STUDENT EDUCATION NUMBER									

Sāmoa Secondary Leaving Certificate

BIOLOGY
2016

QUESTION and ANSWER BOOKLET

Time Allowed: 3 Hours & 10 minutes

INSTRUCTIONS:

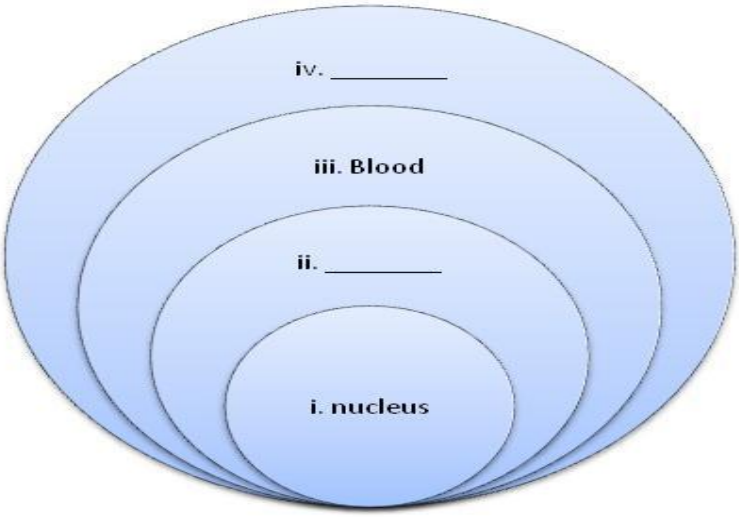
1. You have 10 minutes to read before you start writing.
2. Write your Student Education Number (SEN) in the space provided on the top right hand corner of this page.
3. Answer ALL QUESTIONS. Write your answers in the spaces provided in this booklet.
4. If you need more space, ask the supervisor for extra paper. Write your SEN on all extra sheets used and clearly number the questions. Attach the extra sheets at the appropriate places in this booklet.

CHECK! This booklet contains pages 2-28 in the right order.

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

STRAND 1 **Variety of Life** **Weighting 15**

The diagram below shows levels of organization within a multicellular organism.



Use the above diagram to answer the following:

1a. Name the levels represented by ii and iv.

Skill Level 2

Level ii

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Level iv

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1b. Give an example of Level ii.

Skill Level 1

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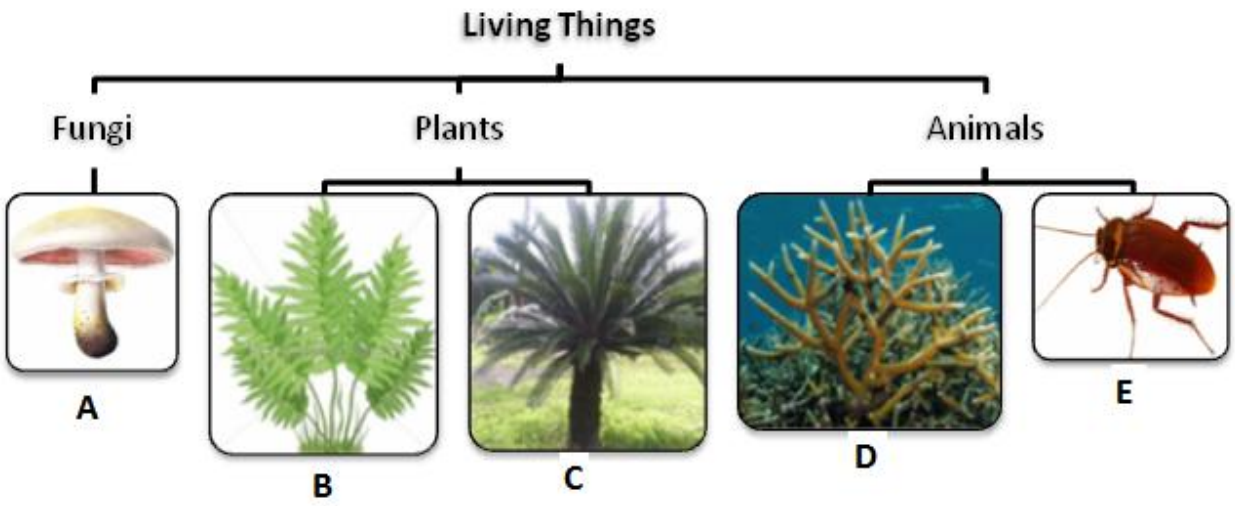
The diagram below represents some groups of living things. Labels A to E refer to the organisms shown.



Use these diagrams to answer following:

2a. State TWO characteristics of A that is common to all fungi.

Skill Level 2

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2b. What phylum does C belong in?

Skill Level 1

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2c. State an advantage that <u>jointed appendages</u> provide to organism E.

Skill Level 1

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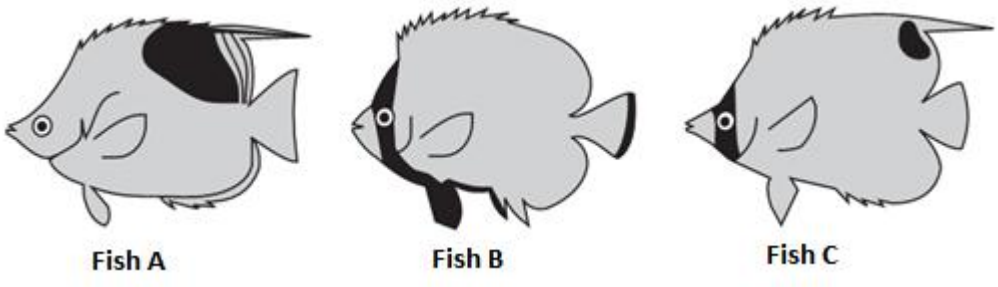
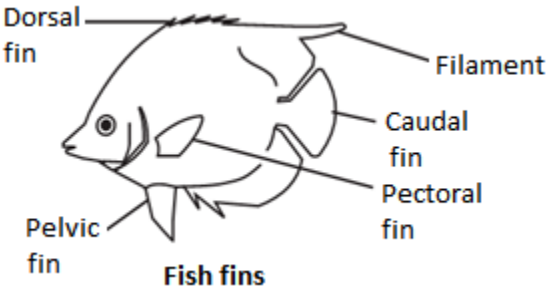
There are over 40 different species of butterfly fish found in tropical reefs throughout the world. Three different species of *Chaetodon* butterfly fish are shown below.



The fish fin diagram and dichotomous key shown below can be used to determine the species of each of these fish.



Dichotomous Key to Butterfly Fish	
1. a. Pelvic fin dark	2
b. Pelvic fin light	4
2. a. Two large white spots below dorsal fin	*C. quadrimacul*
b. Lacks two large white spots below dorsal fin	3
3. a. Caudal fin with two dark bars at tip	*C. reticulatus*
b. Caudal fin with one dark bar at tip	*C. kleinii*
4. a. Dorsal fin has long filament extension	5
b. Filament extension lacking from dorsal fin	6
5. a. Large dark spot on body near filament	*C. ephippium*
b. Small dark spot on body near filament	*C. auriga*
6. a. …….	

3a. Use the dichotomous key and fish fin diagram to identify Fish A, B and C.

Skill Level 3

Fish A:_____

Fish B:_____

Fish C:_____

3b. To what genus do the fish belong?

Skill Level 1

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4. Discuss the importance of diversity to the survival of a species. Give examples.

Skill Level 4

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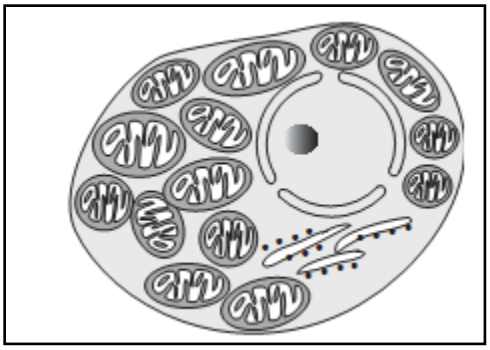
STRAND 2 **Cell Biology** **Weighting 20**

Refer to the cell diagram below to answer Number 5a & 5b.



5a. Based on the internal structure above, circle the letter of the statement that best describes the cell?

Skill Level 1

I. It is a cheek epithelial cell.
II. It is a mature red blood cell.
III. It requires high levels of oxygen.
IV. It produces high levels of sugar.

5b. State ONE evidence from the cell to support your answer above.

Skill Level 1

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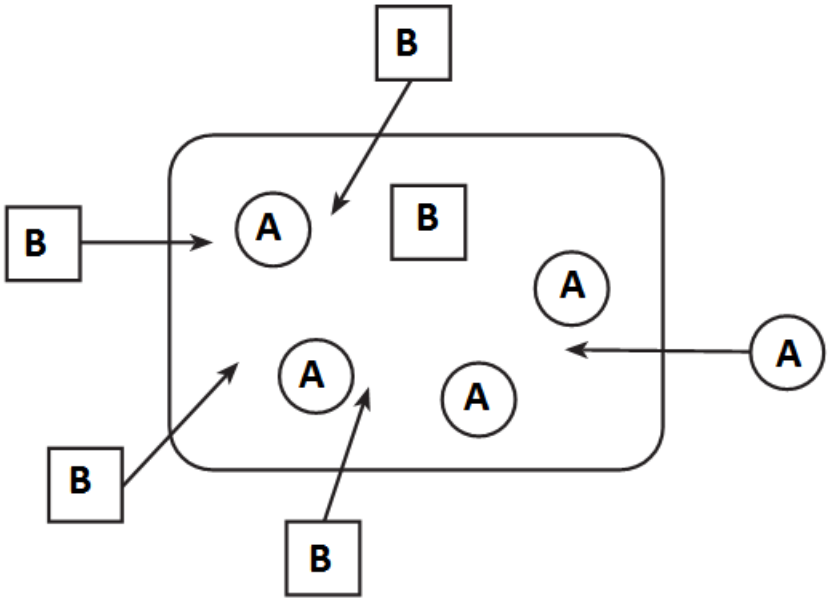

The diagram shows two different types of substances (A and B) entering a cell.

6a. Which substance is most likely using energy to enter the cell?

Skill Level 1

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6b. Explain your answer to (6a) above.

Skill Level 2

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6c. Sam prepared a slide of red blood cells for observation under a light microscope.

Skill Level 3

When the red blood cell is placed in water the cell enlarges. Explain why this happens.

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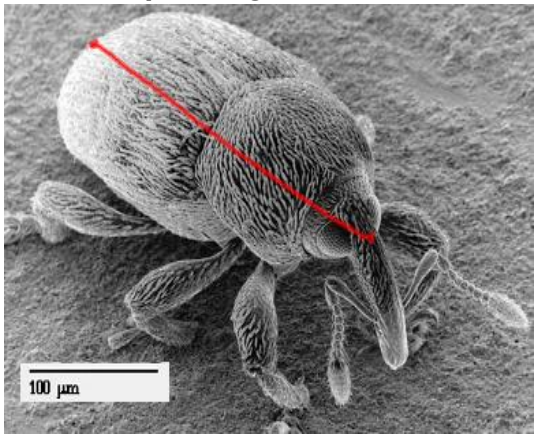
A microscope image of the snout beetle.



7. Use the image above to calculate the actual size of the beetle. Show your calculations and give correct units.

Skill Level 2

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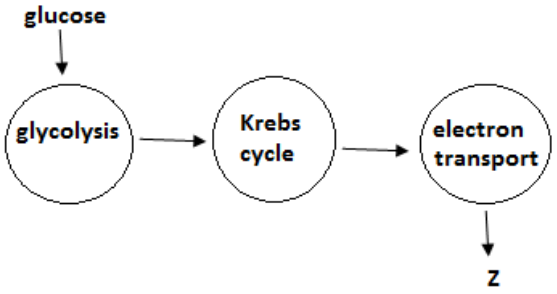
The breakdown of glucose in aerobic respiration can be represented in three stages, as shown below.



8a. Within a mitochondrion, where does the electron transport stage of aerobic respiration occur?

Skill Level 1

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8b. Name product Z.

Skill Level 1

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8c. State ONE importance of the electron transport stage.

Skill Level 1

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9. Complete Table 1 by filling in the missing information. Use simple diagrams for the structure

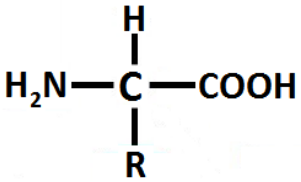
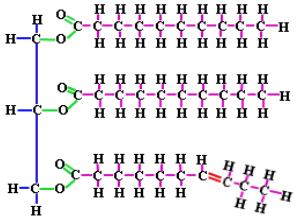
Structure	Organic compound	Function
	Disaccharide	Nutritional source of simple sugars
		Monomer of proteins
	Lipid	

Table 1: The structure of organic compounds and their functions.

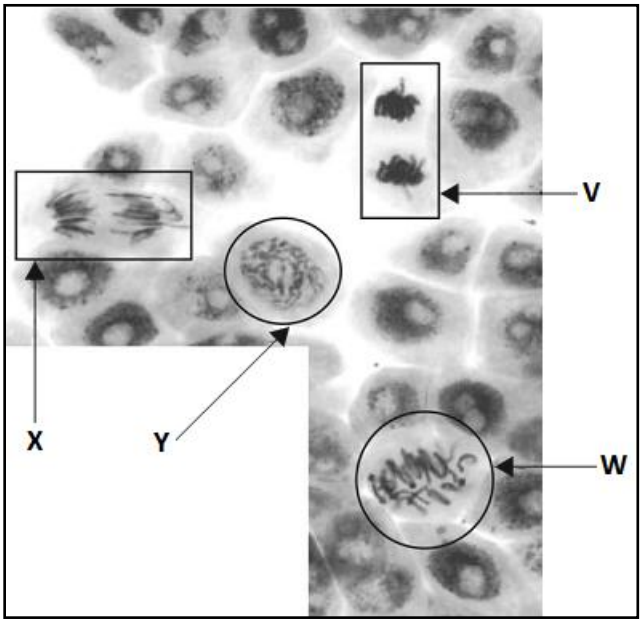
Skill Level 3

10. **Discuss** using the induced-fit model, how the enzyme sucrase catalyses the breakdown of sucrose into the simple sugars, glucose and fructose. Give examples and use diagrams to illustrate.

Skill Level 4

STRAND 3 **Genetics** **Weighting 15**

The photograph below shows a group of cells, some of which are dividing by mitosis. The letters V, W, X and Y indicate cells that are at different points in the cell division process.



11. Starting with the cell closest to the beginning of mitosis, arrange the letters V, W, X and Y in the order in which they would occur during mitosis.

Skill Level 2

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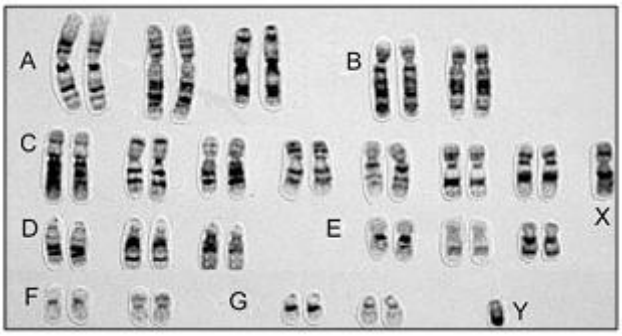
The image below shows the chromosomes from the cells of a 12-week old foetus.



12a. State the total number of body chromosomes in this image.

Skill Level 1

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12b. What is the sex of the foetus?

Skill Level 1

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12c. Provide an evidence from the diagram to support your answer above.

Skill Level 1

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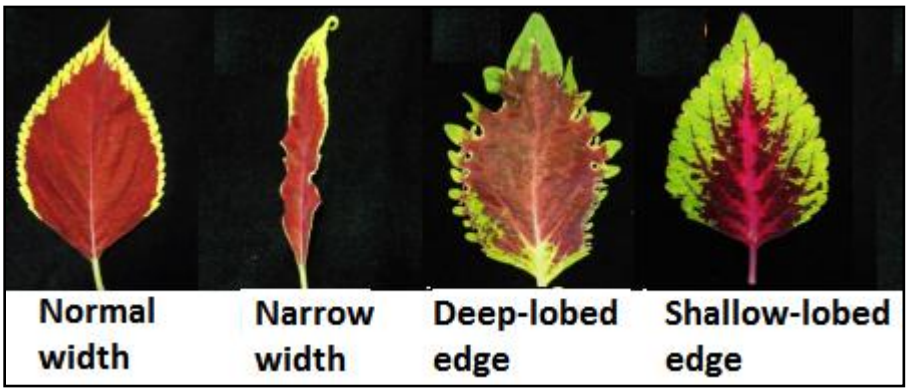
In the Coleus plant, normal width (W) dominates narrow width (w) while deep-lobed leaf edge (D) dominates shallow-lobed edge (d).



A plant breeder conducted the following cross:

Plant 1	**x**	**Plant 2**
Heterozygous for normal width and deep-lobed edge		Recessive for leaf width and leaf edge

13a. What is the genotype of Plant 1?

Skill Level 1

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13b. State ONE feature of the phenotype of Plant 2.

Skill Level 1

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13c. Complete the Punnet square below to determine the possible genotypes of the offspring.

Skill Level 3

Plant 1 gametes → **Plant 2 gametes ↓**				
wd				
wd				
wd				
wd				

13d. How many different phenotypes are found in the cross above?

Skill Level 1

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14. Discuss TWO methods of speciation and how these lead to the development of separate species from a common ancestor. Use examples.

Skill Level 4

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STRAND 4 **Plants** **Weighting 15**

15. Water vapour leaves plants through the pores of their leaves, into the atmosphere through a process called transpiration.

Skill Level 1

State a factor that affects transpiration?

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A student did an experiment to investigate this loss of water by plants. The apparatus that she used is shown in Figure 1.

The rate at which the water level fell (water loss) in the measuring cylinder was measured at regular time intervals, first for a plant without the hair dryer (normal plant) and then for a plant with a hair dryer blowing warm air over the leaves (blown plant). The student used the data obtained to draw the graph below.

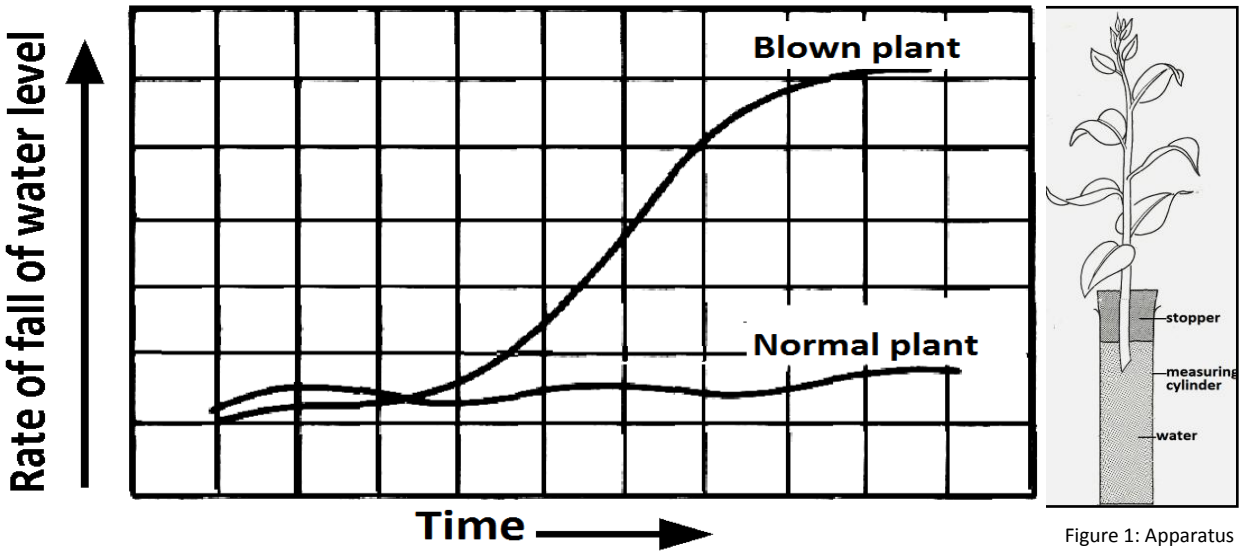

Figure 1: Apparatus

16a. Which of the two plants has lost more water over time?

Skill Level 1

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16b. Name ONE variable that is being investigated in this experiment?

Skill Level 1

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16c. Describe what you would expect to happen to the level of water in the test tube after a few days and give an explanation for your observation.

Skill Level 3

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17. When there is excessive water loss from the tissues of a plant, the plant wilts.

Skill Level 4

Discuss why the plant wilts, the factors that contribute to it, and how this wilting is commonly prevented in real life situations.

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The life cycle of ferns exhibits “alternation of generations”.

18a. Describe the process of **alternation of generations** that occurs in ferns.

Skill Level 2

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18b. Compare the features and purposes of the gametophyte and sporophyte generations.

Skill Level 3

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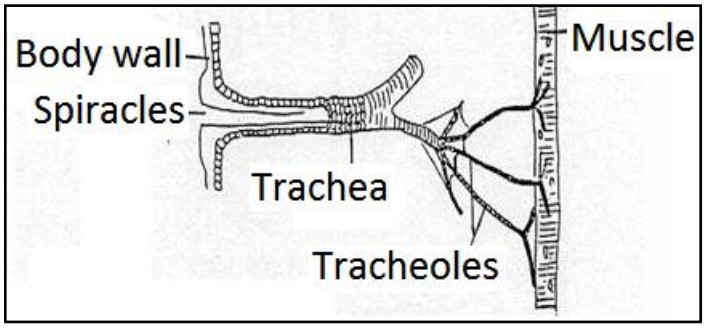
STRAND 5 **Animals** **Weighting 20**

Part of the tracheal system of insects for gas exchange is shown below.



19a. Explain why this system limits the size of insects.

Skill Level 3

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19b. Describe ONE adaptation of the tracheoles for efficient gas exchange.

Skill Level 2

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20a. Discuss the skeleton type of a crab, explaining its advantages and disadvantages. Give examples to support your answer.

Skill Level 4

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20b. Describe how the actions of the bicep and tricep muscles move the lower arm.

Skill Level 2

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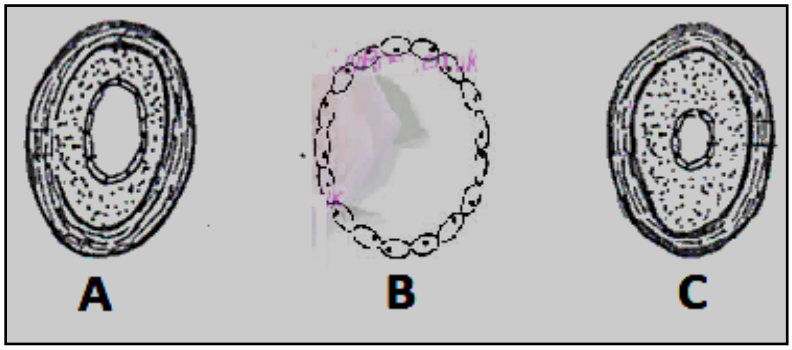
Blood vessels in the human circulatory system.



21a. Name blood vessel A.

Skill Level 1

_____

21b. State the function of blood vessel B.

Skill Level 1

_____

_____

21c. State ONE adaptation of blood vessel B for its role.

Skill Level 1

_____

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22. Give ONE reason why the left ventricle of the heart has thicker walls than the right ventricle.

Skill Level 1

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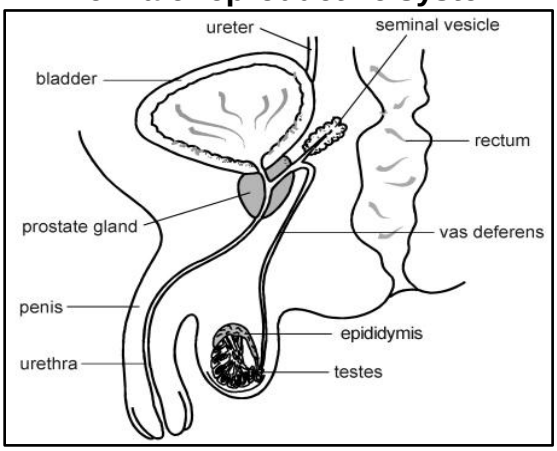
23. Uric acid is a nitrogenous waste and production in the body requires a lot of energy.

Skill Level 3

Explain how the production of uric acid helps some animals to survive.

The male reproductive system



24a. Name a hormone produced by the testes.

Skill Level 1

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24b. State the function of the hormone given in (24a) above.

Skill Level 1

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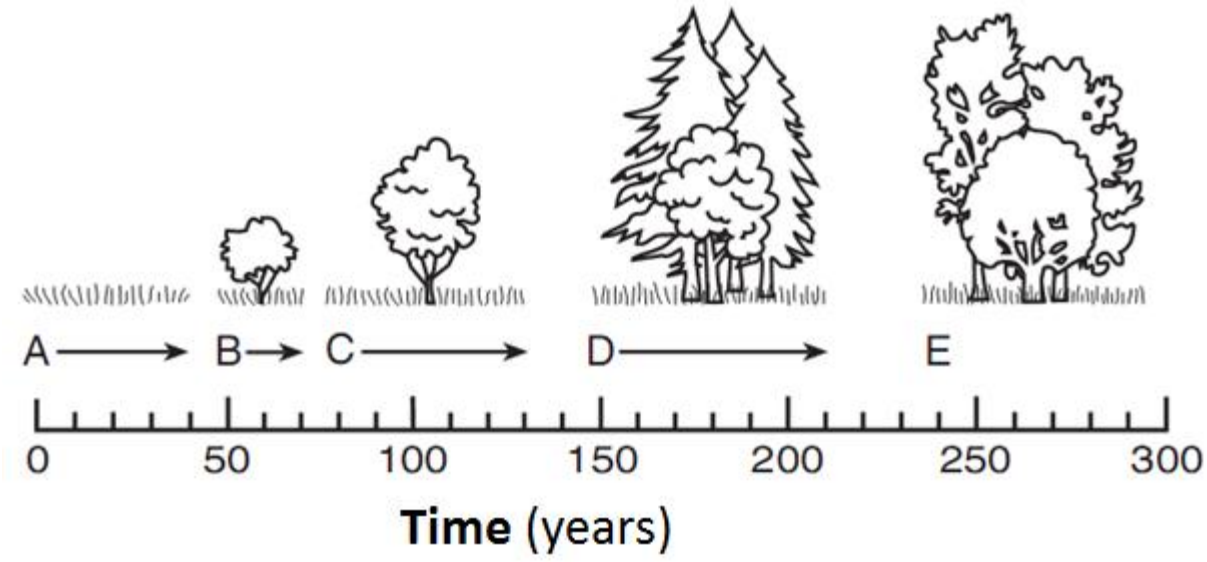
STRAND 6 **Environment** **Weighting 15**

The diagram below shows various ecological communities that occupied an area over a period of 300 years.



25a. Name this community pattern.

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Skill Level 1

25b What term is used to label community E?

_____

Skill Level 1

25c Describe what happened in going from D to E.

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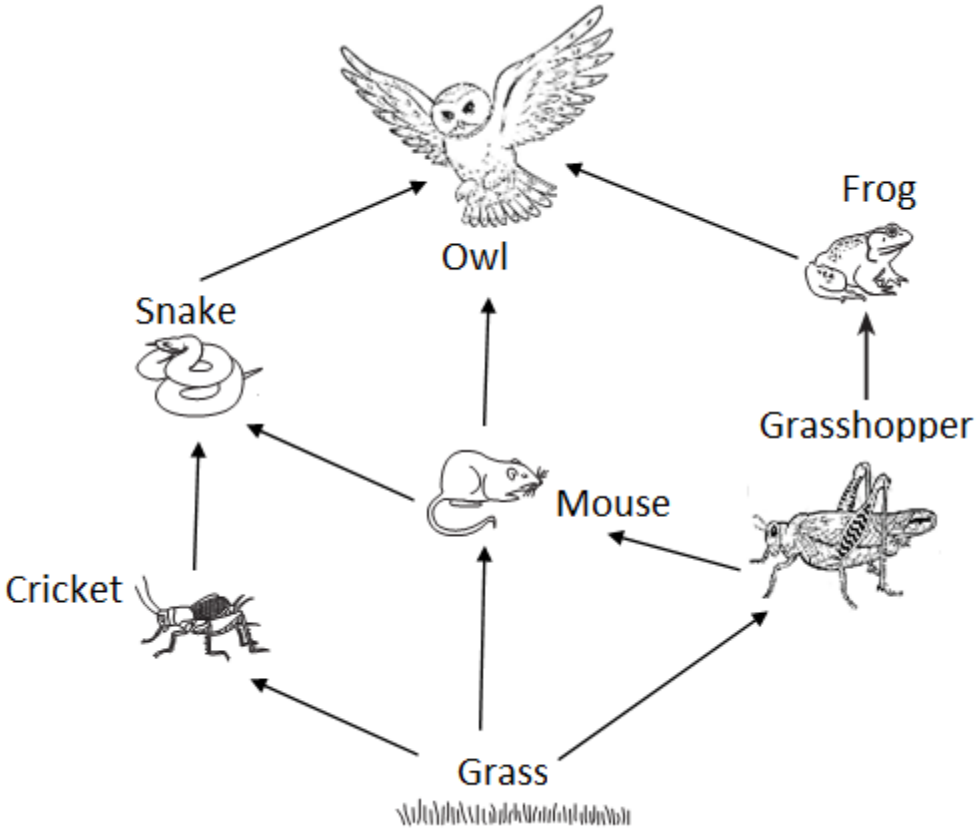
Skill Level 2

Food Web



Use the food web to answer the following questions:

26a. Name ONE organism in the food web that is a carnivore.

Skill Level 1

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26b. A decrease in the grass population will most immediately decrease the available energy to which organism?

Skill Level 1

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26c. Draw a labeled pyramid of biomass for a food chain with four trophic levels.

Skill Level 2

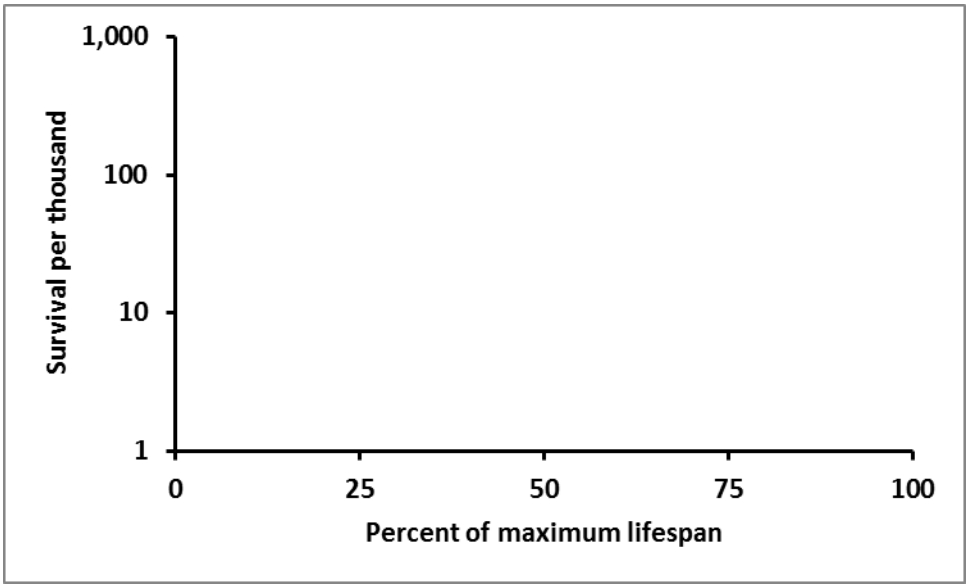
27a. Use the set of axes shown below to draw **survivorship curves** for the species populations described underneath. Label the curves.

Skill Level 3

Species A – Experience a high early mortality and few individuals live to old age.

Species B – High chance of surviving through early and middle life but the number of individuals surviving into old age rapidly decreases.

Species C – Constant mortality rate throughout its entire life.



27b. State ONE factor that could determine the survivorship pattern of Species A.

Skill Level 1

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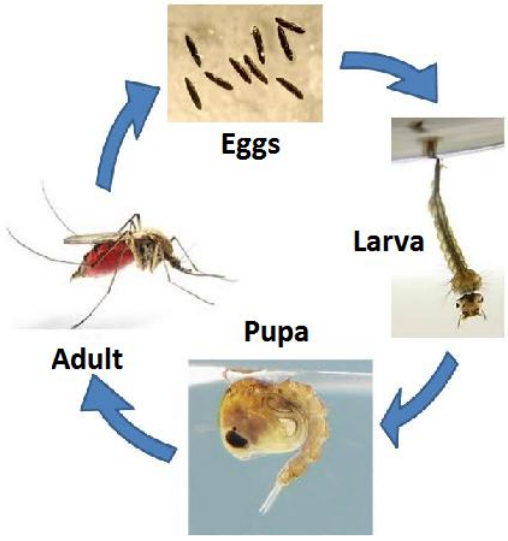
The life cycle of a mosquito is pictured below.



20a. The mosquito uses a number of adaptations to enable them to breed successfully and occupy a wide range of habitats.

Skill Level 3

Explain how the mosquito uses **structural adaptations** to help it survive and breed successfully.

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