JASPER WILLIAMS HIGH SCHOOL

ANNUAL EXAMINATION 2020

YEAR 12 BIOLOGY

Time Allowed: 3 hours
(An extra 10 minutes is allowed for reading this paper.)

INSTRUCTIONS

1. Write your **Index Number** on the front page and inside the back flap of the **Answer Booklet**.
2. Write **all** your answers in the **Answer Booklet** provided.
3. If you use extra sheets of paper, be sure to show clearly the question number(s) being answered and to tie each sheet in your **Answer Booklet** at the appropriate places. Ensure that your **Index Number** is written on the extra sheets.
4. Answer **all** the questions with a blue **or** black ballpoint pen or ink pen. Do **not** use red ink. You may use a pencil **only** for drawing.
5. You may use a calculator, provided it is silent, battery-operated and non-programmable.

SUMMARY OF QUESTIONS

STRAND	GUIDELINES	TOTAL MARK	SUGGESTED TIME
1	There are 14 Multiple Choice questions, 18 Short Answer questions; and one essay question. **Questions 1-32 are compulsory**	64	115 minutes
2	There are 3 Multiple Choice questions, 3 Short Answer questions, and one essay question. **Questions 1-6 are compulsory.**	14	25 minutes
3	There are 3 Multiple Choice questions, 2 Short Answer questions; and one essay question. **Questions 1-5 are compulsory.**	12	21 minutes
Essay	There is one essay question under each strand. Answer only one question from any strand of your choice.	10	19 minutes
	TOTAL	**100**	**180 minutes**

INSTRUCTIONS

The **multiple-choice** questions in this section are all **compulsory**. Each question is worth 1 mark.

(1) In your **Answer Booklet,** circle the letter which represents the **best** answer. **If you change your mind**, put a line through your first choice and circle the letter of your next choice.

For example:

8	A	B	C	D

(2) **If you change your mind** again and like your first answer better, put a line through your second circle and tick (✓) your first answer.

For example:

8	A	B ✓	C	D

(3) **No mark** will be given if you circle more than one letter for a question.

Short Answer Questions
Write your answers in the spaces provided in the **Answer Booklet.**

Essay Questions
There is one essay question given in each strand. Answer **ONE essay** question from any strand of your choice. Write the essay in the spaces provided in the **Answer Booklet.**

STRAND 1 STRUCTURE AND LIFE PROCESSES [64 marks]

There are thirty-three (33) questions in this strand.

1. The heart, blood vessels, blood cells, skeleton, kidney, spleen, and muscles are all tissues or organs that arise from what primary germ layer?

   A. The endoderm
   B. The ectoderm
   C. The mesoderm
   D. The inner cell masses

2. Which could be used to monitor the rate of photosynthesis in a plant?

   A. oxygen production
   B. water production
   C. hydrogen production
   D. carbon dioxide production

3. Which of the following best describes glycolysis in a respiration reaction?

   A. splits water to form oxygen
   B. regenerates NADH from NAD
   C. produces a large amount of ATP
   D. splits glucose to form pyruvic acid

4. Why does heating interfere with the activity of an enzyme?

   A. It kills the enzyme.
   B. It causes enzymes to break up.
   C. It changes the enzyme's shape.
   D. It increases the energy of substrate molecules.

5. Certain antibacterial soaps kill 99% of the bacteria present on hands. Constant use of these soaps could be harmful over time because;

   A. the soap stimulates skin cell
   B. microbes prevent viral diseases
   C. more pathogens may be resistant to the soap
   D. large populations of pathogens are beneficial to the hands

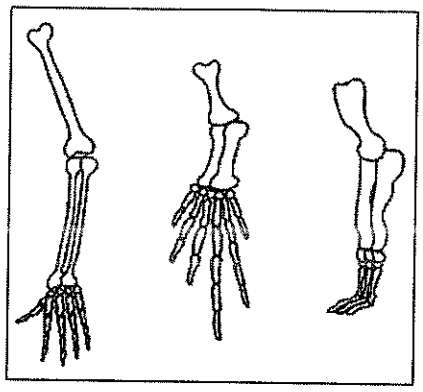
6. Which of the following is not a part of Darwin's theory of natural selection?

   A. Individuals of a population vary
   B. Organisms tend to over-reproduce themselves
   C. There are limited resources for which individuals compete
   D. Modifications an organism acquires during its lifetime can be passed to its offspring

7. In addition to numerous other organisms, the tracheal system is found in _____ and functions in _____.

   A. annelids; circulation
   B. grasshoppers; excretion
   C. honeybees; respiration
   D. scorpions; feeding

8. The diagram below represents the bone arrangements in the front limbs of three different species of mammals.
The similarities and differences in these limbs suggest that all three species developed from the same ancestor, but



A. produced different numbers of offspring
B. lived in different time periods
C. adapted to different habitats
D. migrated to similar habitats

9. Which of the following is not an advantage of the exoskeleton in arthropods and mollusks?

A. Enhances sensory perception
B. Provides protection from predators
C. Provides rigid places for muscles to insert and against which they can do work
D. Permits greater range of movement than body plans without a rigid skeletal structure

10. Which of the following is not a mechanism of asexual reproduction?

A. Parthenogenesis
B. Fission
C. Budding
D. Hermaphroditism

11. Marine fishes osmoregulate by

A. absorbing ions in sea water through their gills
B. drinking sea water and excreting ions across their gills
C. eating prey with low salinities
D. increasing the size of the kidney and excreting dilute urine

12. What is the advantage of the evolution of one-way movement through the digestive tract?

A. It conserves energy.
B. Organisms can become larger.
C. An organism can eat constantly.
D. Different regions can specialize for different functions.

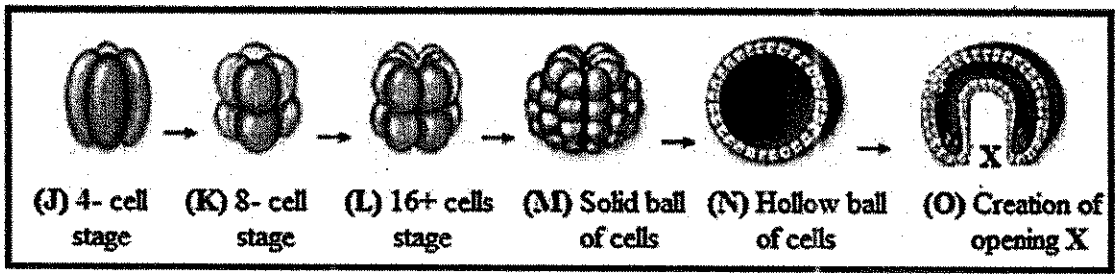
13. The group of plants that is least dependent on water for reproduction is the _____.

A. ferns
B. algae
C. mosses
D. gymnosperms

14. The moss sporophyte obtains its nutrients

A. from the gametophyte.
B. through photosynthesis.
C. from other moss plants.
D. by absorbing from the soil.

15. Study the diagram given below of embryonic development in animals and answer the questions that follow.



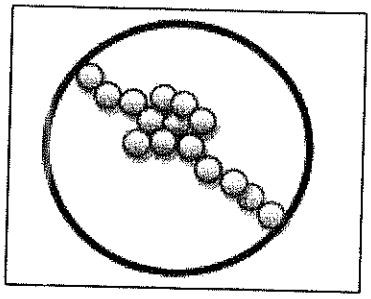
Name opening **X** (diagram (O) above) and state its fate. **(2 marks)**

16. Study the table below and answer the question that follows.

Cube (Model Cell)	Total surface area	Volume
A	8 cm^2	1 cm^3
B	24 cm^2	8 cm^3

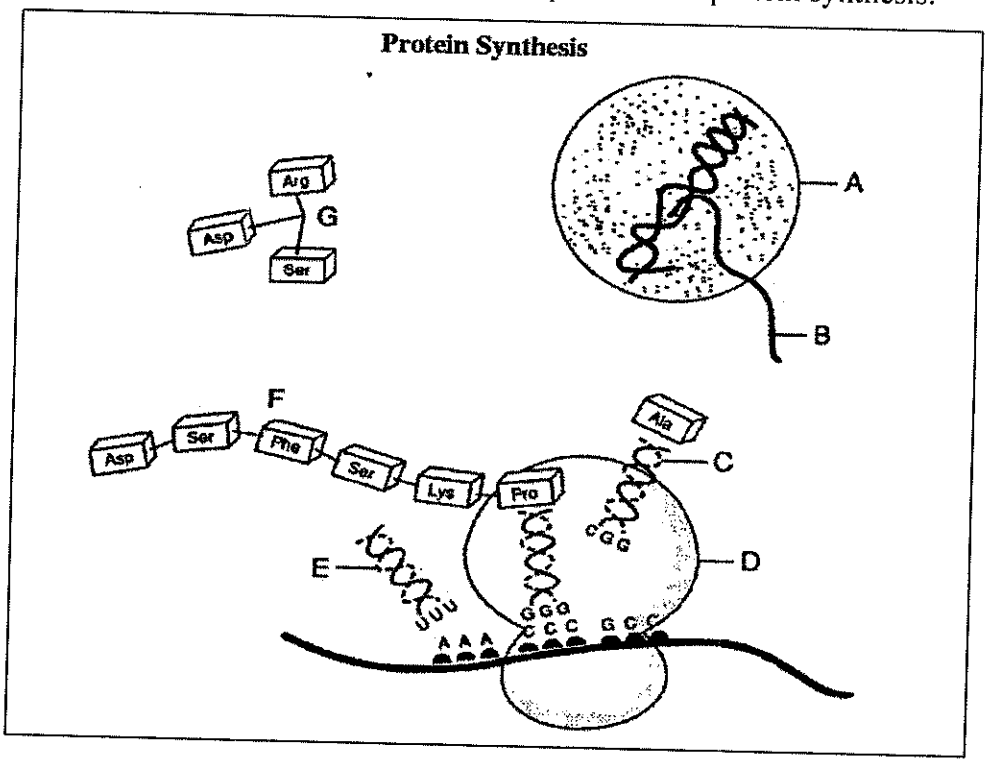
Explain which cube will allow a faster diffusion. **(2 marks)**

17. Some Year 12 students observed the following algal cells under the microscope, at 40X magnification.



Given that the field of view diameter at 40X magnification is 2 mm, estimate the number of cells that would be seen at 100X. **(2 marks)**

18. Use the diagram given below to answer the questions on protein synthesis.



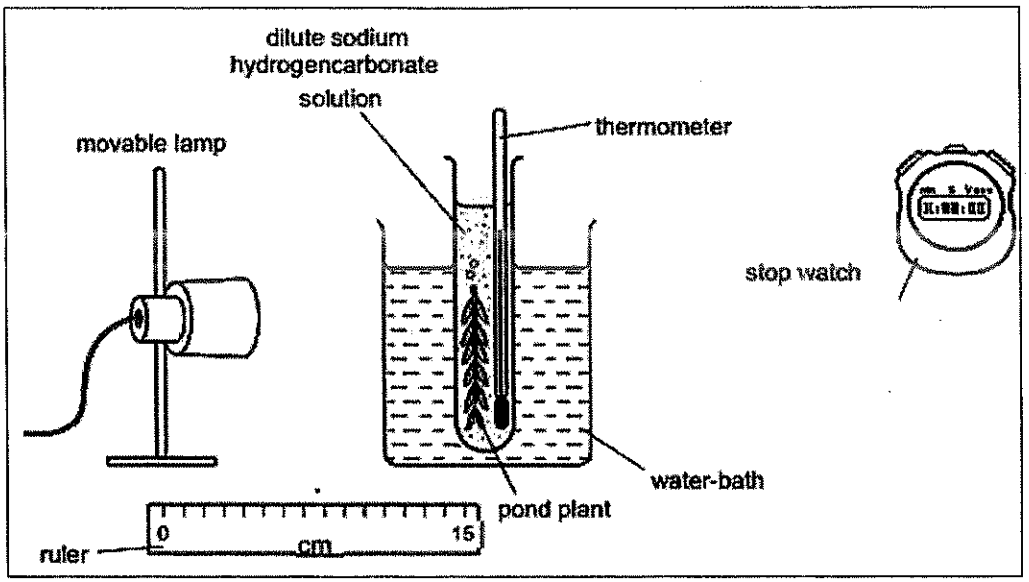
(i) Name the process taking place in the structure labelled A in the diagram. **(1 mark)**

(ii) Sickle cell anemia is a disorder resulting from a mutation that leads to the production of an abnormal protein. Which component of the DNA molecule provides instructions for the production of proteins? **(1 mark)**

(iii) What would be the anticodons on the tRNA if the next mRNA codon was **AGG**? **(1 mark)**

19. A student carried out an investigation to find the effect of carbon dioxide concentration on the rate of photosynthesis of an aquatic plant.

The apparatus that the student used is shown below.



(i) Explain why the student included the beaker of water in the apparatus. **(1 mark)**

(ii) The plant was left for 3 minutes at each light intensity before the reading was taken. Explain why this was done. **(1 mark)**

(iii) State one factor that would limit the rate of photosynthesis. **(1 mark)**

20. In the breeding season, male Anole lizards court females by bobbing their heads up and down while displaying a colorful throat patch.
Now, suppose that anoles prefer to mate with lizards who bob their heads fast (**F**) and have red throat patches (**R**) over those with slow bobbing **(f)** and yellow throats **(r).**

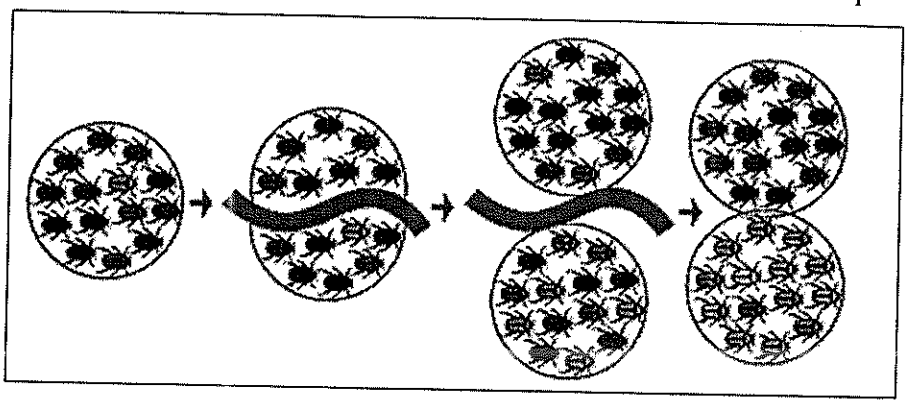
A male lizard heterozygous for head bobbing with a homozygous condition for red throat patch mates with a female that is also heterozygous for head bobbing but has yellow throat patches.

(i) What would be the genotypes of the F1 parents? **(1 mark)**

(ii) Use a punnet square to determine the percentage of the F1 offspring that would have the preferred fast bobbing and red throat phenotype? **(2 marks)**

(iii) How many of the offspring will lack mates because they have both slow head bobbing and yellow throats if sixteen F1offsprings were produced? **(1 mark)**

21. The image shows an example of a river being introduced that caused reproductive isolation.



(i) What do you think reproductive isolation means? **(1 mark)**

(ii) Using the image describe how these organisms became different species. **(1 mark)**

(iii) How does reproductive isolation differ in sympatric modes and allopatric modes of speciation? **(1 mark)**

22. Describe two ways herbivorous mammals are adapted to digest plants. **(2 marks)**

23. Osmosis and transpiration both play a part in the movement of water through a plant.

Which of these two processes makes the greater contribution to the movement of water up the trunk of a tree? Explain your answer. **(2 marks)**

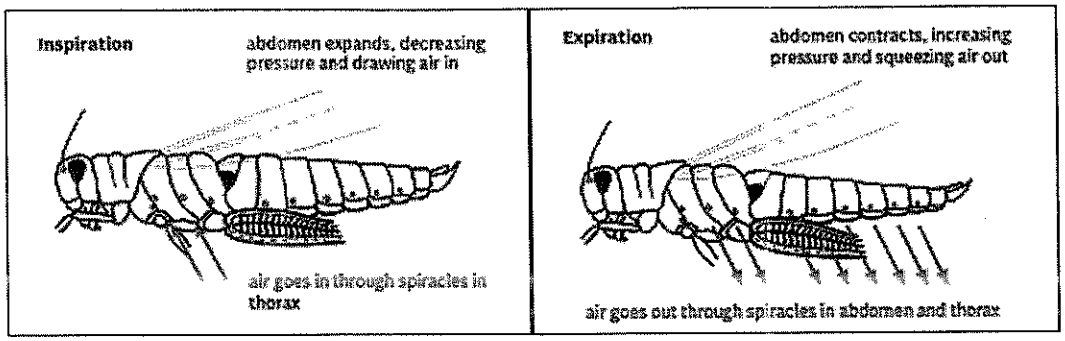
24. Fish have a two-chambered heart and a single circulation whereas Mammals and birds have a four- chambered heart with double circulation.

(i) What is the difference between single-loop and double loop circulation? **(1 mark)**

(ii) Discuss why in spite of having only single loop circulation, a fish's circulatory system is able to supply cells nearly as quickly as the double-loop circulatory system of a mammal. **(1 mark)**

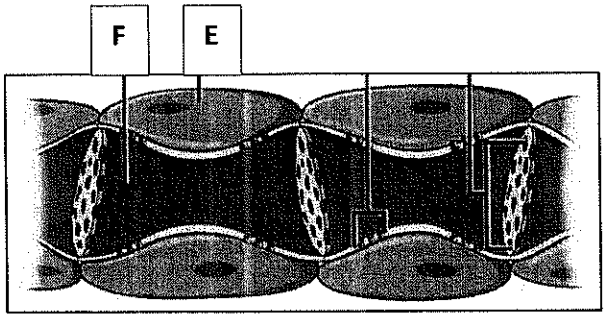
(iii) Give TWO reasons as to why mammals and birds need the most efficient transport system of all organisms. **(2 marks)**

25. Flying insects usually show body movements (ventilation) to increase the air flow through the body, as described in the diagram given below.



How would this increase the efficiency of their gas exchange system? **(2 marks)**

26. Phloem cells are adapted for carrying food from leaves to all parts of a plant. Study the cross-section of phloem cells given below and answer the questions that follow.



(i) State a function of the cell labelled **E**. **(1 mark)**

(ii) Cell **F** has little pores on the walls of both ends. Name this cell and state the function of its porous ends? **(1 mark)**

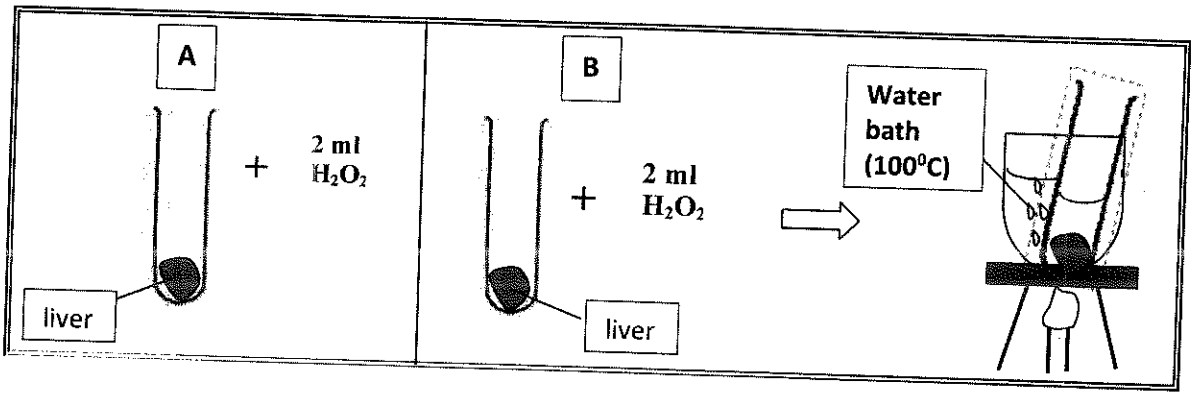
27. Many freshwater fishes and amphibians eliminate ammonia by diffusion across the same gill membranes they use for respiration.

(i) Why does ammonia build up in organisms? **(1 mark)**

(ii) How does the structure of a gill make it an ideal excretory organ? **(1 mark)**

(iii) Why do freshwater fishes typically have very dilute urine? **(1 mark)**

28. Shown below is the experimental set-up for observing enzyme action on the breakdown of hydrogen peroxide (H_2O_2) in the liver. Study the set-up and answer the questions that follow.

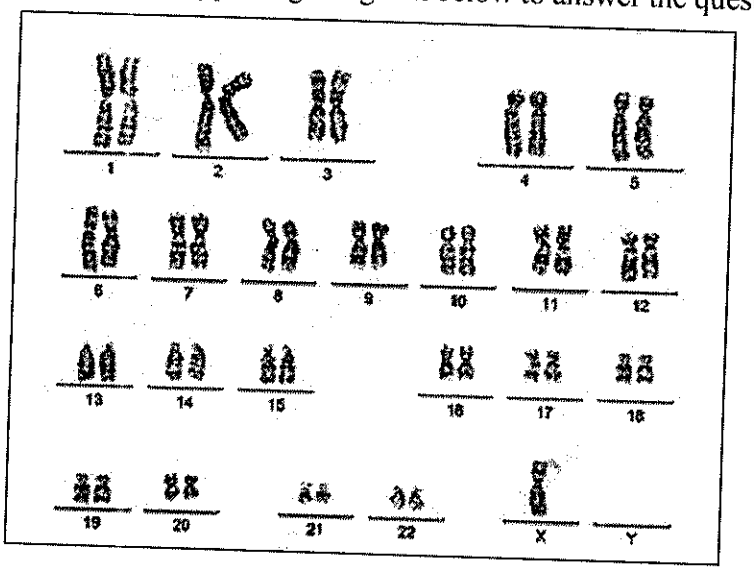


(i) Name the enzyme present in the liver and state its role in the above reaction.
(1 mark)

(ii) When H_2O_2 is added to the liver, state an observation which would indicate that the reaction has begun.
(1 mark)

(iii) How does heating to boiling point as shown in B affect the enzyme action in the liver?
(1 mark)

29. Refer to the Human karyotype diagram given below to answer the questions that follow.

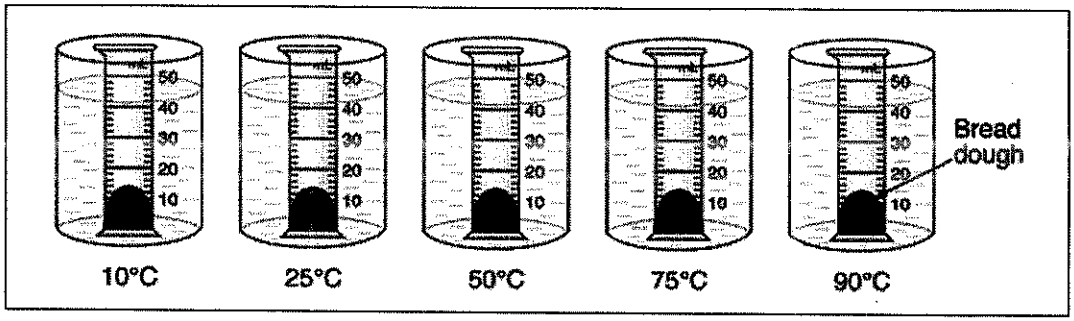


(i) Which stage or phase of cell division would be **best** to use in producing a karyotype? Give a reason for your answer.
(1 mark)

(ii) What syndrome results from having a karyotype like that shown in the diagram.
(1 mark)

(iii) Give **one** characteristic of a person suffering from this syndrome.
(1 mark)

30. A biology class conducted an experiment to determine the rate of respiration of yeast in bread dough at various temperatures.
An equal amount of dough was placed in the bottom of each of five graduated cylinders. Each cylinder was then placed in a different water bath to maintain a particular temperature. A diagram of the setup is shown below.



The amount of expansion of the dough in each cylinder was measured after 15 minutes. The results are shown in the data table below.

The Effect of Temperature on Yeast Respiration

Temperature of Water Bath (°C)	Change in Volume of Bread Dough (mL)
10	4
25	11
50	20
75	25
90	2

(i) Name the term used to describe respiration in yeast. **(1 mark)**

(ii) Why does the dough increase in volume during the experiment? **(1 mark)**

(iii) At which temperature did yeast cells produce the least amount of gas in 15 minutes? **(1 mark)**

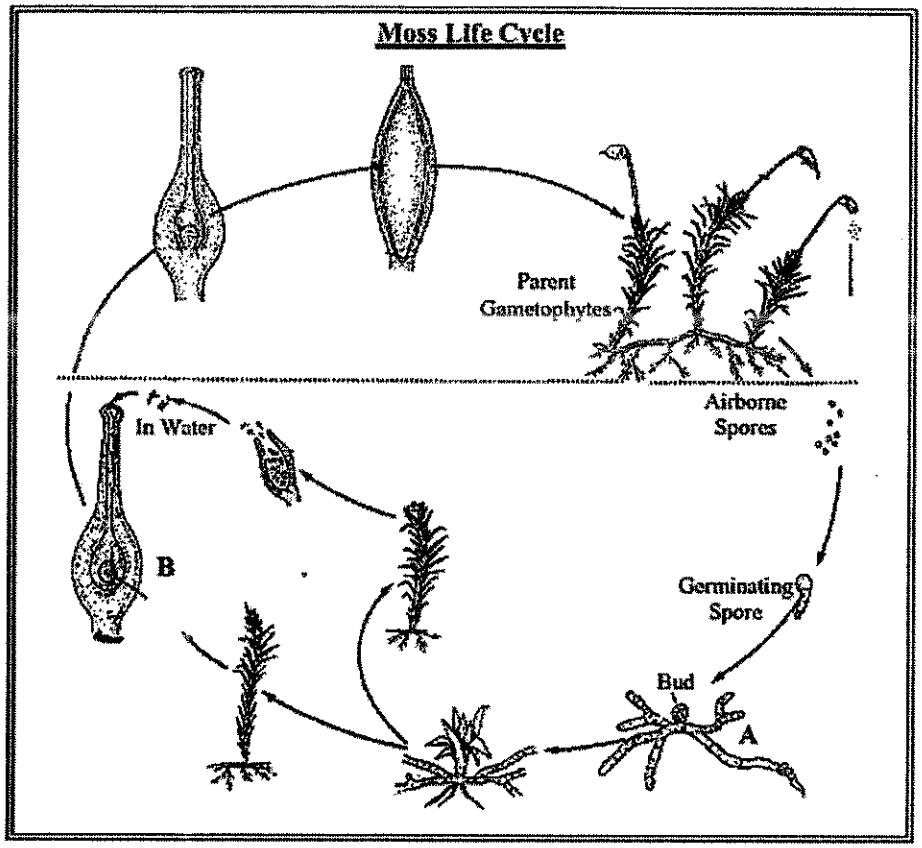
31. Reproductive success is defined as an individual's production of offspring per breeding event or lifetime. Two attributes to reproductive success in animals are parental care and courtship behaviour.

(i) Define **courtship behaviour**. **(1 mark)**

(ii) Discuss one advantage of investing parental care in offspring. **(1 mark)**

(iii) Describe two problems associated with external development on land. **(1 mark)**

32. The mosses (and all bryophytes) have an alternation of generations life cycle



(i) Explain the meaning of **alternation of generation**. **(1 mark)**

(ii) Name the structure labelled **B**. **(1 mark)**

(iii) Which structure of the moss is responsible for :

I. the gradual release of spores ?

II. the drawing of nutrients from the gametophyte ? **(2 marks)**

33. **Essay - Option Question**

The three supporting systems in animals are the **Hydro skeleton, Exoskeleton** and **Endoskeleton**.

With reference to the above statement:

(i) State **two** roles of the support system in animals. **(2 marks)**

(ii) Discuss briefly the **advantages and disadvantages** of each in relation to its role as a supporter. Include in your discussion relevant examples of animals undergoing the types of supporting systems given above. **(6 marks)**

STRAND 2 LIVING TOGETHER [14 marks]

There are eight (8) questions in this strand.

1. According to the competitive exclusion principle, two species cannot continue to occupy the same:

   A. Range
   B. Niche
   C. Habitat
   D. Territory

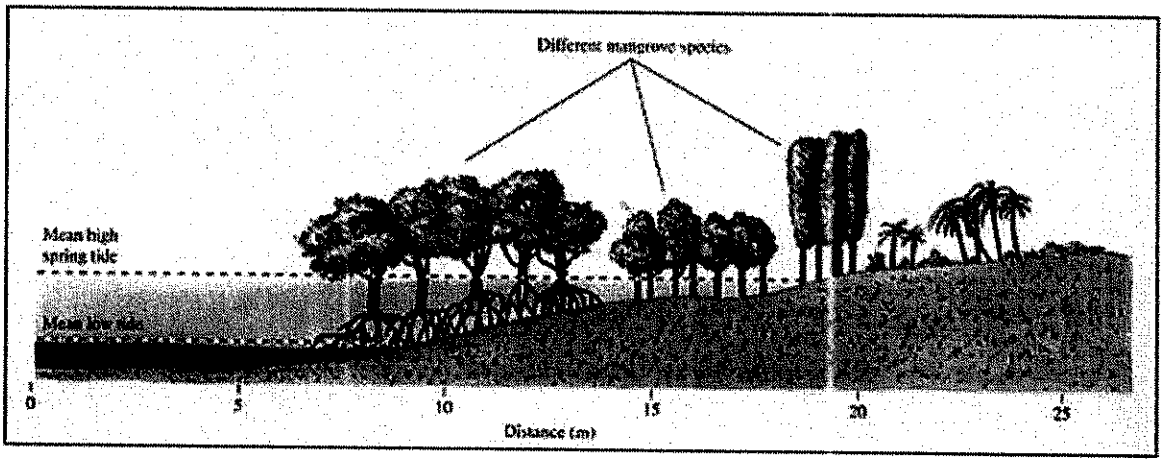
2. A factor that is more likely to affect crowded population much more than spread out population

   A. Limiting Factor
   B. Natural Disaster
   C. Density Dependent Factor
   D. Density Independent Factor

3. When the dark period of short-day plants is interrupted by brief exposure of light, then the plant _____.

   A. Produces more flowers
   B. Will not bear any flowers
   C. Turns into a long day plant
   D. Produces flowers immediately

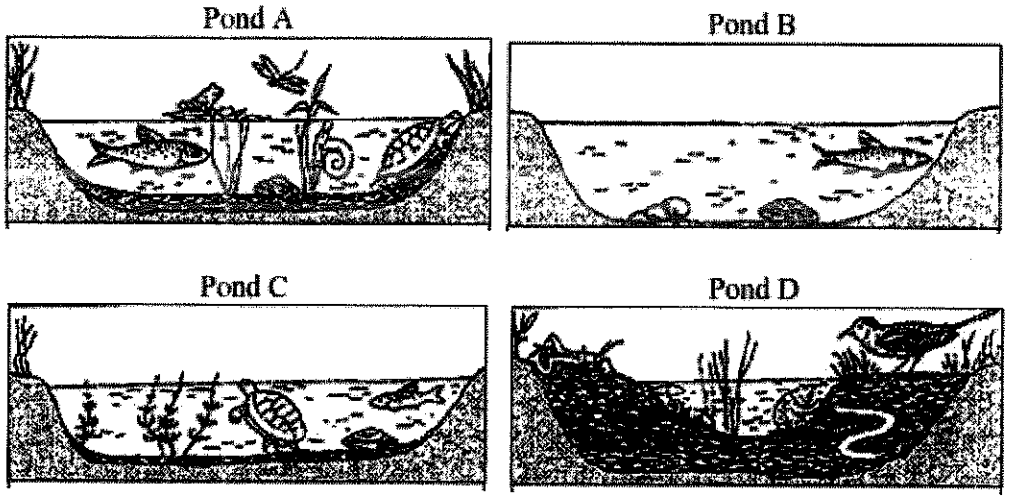
4. Study the diagram below and answer the questions that follow.



(i) The mangrove community shown in the diagram is on the coastline. What is the distribution pattern shown? **(1 mark)**

(ii) Name ONE factor and describe how it affects the distribution of the mangrove community near the coastline. **(1 mark)**

5. The evolution of a body of water from a lake to a marsh can last for thousands of years.

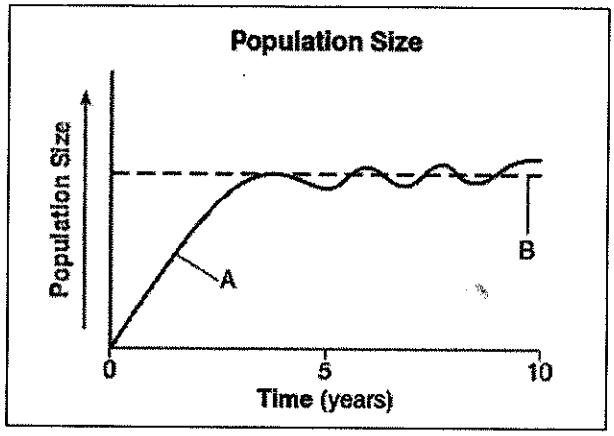


(i) Examine the pictures and list them in order from older to younger in the establishment of the marsh. **(1 mark)**

(ii) Is this an example of primary or secondary succession? **(1 mark)**

(iii) Identify the pond that will show a high degree of stability. **(1 mark)**

6. The graph shows the size of a population over time.

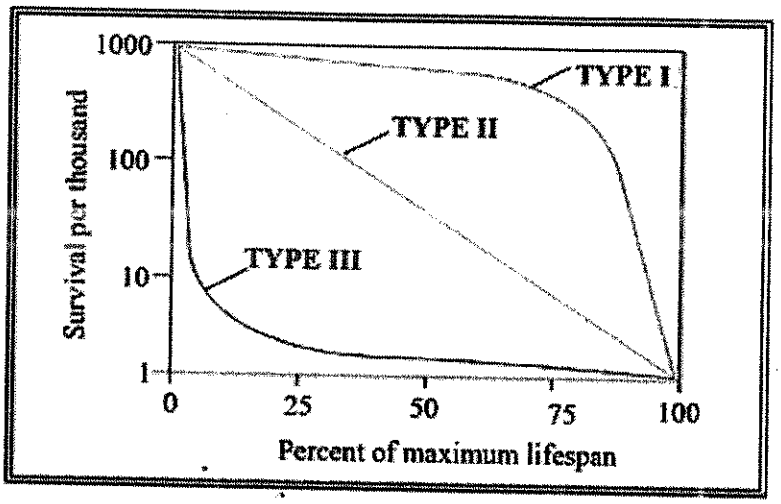


(i) State one reason for the changes in population size represented by line A between years 5 and 10. **(1 mark)**

(ii) Which term best identifies line B in the graph? **(1 mark)**

7. Study the survivorship curve below and answer the questions that follow.

SURVIVORSHIP CURVES



(i) What does a survivorship curve show? **(1 mark)**

(ii) Using natality and mortality terms, explain the survivorship curve labeled TYPE III. **(2 marks)**

(iii) Which curve best represents human beings' survivorship? **(1 mark)**

8. Essay - Option Question

A population may be regulated by density independent and density dependent factors.

With reference to the above statement;

(i) define population and density dependent factor, **(2 marks)**

(ii) discuss two density dependent factors and their respective roles in regulating a population, **(4 marks)**

(iii) name one density independent factor and explain its effect on a population. **(2 marks)**

STRAND 3 BIODIVERSITY, CHANGE AND SUSTAINABILITY [12 marks]

There are six (6) questions in this strand.

1. Which domain contains organisms that are unicellular, prokaryotic, and can cause illness yet also make food such as yogurt.

   A. Eukarya
   B. Archaea
   C. Bacteria
   D. Protista

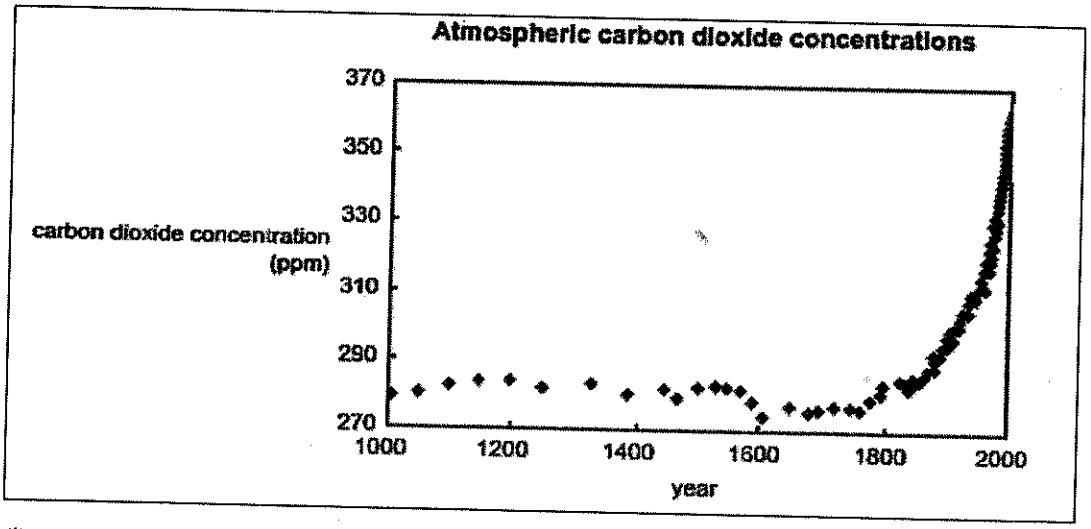
2. The current classification system was devised by:

   A. Aristotle
   B. Plato
   C. Linneaus
   D. Darwin

3. The one which is not considered as naturally occurring greenhouse gas is

   A. CFCs
   B. methane
   C. carbon dioxide
   D. nitrous oxide

4. The following graph shows how atmospheric concentrations of carbon dioxide have changed during the past 1000 years.



   (i) What is meant by the term natural carbon cycle? **(1 mark)**

(ii) Give two reasons why atmospheric concentrations of carbon dioxide have increased significantly during the past 200 years. **(2 marks)**

(iii) Describe two likely impacts of the enhanced greenhouse effect. **(2 marks)**

(iv) Describe one strategy for reducing the impact of the enhanced greenhouse effect. **(1 mark)**

5. (i) Which type of organisms fall in the domain Archaea? **(1 mark)**

(ii) State two main characteristics of the organisms that are used when classifying them? **(2 marks)**

6. **Essay - Option Question**

Climate change is an important issue not only for Pacific Island countries but also worldwide.

With reference to the above statement;

(i) Explain how EGHE leads to Climate change and **(2 marks)**

(ii) discuss **three** of its adverse impacts on Pacific Island countries. **(6 marks)**