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Government of **Western Australia**
School Curriculum and Standards Authority

Externally set task 2016

Student Number: In figures **22297267**

In words _____

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INTEGRATED SCIENCE
GENERAL COURSE

Students can use the following items for this task

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: non-programmable calculators approved for use in the externally set task

Ref: 16-043

Total time for the task: 50 minutes
Total marks: 38 marks
Weighting: 15% of the school mark

Question 1 **(19 marks)**

David grows mangoes on his farm near the Moore River. While he was overseas on a holiday, he visited an aquarium shop and recognised one of the fish on sale. It was a *tandanus bostocki*, better known as a freshwater cobbler. He was surprised that it was selling for $500 when the same fish was plentiful in the section of the Moore River that ran through his farm.

David's mangoes are not very profitable. He wondered whether it would be possible to both grow mangoes and breed cobblers for sale to the international aquarium market. All he would have to do was dig some deep canals from the river, running between the rows of mango trees. These canals would irrigate the trees, while also being used to hold the fish.

There would be some extra costs in buying food for the fish, but the waste products from the fish would be an excellent source of nutrients for the mango trees. It may also save him money by reducing the amount of fertiliser he would use on the trees.

David decided to carry out an investigation to find out whether the nutrients provided by the fish would actually benefit his mangoes. He selected five different rows of mango trees and dug a deep canal beside each row.

Each canal was stocked with different quantities of fish and steel grates were used to prevent them from escaping. When it came time to harvest the mangoes, he recorded the weight of mangoes from each row. The results are shown in the table below.

Rows of mango trees, numbers of fish and average weight of mangoes per tree

Row	Number of mango trees	Number of fish	Weight of mangoes harvested (kg)	Average weight of mangoes per tree (kg)
1	11	100	150	13.6
2	11	200	180	16.4
3	12	300	200	16.7
4	12	400	175	14.6
5	11	500	80	7.3

(a) What was the independent variable in the investigation? (1 mark)

Amount of Mango trees

(b) What was the dependent variable in the investigation? (1 mark)

Amount of fish

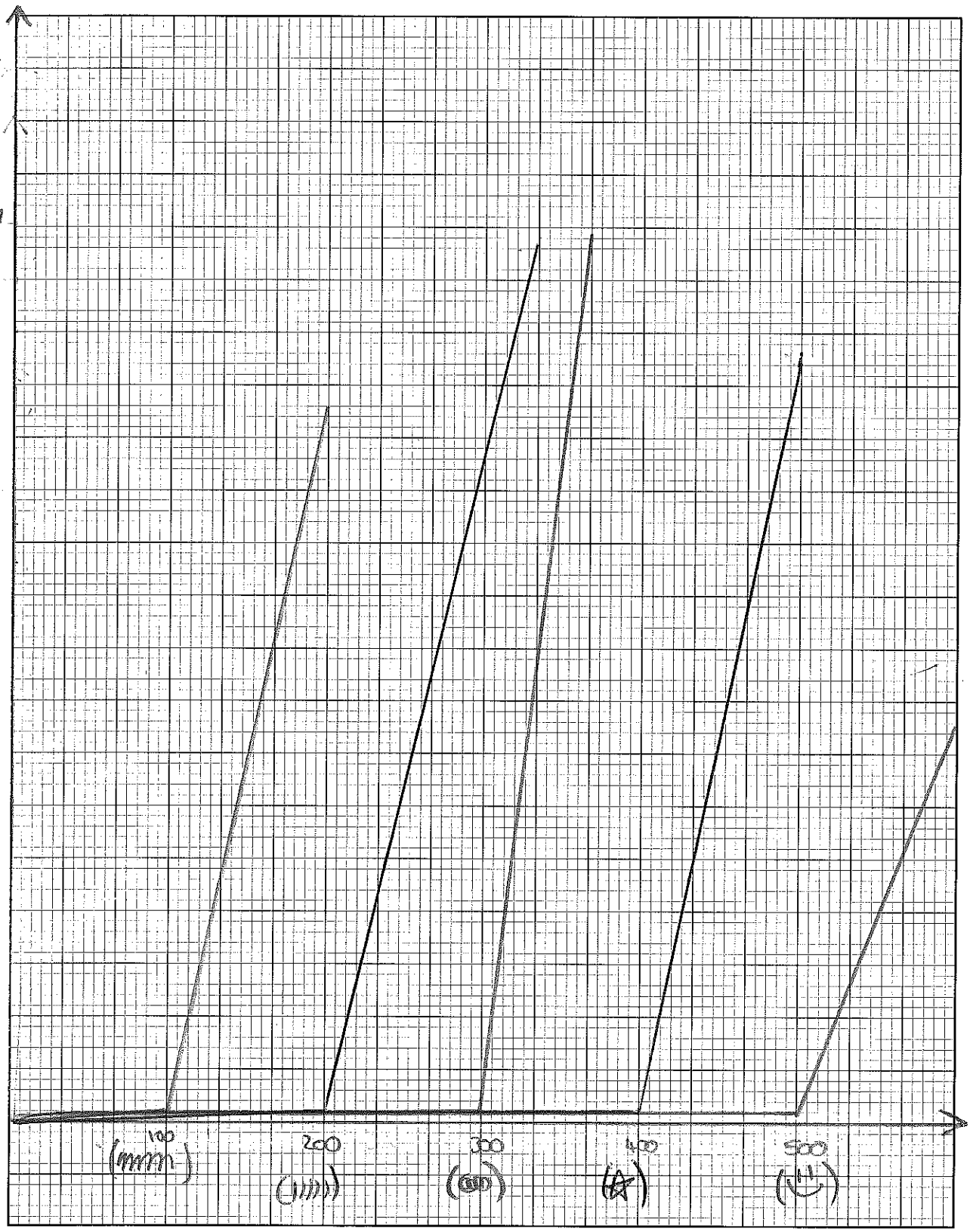
See next page

(c) Write a suitable hypothesis for the investigation. (2 marks)

If a different amount of fish was concealed by a certain amount of feeding nutrients, will the fish gain weight / keep on surviving in that environment.

(d) Using the data from the table, draw a line graph comparing the average weight of mangoes per tree and the number of fish stocked. (4 marks)

Title: The Average weight per mango tree



13.6 – 100
16.4 – 200
16.7 – 300
14.6 – 400
7.3 – 500

See next page

(e) David wants to maximise the total weight of mangoes he harvests. Use the graph you have drawn to work out the **best** number of fish to stock in each canal. In your answer, explain the relationship between the average weight of mangoes per tree and the number of fish. (4 marks)

The 300 full tank has the highest amount of results, and shows an effect. The middle amount (300 fish) is the peak of results, the higher after that, the amount decreases and the results being to get lower.

The 300 fish route would be the best choice route.

(f) David's daughter, Sue, is studying Integrated Science at school. Sue tells her father that his investigation was not well designed. Outline **three** improvements that Sue could have suggested to her father to enhance the investigation design. (3 marks)

One: Research more about the experiment.

Two: Repeat the trial after the first amount of results are recorded.

switch

Three: Continue with the results once recorded, to show to increasing and decreasing action.

(g) Describe **two** ethical issues that David should have considered before starting his investigation. (4 marks)

One: The amount of equipment that is needed to constructed this experiment, the amount of money that may needed to be spent.

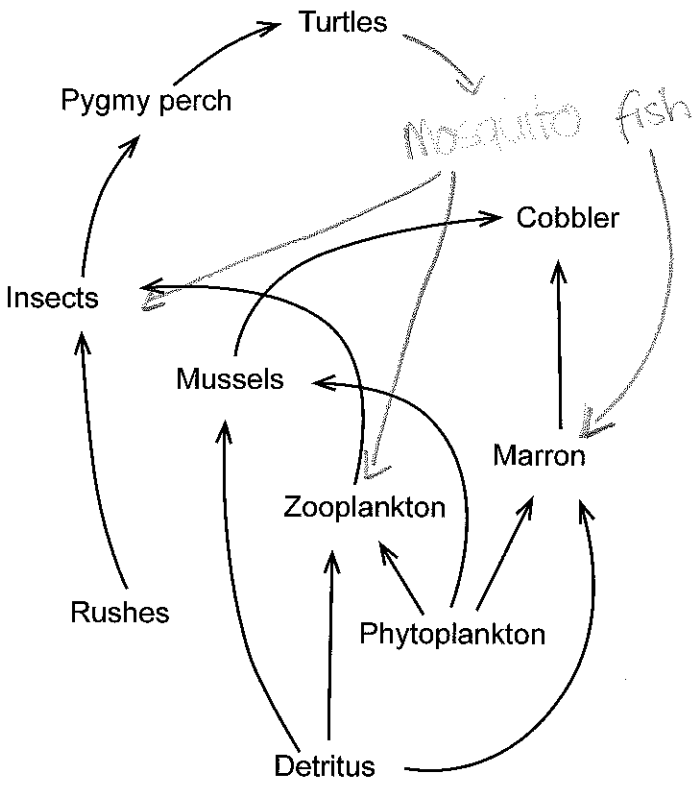
Two: the weather (temperature and what climate) The season has to be correct from the mango's to continue growth, which may affect the fish and the result.

Question 2 **(19 marks)**

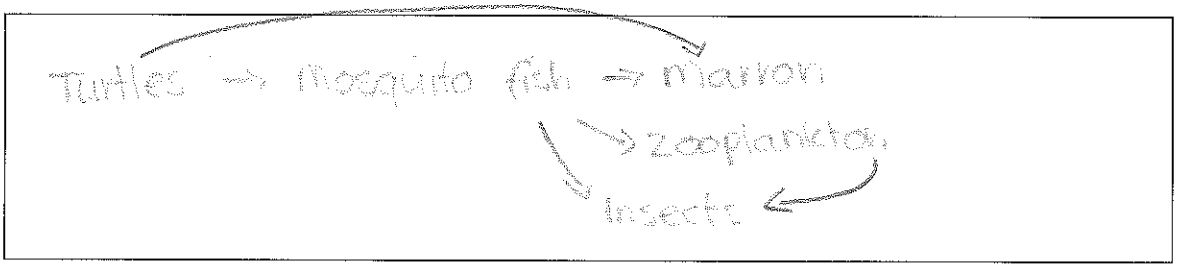
David notices a species of fish in the Moore River that he hasn't seen before. After some research, he identifies it as a mosquito fish. The mosquito fish was introduced into Western Australia from Central America in 1934 to lower mosquito populations. Unfortunately, mosquito fish will only eat mosquito larvae if there is no other food supply. They prefer to eat juvenile marron and zooplankton, while their only major predators are turtles.

David is worried about the impact mosquito fish will have on the Moore River if they establish themselves. Below is a food web of the river as it runs through his farm.

(a) Based on the information above, complete this food web to include the mosquito fish. (2 marks)



(b) From the food web, draw a food chain that includes at least four organisms. (2 marks)



(c) Do you think the population of cobblers would increase, decrease or stay the same after the introduction of mosquito fish? Explain your answer. (3 marks)

Increase, because now that the mosquito fish has been put into the chain, they will continue to eat the marron. Which leaves the cobbler to only worry about one species now.

The mosquito won't completely take out the marron.

(d) Using your food web, predict **two** effects that the mosquito fish might have on organisms in the web other than the cobbler. (2 marks)

One: The Zooplankton, because there are already consumers eating them, their size will decrease.

Two: Phytoplankton, because there will be less to consume from that species.

(e) On the basis of your knowledge of how energy transfers through a food chain, explain why such chains are rarely longer than four or five organisms. (4 marks)

Because if they become any higher, they will be a consumer that can't be over ridden. There will be too much of the energy being put into the higher food chain that there will be none for the ones below. Plus their will be no way for the lower chain to consume the wasted energy if they die.

(f) Name **two** abiotic factors in this river system that might be altered by human activity. Explain how these changes could affect the ecosystem. (6 marks)

One: The environment may become damaged, the sides of the area may cave in and become unable to use.

(damaged of environment)

Two: The water might become intoxicated by so many fish, and are unable to introduce any new species. which makes the food chain restricted.

(No growth of new species)

End of questions

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