Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2010

Science: Double Award (Modular)

Paper 1
Higher Tier

[G8204]

G8204

FRIDAY 21 MAY, MORNING

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all six** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 110.
Quality of written communication will be assessed in question **2(d)(i).**
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Details of calculations should be shown.
Units must be stated in numerical answers where appropriate.

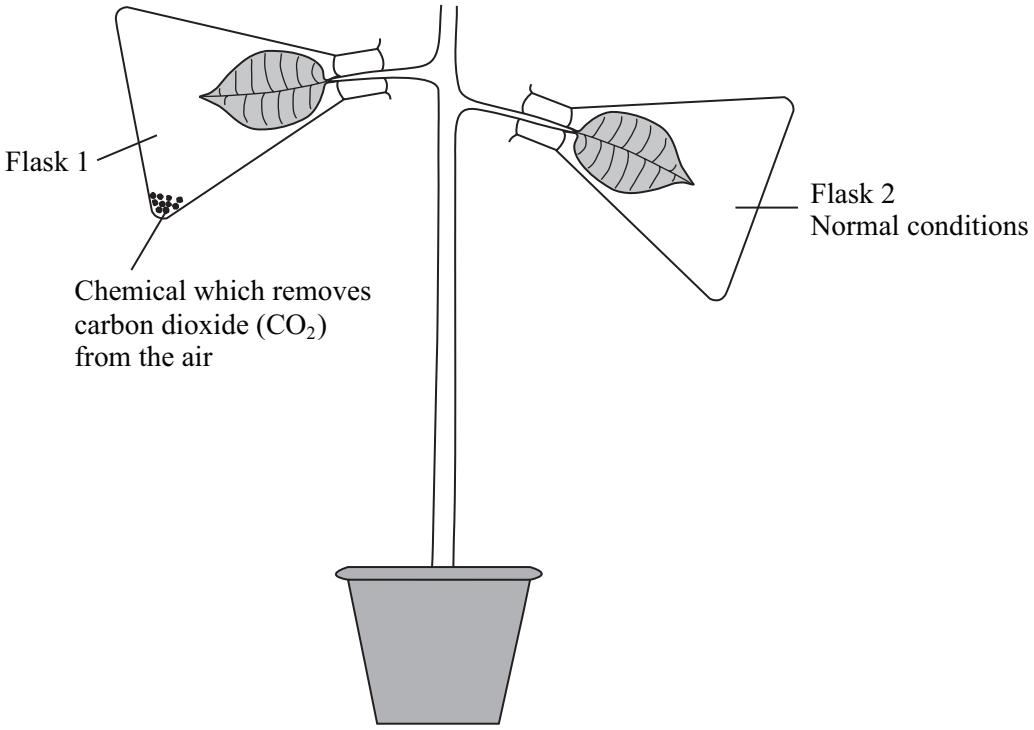
For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
Total Marks	

Examiner Only	
Marks	Remark

1 **(a)** The diagram shows the apparatus used to investigate if carbon dioxide is needed for photosynthesis.

The plant was destarched and then the leaves were sealed in glass flasks.

The plant was then left in sunlight for 12 hours.



(i) How was the plant destarched?

_____ [1]

(ii) Name the chemical used, in the starch test, to remove chlorophyll from the leaves.

_____ [1]

(iii) A starch test was carried out on each leaf.

Describe the colour you would expect to obtain at the end of the starch test in the

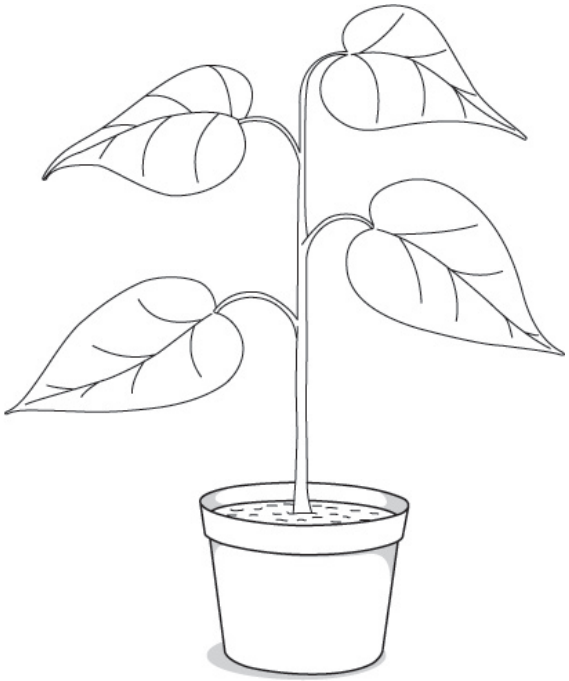
leaf from flask 1 _____

leaf from flask 2 _____ [2]

(b) Another experiment was carried out on a tomato plant to investigate where sugar was transported to after it was made in the plant leaves. The results are shown below.

Part of tomato plant	Percentage of the sugar transported to each part of the plant
Roots	52
Stem	45
Youngest leaf	2
2nd youngest leaf	1

(i) Draw an arrow to show the direction in which **most** sugar was transported in the plant. [1]



(ii) Name the type of cells through which sugars are transported.

_____ [1]

Examiner Only

Marks	Remark

(iii) Give three ways sugars, made by photosynthesis, are used by plants.

1. _____

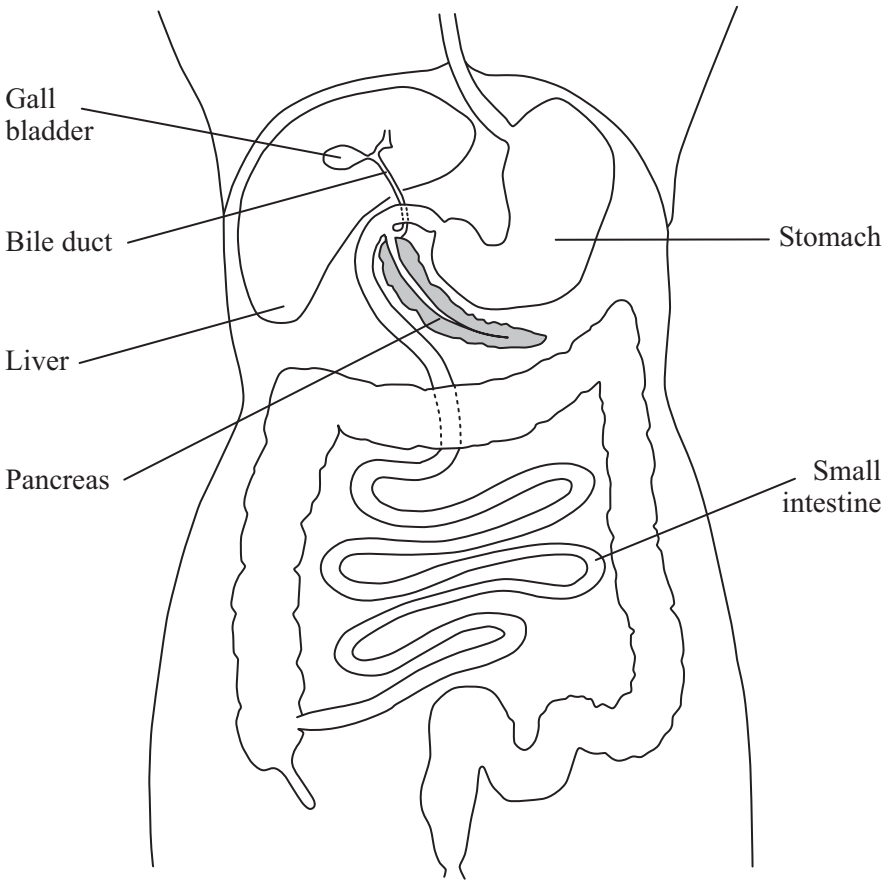
2. _____

3. _____ [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** The diagram shows the liver and associated organs.



(i) The gall bladder passes bile down the bile duct to the small intestine. Give **one** function of bile.

_____

_____ [1]

(ii) Name the enzyme that breaks down fats after bile has acted on them.

_____ [1]

(b) Proteins are digested to amino acids in the small intestine.

(i) Name the process by which amino acids pass into the blood in the small intestine.

_____ [1]

(ii) Name the blood vessel that transports amino acids from the small intestine to the liver.

_____ [1]

(iii) Describe how amino acids are used by cells.

_____

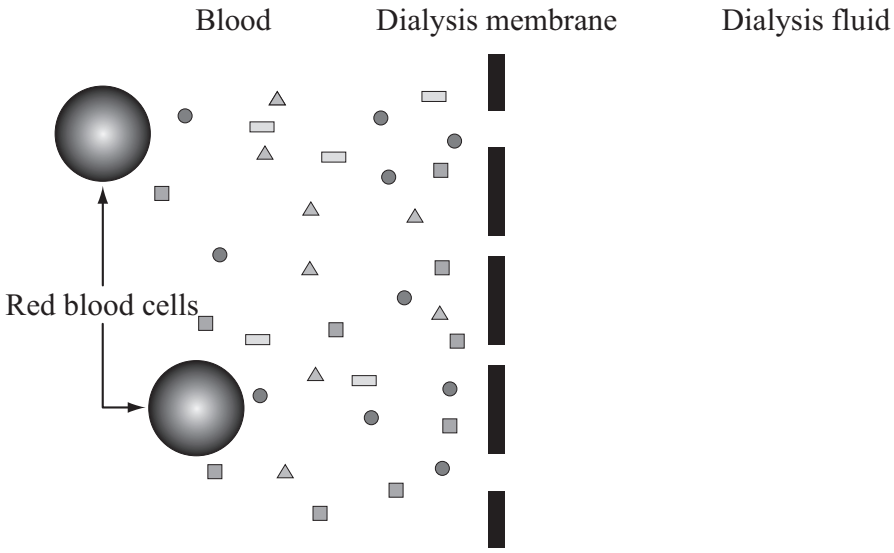
_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(c) Excess amino acids are broken down to urea by the liver and then transported to the kidneys. Anne's kidneys failed and so she had to undergo dialysis.

The diagram shows the composition of Anne's blood as it enters the dialysis machine.



(i) Complete the table to show whether each of the components listed is present in the **dialysis fluid at the start** of dialysis. Place a tick (✓) if the component is present or a cross (✗) if it is absent. The first one has been completed for you.

Component in Anne's blood	Present or absent in dialysis fluid at the start of dialysis
Salts	✓
Water	
Urea	
Glucose	
Red blood cells	

[4]

(ii) At the end of dialysis how would you expect the composition of the dialysis fluid to have changed?

_____ [1]

(iii) Why does the dialysis fluid need to be changed regularly?

_____

_____ [1]

(d) (i) The liver and insulin regulate blood glucose levels.

Describe how this regulation occurs after eating a meal with a high glucose content.

You will be assessed on the quality of written communication in this question.

_____

_____

_____

_____ [3]

Quality of written communication [2]

(ii) Name the condition people suffer from if they cannot regulate their blood glucose levels.

_____ [1]

Examiner Only	
Marks	Remark

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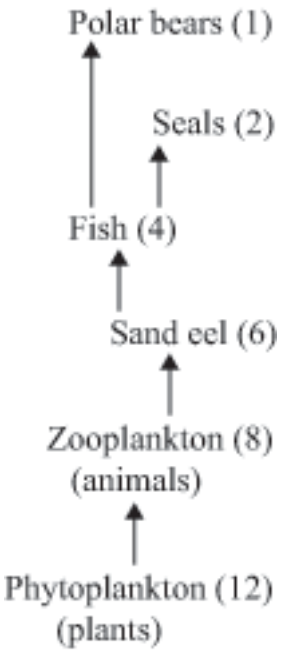
(Questions continue overleaf)

3 **(a)** The diagram shows a food web for an island in the Arctic.

Examiner Only	
Marks	Remark



Examiner Only	
Marks	Remark

(i) Name the energy source for this food web. _____ [1]

(ii) Use the food web to name

a primary consumer _____

a secondary consumer _____ [2]

(iii) Use the food web to give a food chain with **only** five types of organisms. [3]

_____ → _____ → _____ → _____ _____

(iv) Explain why the phytoplankton (plants) are called producers.

_____

_____ [2]

(v) Suggest why the numbers of zooplankton may decrease during winter.

_____

_____ [2]

(vi) On the grid draw a pyramid of numbers for your food chain in (**iii**).
Use the numbers of organisms shown in the food web.
Beside each level write the name of the organism.

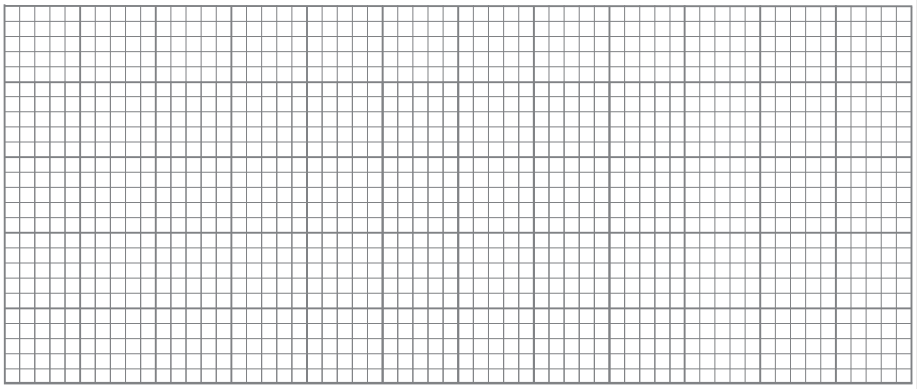
_____

_____

_____

_____

_____

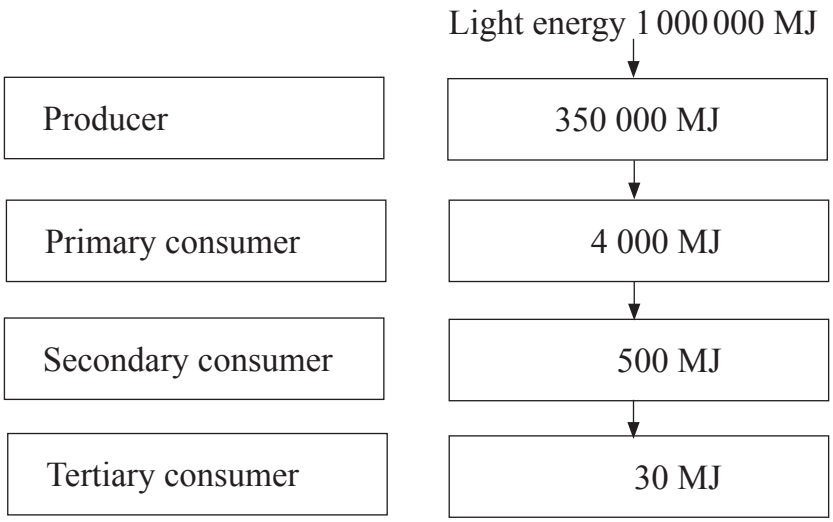


[5]

(vii) Explain why it is an advantage to the polar bear to have more than one food source.

_____ [1]

(b) The diagram shows the transfer of energy from one trophic level to the next. Energy is lost between trophic levels.



(i) What percentage of the energy available to primary consumers is transferred to secondary consumers? Show your working.

_____ % [2]

(ii) Give **two** ways that energy is lost between trophic levels.

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

(c) A scientist wanted to estimate the size of population of fish in a lake. He captured a first sample containing 112 fish from the lake and put a mark on the fin of each one. He released these fish back into the lake. One week later he captured a second sample which contained 140 fish, 16 of which were marked and 124 unmarked.

The formula used to estimate the size of a population is given below.

$$\text{Population} = \frac{\text{Total number of fish in the first sample} \times \text{Total number of fish in the second sample}}{\text{Number of marked fish in the second sample}}$$

(i) Calculate the size of the fish population using the formula given. Show your working.

Answer _____ [2]

(ii) Suggest **two** reasons why the fish population in a lake may decrease.

1. _____

2. _____ [2]

(iii) Why is it more difficult to estimate fish populations in the sea rather than in a lake?

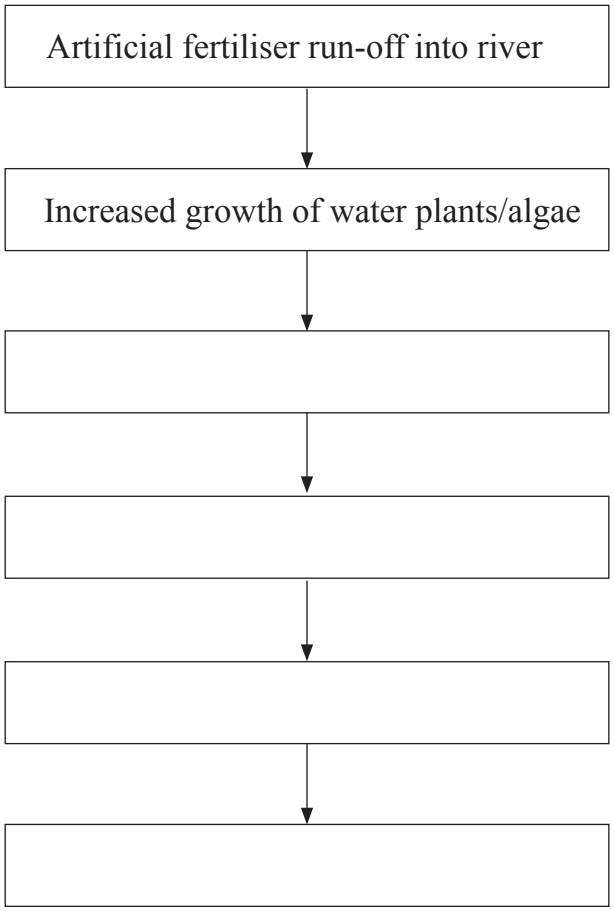
_____ [1]

(iv) Give **one** reason why it is important to monitor fish populations in the sea.

_____ [1]

Examiner Only	
Marks	Remark

4 **(a)** The flow diagram shows the effects of artificial fertiliser run-off in rivers.



(i) Complete the missing boxes to show the stages in this process. [4]

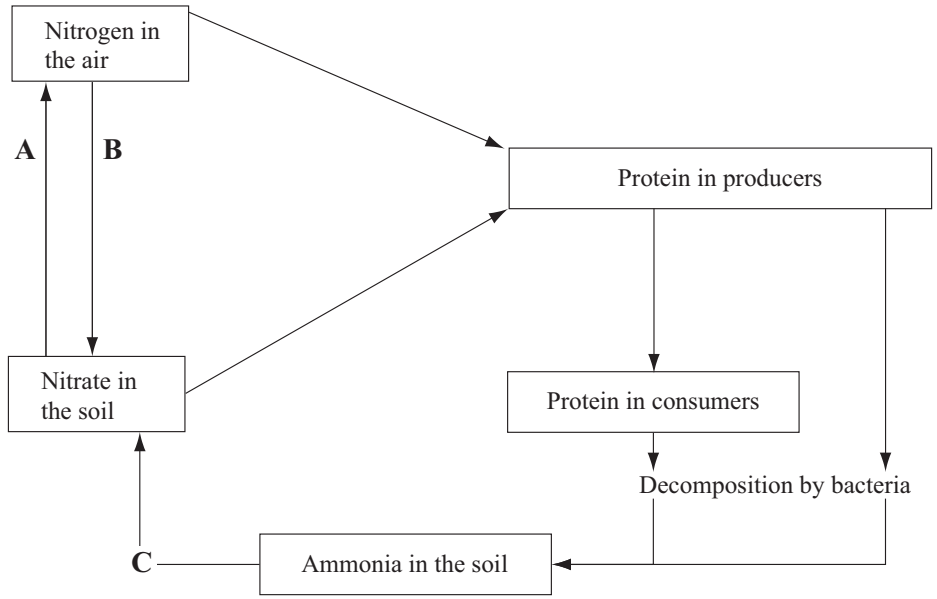
(ii) Name **one** other substance that could cause the same effect if it entered a river.

_____ [1]

(iii) Explain how hot water from cooling processes can lead to the death of fish if added to a river.

_____ [1]

(b) The diagram shows the nitrogen cycle. A, B and C are processes carried out by bacteria.



Use the diagram and your knowledge to answer the following questions.

(i) Bacteria are decomposers. Name another type of decomposer.

_____ [1]

(ii) Name the types of bacteria that carry out the following processes.

A _____

B _____

C _____ [3]

(iii) If a farmer is growing a crop, which of these types of bacteria is not helpful?

_____ [1]

(iv) Planting clover increases the number of type B bacteria as these bacteria are found in swellings in clover roots. Suggest the benefit to the soil of planting clover.

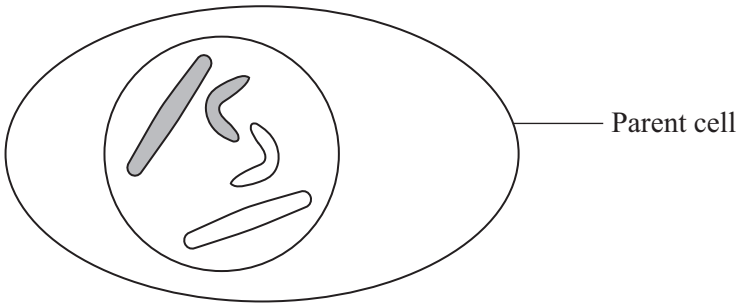
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

5 **(a)** **(i)** The diagram shows an example of a particular type of cell. This type of cell divides to produce gametes. Complete the diagram to show the result of such cell division.



[3]

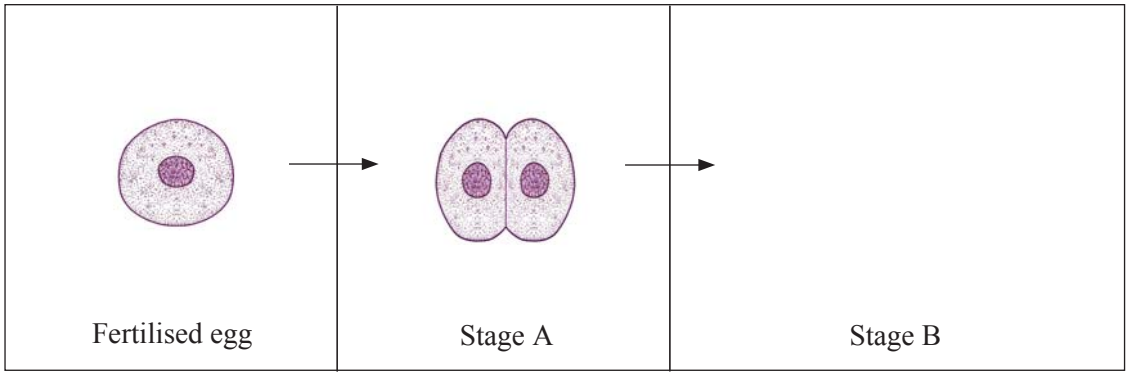
(ii) Name the type of cell division that produces gametes.

_____ [1]

(iii) The parent cell has a diploid number of chromosomes. What term describes the number of chromosomes in the gamete?

_____ [1]

(b) The diagrams show some stages in the development of an egg after fertilisation.

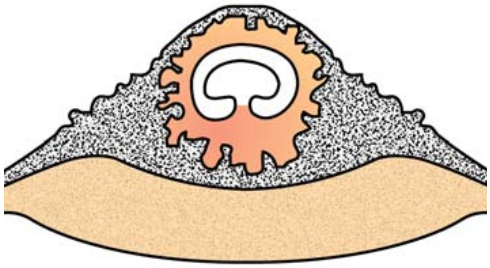


(i) Describe what has happened to the fertilised egg to produce the result at stage A.

_____ [1]

(ii) Complete the diagram at stage B to show what happens next. [2]

A later stage of development is shown in the diagram below.



(iii) Describe what has happened to reach this stage.

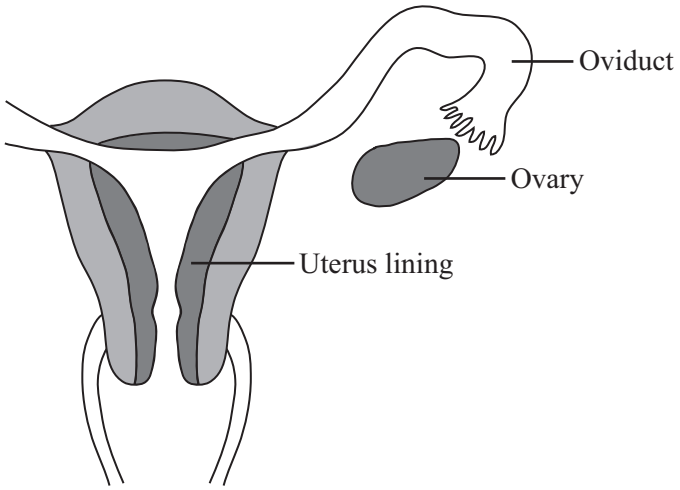
_____

_____ [1]

Examiner Only

Marks	Remark

(c) The diagram shows part of the female reproductive system.



(i) On the diagram mark with an **X** where the process of fertilisation occurs. [1]

(ii) Mark on the diagram with an **I** where implantation will occur. [1]

(iii) Following implantation the placenta develops.

Give two functions of the placenta.

1. _____

2. _____ [2]

Describe one way in which the placenta is adapted for its role.

_____ [1]

(iv) Name the structure that protects the developing baby.

_____ [1]

(v) Name the disease that teenagers are vaccinated against to help protect the developing baby.

_____ [1]

Examiner Only

Marks	Remark

(d) Other diseases such as gonorrhoea are sexually transmitted.

Examiner Only	
Marks	Remark

(i) Name the type of organism that causes gonorrhoea.

_____ [1]

(ii) The incubation period between getting infected with the disease and showing symptoms can be up to 14 days. How might this lead to the spread of the disease?

_____ [1]

(iii) What is the treatment for this disease? _____ [1]

(iv) Name one other sexually transmitted disease.

_____ [1]

Examiner Only	
Marks	Remark

6 Pea plants can produce peas that are wrinkled or smooth.

The gene (allele) for wrinkled is dominant to the gene (allele) for smoothness.

Let R represent the gene (allele) for wrinkled peas.
Let r represent the gene (allele) for smooth peas.

(a) A plant breeder crossed two heterozygous pea plants.

(i) Use a Punnett square to show the possible genotypes of the offspring of this cross.

[3]

(ii) Give the phenotypes of the offspring and the ratio of the phenotypes.

Phenotypes _____ and _____

Ratio _____ [2]

(b) The breeder had a pea plant that produced wrinkled peas but he did not know its genotype.

Examiner Only

Marks	Remark

(i) Use Punnett squares to show the backcrosses (text crosses) that he used to determine the genotype of this pea plant.

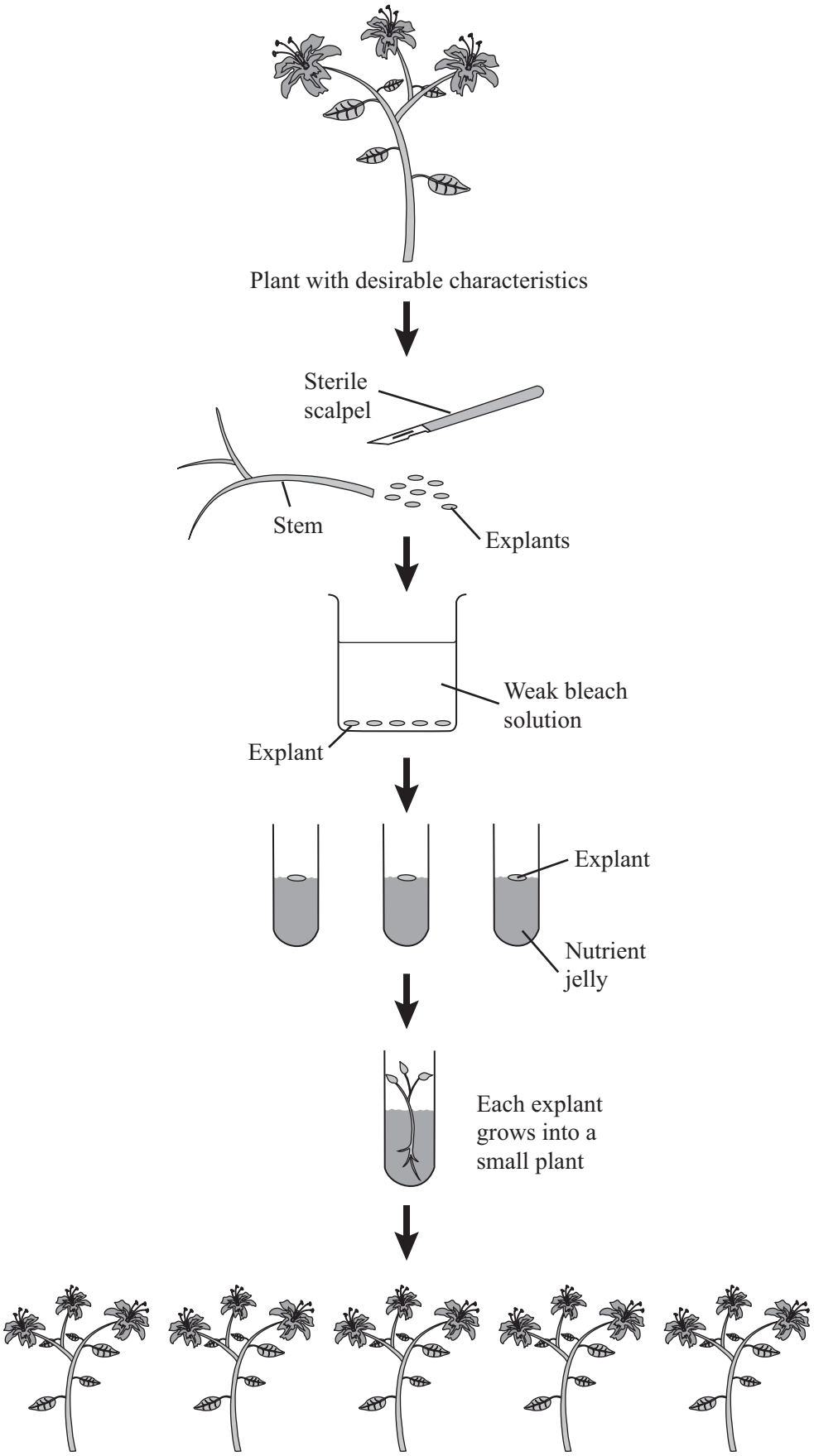
[3]

(ii) If any smooth offspring are produced what does this tell you about the genotype of the parent pea plant?

_____ [1]

Examiner Only	
Marks	Remark

(c) The diagram shows how plants can be produced by the process of tissue culture.



(i) When choosing a plant for tissue culture suggest two desirable characteristics that the plant might have.

1. _____

2. _____ [2]

(ii) Explain why tissue culture is an example of artificial selection.

_____ [1]

(iii) Suggest an advantage of using tissue culture to produce plants commercially.

_____ [1]

(iv) Why do the following minerals need to be added to the nutrient jelly?

Magnesium _____

Calcium _____ [2]

(v) Suggest why the explants are placed in a weak bleach solution.

_____ [1]

(vi) Give **two** environmental conditions that would need to be controlled to produce plants by tissue culture.

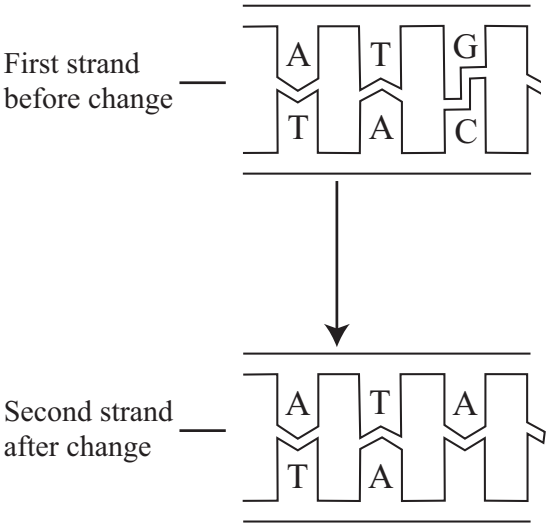
1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

(d) The diagram shows a section of DNA before and after a change in the DNA structure.



(i) If the G on the 1st strand changes to an A, complete the 2nd strand on the 2nd diagram to show the end result. [1]

(ii) What is a change in the DNA structure called?

_____ [1]

(iii) What type of molecule does DNA code for?

_____ [1]

(iv) What effect may this change in DNA have on the molecule it codes for?

_____ [1]

(v) What approach did Watson and Crick take that led them to the discovery of the structure of DNA?

_____ [1]

(vi) What term is used to describe the structure of DNA?

_____ [2]

THIS IS THE END OF THE QUESTION PAPER

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