CCEA GCSE SCIENCE: DOUBLE AWARD (MODULAR)

SCIENCE



EXAM QUESTION PACK

PAPER 1 HIGHER TIER G8204 PAPERS

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Rewarding Learning

General Certificate of Secondary Education
2012

Science: Double Award (Modular)

Paper 1
Higher Tier

[G8204]

WEDNESDAY 30 MAY, AFTERNOON

MARK SCHEME

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				AVAILABLE MARKS
1	(a)	(i)	to destarch it/so that any starch present at the end was made during the experiment; [1]	
		(ii)	to kill the leaf/stop chemical reactions; (boil in) alcohol/ethanol; [2]	
		(iii)	turn off Bunsen burner/use an electric water-bath; [1]	
		(iv)	blue/black [1]	
	(b)	(i)	heat /temperature; [1] ***not*** *humidity/light*	
		(ii)	higher yield/more tomatoes/bigger plants/bigger harvest/more tomatoes; [1]	
	(c)	(i)	the shape doesn't match/it fits it/enzyme is specific/lock and key/ specificity/substrate is specific/enzyme specific; [1]	
		(ii)	more than two glucose molecules; joined together; [2]	
		(iii)	shape of enzyme/active site is changed by heat/denatured/ enzyme changed shape; [1]	
	(d)		Any **two** (adaptation with corresponding explanation) from: Adaptation – microvilli/large surface area; Explanation – increased absorption area/for quicker/more absorption; ***not*** *easier* Adaptation – lots of them; Explanation – more absorption/quicker absorption/more absorption; **or** Adaptation – thin epithelium/one cell thick/thin walls; Explanation – short diffusion distance; **or** Adaptation – permeable or semi-permeable; Explanation – to allow molecules to pass across; **or** Adaptation – good blood supply/blood supply close to the wall; Explanation – main diffusion/concentration gradient/quick distribution around body; **or** Adaptation – villi can move/muscle in villi; Explanation – to allow more glucose/products of digestion to come in contact; **or** Adaptation – lacteal; Explanation – to allow absorption of fats/fatty acids and glycerol; [4]	
	(e)	(i)	hepatic portal vein; [1] insulin; [1] glycogen; [1] urea: [1]	
		(ii)	removed because it is toxic/harmful/poisonous removed by kidney; [2]	21

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				AVAILABLE MARKS
2	**(a)**	**(i)**	sun/sunlight; ***not*** *light on its own* [1]	
		(ii)	vegetation ⟶ beetle ⟶ centipede ⟶ toad ⟶ fox correct food chain (all organisms in correct order); *must contain fox* arrows in the correct direction from the plant; [2]	
		(iii)	vegetation at bottom and largest; fox is the smallest and the top; shape symmetrical and in order; [3]	
		(iv)	fox [1]	
		(v)	more toads eaten by foxes; fewer rabbits available to foxes/kestrel/stoats eat more rabbits/more competition for rabbits/stoats have less voles to eat so more toads eaten by foxes; [2]	
	(b)	**(i)**	850 – (85 + 300 + 250) = 850 – 635 = 215 kJ; [2] [1] *for correct working if final answer is wrong*	
		(ii)	85 kJ; [1]	
	(c)	**(i)**	1972–1999; [1]	
		(ii)	more fish are being removed (caught) than are replaced (born)/ reproduced; [1]	
		(iii)	Any **four** from: • quotas • use large mesh size • set up sanctuaries/breeding areas/nursery areas/seasons/no fishing zones • decommission boats/selling boats • licences • smaller nets [4]	
		(iv)	(see graph) 80 000 – 50 000; divided by 3 = 10 000; [2] 10 000 on own = [2]	
		(v)	14 years (220 000) – 80 000; ÷ 10 000); [2] 140 000 *consequential marking applies from* **(iv)**	22

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				AVAILABLE MARKS
3	**(a)**	**(i)**	minerals run-off (via drainage ditch)/slurry run-off/run-off of fertiliser/ leaching/organic waste/septic tank/septic tank contents/sewage from farm/sewage; [1]	
		(ii)	Any **five** from: • increase in growth of algae/algae bloom • algae block out light from the other underwater; they can't photosynthesise • algae and plants **die** • bacteria start to **decay** algae and plants (decompose/breakdown) • **bacteria** respire and **use up oxygen** • fish and other animal life die [5]	
	(b)	**(i)**	quadrat [1]	
		(ii)	Any **four** from: identify plant species; estimate percentage cover; calculate average/record; and repeat several times for reliability in one area; repeat in the other area; [4] *if use co-ordinates/line transect/belt transect/throw/random numbers* Quality of written communication [2]	
		(iii)	e.g. temperature; thermometer; sun/light; light meter/LDR; pH; pH meter; rain/rainfall; rain gauge/measuring cylinder; wind; anemometer; soil moisture; moisture meter – or oven described; humidity; hygrometer; (Any **two** pairs) [4]	
	(c)	**(i)**	Type of bacteria – nitrogen fixing; Source of nitrogen – nitrogen (in the air); **or** Type of bacteria – nitrifying bacteria; Source of nitrogen – ammonia; [2]	
		(ii)	denitrifying (bacteria); [1]	
	(d)		spread slurry/brown manure/plough the plants back into the ground/green manure/plant legumes/don't harvest crop or leave plants/ aeration/ploughing but only with increasing nitrogen fixing bacteria or process nitrifying bacteria [1]	
	(e)		active transport/uptake; [1]	22

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				AVAILABLE MARKS
4	(a)	(i)	vagina/cervix; [1]	
		(ii)	fertilisation; in oviducts/Fallopian tubes; [2]	
		(iii)	implantation; [1]	
		(iv)	placenta/umbilical cord; [1]	
		(v)	oxygen/glucose/vitamins/minerals/hormones/amino acids/alcohol/drugs/carbon monoxide/iron/calcium/water/antibodies/proteins/microbes or named/viruses (Any **two**) [2]	
		(vi)	anywhere on the uterus wall or lining/neck of uterus dilates/waters break; [1]	
		(vii)	cervix dilates/ruptures/amniotic membrane/mucus plug comes away/afterbirth comes away/cervix opens/placenta comes out; [1]	
	(b)	(i)	condom; diaphragm; [2]	
		(ii)	condom; [1]	
		(iii)	gonorrhoea/syphilis/chlamydia; [1]	
	(c)	(i)	engulf/surround/absorb/takes in/ingest; digest/breakdown/dissolve; [2] *if in wrong order then* [1] *max.*	
		(ii)	production of antibodies/active immunity/vaccination if correctly described [1]	16

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					AVAILABLE MARKS
5	**(a)**	**(i)**	GG and Gg;	[2]	
		(ii)	Gg and Gg parents; Punnett; 1 cross correct; 1 circle around gg;	[4]	
		(iii)	two Punnett squares; both cross with gg (for 2nd mark);	[2]	
		(iv)	Any offspring white (know gold parent was heterozygous)/if no white offspring it is not heterozygous (Gg);	[1]	
	(b)	**(i)**	camouflaged/hiding/blend in; easier to hunt/easier to escape predator to reproduce;	[2]	
		(ii)	(survival to) breed/reproduce; pass on allele for gold colour; pass on genes **or** converse for white lions	[2]	
	(c)	**(i)**	isolate human **gene**/DNA that codes for insulin; remove the plasmid (from bacterium)/ring of DNA; cut plasmid (open); join plasmid and human **gene**; put (it) back into the bacterium;	[5]	
		(ii)	place in a fermenter/bioreactor/tank; bacteria multiply/reproduce/divide/mitosis; **or** bacteria multiply; separation/purification/extraction/harvested;	[2]	
	(d)	**(i)**	T; *on left* A; *on right* *if A and T in wrong order then* [1]	[2]	
		(ii)	double; helix;	[2]	
		(iii)	protein/polypeptide/dipeptide;	[1]	
		(iv)	**X-ray** (diffraction/crystallography); Wilkins/Franklin; 3D structure/**model**; Watson/Crick; complementary **base pairs**; Chargaff; (Any **two**)	[4]	29
				Total	**110**

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011

Science: Double Award (Modular)

Paper 1
Higher Tier

[G8204]

G8204

THURSDAY 19 MAY, AFTERNOON

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 five** questions.

INFORMATION FOR CANDIDATES

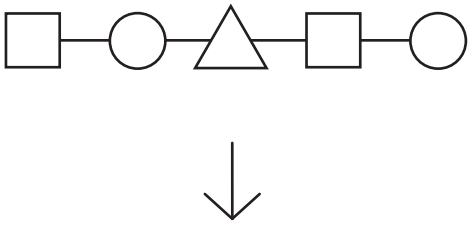
The total mark for this paper is 110.
Quality of written communication will be assessed in question **3(c)(ii)**.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Details of calculations should be shown.
Units must be stated in numerical answers where appropriate.

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

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Examiner Only	
Marks	Remark

1 **(a)** The diagram shows how amino acids link together to form a protein molecule.



(i) Complete the diagram above to show what happens to this protein molecule during digestion in the stomach and small intestine. [2]

(ii) The amino acids will then be absorbed into the blood. Name the process involved.

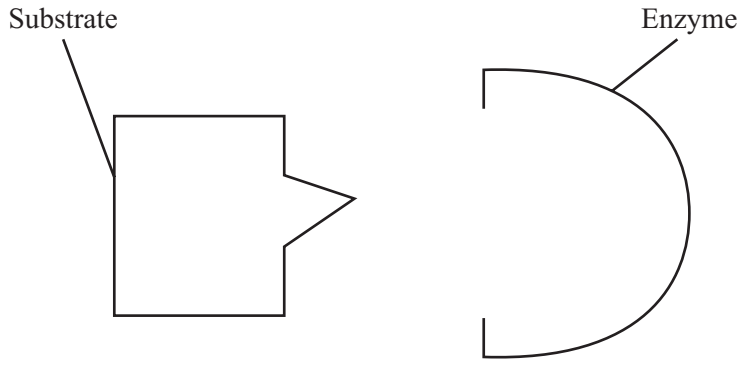
_____ [1]

(iii) Give **two** ways the small intestine is adapted for the process of absorption.

1. _____

2. _____ [2]

(b) The diagram shows the shape of a substrate molecule and part of an enzyme molecule.



(i) Complete the diagram of the enzyme molecule that would break down this substrate molecule. [1]

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(ii) Explain why this enzyme molecule would not break down a different substrate molecule.

_____ [1]

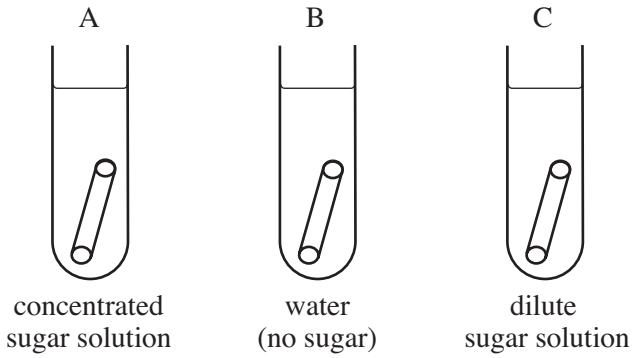
(iii) Why does increasing temperature from 20 °C to 30 °C increase the rate of an enzyme-catalysed reaction?

_____ [1]

Examiner Only	
Marks	Remark

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(c) An investigation into osmosis was carried out with potato cylinders. Three test tubes A, B and C were set up, each with a potato cylinder of 50 mm length and a different concentration of sugar solution. The potato cylinders were left for several hours, removed and their final length recorded. The results are given in the table.



Test tube	Solution	Length of potato cylinder at the start/mm	Length of potato cylinder at the end/mm
A	Concentrated sugar solution	50	48
B	Water (no sugar)	50	53
C	Dilute sugar solution	50	50

(i) Why was it **not** necessary to work out the percentage change in length in this experiment?

_____

_____ [1]

(ii) Give **one** factor that should have been kept constant in this experiment.

_____ [1]

(iii) Explain the results for the potato cylinder in test tube A.

_____

_____ [2]

Examiner Only

Marks	Remark

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(iv) Draw a diagram of one potato **cell** from the potato cylinder in test tube A as it would appear at the end of the investigation.

Label the cell membrane, cell wall and vacuole on your diagram.

[4]

(v) Suggest what would happen if red blood cells are placed in water. Explain your answer.

_____

_____ [2]

(d) (i) Name the process in plant root hair cells that involves the transport of minerals from the soil.

_____ [1]

(ii) Explain why energy is needed for this process.

_____ [1]

(iii) Waterlogged soil contains little oxygen. Explain how the uptake of minerals is affected if the plant is grown in waterlogged soil.

_____

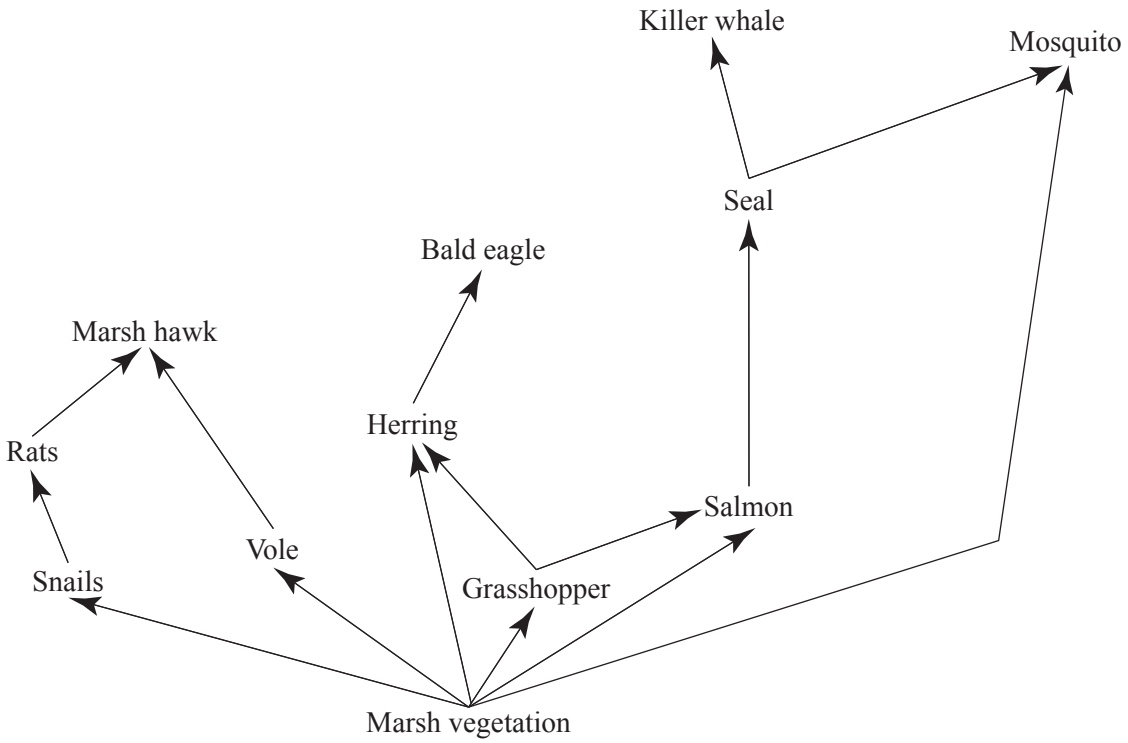
_____ [2]

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Examiner Only	
Marks	Remark

2 **(a)** The diagram shows a food web.



http://www.acklamgrange.org.uk/science/topics/food_web3.jpg

(i) What is the source of energy for this food web?

_____ [1]

(ii) At what two trophic levels is the herring feeding?

_____ and _____ [1]

(iii) Draw the food chain from the food web where the bald eagle is acting as a tertiary consumer.

[2]

(iv) Suggest why the population of salmon might increase if the herring population was wiped out by overfishing.

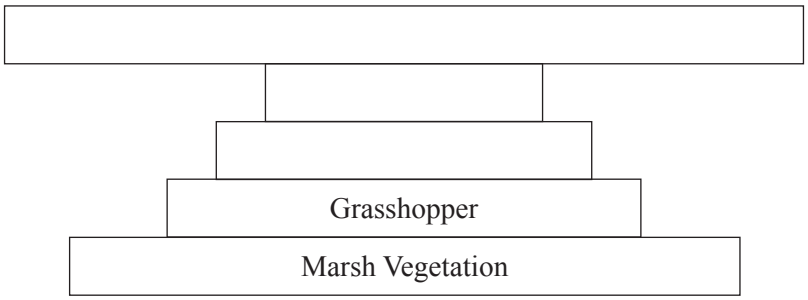
_____ [1]

(v) Explain why the marsh hawk would gain more energy from eating voles than from eating rats.

_____

_____ [2]

A pyramid of numbers for one of the food chains in the food web is shown below.



(vi) Complete the labels on the pyramid with the correct name of the organisms in the food chain. [2]

(vii) On the grid, draw a pyramid of biomass from the pyramid of numbers above.

Beside each level write the name of the organism.

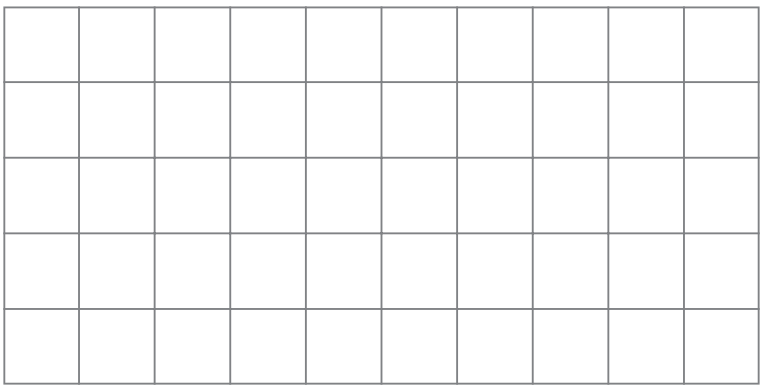
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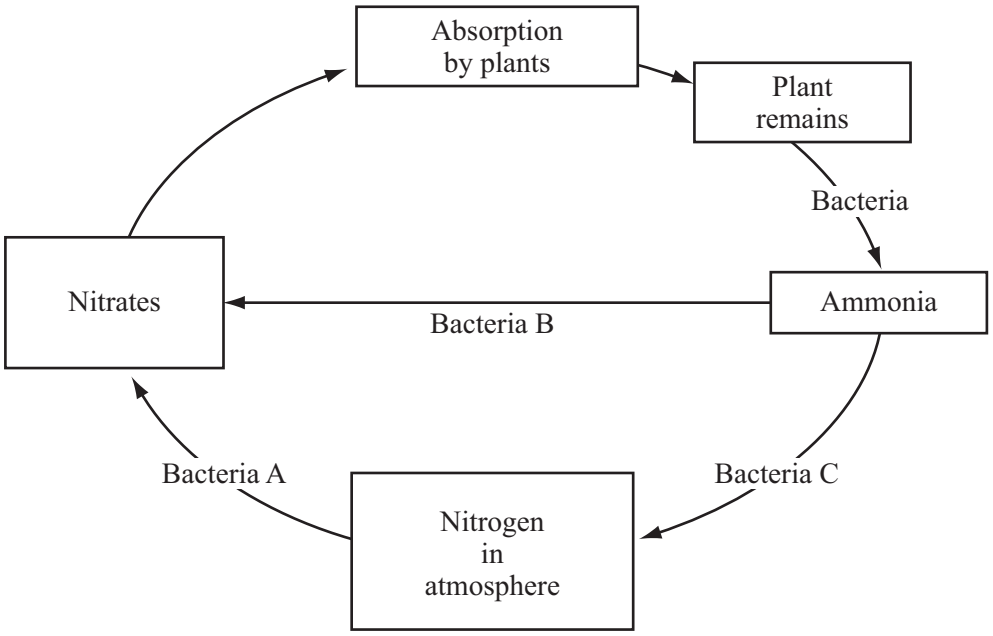
[4]

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Marks	Remark

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(b) The diagram shows part of the nitrogen cycle.



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

(i) Name the types of bacteria shown in the diagram.

Bacteria A _____

Bacteria B _____

Bacteria C _____ [3]

(ii) Explain why harvesting a crop causes a decrease in the nitrate content of the soil.

_____ [1]

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Marks	Remark

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(iii) Suggest and explain **two** methods, other than applying fertiliser, by which a farmer could increase the nitrate content of the soil.

Method 1 _____

Explanation _____

_____

Method 2 _____

Explanation _____

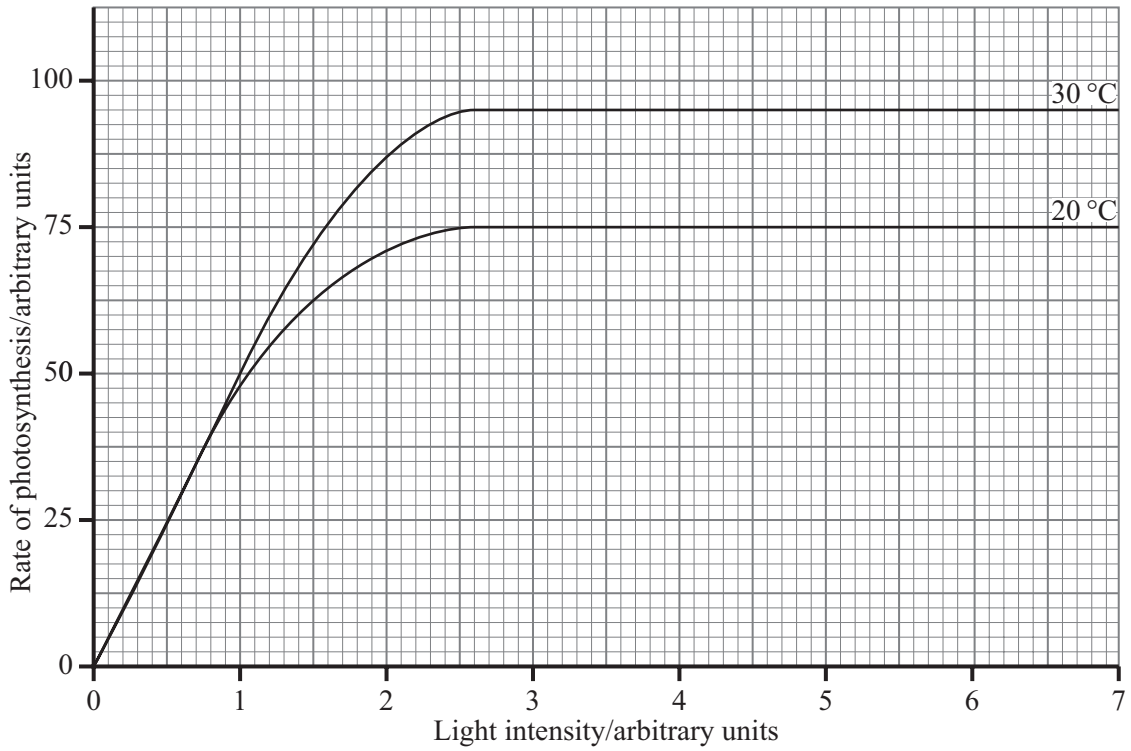
_____ [4]

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Marks	Remark

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Examiner Only	
Marks	Remark

3 **(a)** The graph shows the effect of light intensity on the rate of photosynthesis, at two different temperatures. The carbon dioxide concentration is 0.03% at both temperatures.



(i) Use the information in the graph and your knowledge to suggest the light intensity and temperature that a market gardener should have his greenhouse to maximise his profit. Explain your answer.

Light intensity _____ arbitary units

Temperature _____ °C

Explanation _____

_____

_____

_____

_____ [3]

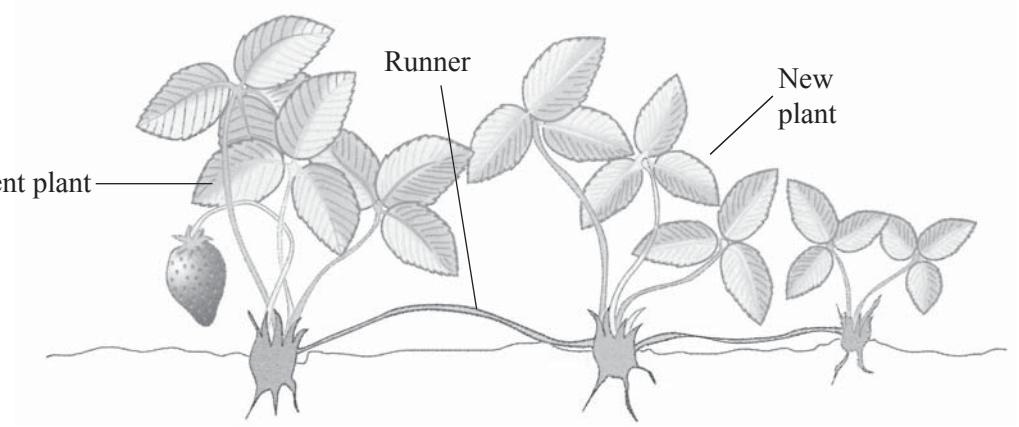
(ii) Explain why temperatures above 50 °C would be a problem when growing plants in a greenhouse.
Suggest how a grower might regulate temperatures in a greenhouse.

_____

_____ [2]

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(b) The diagram shows a strawberry plant with runners.



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(i) Name this type of reproduction.

_____ [1]

(ii) Give **one** disadvantage of this type of reproduction.

_____ [1]

(iii) If a grower had a strawberry plant that produced tasty fruit what **two other** methods could she use to increase her stock of this plant?

_____

_____ [2]

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Marks	Remark

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(c) The table below shows the mineral level (nitrates and phosphates) and depth of light penetration in an unpolluted lake, a polluted lake and Lough Neagh.

Lake	Mineral level/arbitrary units per litre	Depth of light penetration/m
Unpolluted	10–34	6
Polluted (eutrophic)	35–100	3
Lough Neagh	165	1.1

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Use the data in the table and your knowledge to answer the following questions.

(i) Compare the mineral level in Lough Neagh with the other lakes.

_____

_____ [1]

(ii) The minerals are used by the water plants for growth. Why is light only able to penetrate 1.1 m in Lough Neagh?
Explain how this can result in death of fish in the lough.

The quality of written communication will be assessed in this question.

_____

_____

_____

_____

_____

_____

_____

_____

_____ [5]

Quality of written communication [2]

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Marks	Remark

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(d) Organisms of the same species show variation and this allows natural selection.

(i) Suggest **one** adaptation a plant might possess that would enable it to survive better in low light intensity than other plants of the same species.

_____ [1]

(ii) How would this adaptation be passed on?

_____ [1]

(iii) Explain why an adaptation that does **not** give a plant an advantage may not be passed on.

_____

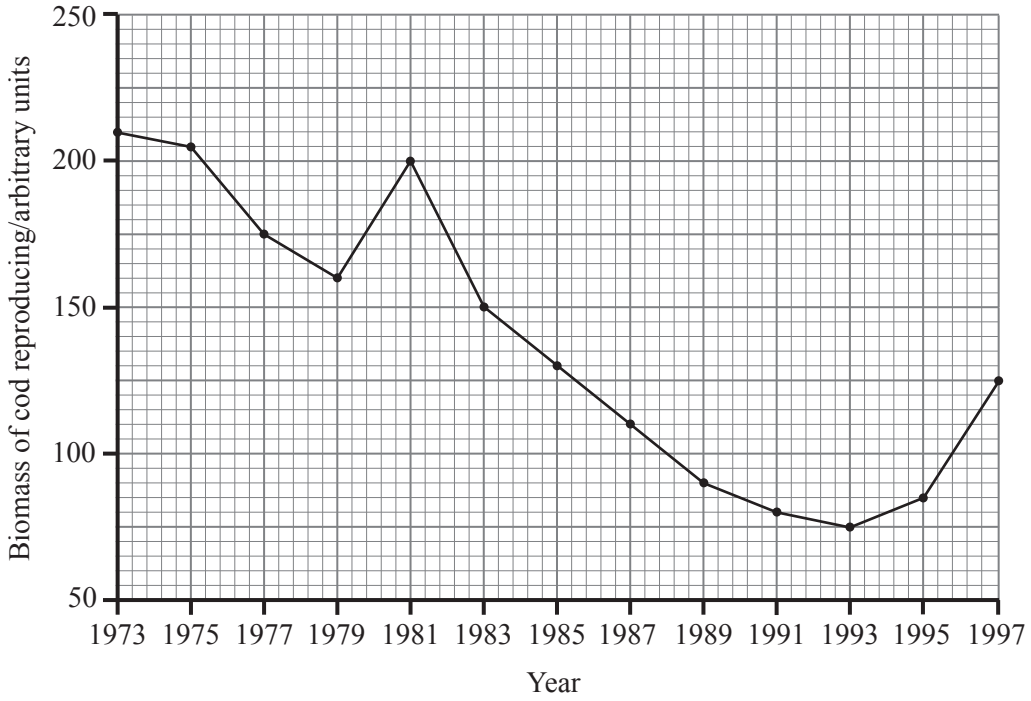
_____ [2]

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Marks	Remark

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Marks	Remark

(e) The graph shows the biomass of cod reproducing in the North Sea over a 24 year period.



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

(i) How many times greater was the biomass of cod reproducing in 1983 compared to 1993?

_____ times [2]

The biomass of cod reproducing in the North Sea started to rise in 1993 after the introduction of new regulations by the European Commission. One regulation made the fishing industry use increased mesh size in fishing nets.

(ii) Explain how this regulation helped to increase the biomass of cod reproducing.

_____

_____ [2]

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(iii) Suggest **two** other regulations that could have been imposed by the European Commission to help increase cod stocks.

1. _____

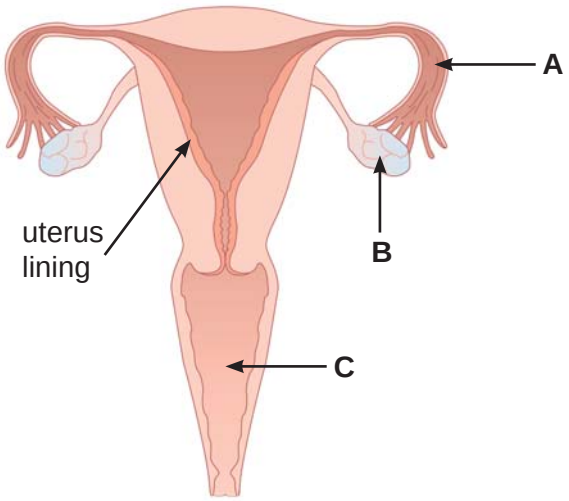
2. _____ [2]

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4 **(a)** The diagram shows part of the female reproductive system.



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(i) Name the parts A, B and C.

A _____

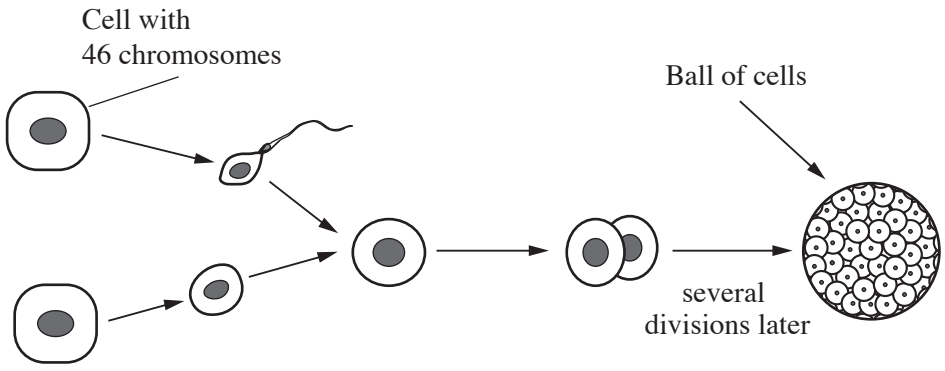
B _____

C _____ [3]

(ii) Give the function of organ B.

_____ [1]

(b) The diagram shows some of the stages of fertilisation and the early development of the embryo.



Stage 1 Stage 2 Stage 3

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(i) What type of cell division occurs at Stage 1 to produce eggs and sperm?

_____ [1]

(ii) Why must eggs and sperm be produced by this type of cell division?

_____ [1]

(iii) The process of fertilisation is shown in stage 2. Where in the female reproductive system does fertilisation take place?

_____ [1]

(iv) What type of cell division occurs at stage 3?

_____ [1]

(v) What must happen to the ball of cells before it can develop into a baby in the uterus?

_____ [1]

(vi) Describe the process of birth.

_____

_____

_____

_____

_____

_____ [3]

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Marks	Remark

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Marks	Remark

(c) A number of methods of contraception can be used to prevent pregnancy.

(i) Complete the table.

Method of contraception	Type of contraception	How pregnancy is prevented
Mechanical (barrier)	Condom	
Surgical		Prevents gametes from reaching the other gamete
	Contraceptive pill	Prevents egg from being released

[3]

(ii) Which method of contraception is permanent?

_____ [1]

(d) Gonorrhoea is a type of sexually transmitted infection which is caused by a bacterium.

(i) How is gonorrhoea treated?

_____ [1]

(ii) Name one other sexually transmitted infection and the type of micro-organism that causes it.

sexually transmitted infection _____

micro-organism _____ [2]

(iii) How may the spread of sexually transmitted infections be reduced?

_____ [1]

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5 **(a)** The colour of the spots in Dalmatian dogs is determined by a gene. The allele (gene) for black spots is dominant to the allele (gene) for brown spots.



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Let B represent the allele (gene) for black spots.
Let b represent the allele (gene) for brown spots.

A Dalmatian which is heterozygous for black spots is crossed with a Dalmatian with brown spots.

(i) Give the genotypes for this cross.

Heterozygous Black spotted Dalmatian	×	Brown spotted Dalmatian
_____		_____

[2]

(ii) Use a Punnett square to show the possible genotypes of the offspring.

[2]

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

Phenotypes _____ and _____

Ratio _____ [2]

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(b) A breeder purchases another black spotted Dalmatian. She carries out a back cross (test cross) to check the genotype of this Dalmatian.

All of the puppies in the litter had black spots.

Draw **one** Punnett square to show how **this** litter was produced.

[3]

(c) The hormone insulin regulates blood sugar levels in the body.

(i) Susan is not able to produce enough insulin. What condition does she suffer from?

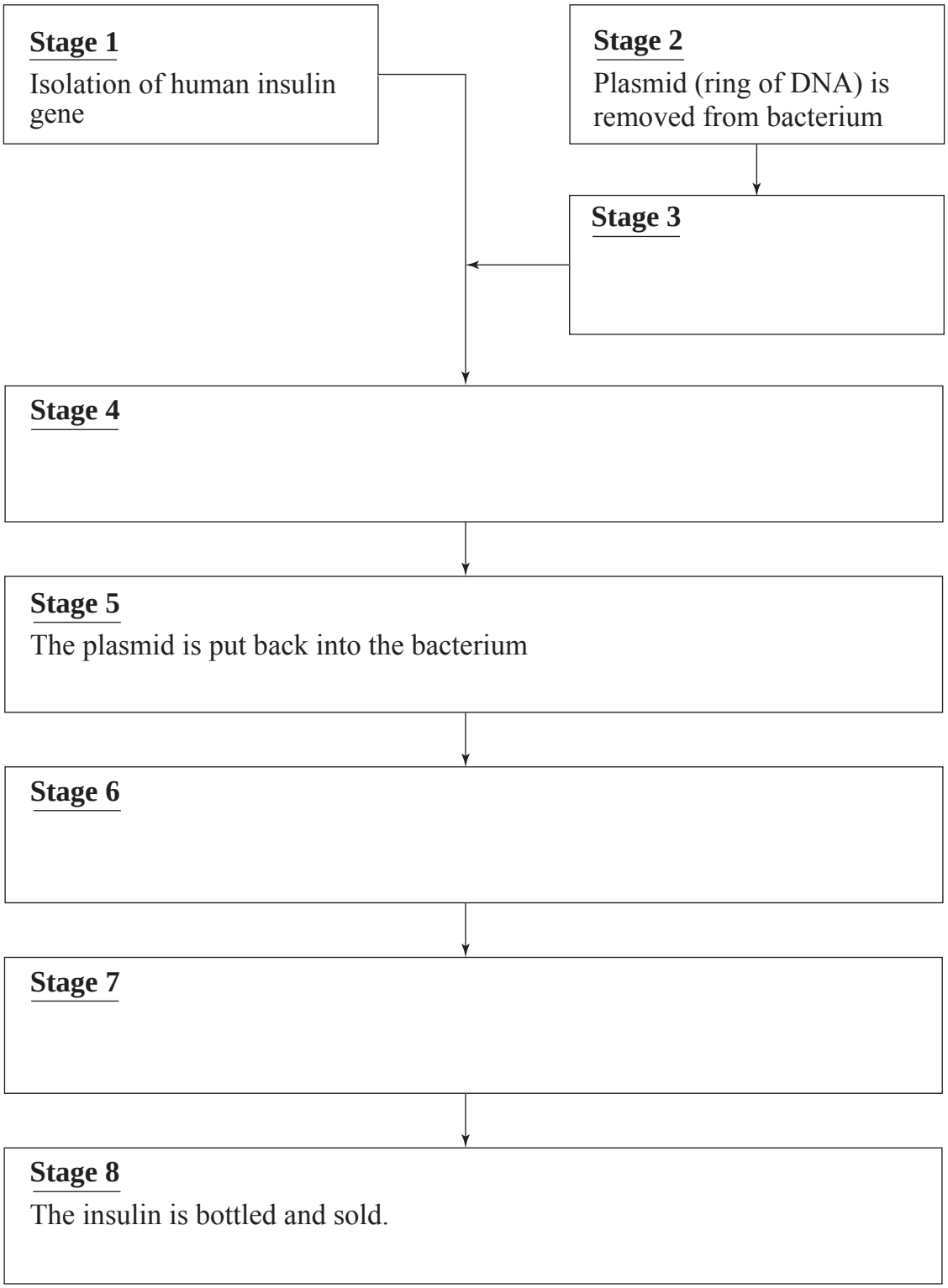
_____ [1]

(ii) How does insulin regulate blood sugar levels?

_____ [1]

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Marks	Remark

The flow diagram shows some stages in the production of human insulin by genetic engineering.



(iii) Complete the boxes for stages **3**, **4**, **6** and **7**. [4]

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Marks	Remark

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(iv) What type of molecule is the hormone insulin?

_____ [1]

(v) State **one** advantage of making human insulin using genetic engineering.

_____ [1]

(d) (i) Name the two scientists who initially used **x-ray diffraction** to work out the shape of DNA.

_____ and _____ [2]

(ii) This knowledge was then used by other scientists to build a 3D model of DNA. Circle the shape below which best shows the structure of DNA.



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[1]

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General Certificate of Secondary Education
2011

Science: Double Award (Modular)

Paper 1
Higher Tier

[G8204]

THURSDAY 19 MAY, AFTERNOON

MARK SCHEME

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				AVAILABLE MARKS
1	(a)	(i)	1st mark for separated molecules; 2nd mark 5 shapes as in diagram correct shapes [2]	
		(ii)	diffusion; [1]	
		(iii)	villi; large/surface area/one cell thick/; capillary network/good blood supply [2]	
	(b)	(i)	shape indented to match [1]	
		(ii)	shape doesn't fit or described/substrate specific/locks key [1]	
		(iii)	more kinetic energy/collisions quicker/more collisions [1]	
	(c)	(i)	all the same length *at the start* [1]	
		(ii)	temp/amount of drying/volume of solution/ same diameter of cylinder/same age type of potato [1]	
		(iii)	water left cell moved out/left cell; more water inside than outside the potato [2]	
		(iv)	Plasmolysed cell; cell wall = double line; 1 for each correct label [4]	
		(v)	explode/burst; no cell wall; water moves in; conc. gradient explained 1 mark – what happens 1 mark – why [2]	
	(d)	(i)	active uptake/transport [1]	
		(ii)	against a concentration gradient/from low to high conc. [1]	
		(iii)	less/reduced uptake/slow less *respiration* [2]	22

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					AVAILABLE MARKS
2	**(a)**	**(i)**	sunlight/sun/light	[1]	
		(ii)	2 and 3 (need both) or 2nd and 3rd	[1]	
		(iii)	marsh vegetation → grasshopper → herring → bald eagle (1 correct food chain, 1 arrows) → must have marsh veg. at start	[2]	
		(iv)	more grasshoppers to eat/more marsh vegetation/more food/ less competition for food	[1]	
		(v)	shorter food chain/described; less energy lost between trophic levels/ less trophic levels	[2]	
		(vi)	mosquito as top bar; salmon and seal;	[2]	
		(vii)	mosquito at top; mosquito smallest; symmetry + pyramid + steps; all labels correct in correct order and correctly labelled;	[4]	
	(b)	**(i)**	bacteria A: Nitrogen fixing bacteria B: Nitrifying bacteria C: Denitrifying	[3]	
		(ii)	nitrates have been used to make plant tissue grow/make protein/ plants not available for decomposition	[1]	
		(iii)	plough; aerates to reduce denitrifying/increase nitrifying/N fixing bacteria; Drain; aerates to reduce denitrifying/increase nitrifying/N fixing bacteria; Plant legumes; increase N fixing bacteria; Slurry/Manure = 1 mark Explanation needs to link	[4]	21
3	**(a)**	**(i)**	2.5 light intensity = 1 mark and 30 °C = 1 mark Highest light for least cost/any higher money is wasted;	[3]	
		(ii)	plants die/wilt/enzymes denature/too much water evaporates/ shading/open windows/blinds/use a thermostat/air conditioning	[2]	
	(b)	**(i)**	asexual/vegetative propagation	[1]	
		(ii)	no variation/all susceptible to disease	[1]	
		(iii)	take cuttings; cloning/grafting/tissue culture/micro propagation;	[2]	

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			AVAILABLE MARKS
(c)	**(i)**	Higher/v. polluted/nearly twice as much P as polluted lake/nearly 5 times P as unpolluted lake; [1]	
	(ii)	Algal bloom (prevents light penetration); plants under surface can't P/S; so die; bacteria decompose/eat these plants; use up O_2; less O_2 for fish [5] Quality of written communication – two biological statements [2]	
(d)	**(i)**	more leaves/more chloroplasts/more chlorophyll/taller/grow earlier/bigger leaves/larger surface area/different chlorophyll [1]	
	(ii)	in the genes/genetically [1]	
	(iii)	death would not survive; before reproduction [2]	
(e)	**(i)**	150/75 (1 mark) two (answer on own = 2 marks) [2]	
	(ii)	younger fish escape/not caught/smaller fish escape; /survive to reproduce/breed; [2]	
	(iii)	quotas; closed seasons; ban fishing; decommissioning of boats; sanctuaries/exclusion zones/nursery areas/breeding areas; [2]	27
4 **(a)**	**(i)**	A: oviduct/fallopian tube B: ovary C: vagina [3]	
	(ii)	production of eggs [1]	
(b)	**(i)**	Meiosis [1]	
	(ii)	so that they are haploid/to restore diploid no; [1]	
	(iii)	oviduct [1]	
	(iv)	Mitosis [1]	
	(v)	implant – into the lining of the womb/specialisation of cells [1]	
	(vi)	contractions of uterus; mucus plug comes away; waters break; cervix dilates; baby moves down birth canal; head first; umbilical cord is cut; afterbirth; (*any three* in correct order) [3]	

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				AVAILABLE MARKS
	(c)	**(i)**	condom; sperm does not meet egg/sperm unable to fertilise egg Vasectomy/sterilisation; Chemical; [3]	
		(ii)	vasectomy/surgical [1]	
	(d)	**(i)**	antibiotics [1]	
		(ii)	HIV/AIDS virus; syphilis; bacterium; chlamydia; bacterium; [2]	
		(iii)	Use condoms/abstinence/fewer sexual partners [1]	20
5	**(a)**	**(i)**	Bb; × bb in this order [2]	
		(ii)	Punnett square; Correct cross; [2]	
		(iii)	Phenotypes: Black (spots) brown (spots); Ratios: 1 : 1 ; [2]	
	(b)		correct gametes Bb; bb All offspring are heterozygous Bb [3]	
	(c)	**(i)**	Diabetes; [1]	
		(ii)	converts glucose to glycogen/increases the rate of respiration/ increases the uptake of glucose [1]	
		(iii)	Stage 3: the plasmid is cut open; Stage 4: the gene for insulin is inserted into the plasmid; Stage 6: the genetically engineered bacterium multiplies rapidly/ reproduces Stage 7: the hormone has to be extracted/bacteria filtered out/the hormone has to be purified/insulin removed [4]	
		(iv)	protein [1]	
		(v)	no side effects/cheaper/large scale production/quicker [1]	
	(d)	**(i)**	Franklin; Wilkins; [2]	
		(ii)	Double helix (centre diagram); [1]	20
			Total	**110**

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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	

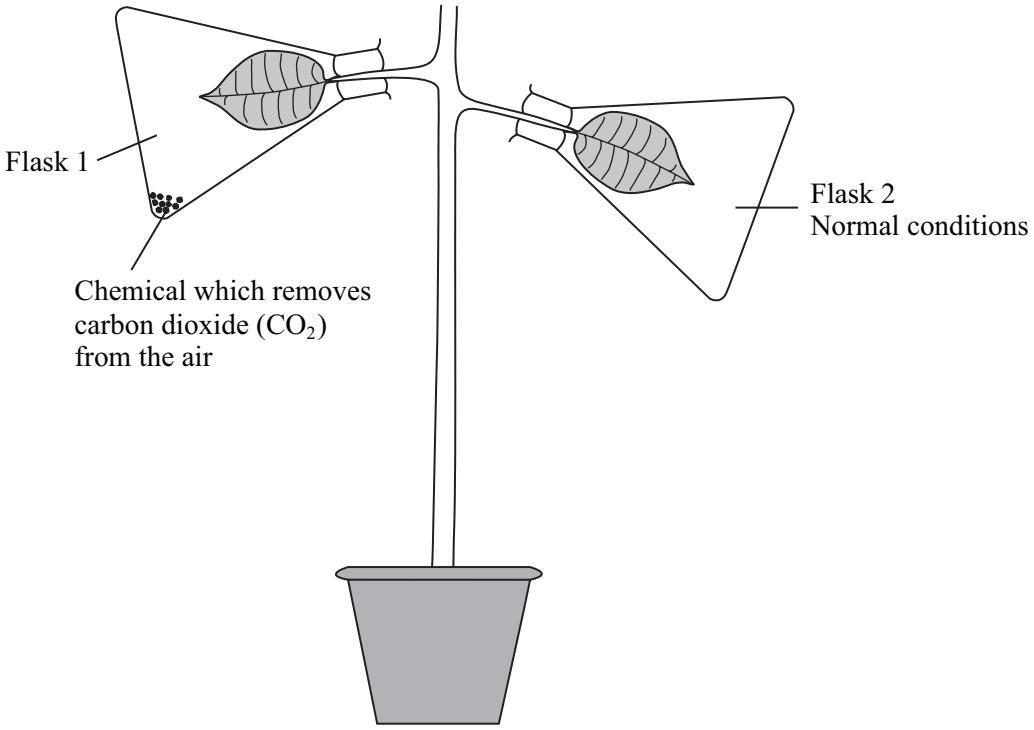
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Examiner Only	
Marks	Remark

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 _____

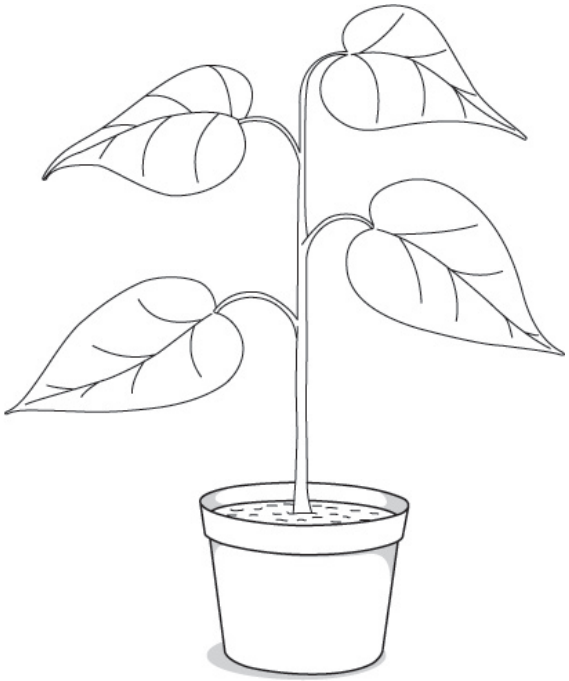
leaf from flask 2 _____ [2]

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(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]



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

_____ [1]

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Marks	Remark

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

1. _____

2. _____

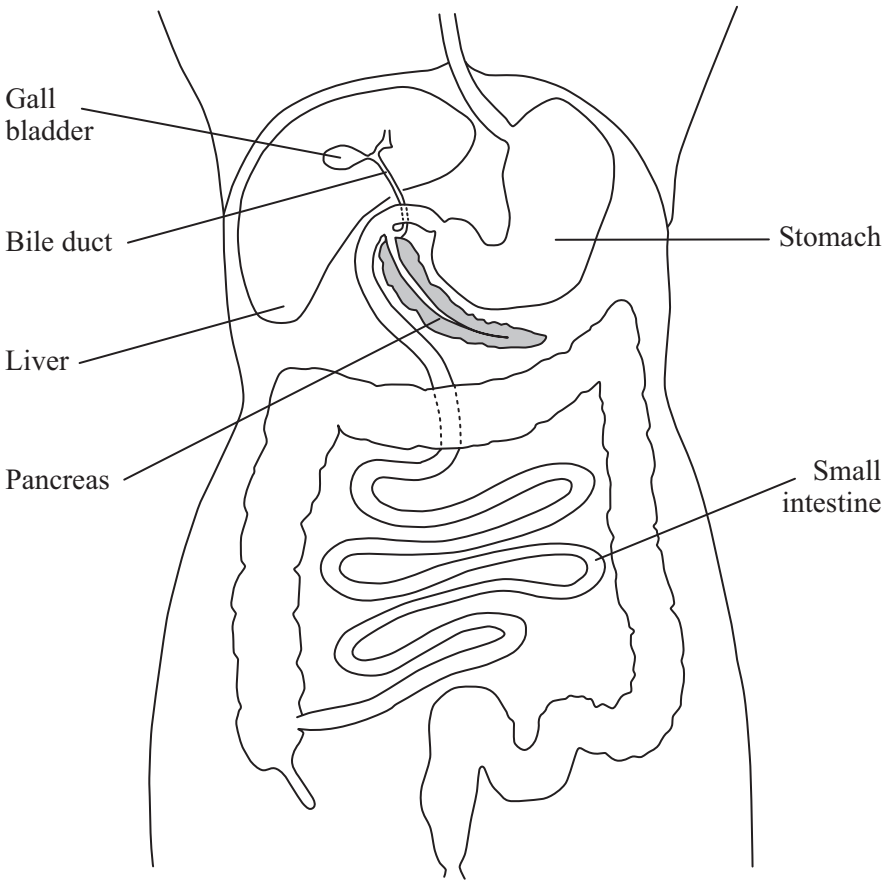
3. _____ [3]

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Marks	Remark

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Examiner Only	
Marks	Remark

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



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(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]

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(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.

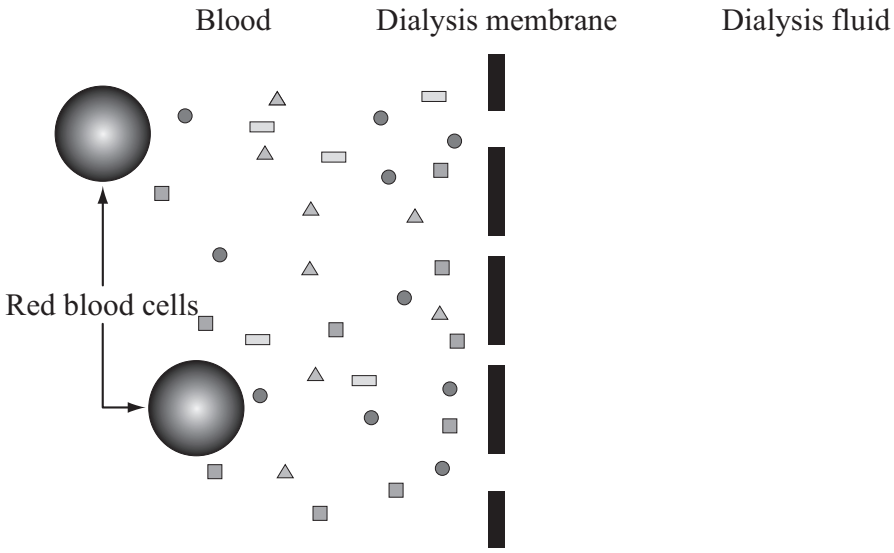
_____

_____ [2]

Examiner Only	
Marks	Remark

(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.



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(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]

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Marks	Remark

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(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]

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Marks	Remark

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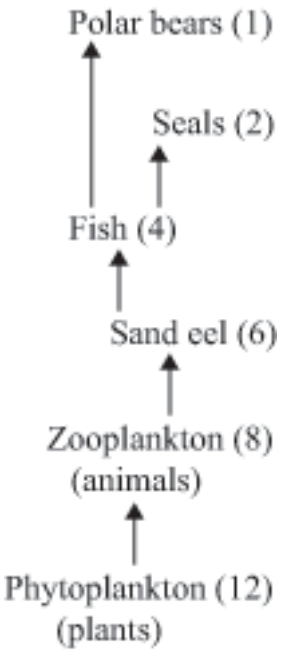
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(Questions continue overleaf)

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

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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.

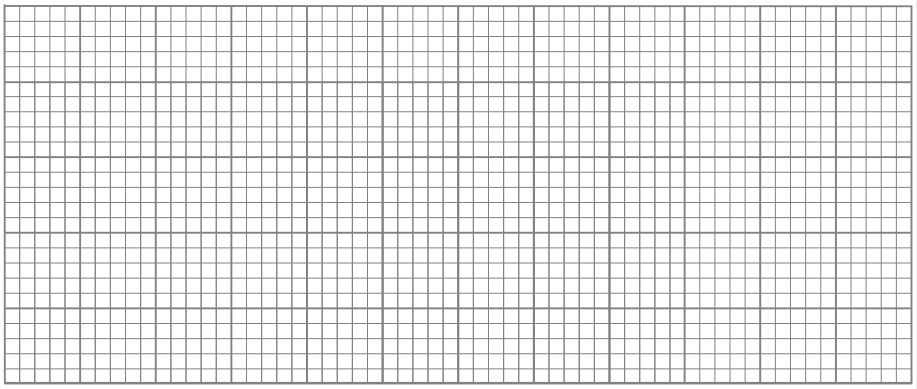
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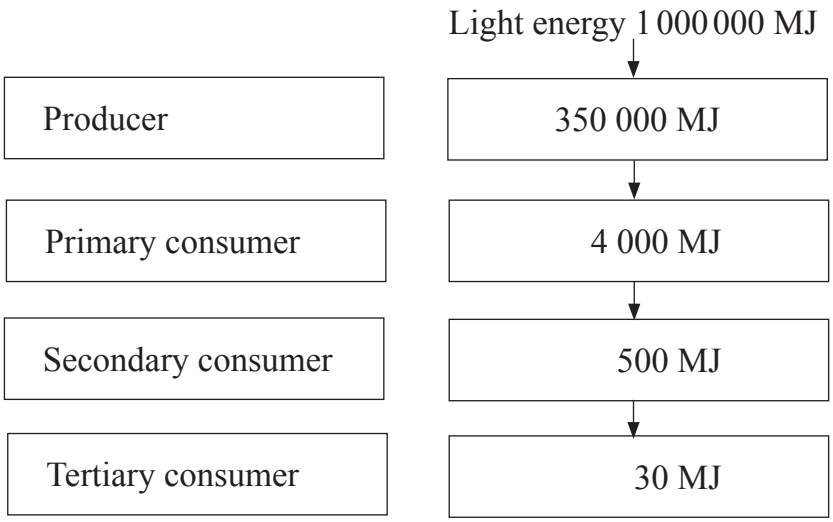
[5]

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(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]

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Marks	Remark

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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]

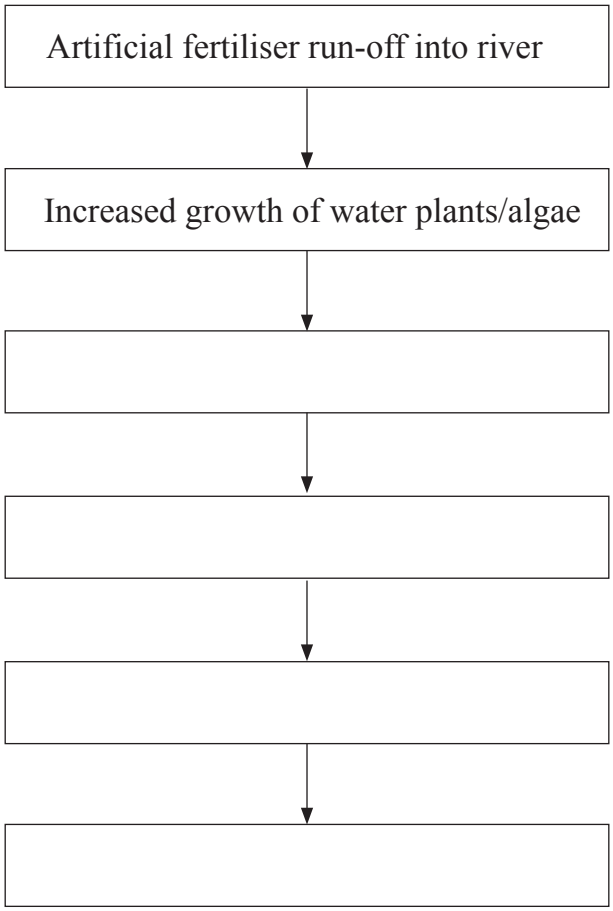
(iv) Give **one** reason why it is important to monitor fish populations in the sea.

_____ [1]

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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.

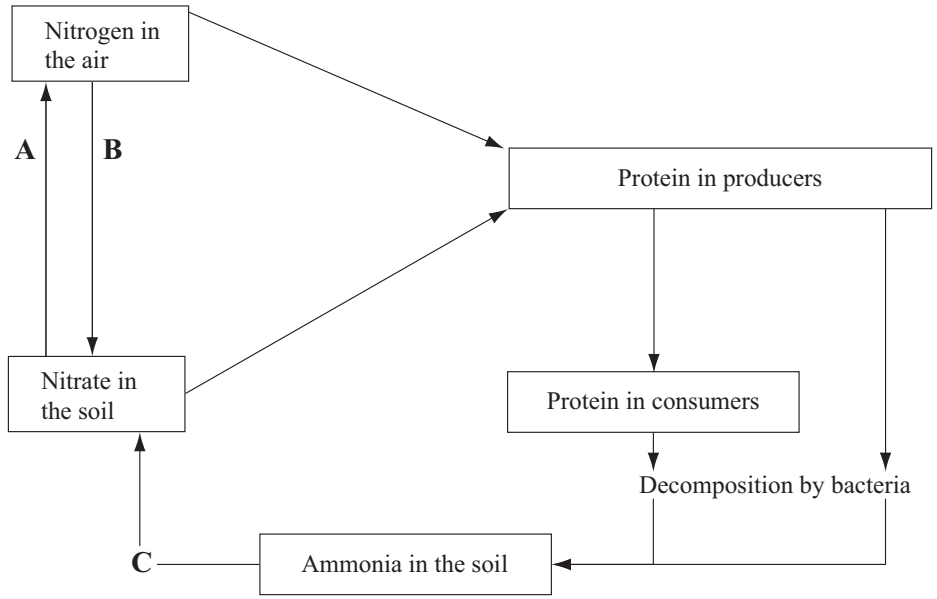
_____ [1]

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

_____ [1]

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(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]

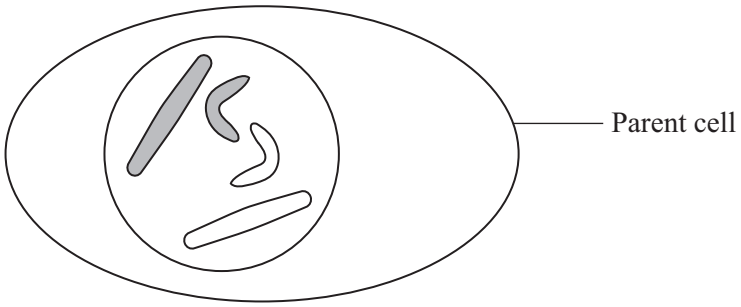
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Marks	Remark

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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]

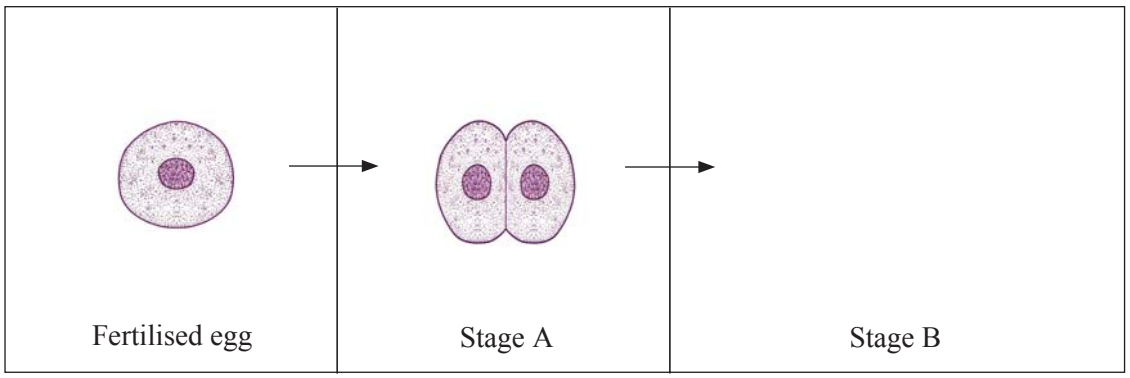
(iii) The parent cell has a diploid number of chromosomes. What term describes the number of chromosomes in the gamete?

_____ [1]

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Examiner Only	
Marks	Remark

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



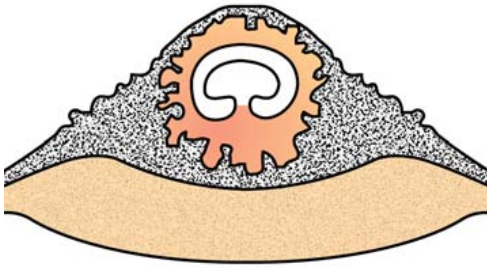
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(i) Describe what has happened to the fertilised egg to produce the result at stage A.

_____ [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.



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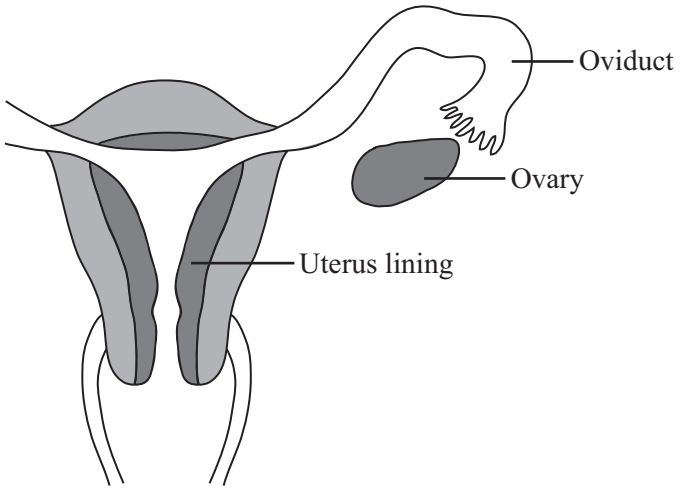
(iii) Describe what has happened to reach this stage.

_____

_____ [1]

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



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(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]

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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]

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(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.

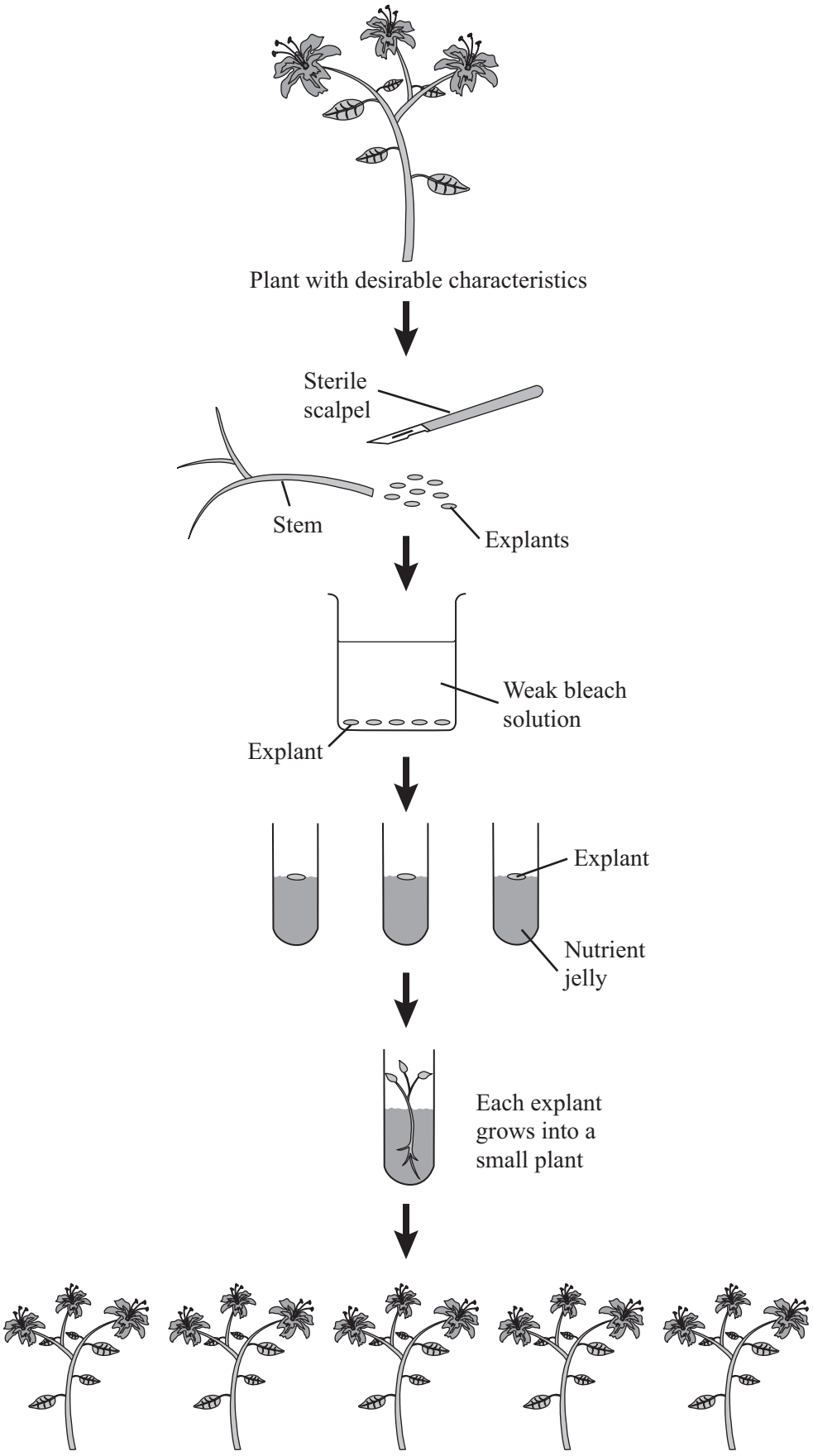
[3]

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

_____ [1]

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



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Examiner Only	
Marks	Remark

(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.

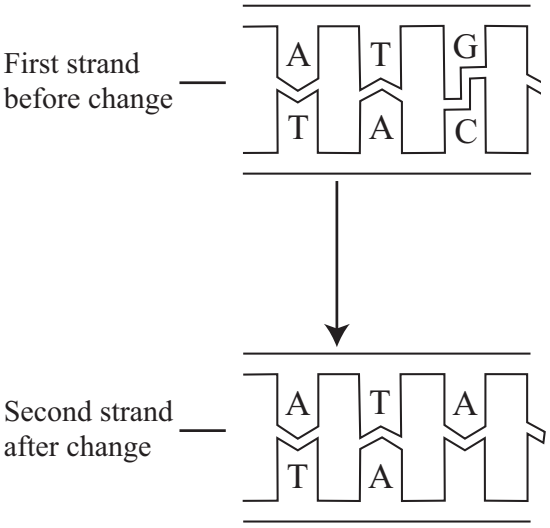
1. _____

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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GCSE

Science: Double Award (Modular)

Summer 2010

Mark Schemes

Issued: October 2010

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Rewarding Learning

General Certificate of Secondary Education
2010

Science: Double Award (Modular)

Paper 1
Higher Tier

[G8204]

FRIDAY 21 MAY, MORNING

MARK SCHEME

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					AVAILABLE MARKS
1	(a)	(i)	Place in dark cupboard for **1 day or more**	[1]	
		(ii)	Alcohol/ethanol/meths	[1]	
		(iii)	Yellow/brown/yellow-orange; (**not** red/no colour change) Blue/black/black; (**not** blue (on own)/brown-black)	[2]	
	(b)	(i)	Down – arrow	[1]	
		(ii)	Phloem	[1]	
		(iii)	Energy/active transport/respiration/germination (**not** food glycogen); fruit formation/seed formation/stored on fats; growth/new leaves/new flowers/protein/reproduction – gametes; (**not** repair on own/nutrient storage) cellulose; (**not** cell walls on own) chlorophyll; nectar; (**not** attract insects) stored as starch/starch on own/tubers; (**not** storage/stores glycogen) (Any three)	[3]	9
2	(a)	(i)	Emulsify fats/ Neutralise acids; (**not** breakdown fat droplets/food)	[1]	
		(ii)	Lipase	[1]	
	(b)	(i)	Diffusion/absorption	[1]	
		(ii)	Hepatic portal vein (**not** hpv/hepatic portal)	[1]	
		(iii)	To make protein/enzymes; growth/repair;	[2]	
	(c)	(i)	Water ✓ Urea ✗ (**not** left blank) Glucose ✓ Red blood cells ✗ (**not** left blank)	[4]	
		(ii)	Urea/**more** salt/**more** water/more urea/ equal amount of salt as in blood (**not** red blood cells/glucose/water/salt)	[1]	
		(iii)	Maintain concentration gradient/described/ prevent urea going back into blood	[1]	

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				AVAILABLE MARKS
(d)	**(i)**	Insulin produced in the pancreas; Stored as **glycogen**/stores **glycogen**; stored as **fat**; (**not** stores on own) (insulin causes) more uptake; (liver) more respiration; insulin reduces the blood glucose level; (**not** returns blood sugar level to normal) (Any **three**)	[3]	
		QWC	[2]	
	(ii)	Diabetes	[1]	18
3	**(a)**	**(i)** Sun/sunlight/light/light energy;	[1]	
		(ii) Zooplankton;	[1]	
		sand eel;	[1]	
		(iii) Phytoplankton → zooplankton → sand eels → fish ➡ polar bears [1] mark phytoplankton at start & polar bears at end [1] mark arrow [1] mark organisms in between in correct order (zooplankton – sand eels – fish)	[3]	
		(iv) Produce sugars/food/photosynthesis/starch; (**not** produce energy) Using sunlight;	[2]	
		(v) Less phytoplankton; due to less light/temp; (**not** harsh conditions – **not** more sand eels eat them)	[2]	
		(vi) Pyramid Numbers 1 – polar bear 4 – fish 6 – sand eels 8 – zooplankton 12 – phytoplankton [1] symmetrical **and** pyramid shape [1] mark numbers correct [1] mark phytoplankton at base [1] mark polar bear top/or seals if CM from **(iii)** [1] mark all other labels correct	[5]	
		(vii) If problem with one food source – still have other/more to eat 1 may die out	[1]	

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				AVAILABLE MARKS
	(b)	**(i)** $\frac{500}{4000}$; × 100 = 12.5%; or 2 marks for 12.5%	[2]	
		(ii) Not all the animal is eaten; Movement/hunting; excretion/defaecation/urine/faeces/waste; (Any **two**) reproduction; respiration/heat	[2]	
	(c)	**(i)** $\frac{112 \times 140}{16}$; = 980;	[2]	
		(ii) Disease; pollution/acid rain/eutrophication/thermal pollution; overfishing; (**not** fishing) predators; lack of food/decrease number of prey; (Any **two**)	[2]	
		(iii) Larger area/not enclosed/fish can move	[1]	
		(iv) adjust or apply quotas/legislation/to prevent extinction/ to determine pollution levels/to prevent overfishing;	[1]	26
4	**(a)**	**(i)** Plants die; Microbes decay plants; Use up oxygen; Less oxygen for the fish; Fish die; Must be in the correct sequence but can have more than 1 in 1 box.	[4]	
		(ii) silage/slurry/sewage/detergent/farm waste/urine/manure (**not** waste)	[1]	
		(iii) Less O_2 present	[1]	
	(b)	**(i)** Fungi (**not** earthworms)	[1]	
		(ii) Denitrifying – A; Nitrogen fixing – B; Nitrifying bacteria – C;	[3]	
		(iii) Denitrifying/A	[1]	
		(iv) **More** nitrates (**not** nitrogen/protein/fertiliser)	[1]	12

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					AVAILABLE MARKS
5	**(a)**	**(i)**	4 cells; (**not** ball of cells) Each cell 1 large + 1 small chromosome; At least two different combinations; If 2 cells – haploid with diff. combinations = 1 mark	[3]	
		(ii)	Meiosis	[1]	
		(iii)	Haploid (**not** n)	[1]	
	(b)	**(i)**	Divided into two/mitosis/divided/duplicated/replicated	[1]	
		(ii)	Divided into four cells and each with a nucleus; attached;	[2]	
		(iii)	Different tissues/organs formed/implantation/embeds/ development of placenta/umbilical cord/amnion/ named tissue or organ forms/moved to uterus	[1]	
	(c)	**(i)**	In oviducts	[1]	
		(ii)	In lining of uterus and must be above the indent	[1]	
		(iii)	• Diffusion/gas exchange/O_2 from mother/CO_2 from foetus; antibodies from mother; nutrients from mother; urea from foetus; (Any **two**) • large surface area/or described/good blood supply	[2] [1]	
		(iv)	Amnion/amniotic fluid	[1]	
		(v)	Rubella/German measles	[1]	
	(d)	**(i)**	Bacteria	[1]	
		(ii)	Spread to someone else **before know you have it**	[1]	
		(iii)	Antibiotics/named	[1]	
		(iv)	AIDS/Syphilis/Chlamydia/Herpes/Genital warts/HIV (**not** Gonorrhoea)	[1]	20

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AVAILABLE MARKS

6 **(a)** **(i)**

	R	r
R	RR	Rr
r	Rr	rr

Punnett;
both parents correct;
correct cross; [3]

(ii) wrinkled and smooth
3 : 1
(Must have phenotype to get 2 marks) [2]

(b) **(i)**

	R	R
r	Rr	Rr
r	Rr	Rr

	R	r
r	Rr	rr
r	Rr	rr

[3]

Only two Punnetts;
each with rr;
one RR and one Rr;

(ii) Parents must have been heterozygous/carry the recessive gene/Rr [1]

(c) **(i)** drought resistant/frost resistant/wind/resistant;
Disease free/disease resistant;
long shelf life/long lasting flowers or fruit;
colour/scent/attractiveness/taste/variegated/good shape;
quick growing/large yield/**lots** of flowers/**lots** of fruit/big leaves/tall plants/dwarf plant;
(**not** size/height/strength) [2]

(ii) Characteristics selected by man
(**not** produced by man) [1]

(iii) Large numbers/faster/**all** same/get plants out of season
(**not** cheaper/easily done/economically viable unqualified) [1]

(iv) Mg – Chlorophyll/chloroplasts;
Ca – Cell walls/cellulose cell walls (**not** cellulose on own); [2]

(v) Sterilise/to kill bacteria/remove bacteria
(**not** remove germs/impurities/clean them) [1]

(vi) Light (sun); temp (heat); pH; nutrient concentrates/nutrient cocktail; fertiliser; CO_2; O_2; humidity (water/moisture); (Any **two**) [2]

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				AVAILABLE MARKS
(e)	**(i)**	T	[1]	
	(ii)	Mutation	[1]	
	(iii)	Protein (**not** amino acids or protein **and** amino acids)	[1]	
	(iv)	Different protein made/A different amino acid in sequence/ causes a genetic disorder/different molecule/changes shape;	[1]	
	(v)	Model/3D Model (**not** x-rays/using microscopes)	[1]	
	(vi)	Double; Helix;	[2]	25
			Total	**110**

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