Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						4	4	3	7	/	4	H	Signature	

Paper Reference(s)

4437/4H

Examiner's use only

Team Leader's use only

London Examinations IGCSE

Science (Double Award)

Biology

Paper 4H

Higher Tier

Wednesday 20 May 2009 – Afternoon

Time: 1 hour 30 minutes

Question Number	Leave Blank
1	
2	
3	
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6	
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8	
9	
10	
11	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
The paper reference is shown at the top of this page. Check that you have the correct question paper.
Answer **ALL** the questions in the spaces provided in this question paper.
Show all the steps in any calculations and state the units.
Calculators may be used.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 11 questions in this question paper. The total mark for this paper is 90.
There are 24 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.

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Answer ALL the questions. Write your answers in the spaces provided.

1. The photograph shows a sea turtle on a sandy beach. Some sea turtles are regarded as endangered species.

(a) Suggest what is meant by the term **endangered species**.

.....

.....

(1)

(b) Sea turtles feed on jellyfish that have fed on microscopic organisms called plankton.

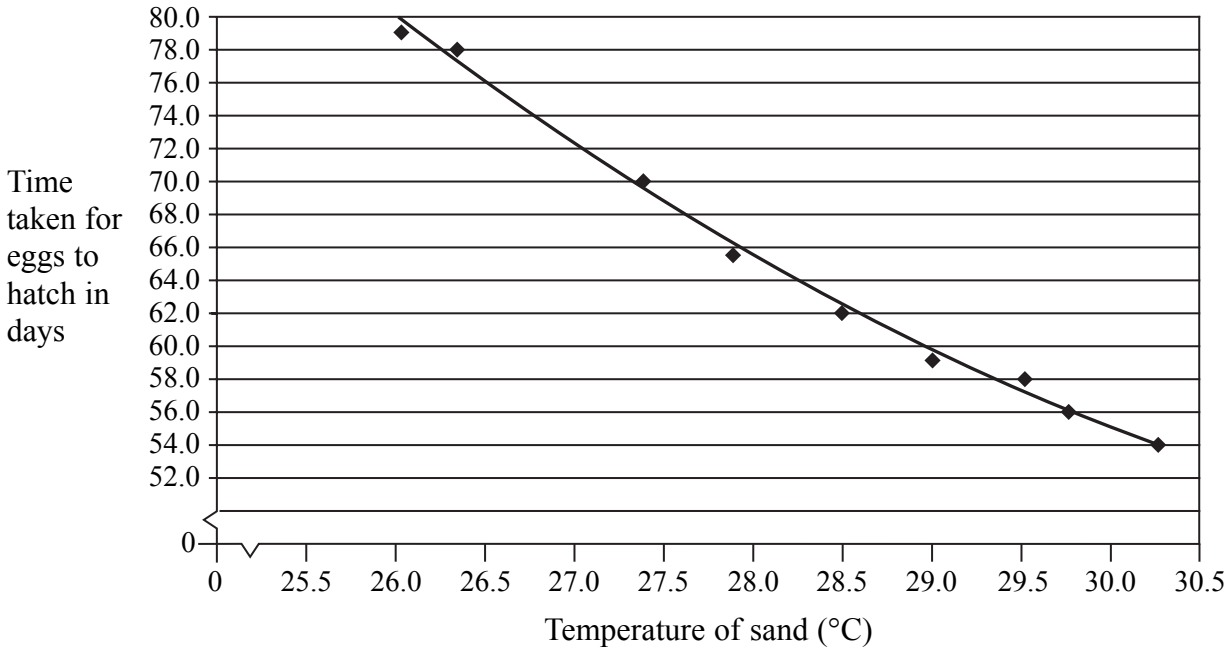
Use this information to draw a food chain in the space below.

(2)

Leave blank

(c) Sea turtles lay their eggs on sandy beaches. They dig holes (nests) in the sand and then lay up to 120 eggs in the hole. They then refill the hole with sand.

The temperature of the sand can affect the time taken for the eggs to hatch. This relationship is shown in the graph below.



(i) How does the temperature of the sand affect the time taken for the eggs to hatch?

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(1)

(ii) At what temperature of the sand do the eggs take 55 days to hatch?

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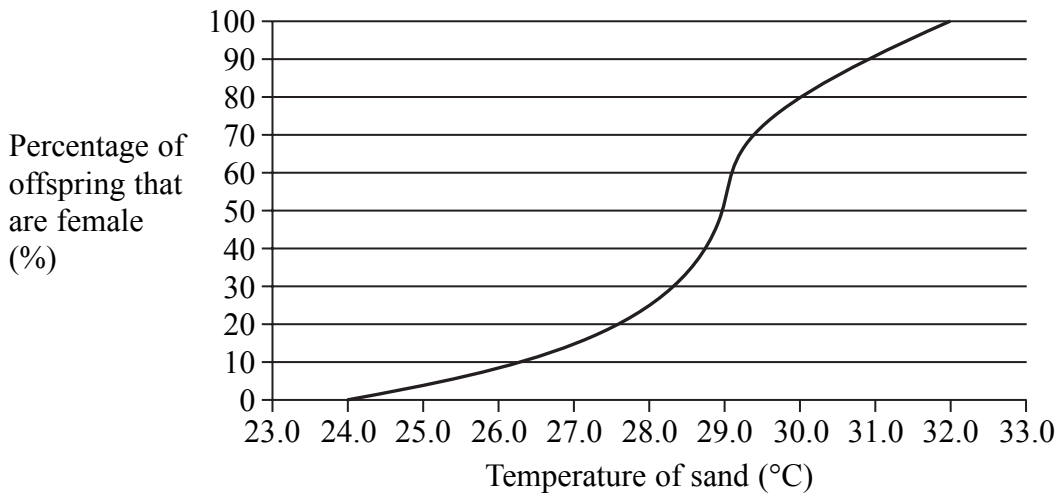
(1)

Leave blank

(d) Sea turtles are unusual in that the temperature of the sand can also affect the sex of the offspring. The graph below shows this relationship.



(i) What temperature of the sand would give equal numbers of males and females?

.....

(1)

(ii) In one nest, the temperature of the sand was 30 °C. In this nest 120 offspring hatched.
Use the graph to calculate how many of these offspring are likely to be male and how many are likely to be female.

Write your answers in the table below.

Sex	Number of offspring
male	
female	

(2)

(e) Scientists are concerned that global warming might reduce the population of sea turtles.

Use information in the graph from part (c) to support this suggestion.

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(2)

(Total 10 marks)

Q1

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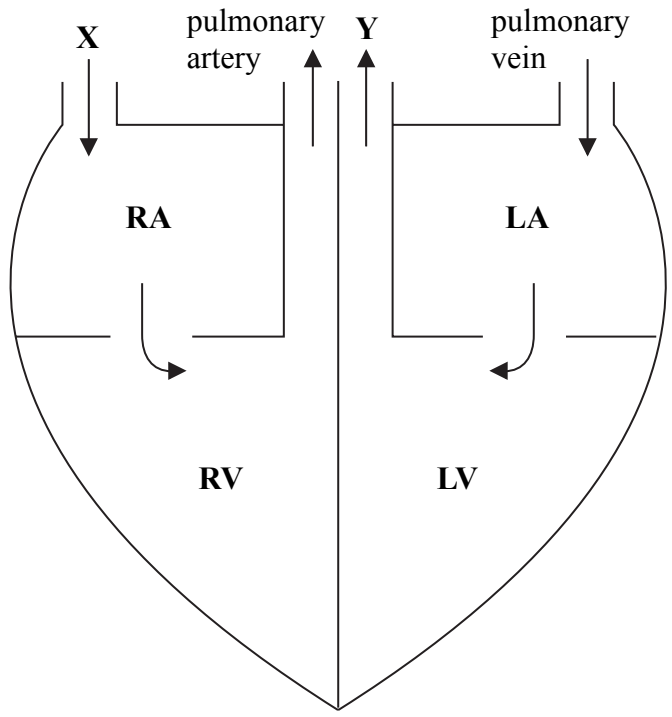
2. The diagram shows a simplified section through a human heart. The pulmonary artery and pulmonary vein have been labelled. The arrows show the direction of blood flow.



(a) (i) Name the blood vessels labelled **X** and **Y**.

X .....

Y .....

(2)

(ii) What do the letters **LV** on the diagram stand for?

LV .....

(1)

(iii) What is the function of the pulmonary artery?

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(2)

Leave blank

(b) Describe and explain the biological consequences of smoking on the human heart.

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(5)

Q2

(Total 10 marks)

Turn over

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3. An athlete was being trained for a marathon. During a training session the athlete ran for one hour. The trainer measured the heart rate of the athlete every 10 minutes during this training session. The results are shown in the table.

Time in minutes	Heart rate in beats per minute
0	60
10	90
20	95
30	100
40	118
50	120
60	120

(a) Describe the pattern shown by the results.

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.....

(2)

(b) What was the percentage increase in the athlete's heart rate at the end of the training session when compared to the start? Show your working.

Increase = ... %

(2)

Leave blank

(c) The trainer explained to the athlete that it was important to reduce the build-up of lactic acid in muscle cells while running.

(i) Name the process that produces lactic acid.

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(1)

(ii) If an athlete breathes deeply, this can help reduce the build-up of lactic acid in muscle cells while running. Suggest why.

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(2)

Q3

(Total 7 marks)

Leave blank

4. The photograph shows ‘CopyCat’, the first cat to be produced by cloning.

(a) The passage below describes the steps taken to produce CopyCat. Use a suitable word to write on the dotted lines to complete the passage.

A ..... from a body cell taken from CopyCat’s mother was put into an ..... egg cell. The egg cell was then given an electric shock to make it divide by the process of ..... . The resulting ball of cells, called an ....., was placed into the ..... of another cat (surrogate mother) and after some time CopyCat was born. CopyCat is known as a clone because she is genetically ..... to her mother.

(6)

(b) Use the symbols **XX** or **XY** to complete the table to show the sex chromosomes of each of the animals used in cloning CopyCat. One has been done for you.

Animal	Sex chromosomes
CopyCat’s mother	**XX**
The surrogate mother	
CopyCat	

(2)

(Total 8 marks)

Q4

Leave blank

5. (a) Plants absorb water from the soil through their root hair cells.

In the space below, draw and label a root hair cell.

(2)

(b) Explain how water is absorbed into a root hair cell from the soil.

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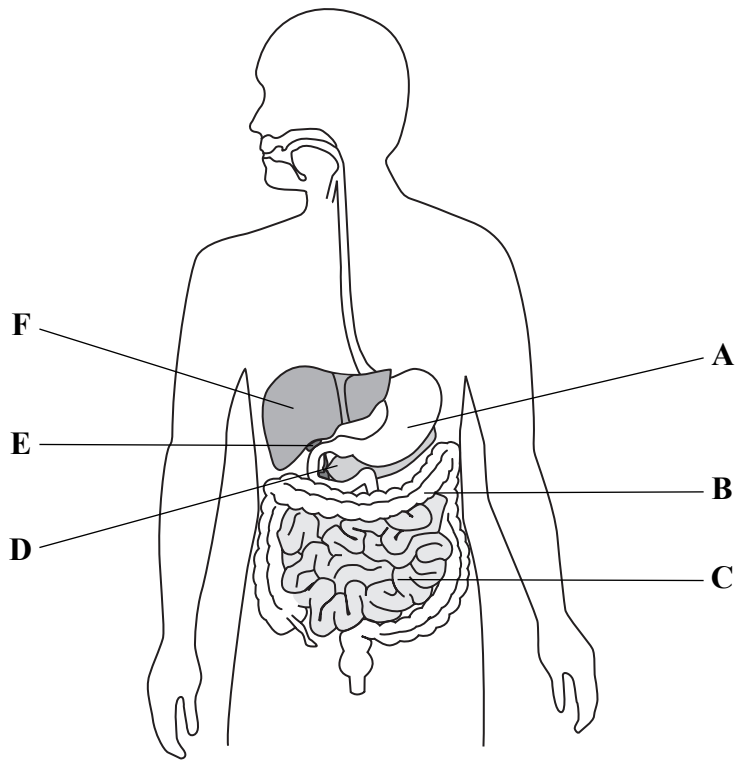
(2)

Q5

(Total 4 marks)

Leave blank

6. The diagram shows the human digestive system with parts labelled **A**, **B**, **C**, **D**, **E** and **F**.



(a) (i) Which letter shows where bile is made?

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(1)

(ii) Explain how bile is involved in digestion.

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(4)

Leave blank

(b) Products of digestion are absorbed by structures called villi.

(i) In which part of the digestive system are most villi found?

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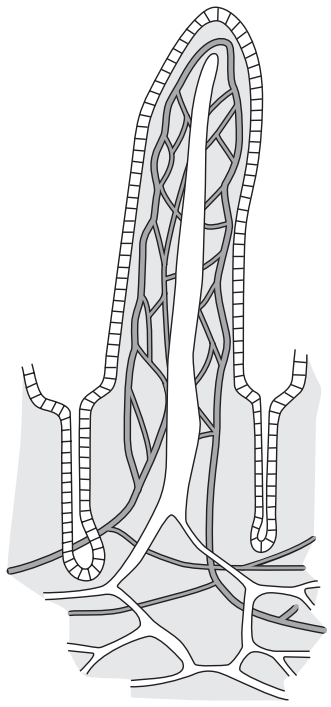
(1)

(ii) The diagram shows a villus.



Explain how the structure of a villus is adapted for the absorption of the products of digestion.

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(4)

Q6

(Total 10 marks)

Leave blank

7. At birth a small sample of blood is taken from babies to test for the concentration of an amino acid called phenylalanine. Too much of this amino acid in the first few years of life can damage the nervous system. The condition is inherited and is called phenylketonuria (PKU). The condition is caused by a recessive allele.

(a) A couple plan to have children. The father and mother are both heterozygous for PKU.

(i) Draw a genetic diagram to show the genotypes of the parents, the gametes and the possible genotypes and phenotypes of their children.

Use **n** to represent the allele for having PKU.
Use **N** to represent the allele for not having PKU.

(4)

(ii) What is the probability of this couple producing a child who will **not** have PKU?

.....

(1)

(b) Suggest a treatment doctors give to babies who are found to have PKU.

.....

(1) **Q7**

(Total 6 marks)

Leave blank

8. Birnham Wood contains 400 beech trees, 300 000 primary consumers and 50 000 secondary consumers.

(a) Draw and label a pyramid of **biomass** for Birnham Wood.

(3)

(b) Explain why transfer of energy between primary and secondary consumers can never be 100% efficient.

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(4)

Q8

(Total 7 marks)

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9. (a) Plants with desired characteristics can be developed by selective breeding. However, the process takes a long time.

Genetic modification can be used as a faster method to produce plants with desired characteristics. Describe the procedure of genetic modification.

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(5)

(b) When a new plant has been produced with desired characteristics, micropropagation (tissue culture) can be used to continue the commercial production of this plant.

Give **one** reason for using micropropagation in this situation.

.....

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(1)

(Total 6 marks)

Q9

Leave blank

10. It is important that the blood glucose concentration in the body is kept between 3.5 and 7.5 mmol per litre. When we eat, the blood glucose concentration rises, but it usually returns to normal within 2 to 3 hours.

(a) The passage below describes what happens in the body after someone eats a meal. Write on the dotted lines the most suitable words to complete the passage.

After a person eats a meal the blood glucose concentration rises. This rise in glucose results in the release of the hormone .....

from cells in the ..... . This hormone travels in the ..... to a target organ called the ..... . Here, excess glucose is converted to a large insoluble carbohydrate called ..... and stored.

(5)

(b) If the blood glucose concentration rises above 9 mmol per litre, glucose starts to appear in the urine. This may be a sign of diabetes, a condition in which a person cannot control their blood glucose concentration.

A test called a "glucose tolerance test" may be used to find out if a person has diabetes. The person does not eat for eight hours and is then given a glucose drink. For the next three hours the person's blood glucose concentration is measured.

(i) Suggest why the person does not eat for eight hours before having the test.

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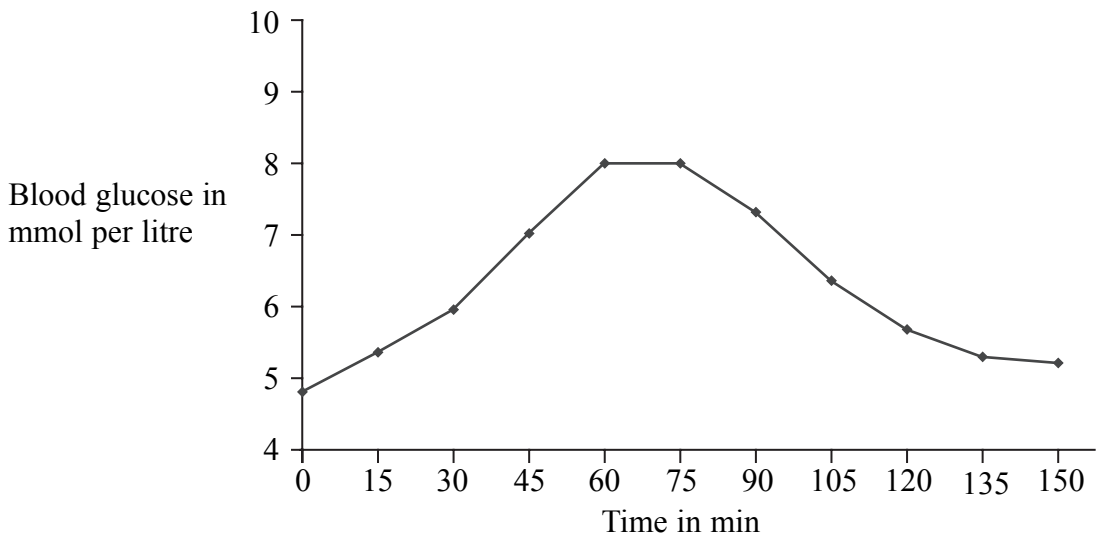
(1)

Leave blank

(ii) The results of a person's glucose tolerance test are shown in the graph below.



This person does not have diabetes. How do the results shown in the graph support this statement?

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(3)

Q10

(Total 9 marks)

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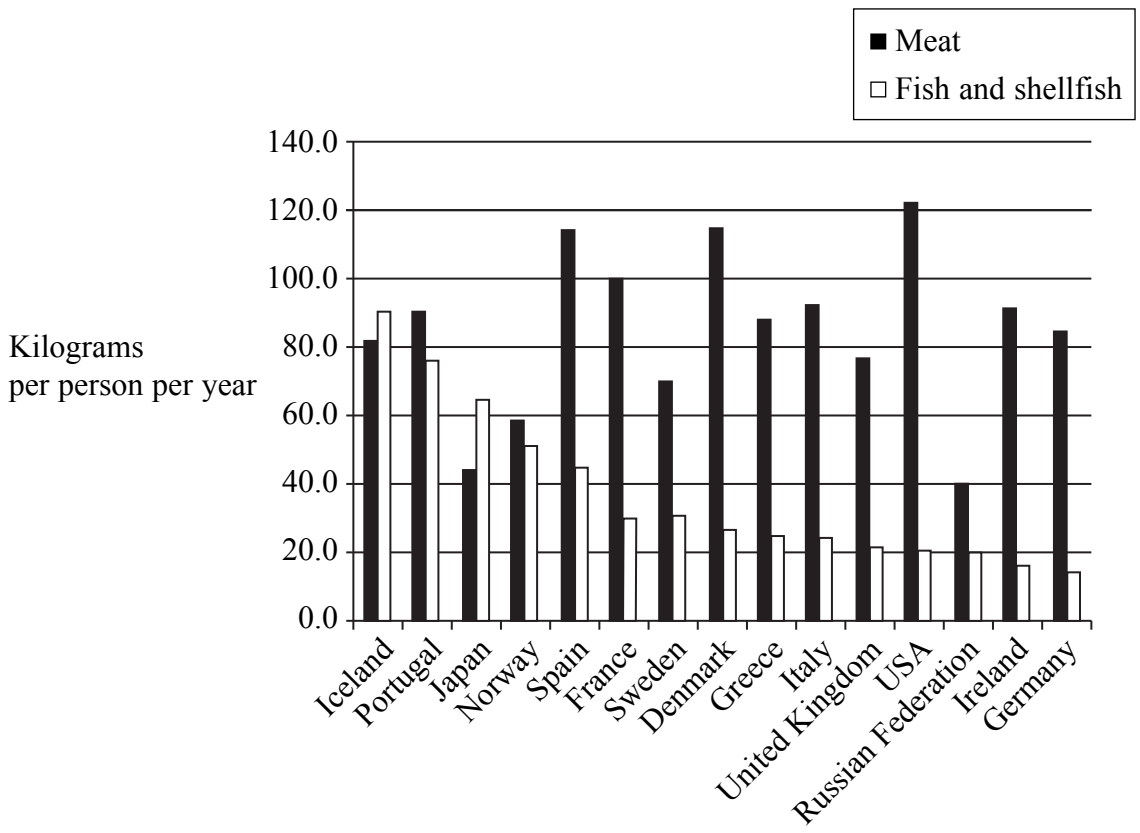
11. The graph shows the mass of fish and meat eaten in some countries.



(a) (i) In which countries do people eat more fish than meat?

.....

(1)

(ii) Meat and fish contain approximately 100 g of protein per kilogram.

Calculate how many kg of protein a person in France obtains in one year from eating meat and fish. Show your working.

Answer = ... kg

(2)

Leave blank

(iii) Why is protein important for growth?

.....

.....

(1)

(b) The photograph shows a fish farm. A fish farm produces large numbers of fish of the same species. The fish are kept in cages in the water. Water is able to circulate through the cages. The fish are given small amounts of food at regular intervals during the day.

(i) Suggest why it is important that water can circulate through the cages.

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(2)

(ii) Suggest why fish farmers supply small amounts of food at regular intervals.

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(1)

Leave blank

(c) Some fish farmers calculate a 'Food Conversion Efficiency' (FCE). The formula they use is shown below

$$\text{food conversion efficiency} = \frac{\text{total fish body mass gained}}{\text{total mass of food eaten}} \times 100$$

Suggest why fish farmers aim to have a high FCE.

.....

.....

.....

(2)

(d) Competition between members of the same species of fish (intraspecific) can reduce the yield of fish. Competition between different species (interspecific) can also reduce the yield of fish.

Describe ways in which fish farmers can reduce these types of competition.

Intraspecific .....

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Interspecific .....

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(4)

Q11

(Total 13 marks)

TOTAL FOR PAPER: 90 MARKS

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