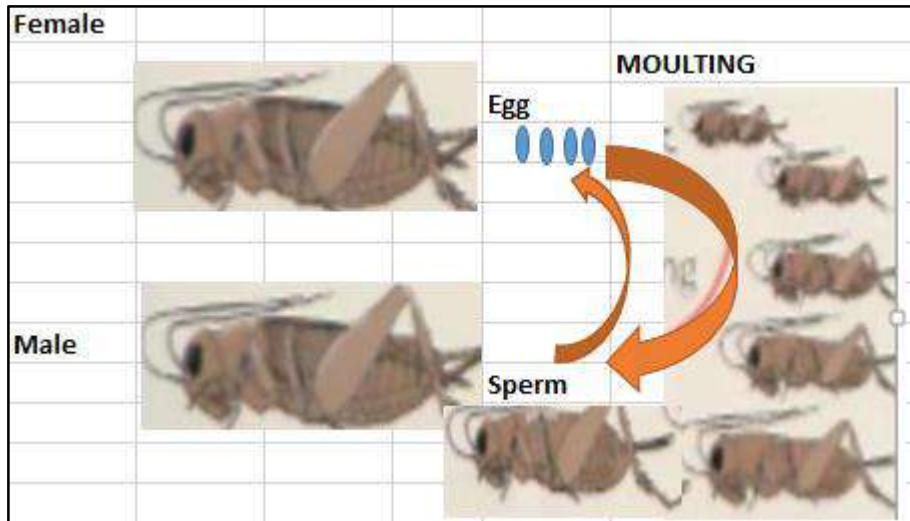
- B. Estrogen is another hormone that plays an important role in the menstrual cycle of female reproduction.

Explain how the **level of estrogen** affects the lining of the uterus wall.

(2 marks)

Sect B:	
Q.30.	
Total marks	10

Q.31. The picture below shows the life cycle of a cricket.



Use the pictures to answer questions (i – iv) that follow.

i. Name the Phylum and Class that crickets belong to.

a. Phylum. _____

b. Class. _____

(2 marks)

ii. In the cricket life cycle diagram above, where do meiosis and mitosis occur?

a. meiosis _____

b. mitosis _____

(2 marks)

iii. Describe ONE (1) **problem** crickets must overcome in order to reproduce.

(2 marks)

iv. State THREE (3) **adaptive features** insects have that make them so successful and colonize almost all habitats.

1. _____

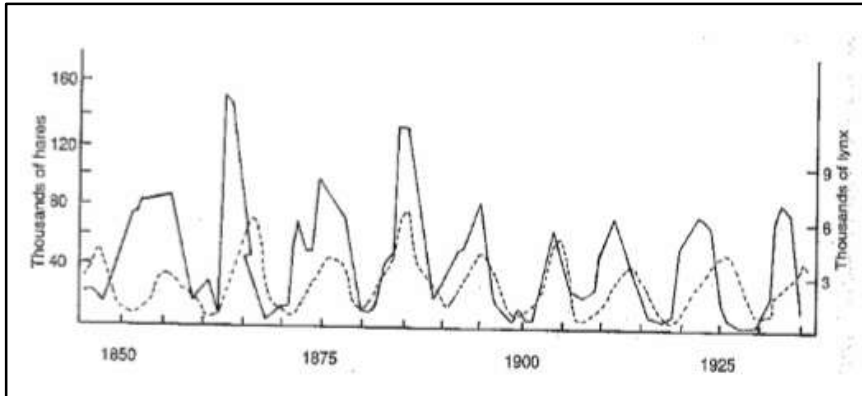
2. _____

3. _____

(3 marks)

Sect B:	
Q.31.	
Total marks	9

Q.32. The graph below shows the changes in the population of hares (the **prey**; solid line) and lynxes (the **predator**; dotted line) from 1850 to 1925 in Canada. (Note the separate scales for hare and lynx numbers).



Key:
 _____ hare
 lynx

Use the graph above to answer questions (i – iii) that follow.

i. Provide the HIGHEST population of hare and lynx to the nearest thousand.
 Lynx: _____
 Hare: _____
 (2 marks)

ii. What year was the population of **hare** the highest and why?
 Year: _____
 Justification: _____
 (2 marks)

iii. Explain the CAUSE of **fluctuations** in between 1850 to 1925 of the hare and lynx species.

(4 marks)

Sect B:	
Q.32.	
Total marks	8

Q.33. A group of biology students conducted a study of the rocky shore community near their school. Their study showed the following data below.

Table of results showing species abundance and their respective water mark zones.

Water mark zone	Species		
	Barnacle	Mussel	Red Algae
High tide	200	5	0
Middle tide	5	250	2
Low tide	0	0	200

i. Describe ONE (1) **environmental factor** that influences the distribution of the species listed in the table above.

(2 marks)

ii. Explain the **challenge** faced by barnacles in its zone.

(2 marks)

iii. Explain which **species** would have the LEAST tolerance for sunlight.

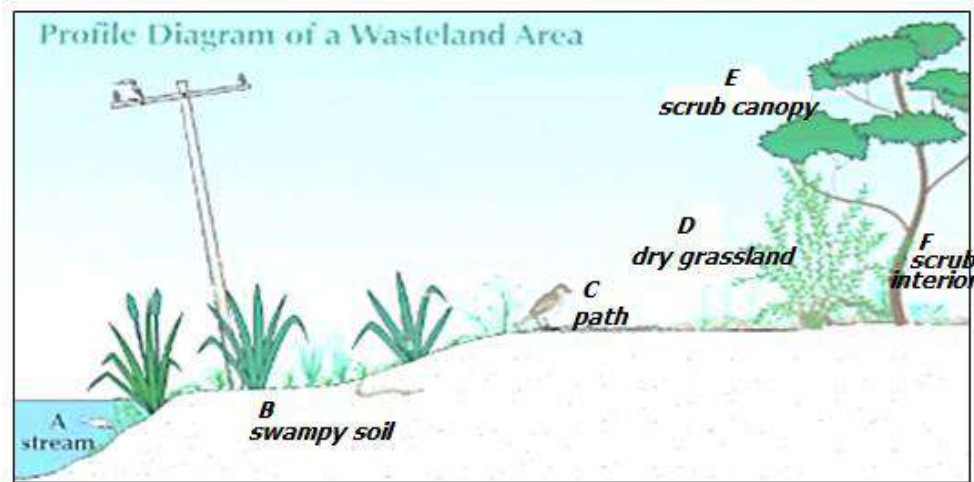
(2 marks)

iv. Explain how **ecological niche** may affect competition between two different species occupying the same niche.

(2 marks)

Sect B:	
Q.33.	
Total marks	8

Q.34. A student studies particular wetland ecological community and draw a diagram that shows a profile of the wetland area studied.
(A list of species observed were also listed).



The table below shows species diversity of the above community.
(Letter represent locations in the above diagram).

Species	Location		
Beetle	E		
Caterpillars	E		
Small fish	A		
Grass	B	D	
Insect larvae	A		
Manuka tree	E	F	
Slaters	C	F	
Snails	B	C	
Butterflies	B	C	
Crickets	C	D	D
Grasshopper	D		
Worms	B		
Slugs	B		
Spiders	E		
Flying insect	A	B	

With reference to the diagram and the table above, answer questions (i – vii) that follow.

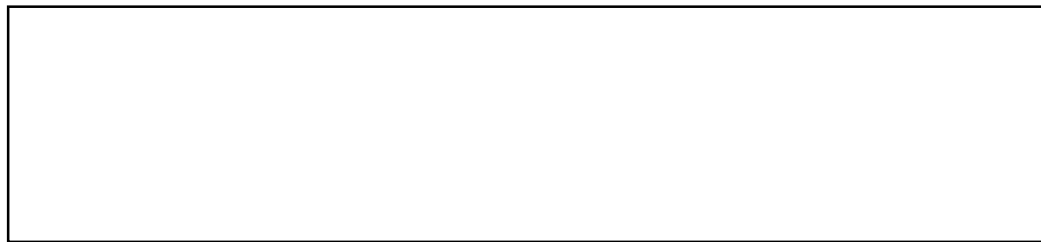
i. Describe a possible **zonation pattern** observed in the community.

(2 marks)

ii. Explain the term **stratification** with reference to the wetland ecological community.

(2 marks)

iii. Draw a **flow chart** of a simple food chain that may occur in the wetland ecological community.
(Use at least 4 organisms).



(2 marks)

iv. Describe the term **Climax Community** and give an example.

(2 marks)

v. Explain ONE (1) MAJOR **environmental effect** caused by mining to the Wetland ecological community.

(2 marks)

vi. Describe how humans have influenced community succession.

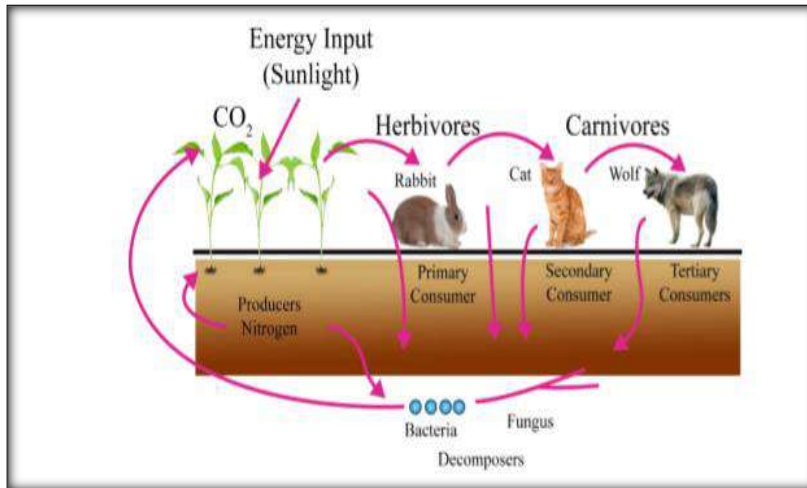
(2 marks)

vii. Describe ONE (1) specific **adaptive feature** that frogs have which allow them to survive better in location **A** and **B**.

(2 marks)

Sect B:	
Q.34.	
Total marks	14

Q.36. The diagram below shows a Forest ecosystem.



Use the diagram to answer questions (i and ii) that follow.

- i. Discuss the importance of carbon cycle in the atmosphere.
- ii. Discuss the impacts that an increased CO_2 in the atmosphere may have on organisms and the environment.

i) Discuss the **importance of carbon cycle** in the atmosphere.

(5 marks)

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ANSWER SHEET – Section A

Write the letter of the correct answer only.

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2	<input type="text"/>	12	<input type="text"/>
3	<input type="text"/>	13	<input type="text"/>
4	<input type="text"/>	14	<input type="text"/>
5	<input type="text"/>	15	<input type="text"/>
6	<input type="text"/>	16	<input type="text"/>
7	<input type="text"/>	17	<input type="text"/>
8	<input type="text"/>	18	<input type="text"/>
9	<input type="text"/>	19	<input type="text"/>
10	<input type="text"/>	20	<input type="text"/>

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Section	Mark	Marker	Checker
Section A. 1 – 20	40		
Section B. 21 – 38	147		
Section C. 39 - 42	20		
TOTAL	207		
MARKER/CHECKER INITIAL			

Number Correct X 2 =

40