

MARKER CODE				



Student Personal Identification Number				

Solomon Islands National Form Six School Certificate

BIOLOGY

2017

QUESTION AND ANSWER BOOKLET

Time allowed: Three 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	140 marks
Section C: Extended Response Questions	<u>30 minutes</u>	<u>20 marks</u>
	3 hours	200 marks

2. Write your answers to **Section A** on the Answer Sheet on the **FOLD-OUT 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 **fold-out flap**.
4. If you use extra sheets of paper, 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.

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 questions.

Check that this booklet contains pages **1 - 43** in the correct order and that none of these pages are blank. Pages **41 & 42** have been left blank deliberately.

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

TOTAL MARKS

200

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 FOLD-OUT FLAP. IF YOU CHANGE YOUR ANSWER, PUT A LINE THROUGH THE FIRST ANSWER AND WRITE YOUR NEW CHOICE BESIDE THE BOX.

1. A piece of fish flesh was placed in a sample of liquid taken from a dog's stomach. It was incubated at body temperature of 37°C. Which of the following would increase the rate of digestion of the piece of fish flesh?
 - A. Adding water
 - B. Shaking the sample
 - C. Increasing the temperature to 60°C.
 - D. Adding saliva from the dog's mouth.

2. When a muscle becomes fatigued, which of the following would best represent its condition? It contains:
 - A. No glycogen, little lactic acid and much ATP
 - B. Little lactic acid, little ATP and much glycogen.
 - C. Much lactic acid, much ATP and much glycogen.
 - D. Little or no ATP, little glycogen and much lactic acid.

3. During the 'Dark reactions' of photosynthesis:
 - A. O₂ is released.
 - B. CO₂ is absorbed.
 - C. Electrons are released.
 - D. ATP is converted into ADP.

4. When two solutions of different concentrations are separated by a semi-permeable membrane the process of Osmosis takes place. This involves diffusion of
 - A. Solute particles from a higher to a lower concentration.
 - B. Solute particles from a lower to a higher concentration.
 - C. Water from the side of lower solute concentration to that of greater concentration.
 - D. Water from the side of greater solute concentration to that of lower concentration.

5. Which of the following is the most correct sequence when setting up a microscope on higher power and having a slide ready for viewing?
- Adjust light, arrange slide, focus lower power, focus high power.
 - Focus low power, focus high power, arrange slide, adjust light.
 - Adjust light, focus low power, focus high power, arrange slide.
 - Arrange slide, focus low power, focus high power, adjust light.
6. DNA was extracted from the cells of a cat and analysed. The table below shows the percentage abundance of the four bases.

Cytosine	Base X	Base Y	Base Z
22.8	27.4	22.5	27.3

Which of the following gives the correct identification of the bases, X, Y and Z?

- X = Guanine Y = Thymine Z = Adenine
 - X = Thymine Y = Adenine Z = Guanine
 - X = Guanine Y = Adenine Z = Thymine
 - X = Adenine Y = Guanine Z = Thymine
7. A phenotypic ratio of 9:3:3:1 results from
- A dihybrid cross.
 - Co-dominance cross.
 - A monohybrid cross.
 - Incomplete dominance.

8. Four babies born at Honiara National Referral Hospital had the following blood types:

- Baby Patty – Blood Type A
- Baby Maddie – Blood Type O
- Baby Natty – Blood Type AB
- Baby Shaggy – Blood Type B

Since there was a mix-up of these babies, the parents were called in to conduct blood tests to confirm the real parents.

The table below shows the result of the parents' blood test

Parents	Parents' Blood Types
1	A and B
2	B and B
3	AB and O
4	A and A

It is possible to conclude that the possible parents of Baby Natty are

- A. Parents 1
- B. Parents 2
- C. Parents 3
- D. Parents 4

9. Which of the following statements is true?

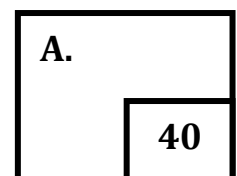
- A. Vascular bundles in dicots are arranged in a ring.
- B. Vascular bundles in monocots contain cambium.
- C. Vascular bundles occur in ferns, not dicots or monocots.
- D. Vascular bundles in dicots are scattered randomly throughout the stem.

10. An important adaptation which has allowed angiosperms to colonise a greater variety of habitats than ferns is:

- A. Development of the seed habit.
- B. A well-developed vascular system.
- C. Development of protective floral parts.
- D. The evolution of non-swimming sperm cells.

11. An organism that attaches itself to the side of a fish and sucks blood and body juices of the fish for food would probably have:
- A. No digestive tube.
 - B. A very short, simple digestive tube.
 - C. A long digestive tube with many blind pouches.
 - D. A digestive tube unlike that of any other animal.
12. A cross-section of a leaf shows large spaces between the cells in the spongy mesophyll. The most important function of these spaces is to:
- A. Ensure that the leaf cells are turgid at all times.
 - B. Provide for storage of water to be used when conditions are dry.
 - C. Allow the transport of food to other parts of the plant during the night.
 - D. Allow a rapid diffusion of gases between the leaf cells and the outside air.
13. A housefly has an open circulatory system which does not allow the rapid circulation of its blood. However, the housefly is able to release a large amount of energy very rapidly. This is possible because the fly:
- A. Stores oxygen in its blood.
 - B. Does not use oxygen for muscle contraction.
 - C. Has tracheal tubes which reach all body parts.
 - D. Absorbs oxygen directly through its exoskeleton.
14. The circulatory system in which the blood flows through the heart once and is always contain in blood vessels is
- A. Open cavity system.
 - B. Open circulatory system.
 - C. Closed single circulatory system.
 - D. Closed double circulatory system.
15. Which organisms would normally produce the most concentrated urine?
- A. Humans.
 - B. Saltwater fish.
 - C. Estuarine eels.
 - D. Freshwater fish.

16. In the human female menstrual cycle, the hormone that causes the uterus to repair itself is
- A. Oestrogen.
 - B. Progesterone.
 - C. Luteinising hormone.
 - D. Follicle stimulating hormone.
17. According to the binomial classification system, *Oleracea brassica* is most closely related to:
- A. *Olerata tenax*.
 - B. *Brassica oleracea*.
 - C. *Oleracea olerata*.
 - D. *Brassica capitata*
18. In an S-shaped curve which represents the growth of a population, the exponential phase is due to a progressive:
- A. Increase in generation time.
 - B. Decrease in generation time.
 - C. Increase in the number of parents.
 - D. Increase in the number of offspring for each parent.
19. When a female wasp lays eggs in a live rain tree, she also deposits spores of a fungus that lives on and softens the wood making it suitable for the wasp grub to eat.
- The relationship between the wasp and fungus is:
- A. Parasitism.
 - B. Mutualism.
 - C. Saprophytism.
 - D. Commensalism.
20. Which of the following is NOT essential in a permanently closed balanced aquarium?
- A. A producer organism.
 - B. A decomposer organism.
 - C. A second order consumer.
 - D. An external energy source.

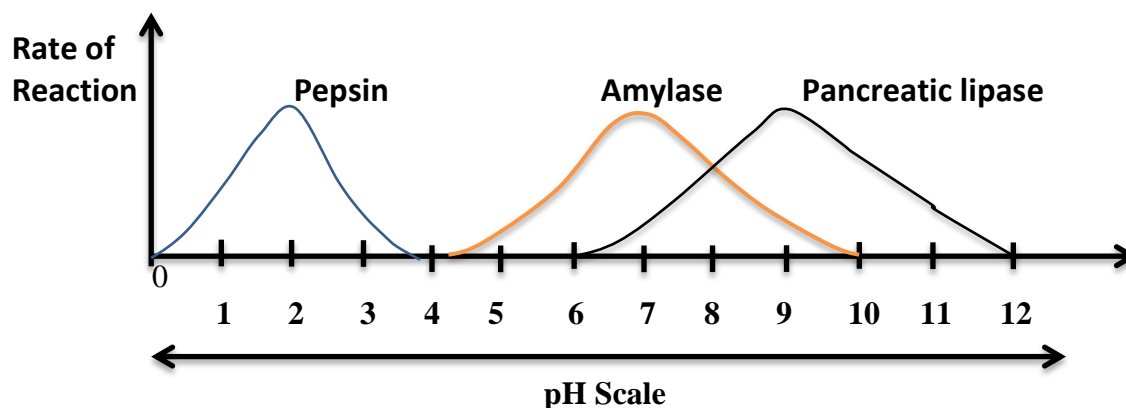


SECTION B:**(140 MARKS)**

ANSWER ALL THE QUESTIONS IN THE SECTION.
WRITE YOUR ANSWERS IN THE SPACE PROVIDED.

QUESTION B1 (18 Marks)

- a) Enzymes are sensitive to pH conditions. The diagram below shows three digestive enzyme activities in relation to pH values.



- i. State the characteristic of enzyme illustrated in the above graph?

(1 mark)

- ii. Name the enzyme that has an optimal pH activity at an acidic condition?

(1 mark)

- iii. Explain the effect of pH on enzyme action.

(2 marks)

- | Light Intensity (Lux) | Photosynthetic Rate (Photosynthetic Unit) | | |
|-----------------------|---|-----------|-----------|
| | Species A | Species B | Species C |
| | 10 | 5 | 5 |
| | 20 | 9 | 29 |
| | 35 | 19 | 46 |
| | 40 | 23 | 49 |
| | 50 | 32 | 54 |
| | 60 | 42 | 58 |
| | 70 | 55 | 60 |
| | 80 | 72 | 60 |

- [illegible]

7

- ii. Use the graph you have constructed on the previous page to estimate the photosynthetic rate of species **C** at a light intensity of 50 lux.

(1 mark)

- iii. Describe the effect of changing light intensity on the photosynthetic rate of species **B**.

(2 marks)

- iv. Give TWO environmental factors affecting photosynthetic rate which would need to be controlled throughout the experiment.

1. Environmental factor one: _____

2. Environmental factor two: _____

(2 marks)

- v. A person wished to grow a lawn in a shady area where the light intensity never exceeded 30 lux.

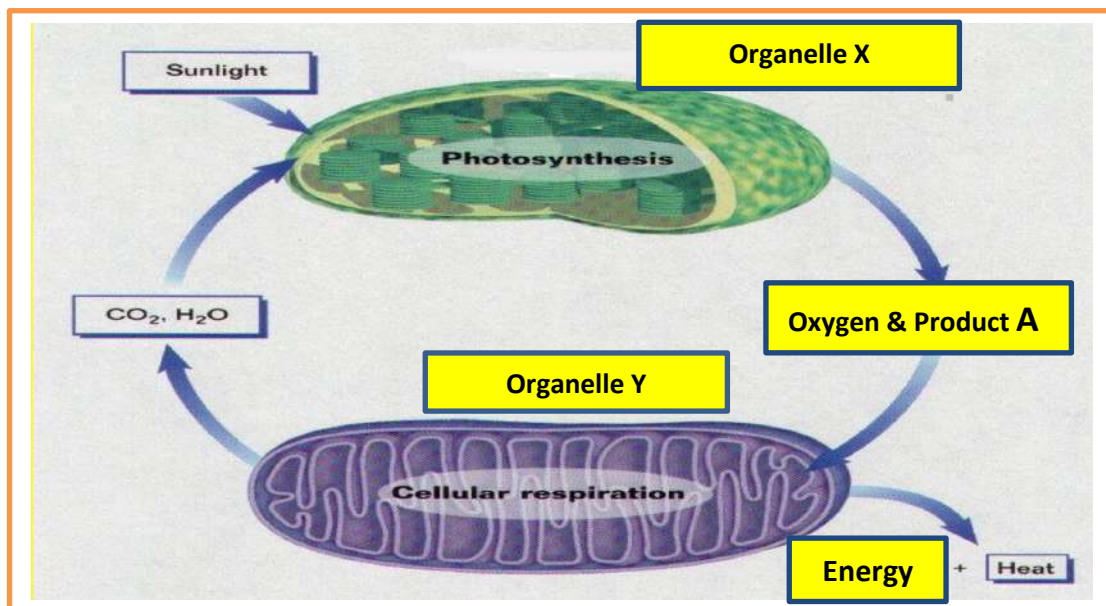
1. Which of the above species of clover you would recommend for a person to sow in such a position?

(1 mark)

2. Give a reason for your answer in (v) above.

(1 mark)

c) Study the diagram below and use it to answer the questions that follow.



i. Identify the product labelled **A** in the above diagram.

(1 mark)

ii. State the importance of Oxygen to the reaction that occurs inside organelle **Y**.

(1 mark)

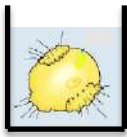
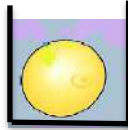
iii. Name the high-energy compound produced during the process that occurs in Organelle **Y**.

(1 mark)

B1
18

QUESTION B2**(10 Marks)**

- a) The following diagrams showing animal cells were placed in three Beakers with different sugar concentrations. The effect of the concentrations (hypotonic, isotonic or hypertonic) could be seen clearly by the appearance of the cells in the diagrams below.

**Beaker A****Beaker B****Beaker C**

- i. What is happening to animal cell in Beaker A?

(1 mark)

- ii. Explain what has caused the cell condition shown in Beaker A to occur?

(2 marks)

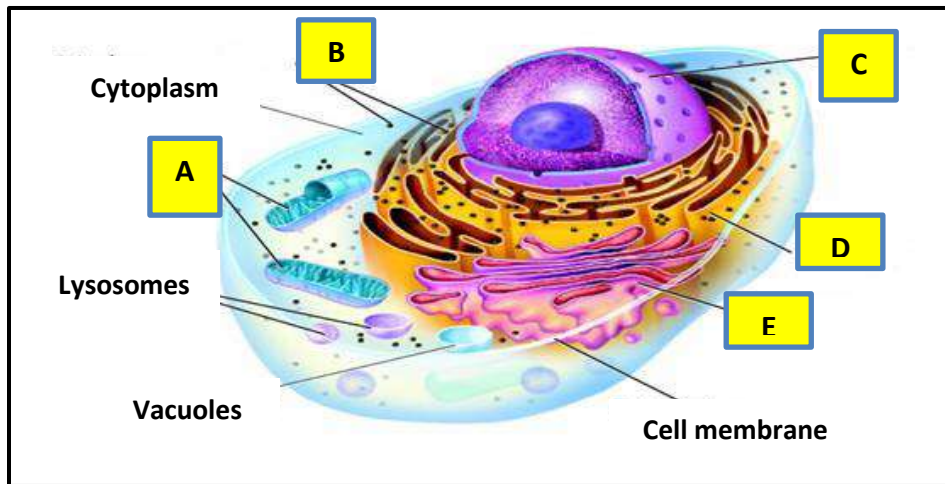
- iii. Which of the beakers shows a hypertonic environment?

(1 mark)

- iv. How would an increase in sugar concentration affect the rate of diffusion that occurs in Beaker C?

(1 mark)

- b) The diagram below is an illustration of a CELL. Use the diagram to answer the questions that follow.



- i. Name the parts labelled A and D.

Part A: _____

Part D: _____

(2 marks)

- ii. Give ONE advantage of having large numbers of organelle A in a muscle cell.

(1 mark)

- iii. Explain why a cell involved in active transport would contain a large number of organelle A.

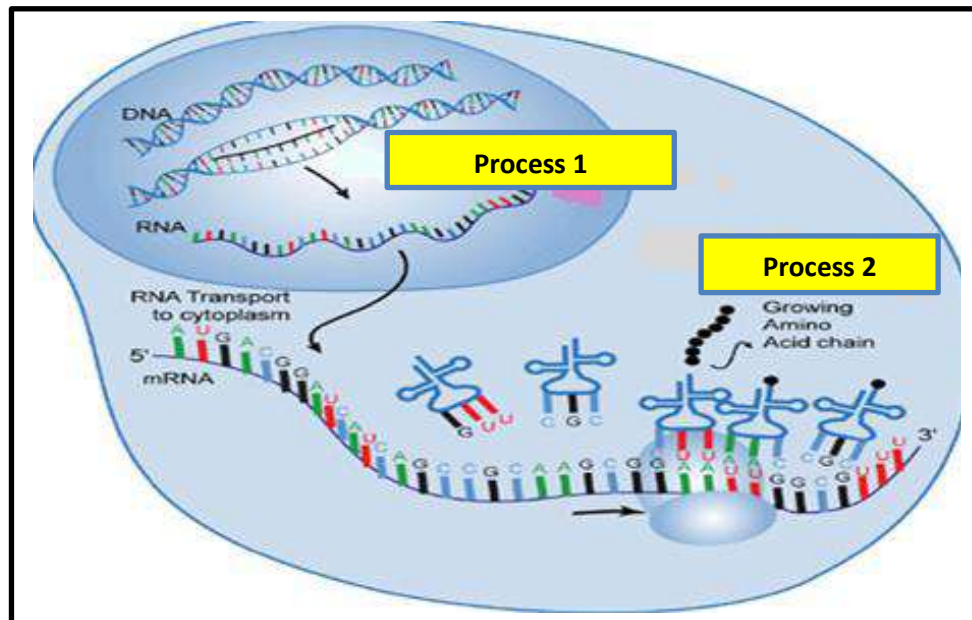
(2 marks)

B2	
	10

QUESTION B3

(12 Marks)

- a) Study the diagram below which summarises protein synthesis and answer the following questions.



- i. Name the processes labelled 1 and 2.

Process 1: _____

Process 2: _____

(2 marks)

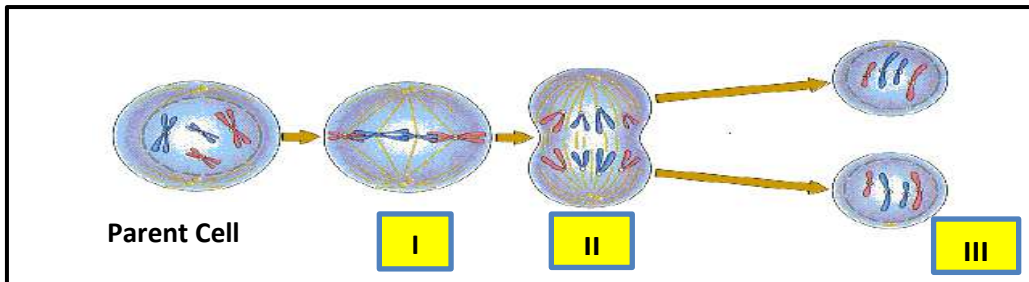
- ii. Explain what happens during Process 1.

(2 marks)

- iii. Name the cell organelle where Process 2 occurs.

(1 mark)

b) The diagram below show a type of cell division



i. Name the type of cell division in the diagram above.

(1 mark)

ii. Explain the role of this cell division in the life cycle of an organism.

(2 marks)

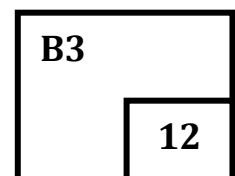
iii. Describe what happens in each of the different stages shown by **I** and **II**.

Stage I: _____

(2 marks)

Stage II: _____

(2 marks)



QUESTION B4**(13 Marks)**

- a) Ichthyosis in rats is a condition where the skin is dry, hard and scaly with little hair. The table below shows the results of the mating experiments. Use the data to answer the follow up questions.

Parent	Offsprings		
	Normal	Ichthyotic	Total
Homozygous normal x homozygous ichthyotic	54	0	54
Heterozygous x heterozygous	529	99	628
Heterozygous x homozygous ichthyotic	9	3	12

- i. Is ichthyosis dominant or recessive? Give a reason for your answer.

_____ (2 marks)

- ii. Calculate the ratios of normal to ichthyotic in the second and third crosses?

1. Ratio in second cross: _____

_____ (2 marks)

2. Ratio in third cross: _____

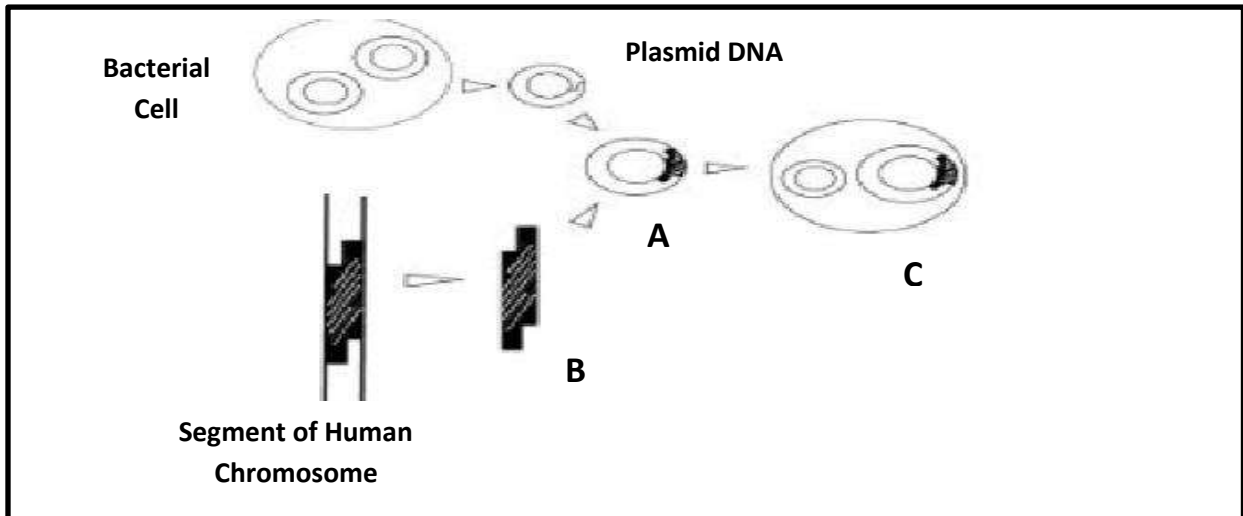
_____ (2 marks)

- iii. How can you account for these ratios?

_____ (2 marks)

- b) In the Solomon Islands today, a lot of diabetic patients are injected with insulin made by genetically altered bacteria.

The diagram below illustrates the method used for the manufacture of the human insulin. Use the diagram to answer follow up questions.



- i. State the name of the process shown above.

(1 mark)

- ii. Write the letter of the structure where genetic recombination first occurs.

(1 mark)

- iii. Write the letter of the structure in which "gene cloning" can occur.

(1 mark)

- c) Give TWO disadvantages of Selective Breeding.

i. _____

ii. _____

(2 marks)

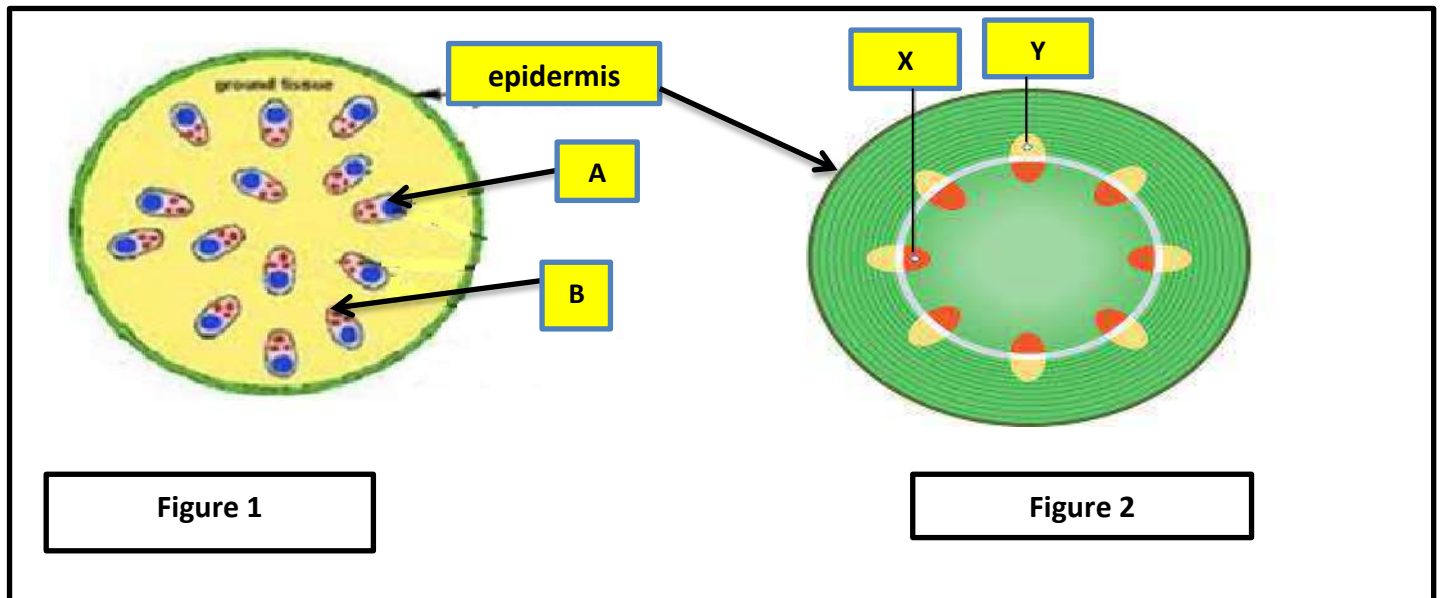
B4

13

QUESTION B5

(14 Marks)

a) The diagrams below represent transverse sections of monocot and dicot stems.



i. Which diagram represents the transverse section of a Dicot stem?

(1 mark)

ii. Explain your answer in (i) above.

(2 marks)

iii. Name the structure labelled **B** in figure 1?

(1 mark)

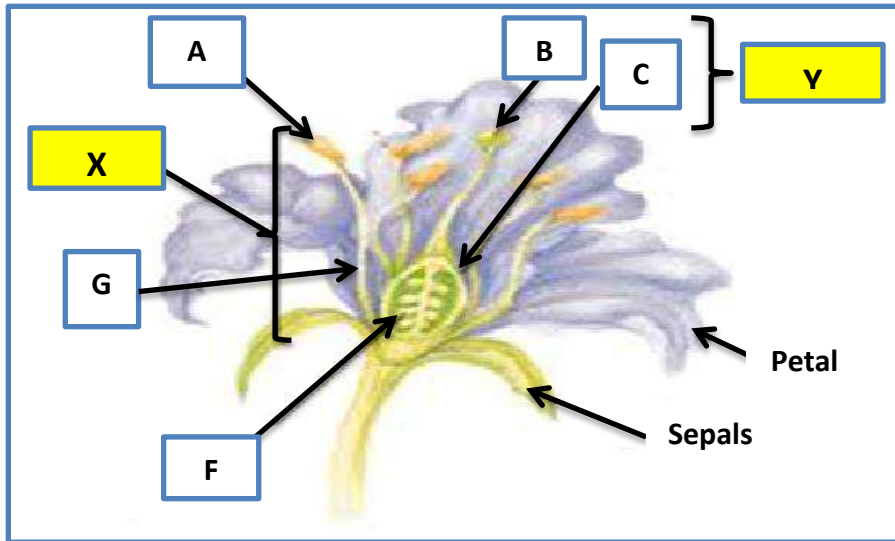
iv. State ONE function of structure **B** in figure 1?

(1 mark)

v. Describe the role of structure **Y** in figure 2, on page 16?

(2 marks)

b) Using the diagram of a flowering plant below to the answer the follow up questions.



i. State the function of the structure labelled **B**.

(1 mark)

ii. What does structures **C** and **F** give rise to after fertilisation?

Structure **C**: _____

Structure **F**: _____

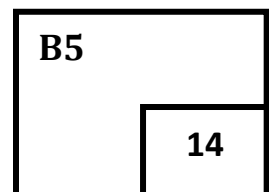
(2 marks)

iii. State ONE feature which suggest that the flower is insect pollinated.

(1 mark)

- iv. Distinguish structures **X(A & G)** and **Y (A & C)** parts of the flower on page 17.

(3 marks)



QUESTION B6**(12 Marks)**

- a) Complete the table below to identify the organ and describe its function in Digestion in humans.

Name of organ	Description of function in Digestion
i)	Produces enzymes, insulin
Stomach	ii)
iii)	Tube to carry food to the stomach.
Small Intestine	iv)
v)	Processes digested foodstuffs received from small intestine.

(5 marks)

- b) Study the gut systems shown in the diagrams below and answer questions (i), (ii) and (iii).

Diagram 1

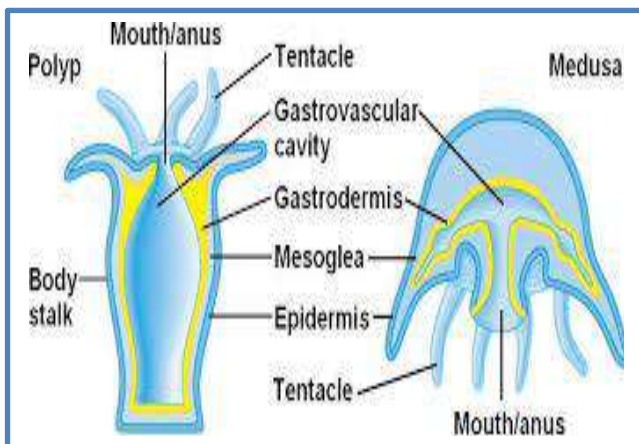
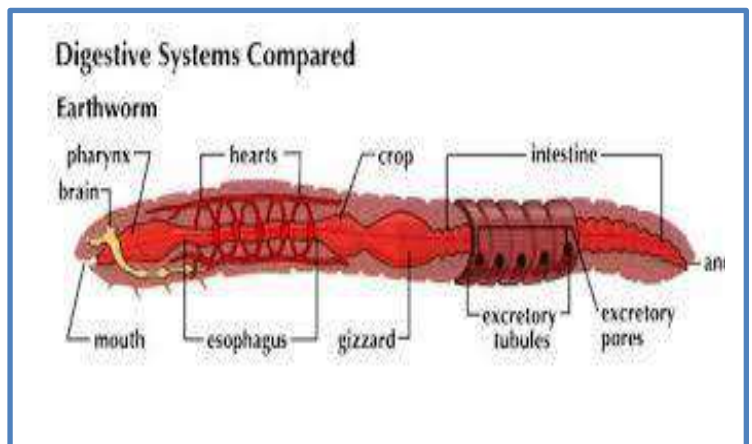


Diagram 2



- i. Name the type of guts in **Diagrams 1** and **2**.

Diagram 1: Type of gut: _____

Diagram 2: Type of gut: _____

(2 marks)

- ii. Gut system in **Diagram 1** is an example of an 'incomplete digestive system' while **Diagram 2** illustrates an example of a 'complete digestive system'. Differentiate between incomplete and complete digestive systems.

(3 marks)

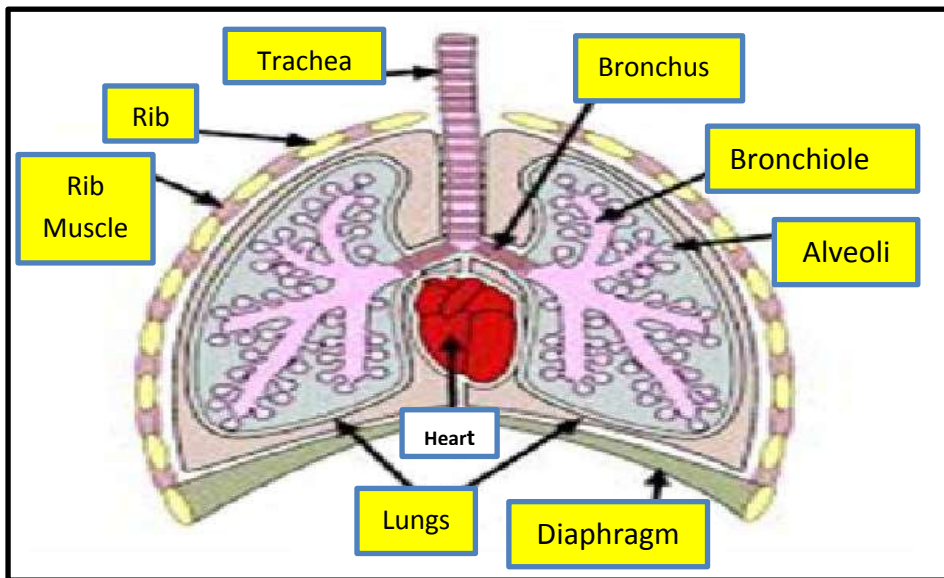
- iii. Describe the efficiency of the earthworm's gut system in **Diagram 2**, with respect to its habitat and mobility.

(2 marks)

B6
12

QUESTION B7 **(15 Marks)**

- a) The diagram below shows the breathing organs inside the human chest. Study the diagram and answer follow up questions.



- i. Name the groups of muscles that are responsible for the movements which cause air to enter the lungs.

_____ (1 mark)

- ii. Name the process by which oxygen moves from the alveoli into the blood capillaries.

_____ (1 mark)

- iii. Give any TWO factors about alveoli which make it efficient for gas exchange.

Factor 1: _____

Factor 2: _____

(2 marks)

- iv. Explain how the movement of oxygen into the blood is helped by the large number of alveoli in the lungs.

(2 marks)

- v. A Form 6 student breathed in and out of a plastic bag so that he was breathing in his own exhaled air. Explain what would happen to his breathing?

(2 marks)

- b) Three different patients at the National Referral Hospital had their blood cells estimated, and below are their results. Use the information in the table to answer the follow up questions (i), (ii), (iii) and (iv).

Name of Person	Red blood cells/mm ³	White blood cells/mm ³	Platelets/mm ³
Mike	7 500 000	660	350 000
Jonny	6 350 000	13 000	360 000
Frazer	3 380 000	6 600	500

- i. Which person was anaemic? Give a reason for your answer.

Person: _____

Reason: _____

(2 marks)

- ii. What would you advise Frazer to eat?

(1 mark)

- iii. Which person would take a long time for his blood to clot? Give a reason for your answer.

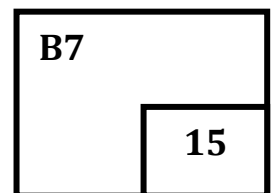
Person: _____

Reason: _____
(2 marks)

- iv. Which person seems to have an infection? Give a reason for your answer.

Person: _____

Reason: _____
(2 marks)



QUESTION B8**(14 Marks)**

- a) The table below shows the approximate volume of fluid filtered and reabsorbed during passage down the kidney tubule in various vertebrates.

Animal species	Filtration rate mL/kg bodyweight/h	Urine flow mL/kg bodyweight/h	Proportion absorbed (%)
A	15	6	60
B	25	17	32
C	41	11	73
D	157	4	97

- i. Which of the FOUR species is likely to live in very dry conditions? Justify your answer.

1. Name of Animal species:

_____ (1 mark)

2. Justify answer:

(2 marks)

- ii. Which of the FOUR species would have the shortest length of kidney tubule?

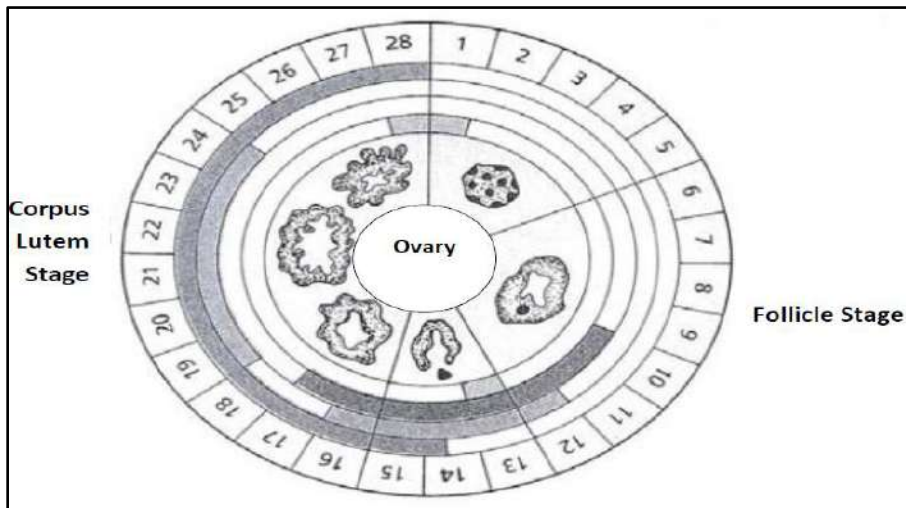
1. Name of Animal species:

_____ (1 mark)

2. Justify answer:

(2 marks)

- b) The diagram below represents the events that happen in a menstrual cycle. Study the diagram then answer the questions that follow.



- i. Describe what happens on the **1st – 5th** days of the menstrual cycle?

(2 marks)
- ii. Explain what happens during the follicle stage (days **6th – 12th**) of the above cycle

(2 marks)
- iii. Differentiate a role of the Oestrogen and Progesterone hormones in the above cycle.
 1. Role of Oestrogen hormone:

(2 marks)
 2. Role of Progesterone hormone:

(2 marks)

B8

14

QUESTION B9**(8 Marks)**

- a) The table below contain **Organisms A - F** and their scientific names. Study the information in the table and answer questions (i), (ii) and (iii).

Organisms	Scientific names
A	<i>Dasyuris viverrinus</i>
B	<i>Tursiops truncalus</i>
C	<i>Panthera leo</i>
D	<i>Felis viverrinus</i>
E	<i>Delphinus delphis</i>
F	<i>Panthera uncia</i>

- i. Which organisms belong to the same ***genus***? Justify your answer.

1. Organisms: _____ (1 mark)

2. Justify answer: _____

_____ (2 marks)

- ii. Which organisms belong to the same ***species***? Justify your answer.

1. Organisms: _____ (1 mark)

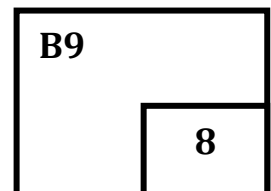
2. Justify answer: _____

_____ (2 marks)

- iii. If Organisms **C** and **F** are used in a breeding program, will they be able to produce a viable offspring? Explain your answer.

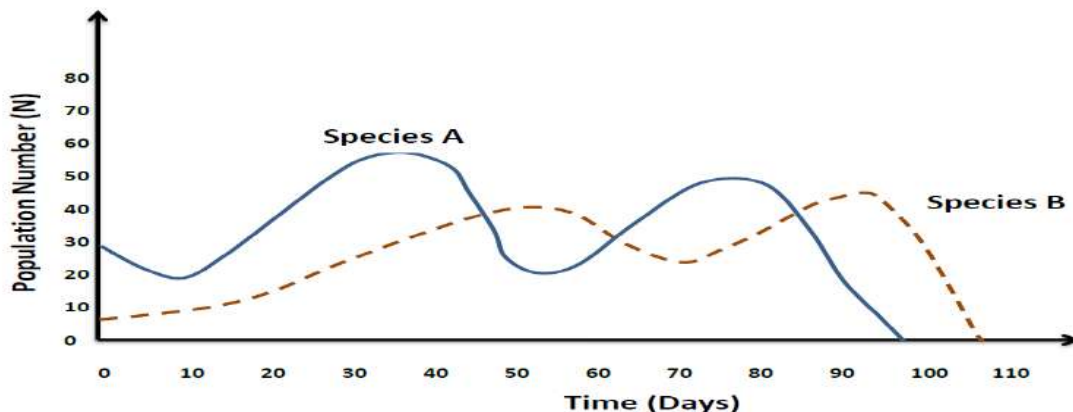
1. Explain answer:

(2 marks)



QUESTION B10**(16 Marks)**

- a) The relationship between the populations of two species of ants, species A and species B, was investigated in an experiment. One of these species was a herbivore and the other was a predator which fed on the herbivorous species. The graph below shows the number of both species over a period of time. Study the diagram and answer the follow up questions.



- i. Which species is most likely to have been the prey? Justify your answer.

1. Prey Species: _____ (1 mark)

2. Justify answer: _____
_____ (2 marks)

- ii. Which species is most likely to have been the predator? Justify your answer.

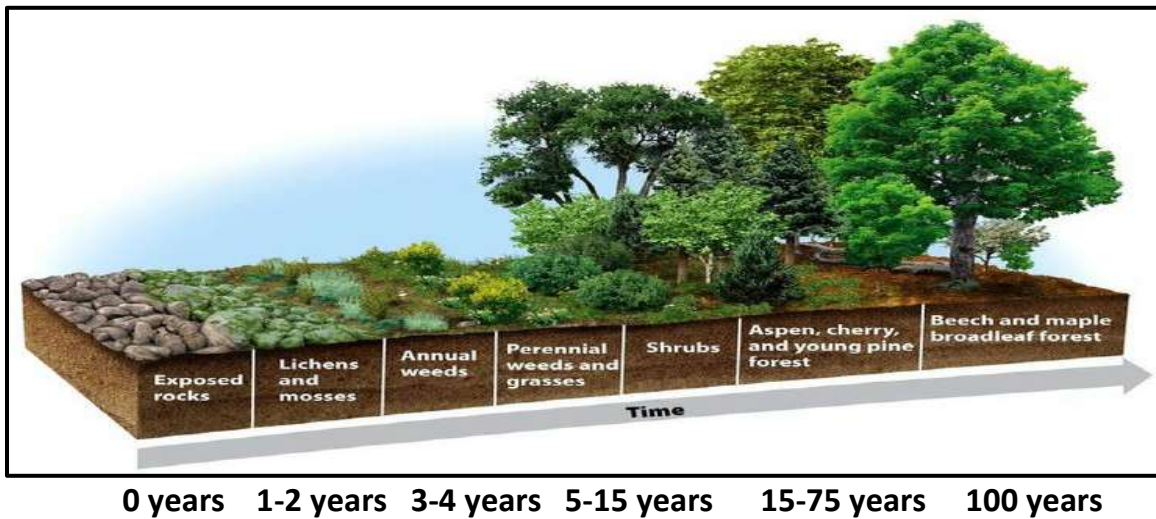
1. Predator Species: _____ (1 mark)

2. Justify answer: _____
_____ (2 marks)

- iii. Describe how ONE abiotic factor might have influenced the results of this investigation.

(2 marks)

- b) The diagram below shows how several stages are involved in establishing a rainforest under suitable conditions. Study the diagram and answer questions (i), (ii), (iii), (iv) and (v).



- i. Name the community pattern shown in the diagram above.

_____ (1 mark)

- ii. Give TWO environmental conditions that the annual plant species are tolerant of in this community.

1. _____

2. _____

(2 marks)

- iii. Describe the role of the annual plants in this community.

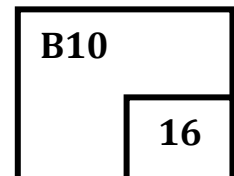
(2 marks)

- iv. Explain why introduced plants are more likely to occur within the first five to ten years rather than after a hundred years.

(2 marks)

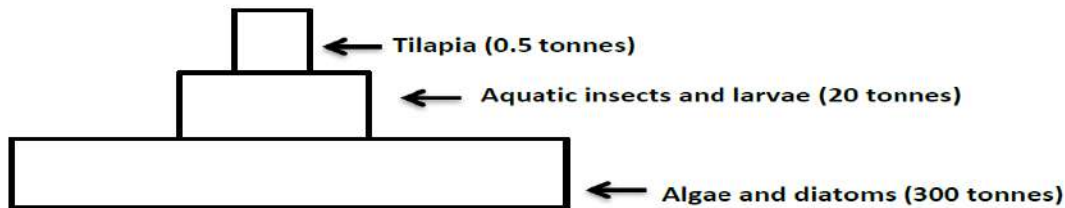
- v. Some conservationists suggest that replanting will replace the rainforest that have been logged. Predict ONE problem such procedures may encounter.

(1 mark)



QUESTION B11**(8 Marks)**

- a) The following information refers to a population of Tilapia fish. Study the TWO diagrams and answer questions, (i), (ii), (iii) and (iv).

Diagram 1 represents biomass pyramid for the Tilapia fish**Diagram 2 represents a diet schedule of the Tilapia population****Diet of Tilapia**

Age	Time of Year	Diet
First three months	-	Maggot larvae and small May flies
3 months to 1 year old (juvenile)	-	May fly numphs
Later years (adult)	September – January	Caddis fly larvae May fly numphs Snails Black beetles and adults
	February – August	Large caddis flies May fly numphs Snails

- i. From the information above construct a food chain in the box below.

(2 marks)

- ii. Explain why the adults Tilapia do not eat black beetles during the months of February to August.

(2 marks)

- iii. Describe how you could estimate the Tilapia population within a section of the stream.

(2 marks)

- iv. Explain why the biomass of the Tilapia population is 0.5 tonnes while that of the producers in the stream is 300 tonnes.

(2 marks)

B11	
	8

SECTION C: EXTENDED RESPONSE QUESTION

(20 MARKS)

Answer Question C in the spaces provided. The amount of space provided is a guide to the length of response needed. Marks will be given for answers that show clear, accurate expressions of ideas and the ability to develop a discussion or an argument in a logical and cohesive manner. USE THE MARKING CRITERIA PROVIDED AT THE END OF EACH QUESTION.

QUESTION C1

(10 Marks)

Compare and contrast the type of circulatory systems in **Bonitos and grasshoppers**. Explain how each type of blood circulation may be advantageous and disadvantageous to the organism.

[illegible]

This image shows a single page of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[illegible]

QUESTION C2

(10 Marks)

Sea level rise is becoming a grave concern to most people who are living on the coasts and artificial islands in the Solomon Islands today. Explain the causes of sea level rise and discuss three adverse impacts on the lives of the people living on our sea coasts.

[illegible]

This image shows a full page of blank, lined paper. It features approximately 28 horizontal blue or grey lines spaced evenly apart, typical of notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings on the page.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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ANSWER SHEET – Section A

Write the letter of the correct answer only.

1	<input type="text"/>	11	<input type="text"/>
2	<input type="text"/>	12	<input type="text"/>
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FOR OFFICIAL USE ONLY

Question	Mark	Marker	Check Marker
A	40		
B1	18		
B2	10		
B3	12		
B4	13		
B5	14		
B6	12		
B7	15		
B8	14		
B9	8		
B10	16		
B11	8		
C1	10		
C2	10		
TOTAL	200		
MARKER'S INITIAL			

Number
Correct

X 2 =

	40
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