Student Number: ……

Teacher's Name: ……

2018

Task 3: Yearly Examination

Weighting: 40%

Preliminary Biology

General Instructions

- Reading time - 5 minutes
- Working time - 2 hours 15 minutes
- Write using black pen
- Draw diagrams using pencil
- Board-approved calculators may be used
- This paper MUST NOT be removed from the examination room.

ct Teachers:
PRIOR
OBERTS
THOMPSON
THRUM

Total marks - 75

This examination has two parts, Part A and Part B

Part A - 20 marks

- Attempt Questions 1-20
- Allow about 35 minutes for this part

Part B - 55 marks

- Attempt Questions 21-33
- Allow about 1 hour and 40 minutes for this part

Section I
75 marks

Part A – 20 marks

Attempt Questions 1-20
Allow about 35 minutes for this part

Use the multiple-choice answer sheet.

Select the alternative A,B,C or D that best answers the question. Fill in the response oval completely.

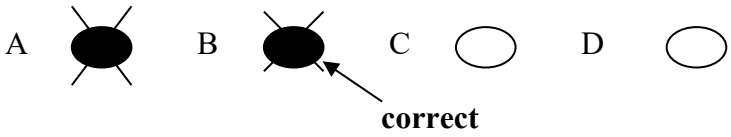
Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9



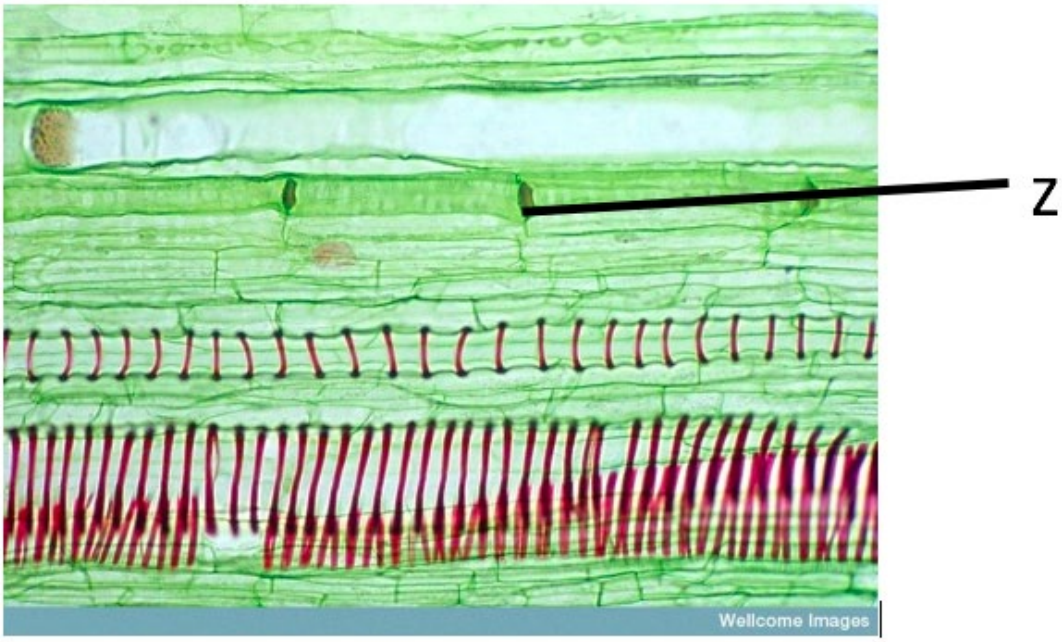
If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.



If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.



1. The following diagram shows a longitudinal section of a plant stem.



What is the name of the structure labelled Z?

A. Xylem

B. Sieve plate

C. Sieve tube

D. Companion cell

2. Why do we use transects when studying populations?

A. To estimate the abundance of a population.

B. To estimate the distribution of a population.

C. To ensure random sampling of an ecosystem.

D. To determine the number of organisms in an ecosystem.

3. Which structures are found in both mitochondria and prokaryotic cells?

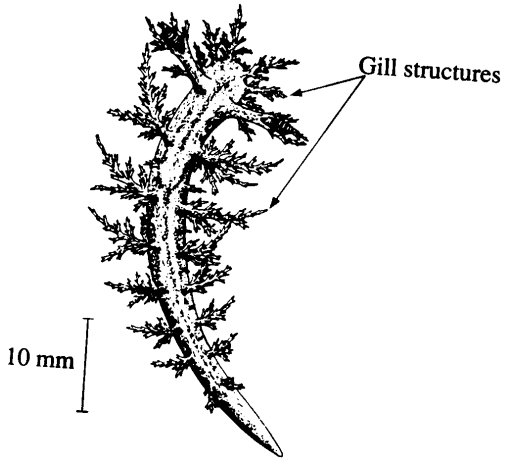
A. DNA only.

B. DNA and ribosomes.

C. Complex internal membranes.

D. DNA and complex internal membranes.

4. Below is a diagram of a nudibranch (sea slug) gill system.



What is the most likely reason for the large number of gill structures?

A. Provide protection for the respiratory surfaces.

B. Increase the surface area for exchange of gases.

C. Decrease the absorption of pollutants from the environment.

D. Decrease the volume of blood required for the diffusion of gases.

5. Which feature of stem cells enables them to replace cells in tissues such as the skin?

A. They differentiate to form new skin cells.

B. They have a full number of chromosomes.

C. They are undifferentiated cells present at birth.

D. They divide by mitosis to supply some cells that can differentiate into cells needed.

6. Like a human, an octopus has two eyes.

They are remarkably similar in structure to human eyes, having a lens and a retina. They are quite unlike the compound eyes found in many other invertebrate groups.

This similarity between human and octopi eyes is an example of:

A. divergent evolution.

B. convergent evolution.

C. anatomical similarity due to biogeography.

D. anatomical similarity due to common ancestry.

7. The following image shows an example of a biological relationship between two species. The fern is growing on the tree.



This relationship between the tree and the fern is an example of:

A. Commensalism

B. Competition

C. Parasitism

D. Predation

8. Which description best explains the environmental factors of temperature, availability of gases and amount of light?

A. They are biotic and abiotic factors in the environment.

B. They are physical factors that affects the distribution of plants, but not animals.

C. They are biotic factors that can influence the distribution and abundance of organisms.

D. They are abiotic factors that can influence the distribution and abundance of organisms.

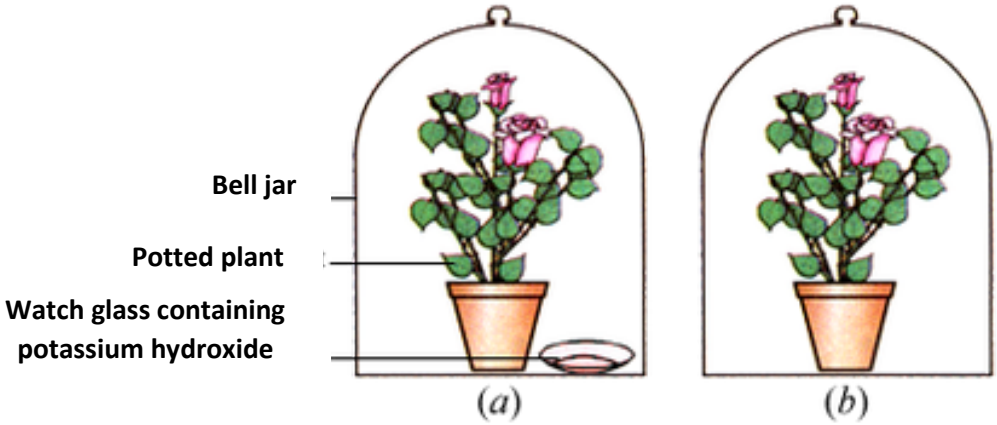
9. A student set up the following experiment to show that carbon dioxide is needed for photosynthesis.

i. Put a plant inside a sealed bell jar.

ii. Use potassium hydroxide to absorb CO_2 out of the air in the jar.

iii. Leave the plant for 24 hours.

iv. Record if starch is present in the leaves for each bell jar.



Which one of the following should they do to help ensure the validity of their experiment?

A. Use the same type of plant.

B. Ensure the plant has the same coloured flowers.

C. Change the amount of potassium hydroxide used.

D. Ensure the experiment is repeated two more times.

10. The fossil record of the horse shows considerable change over the last 60 million years. The fossil record of the crocodile, however, over an even longer period of time, shows comparatively little change.

Which one of the following offers the best explanation for the small amount of change in the crocodile?

A. The environment in which the crocodile lives has changed very little over that time.

B. Crocodiles live for a long time. Rates of evolution are much slower in long-lived species.

C. Reptiles are less subject to natural selection than mammals, therefore evolution is much slower.

D. 'The Survival of the Fittest', crocodiles are 'fitter' than horses in an evolutionary sense and have therefore survived better.

11. Which of the cell organelles listed below will be clearly visible under the high power (x400) lens of the light microscope?

	Lysosome	**Endoplasmic Reticulum**	**Nucleus**	**Chloroplast**
A.	✓	✓	✓	✓
B.	✗	✓	✗	✓
C.	✓	✗	✓	✗
D.	✗	✗	✓	✓

12. Skinks are lizards that can drop their tail off when threatened by predators. The bones of the tail are surrounded by muscles which can spasm and snap the vertebrae when the lizard is stressed. The dropped-off tail moves around and distracts the predator so that the lizard can escape.

What conclusion could be made about this adaptation?

A. The lizard can adapt when faced with predators to drop their tails.

B. Lizards can learn to drop their tails and better survive predators.

C. Lizards faced with more predators will be better at dropping their tails.

D. Lizards which drop their tails can survive and pass on this adaptation to their offspring.

13. A sample of blood was analysed. It was noted that it passed through a number of organs. In one particular organ, oxygen and urea levels decreased and carbon dioxide levels increased.

What is the most likely organ where this composition change of blood would occur?

A. Brain

B. Heart

C. Kidneys

D. Lungs

14. A student observing an unfamiliar organism had difficulty in deciding whether the organism should be called an animal or a plant.

Which of the following pieces of information about the organism would be of greatest value in solving this problem?

A. Details about where the organism lives.

B. Whether the organism responds to stimuli.

C. The way in which the organism obtains food.

D. Whether the organism is capable of movement.

15. Two solutions were tested to confirm their identity. They contained:

Solution 1: Starch and sucrose

Solution 2: Glucose and protein

The table shows the conclusions from the results recorded for the various tests.

	add iodine solution		boil with Benedict's solution		boil with Benedict's solution after hydrolysis		add biuret solution	
	1	**2**	**1**	**2**	**1**	**2**	**1**	**2**
A.	+	–	+	–	–	+	–	+
B.	–	+	+	–	+	–	–	+
C.	+	–	–	+	+	–	–	+
D.	–	+	+	–	+	+	+	–

key

+ = biological molecule present

– = biological molecule absent

Which row identifies the two solutions?

A. A

B. B

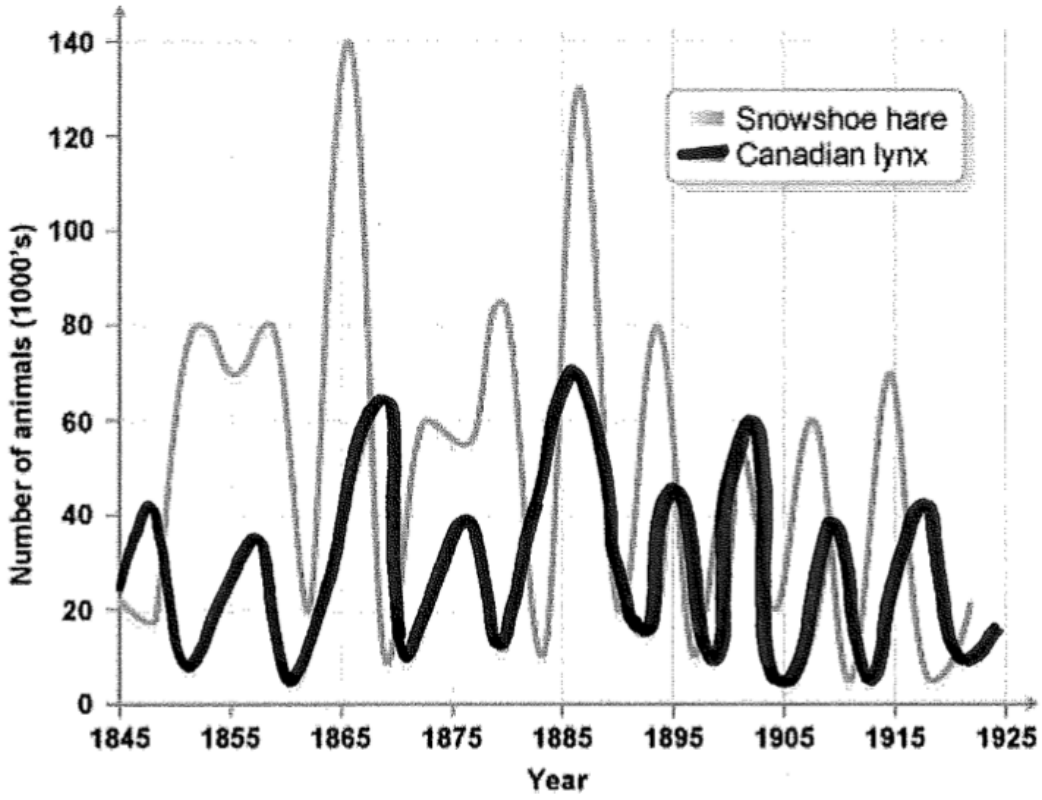
C. C

D. D

16. Which of the following correctly describes veins, arteries and capillaries?

	Vein	**Artery**	**Capillary**
A.	Thin muscle wall	Thin wall containing valves	Thick muscular walls comprised of elastic tissue
B.	Always carries deoxygenated blood	Carries oxygenated and deoxygenated blood	Always carries oxygenated blood
C.	Large bore	Small bore	Bore diameter allowing for only one red blood cell
D.	Carries blood under high pressure	Carries blood under low pressure	Carries blood under high pressure

17. The following graph shows the number of Snowshoe hare and Canadian lynx between the years 1845 and 1925.



Which of the following best explains the trend seen in the data?

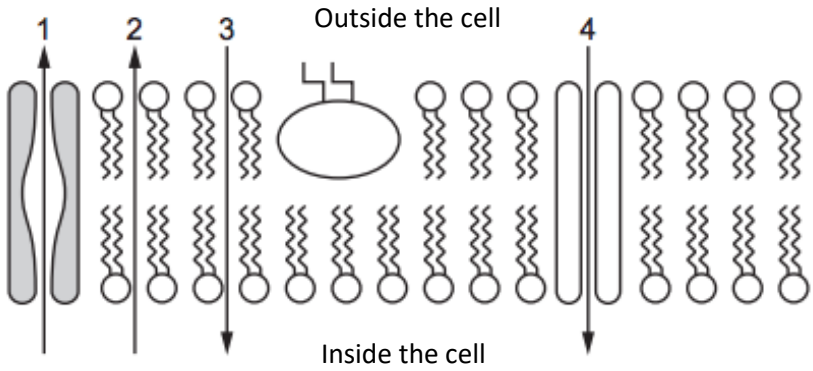
A. Changes in rainfall from year to year result in fluctuations in population numbers for both species.

B. Population numbers for each species fluctuate as niches are occupied by the hare and the lynx in an alternating pattern.

C. The relationship between population numbers of predator – prey species are closely linked as the predator species eats the prey species.

D. Competition for resources between the hare and the lynx result in fluctuations in population numbers in an approximate two-year cycle.

18. The diagram below represents a surface membrane of a cell.



Which row in the table correctly identifies the processes occurring at each numbered point?

	1	2	3	4
A.	carbon dioxide by diffusion	water by osmosis	glucose by diffusion	sodium ions by active transport
B.	fatty acids by diffusion	oxygen by diffusion	carbon dioxide by diffusion	water by osmosis
C.	sodium ions by active transport	carbon dioxide by diffusion	water by osmosis	glucose by facilitated diffusion
D.	water by osmosis	oxygen by diffusion	fatty acids by diffusion	glucose by active transport

19. **Questions 19 and 20 refer to the information below.**

The Codling moth (*Cydea pomonella*) is an introduced species from Europe. Its caterpillars are a serious pest of commercially produced apples.

The table below summarises some findings about Codling moth caterpillar survival in apples.

Large Apples			**Small Apples**		
No. of eggs laid	Average no. of caterpillars surviving		No. of eggs laid	Average no. of caterpillars surviving	
	Red apples	Green apples		Red apples	Green apples
1	0.95	0.94	1	0.94	0.94
2	1.84	1.85	2	1.68	1.70
3	2.58	2.53	3	1.98	2.00
4	3.10	3.11	4	2.11	2.10

From the table, it is possible to conclude that the data are:

A. Accurate.

B. Reliable.

C. Neither valid nor reliable.

D. Neither accurate nor reliable.

20. Which situation will give an individual caterpillar the best chance of survival?

A. To be 1 of 4 eggs laid on a large green apple.

B. To be the only egg laid, regardless of apple colour or size.

C. To be laid on a large apple, regardless of the number of eggs.

D. To be 1 of 4 eggs laid on any apple, regardless of size or colour.

Part B (55 marks)

Questions: 21 – 33
Marks: 55
Time: Allow approximately 1 hour and 40 minutes for this Part.

Answer the questions in the spaces provided.

Show all relevant working in questions involving calculations.

Question 21 (2 marks)

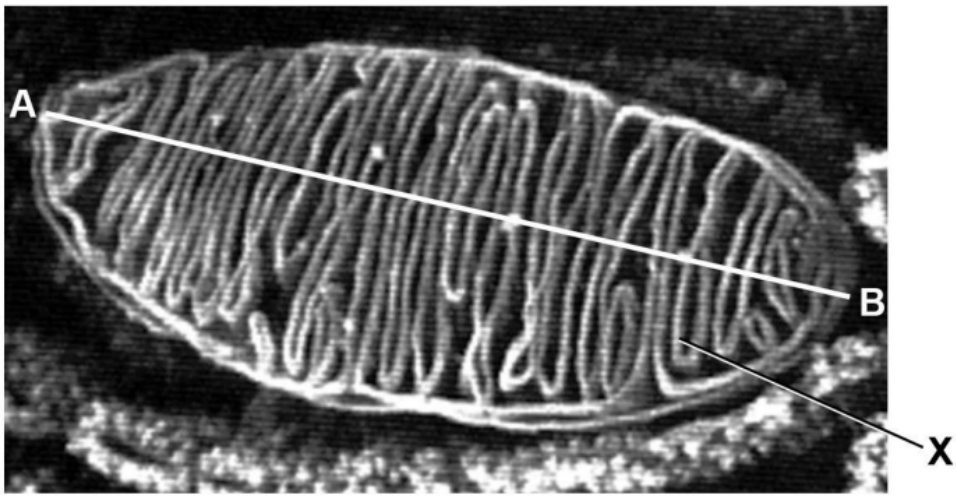
Complete the following table

2

Organisation level	**Definition**	**Example**
Cell		
Tissue		
Organ		
Organ System		

Question 22 (5 marks)

Below is an electron micrograph of a eukaryotic organelle.



(a) Identify the organelle. **1**

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(b) State ONE feature of the image that indicates the image is from an electron micrograph. **1**

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(c) Structure X is a folded membrane called cristae. Explain the function of the cristae in this organelle. **3**

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Question 23 (3 marks)

Explain why the possession of anatomical similarities found in mammals, birds, reptiles and amphibians, are regarded as evidence for evolution. **3**

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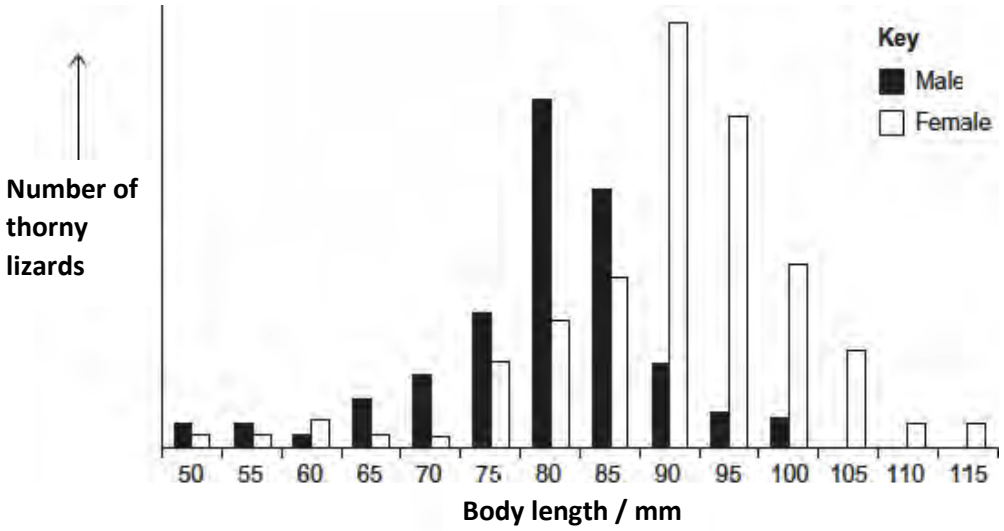
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Question 24 (4 marks)

Ecologists measured the body lengths of male and female thorny lizards living in the same habitat. The ecologists measured the body lengths to the nearest 5 mm. The graph shows how they presented their results.



(a) Give TWO differences in the variation in body length of male and female thorny lizards. **2**

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(b) Describe the trend seen in the graph. **2**

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Question 25 (3 marks)

Read the following passage:

Photosynthesis takes place in the chloroplasts. These are disc-shaped organelles surrounded by an outer envelope consisting of two layers of membrane. Inside, there are further membranes which are arranged in stacks called grana. Surrounding these is the stroma. Chlorophyll and other light- capturing pigments are found on the membranes of the grana and it is here that the light-dependent reaction takes place.

(a) Identify the reactants of the light dependent stage of photosynthesis. **1**

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(b) Outline the processes that occur in the light dependent reactions. **2**

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Question 26 (3 marks)

Draw a flowchart to describe the mechanism used in plants to distribute products of photosynthesis. **3**

Question 27 (4 marks)

Explain, using examples, why competition exists in ecosystems. **4**

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Question 28 (7 marks)

It has been just over 200 years since Darwin put forward his theory of natural selection to explain how evolution could occur.

(a) Explain why variation is important for evolution. **3**

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(b) Compare the concept of punctuated equilibrium with the gradual process proposed by Darwin's theory. **4**

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Question 29 (5 marks)

Describe a first-hand investigation you performed to observe the structure of stomata in plants. Include: **5**

- An equipment list
- A risk assessment
- Method
- Results

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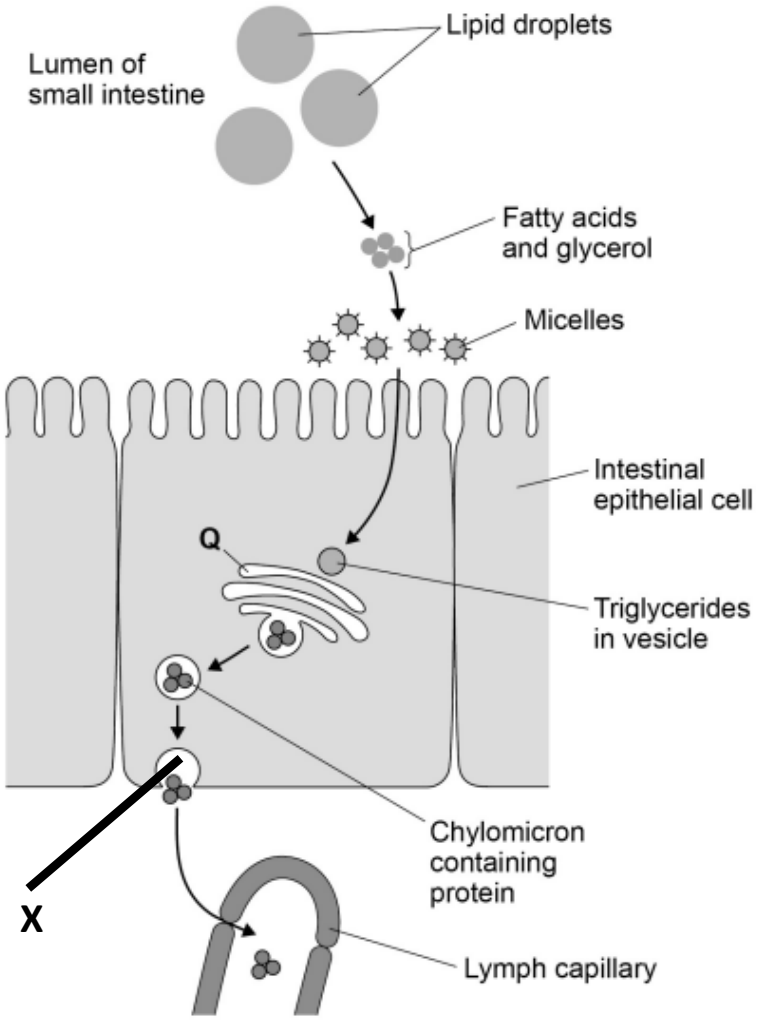
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Question 30 (5 marks)

The image below represents the passage of digested lipids from the intestines to the lymphatic system.



(a) Identify the process occurring at point X. **1**

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Question 30 continued.

(b) Compare the processes of facilitated diffusion and active transport with reference to the movement of substances across the cell membrane. **4**

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Question 31 (5 marks)

Evaluate the efficiency of gas exchange surfaces in an insect, fish and mammal. **5**

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Use the diagrams below to answer Question 32

The diagrams below show the finches that were collected by Darwin while he visited the Galapagos Islands.

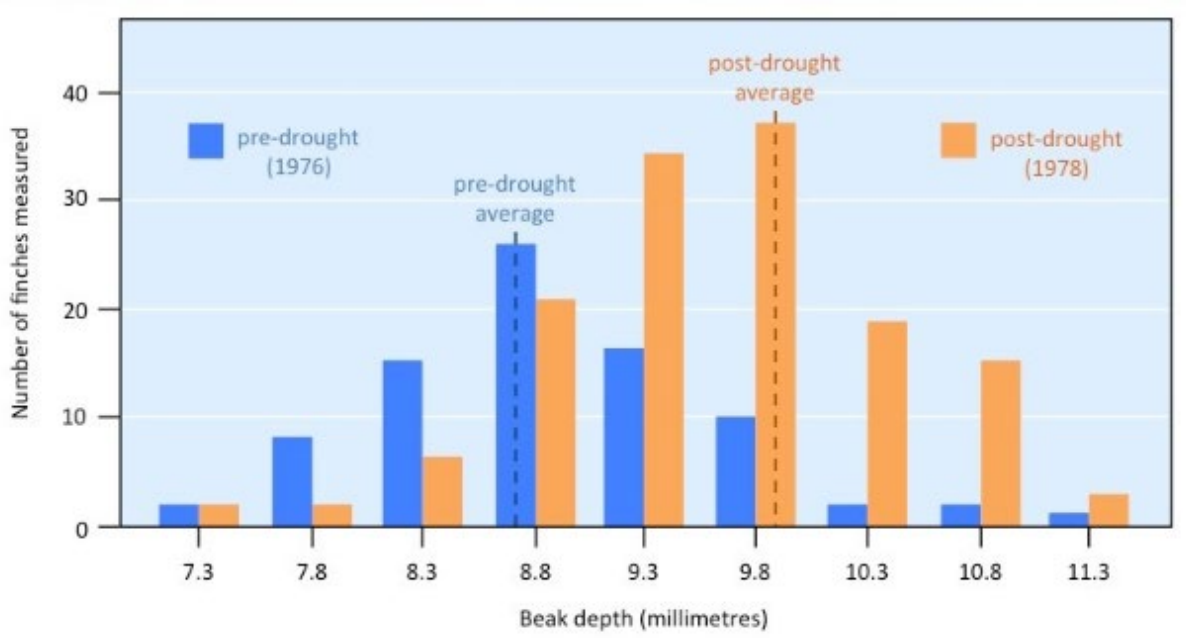


Figure 1- Research on beak depth and rainfall

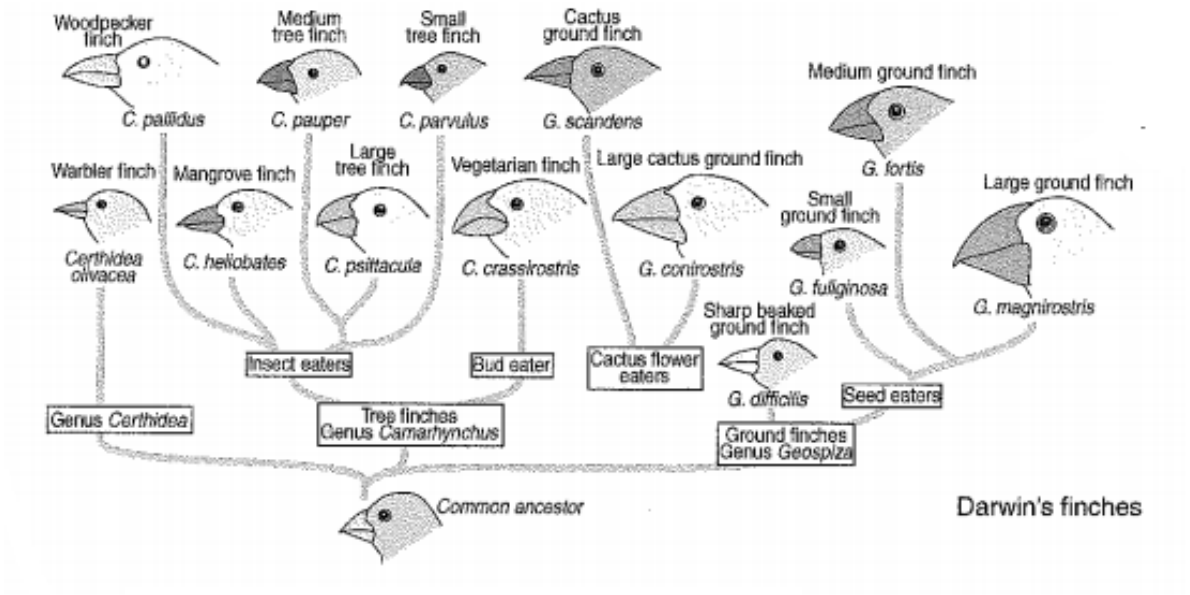


Figure 2- Relationships between Darwin's finches

Question 32 (5 marks) **5**

What can Darwin and modern scientific research show about the variation in the beaks of the finches?

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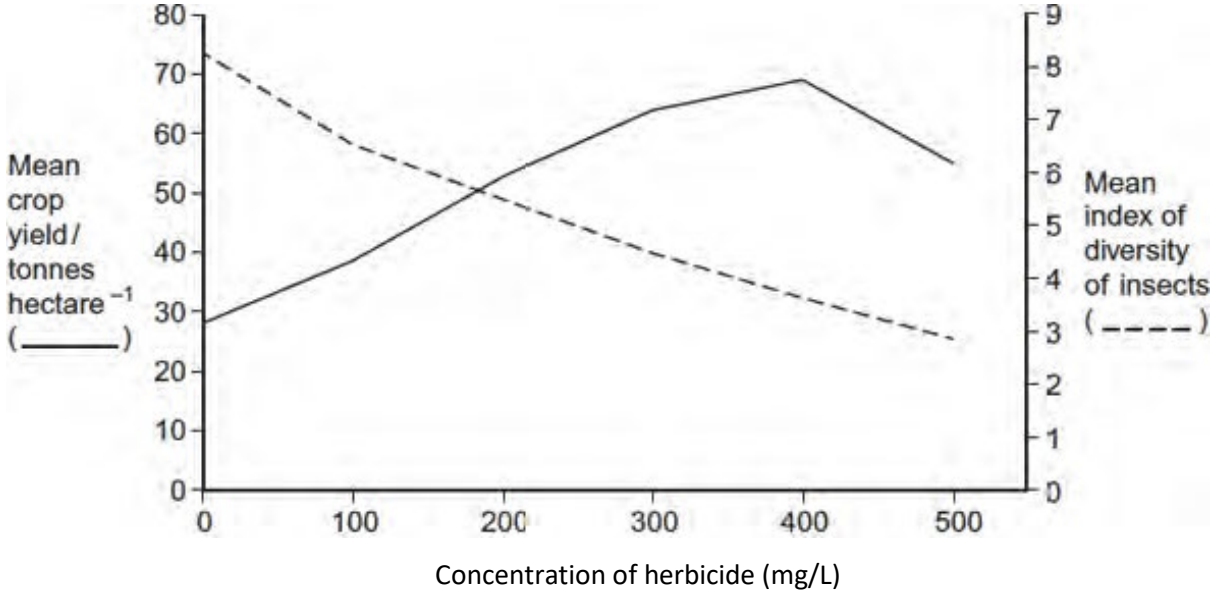
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Question 33 (4 marks)

A herbicide is a chemical used to kill weeds. Ecologists investigated the effect of a herbicide on crop yield and the diversity of insects. They sprayed different fields with the same volume

of different concentrations of the herbicide. At harvest, the ecologists determined the mean crop yield and the mean index of diversity of insects for fields that had received the same concentration of the herbicide.

The figure below shows their results.



(a) Some fields acted as controls. They were sprayed with a solution that did not contain the herbicide. Justify the purpose of these control fields. **2**

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(b) Suggest an explanation for the relationship between the concentration of herbicide and the mean crop yield. **2**

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End of Task