Name: .... (   )

ASSUMPTION ENGLISH SCHOOL
PRELIMINARY EXAMINATION 2019

BIOLOGY
6093 / 02

LEVEL: Sec 4 Express **DATE:** 3 September 2019

CLASS: Sec 4/2 **DURATION:** 1 hour 45 minutes

Additional Materials provided: NIL

INSTRUCTIONS TO CANDIDATES
Do not open this booklet until you are told to do so.

Write your NAME and INDEX NUMBER at the top of this page.

SECTION A (50 marks)
STRUCTURED QUESTIONS
Answer all questions in the spaces provided.

SECTION B (30 marks)
FREE RESPONSE QUESTIONS
Answer three questions in this section in the spaces provided.
Question 3 is in the form of an Either / Or question.
Only one of the alternatives should be answered.

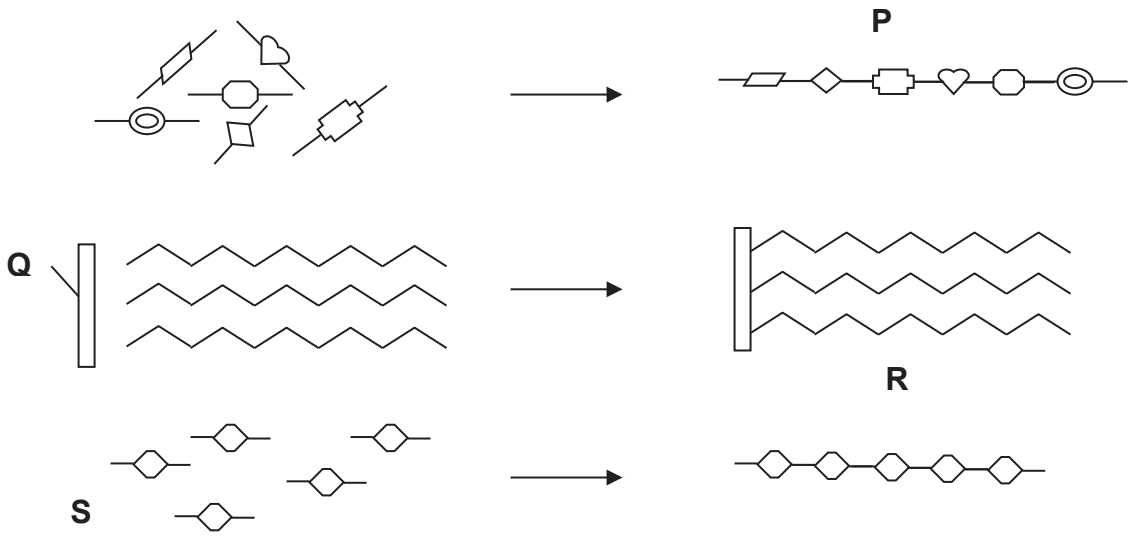
For Examiner's Use	
Paper 1	/40
Paper 2 Section A	/50
Paper 2 Section B	/30
Paper 3	/40
Total	/160
Overall	/100

This Question Paper consists of 18 printed pages including this page.
[Turn over

SECTION A – STRUCTURED QUESTIONS (50 marks)

Answer **ALL** the questions in the spaces provided.

1 The figure below shows some chemical molecules found in the human body and how they are joined to form larger molecules.



(a) Identify molecules **P**, **Q**, **R** and **S**.

P: …… **Q**: ……

R: …… **S**: …… [2]

(b) **(i)** State a test that a student can use to test for the presence of **S** in a liquid sample of food.

…… [1]

(ii) Describe how this test is carried out and the observations that can confirm the presence of **S** in the food.

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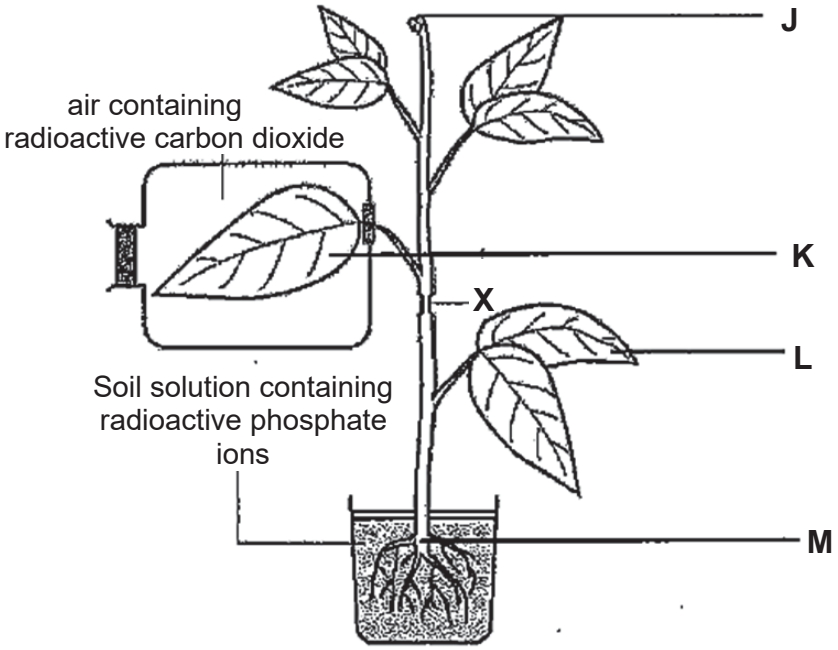
…… [2]

2 The figure shows a potted plant with an outer ring of bark removed at point **X**. Leaf **K** is enclosed within a bottle containing carbon dioxide with radioactive carbon. The soil was watered with a solution containing radioactive phosphate ions. The entire plant was exposed to sunlight for 6 hours.



(a) Which tissue of the vascular bundle is removed at point **X**?

..... [1]

(b) Which labelled part(s) **J, K, L** and / or **M** will be tested positive for radioactive sugar? Explain your answer.

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..... [4]

(c) Which labelled part(s) **J, K, L** and / or **M** will be tested positive for radioactive phosphate ions? Explain your answer.

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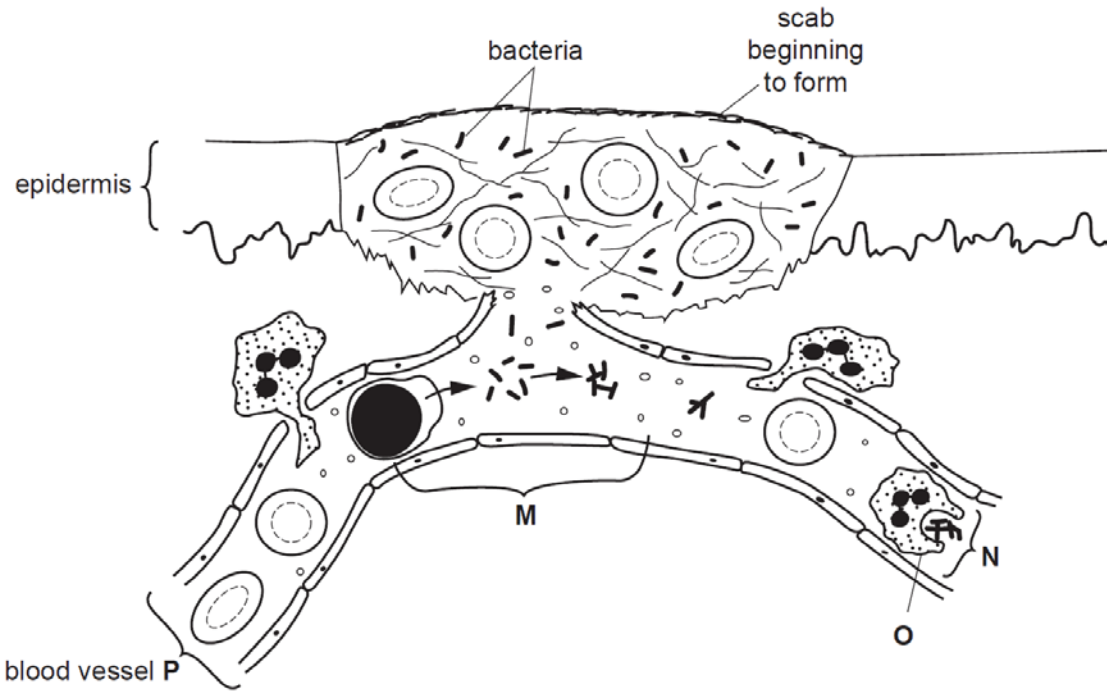
..... [3]

3 The diagram shows a section through a small surface wound to the skin.



(a) Name cell **O** and the type of blood vessel **P** shown in the diagram.

O: ..... **P**: ..... [2]

(b) Explain what is happening to the bacteria at **M** and **N**.

M: ……..……..……..……..

……..……..……..……..

N: ……..……..……..……..

……..……..……..…….. [2]

(c) Explain how the wound is being sealed in the region under the scab.

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..... [2]

(d) **(i)** Complete the table by circling the changes in concentration of glucose and oxygen after passing through blood vessel **P**.

substance	concentration after passing through **P**
glucose	higher / lower / remain the same
oxygen	higher / lower / remain the same

[1]

(ii) Explain the changes in the concentration of oxygen and glucose, if any, in part **(d)(i)**.

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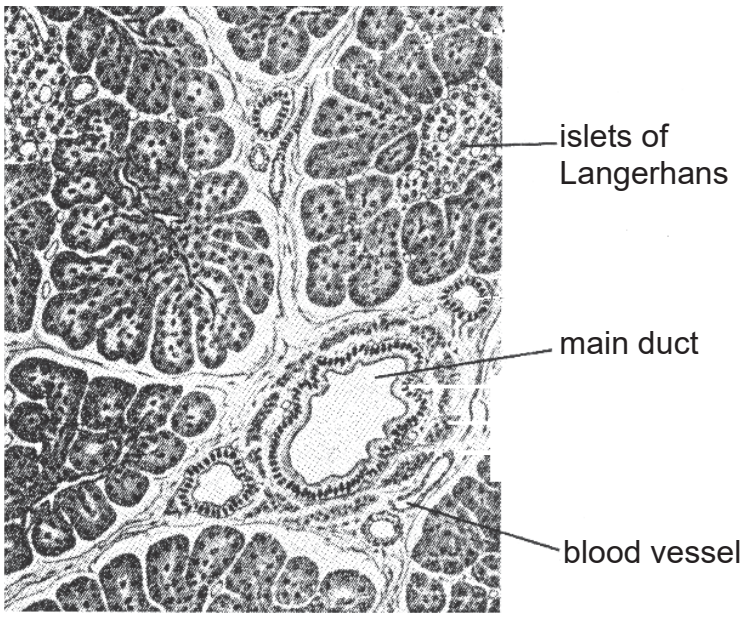
..... [2]

4 The figure shows a section of a pancreas, as seen using a light microscope.



(a) **(i)** Name one soluble protein which can be found in the main duct after a meal.

..... [1]

(ii) State the organ in which the main duct empties its contents into.

……..……. [1]

(b) **(i)** State the substance that will be released by the islets of Langerhans into the blood vessel after a meal.

..... [1]

(ii) Explain how the substance identified in **(b)(i)** helps to regulate blood glucose concentration.

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..... [3]

5 Four girls, who were adopted and brought up by different sets of foster parents, were brought together after their step-parents realised that they may be long lost siblings and had the same biological parents. The following data were recorded after they met up with each other.

	Amy	Bernadette	Christie	Diane
height / cm	168	168	160	165
weight / kg	52	57	67	57
blood type	O	AB	O	A

(a) Group the characteristics (height, weight, and blood type) into the table below.

continuous variation	discontinuous variation

[1]

(b) Two of the girls are identical twins. Identify the girls and give a reason for your answer.

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……..…… [1]

(c) The girls got together to search for their biological parents. They narrowed the search to 4 couples. The blood types of the couples are as shown.

	father	mother
couple 1	A	B
couple 2	AB	AB
couple 3	A	AB
couple 4	O	AB

(i) Which couple do you think are the biological parents of the four girls? Explain your answer.

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..... [3]

(ii) All the couples listed in **(c)(i)** had brown eyes. Bernadette and Diane had brown eyes as well while Christie was found to have blue eyes. The allele for brown eyes is a dominant allele over the allele for blue eyes. What is the probability that Amy has blue eyes?

..... [1]

6 The diagram shows parts of an insect-pollinated and a wind-pollinated flower.

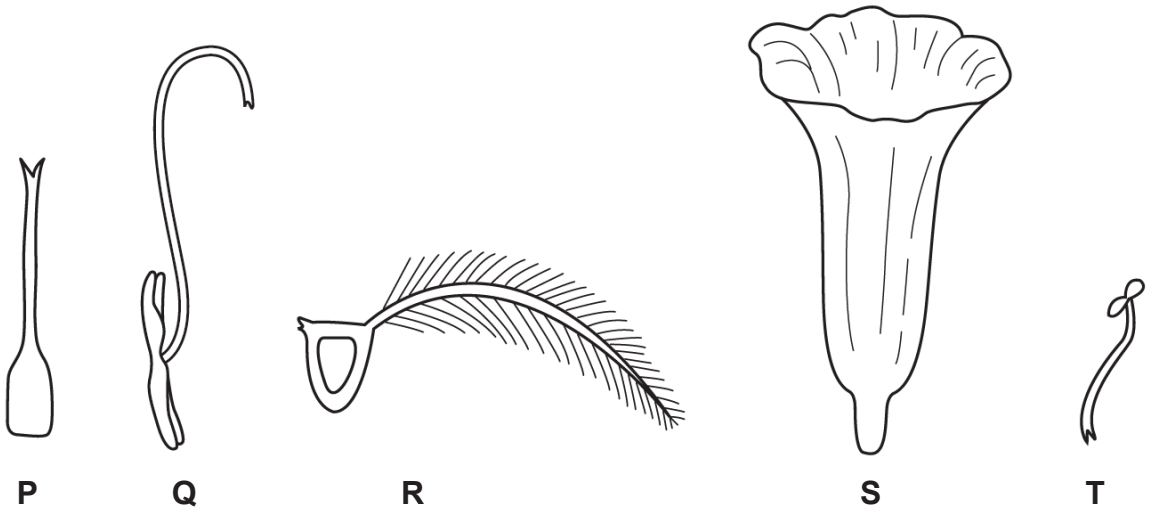

Fig. 6.1

(a) Using the letters **P**, **Q**, **R**, **S** and **T**, list the parts that are from

the insect-pollinated flower: .....

the wind-pollinated flower: ..... [2]

(b) Explain how the structure of **R** helps it to carry out its function.

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..... [2]

(c) The diagram shows a pollen grain with its pollen tube.

(i) On Fig. 6.1, use a line labelled **L** to show exactly where the pollen grain as shown is found. [1]

(ii) Explain how the pollen tube shown in the diagram is formed.

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..... [2]

(d) State and explain the difference between a nucleus in a pollen grain and a nucleus in a cell in structure **S**.

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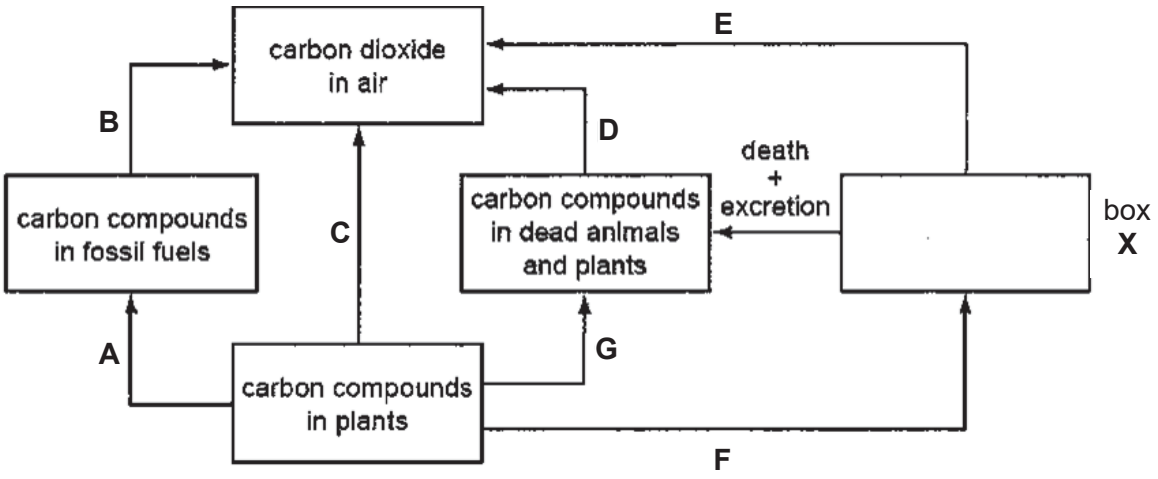
..... [2]

7 The figure shows the carbon cycle. The arrows represent the various processes that take place in the cycle.



(a) Complete the diagram by filling in 'box **X**'. [1]

(b) Which two letters represent respiration?

……..……. [1]

(c) **(i)** Draw an arrow in the diagram to indicate another process that can occur in the carbon cycle. [1]

(ii) State the process indicated by the arrow drawn in **(c) (i)**.

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(d) Describe how oceans can also be part of the carbon cycle and acts as carbon sinks.

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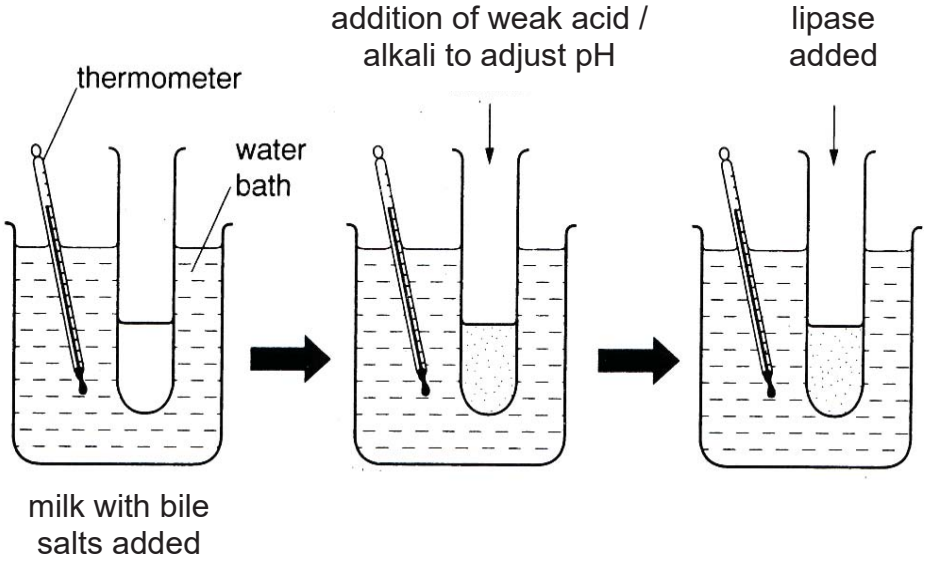
SECTION B – FREE-RESPONSE QUESTIONS (30 marks)

Answer **three** questions in the spaces provided. Question 3 is in the form of an Either / Or question. Only one of the alternatives should be answered.

1 An experiment was carried out on digestion of fat using a sample of milk. Bile salt was added to 5 cm^3 of milk. The pH of the mixture was adjusted to pH 8.0 and lipase was then added to the mixture.



The pH of the mixture was recorded at ten minute intervals for 60 minutes using a pH meter. The table shows the results of the investigation.

time / min	pH
0	8.0
10	7.1
20	6.8
30	6.6
40	6.5
50	6.4
60	6.4

(a) Suggest why the pH of the milk was adjusted to 8.0 before the lipase was added.

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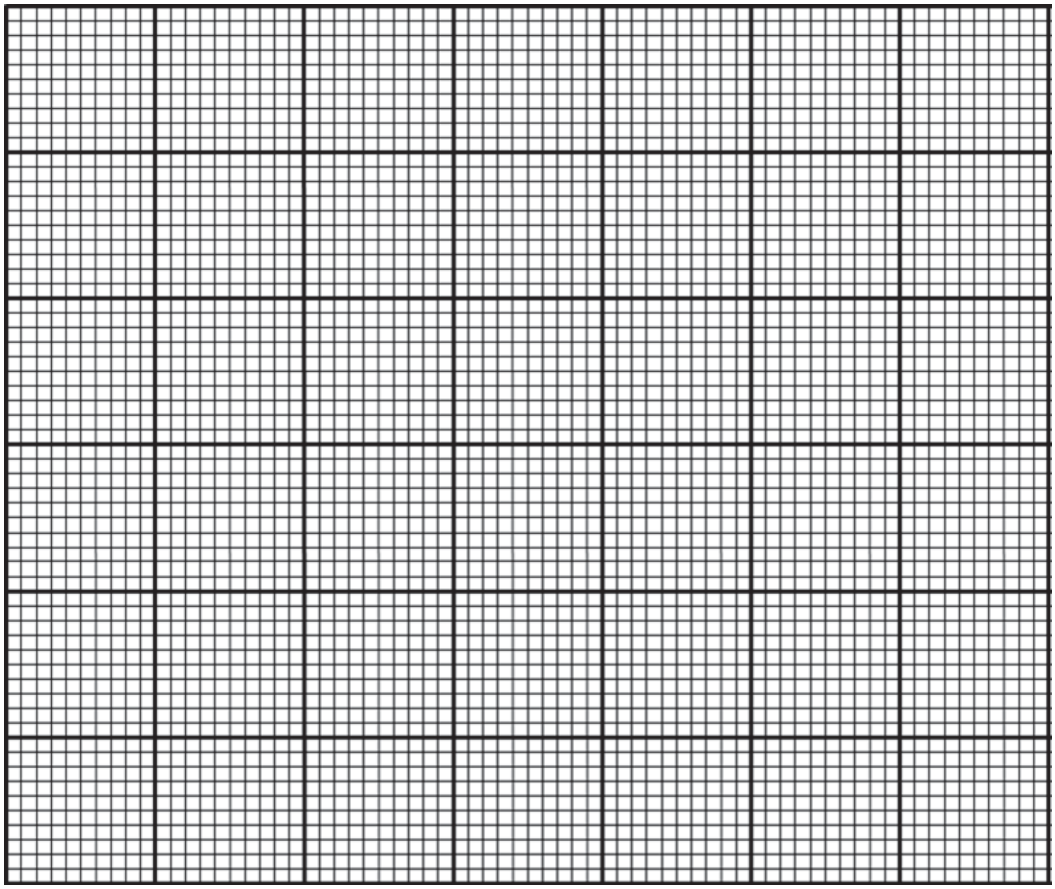
..... [1]

(b) **(i)** Plot a graph to show the results of the experiment.



[3]

(ii) Using the graph, state the pH of the mixture after 5 minutes.

..... [1]

(c) Using the 'lock and key' hypothesis, explain the results of the experiment.

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(d) Describe and explain how the experiment results will change if no bile salts were added.

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…… [2]

2 **(a)** Describe what is meant by the term *mutation*.

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…… [2]

(b) The familiar orange-pink colour of salmon (a type of fish) flesh is due to a gene that allows salmon to process carotene, a type of protein, found in its diet. In the wild, about 1 in 20 salmon are white fleshed. White flesh in salmon is a recessive trait. A salmon breeder wanted to find out the genotype of his orange-pink colour salmon. Suggest how he could determine the genotype with the help of clearly labelled genetic diagram(s).

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..... [4]

(c) Scientists have genetically modified salmon to grow faster. They have taken a gene from the ocean pout (another type of fish) and inserted it into salmon. The pout gene permanently 'switches on' the salmon gene to make growth hormone, allowing the salmon to grow all year round instead of only in spring and summer. The resulting genetically modified (GM) salmon grows to maturity in 18 months instead of 3 years and appears to be larger than its wild-type counterparts.

Outline the procedure by which scientists combine the ocean pout gene with a bacterial plasmid to form a recombinant DNA which is reintroduced into bacterial cells. (The recombinant DNA is eventually inserted into salmon DNA to create GM salmon).

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EITHER

3 (a) Define *homeostasis.*

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…… [1]

(b) Explain what is meant by *negative feedback*.

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…… [2]

(c) Describe how the various parts of the human skin work together to prevent the body from overheating when a person is under the sun.

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OR

3 **(a)** Describe how the nephron is involved in the production of urine.

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(b) Describe and explain how the kidneys perform their roles as osmoregulators when a person drinks a large volume of water.

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- End of Paper -