

OCR GCSE GATEWAY BIOLOGY A • J247

BIOLOGY



EXAM QUESTION PACK

WS1.1 DEVELOPMENT OF SCIENTIFIC THINKING

SCORE

/45

PERCENTAGE

%

STEMUP

These questions belong to OCR, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by OCR. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with OCR and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. OCR has not endorsed, approved or been involved in the production of it. OCR and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

OCR publishes its past papers, mark schemes and examiner reports. Always check the current specification at ocr.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Gateway Biology A (9-1)

Development in scientific thinking

Please note that you may see slight differences between this paper and the original.

Candidates answer on the Question paper.

OCR supplied materials:

Additional resources may be supplied with this paper.

Other materials required:

- Pencil
- Ruler (cm/mm)

Duration: Not set

Candidate
forename

Candidate
surname

Centre number

Candidate number

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions, unless your teacher tells you otherwise.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Where space is provided below the question, please write your answer there.
- You may use additional paper, or a specific Answer sheet if one is provided, but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with either a pencil or an asterisk. In History and Geography a *Quality of extended response* question is marked with an asterisk, while a pencil is used for questions in which *Spelling, punctuation and grammar and the use of specialist terminology* is assessed.
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **45**.
- The total number of marks may take into account some 'either/or' question choices.

- 1 A student models the process of mitosis using cookies and sprinkles.



Mitosis is part of the cell cycle.

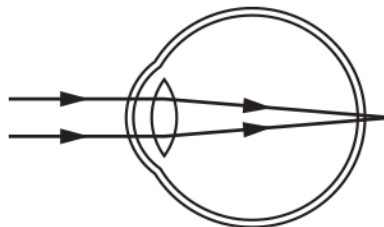
Which part of the cell cycle has the student modelled?

- A Cell division
- B Chromosome movement
- C DNA replication
- D Growth of cell

Your answer

[1]

- 2 Look at the diagram showing an eye defect.



What is the defect and which lens could be used to correct it?

- A Long-sightedness, corrected with a concave lens
- B Long-sightedness, corrected with a convex lens
- C Short-sightedness, corrected with a concave lens
- D Short-sightedness, corrected with a convex lens

Your answer

[1]

- (i) Explain why overheating of the body may stop chemical reactions in cells.

[2]

- (ii) * Look at Fig. 20.2 which shows two people riding on boards.

Person A is riding a board on sand in a hot desert. **Person B** is riding a board on snow.

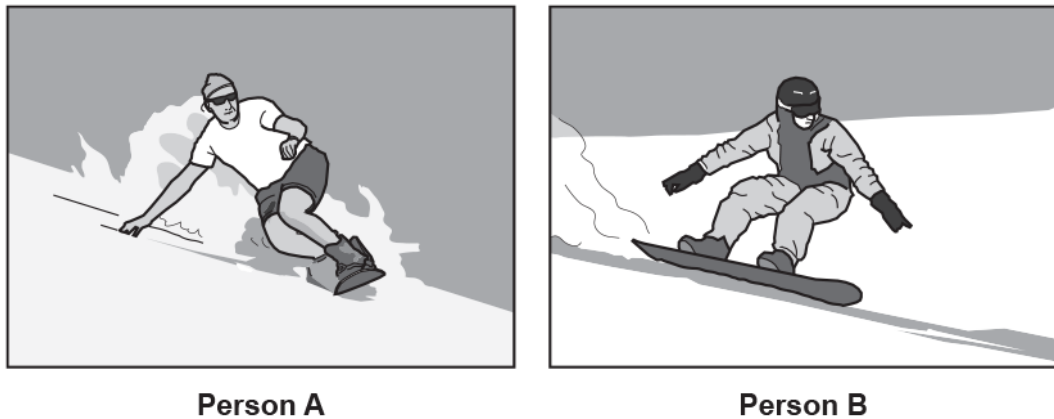


Fig. 20.2

Explain the different problems of temperature regulation for these two people and give examples of the ways their bodies solve these problems.

[6]

4 Many types of cancer have been linked to certain genes.

Scientists are trying to find ways to change the genes in embryos to reduce the risks of cancer.

(i) What name is given to the process scientists use to change the genes of an organism?

[1]

(ii) Write down **one** reason why some people disagree with the process given in (i).

[1]

- 5 A student models the process of mitosis using cookies and sprinkles.



Mitosis is part of the cell cycle.

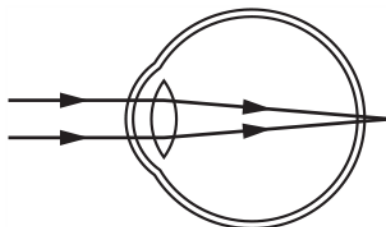
Which process in the cell cycle has the student modelled?

- A Cell division
- B Chromosome movement
- C DNA replication
- D Growth of cell

Your answer

[1]

- 6 Look at the diagram showing an eye defect.



What is the defect and which lens could be used to correct it?

- A Long-sightedness, corrected with a concave lens
- B Long-sightedness, corrected with a convex lens
- C Short-sightedness, corrected with a concave lens
- D Short-sightedness, corrected with a convex lens

Your answer

[1]

- 7 In people with multiple sclerosis their immune cells stop working as they should. HSCT is a treatment for multiple sclerosis which destroys all the immune cells.

Once the immune cells are destroyed, cells from a patient's bone marrow can replace the immune cells.

What type of cell is used to replace the destroyed immune cells?

- A Neurone cell
- B Red blood cell
- C Stem cell
- D White blood cell

Your answer

[1]

- 8 A side effect of some antibiotics is to inhibit the release of thyroxine into the blood.

What will these antibiotics do to levels of TSH and TRH?

- A Both decrease
- B Both increase
- C Both stay the same
- D TSH increases and TRH decreases

Your answer

[1]

- 9(a) Carolina horsenettle is a weed that grows in crop fields in the USA.

New horsenettle shoots develop from buds on roots in spring. The shoots die in the autumn but the roots remain alive under the ground.

Effective weed control involves stopping seed production and killing the root system.

Selective herbicides are used to control Carolina horsenettle.

The best time to apply selective herbicide is when the horsenettle is actively growing between the bud and flower stage.

- (i) Describe how a selective herbicide works.

(ii) Fig. 20.1 and Table 20.1 show information about four different herbicides A, B, C and D.

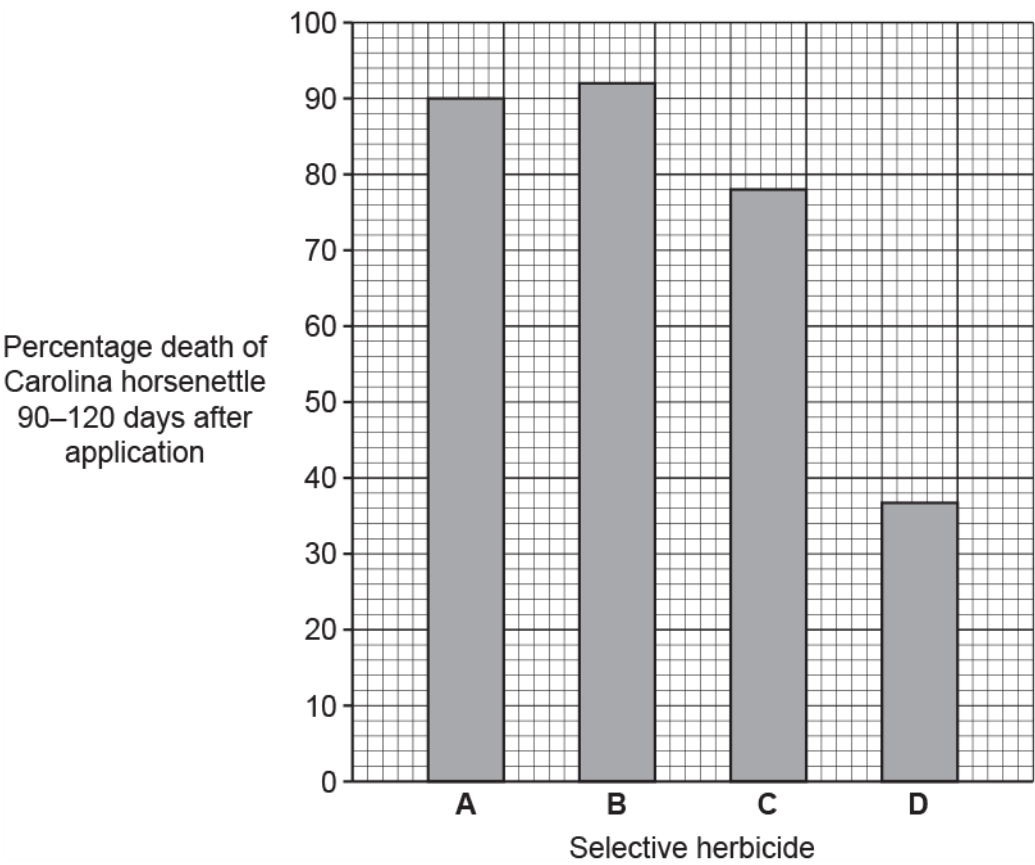


Fig. 20.1

Selective herbicide	A	B	C	D
Effect on Carolina horsenettle	prevents seeds and roots of plants growing	prevents seeds and roots of plants growing	prevents seeds and roots of plants growing	prevents shoot growth and fruiting but minimal damage to roots
What plants herbicide works on	Carolina horsenettle	Carolina horsenettle and several other broad-leaved plant	Carolina horsenettle	Carolina horsenettle and most other broad-leaved plant

		species		species
Cost of herbicide	medium	high	medium	low

Table 20.1

Carolina horsenettle is growing in a field with a crop and other broad-leaved weeds.
Evaluate the information on selective herbicides A, B, C and D.

Which selective herbicide would be best to use and when it should be applied?
Explain your decision.

[4]

(b)

(i) Describe **one** effect that gibberellin hormones have on plants.

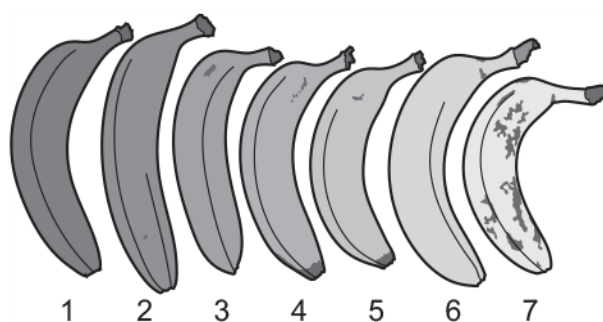
[1]

(ii) A student investigates ripening in bananas.

The student keeps bananas in different conditions. After 1 week he decides if each banana was **ripe** or **not ripe**.

The results were difficult to interpret so he planned to develop the experiment.

He found a picture that he thought he could use.



Explain how this could help develop his experiment.

[2]

These antibodies are called monoclonal antibodies.

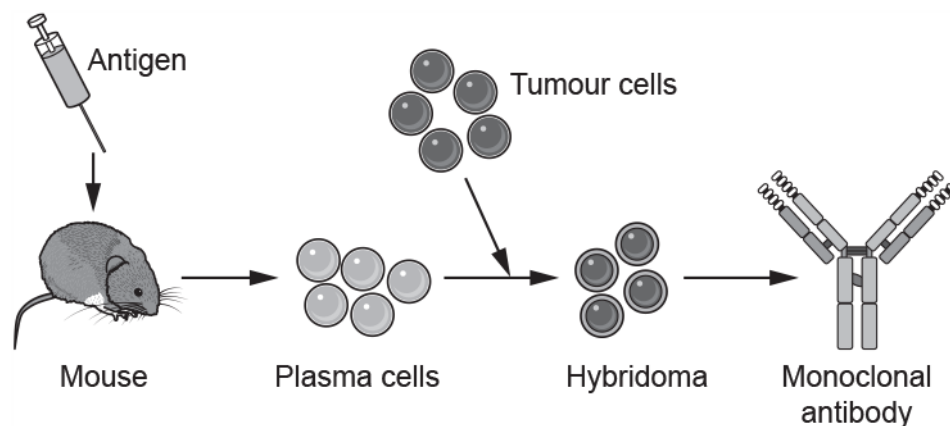


Fig. 20.2

Two scientists discovered a different method of making monoclonal antibodies.

They put genes that code for many different antibodies into viruses. The viruses then make the antibodies on their surfaces.

If an antigen attaches to an antibody, the scientists use the gene for this antibody to genetically engineer bacteria. The bacteria are then used to make large quantities of the antibody.

- (i) Describe how scientists could use the antibody gene to genetically engineer bacteria to make many copies of the antibody.

- (ii) Many people would prefer to use antibodies made using bacteria and viruses, rather than the method shown in Fig. 20.2.

Suggest an explanation for this.

- (iii) In 2018, the scientists were awarded the Nobel Prize for their work.

Explain why their work had to be peer reviewed before they were awarded the prize.

11(a) Scientists investigate antibiotic pollution in two different lakes.

They collect samples of water from the two lakes. The scientists then use aseptic techniques to investigate how resistant the bacteria in the water are to antibiotics. Fig. 22.2 shows the apparatus they use.

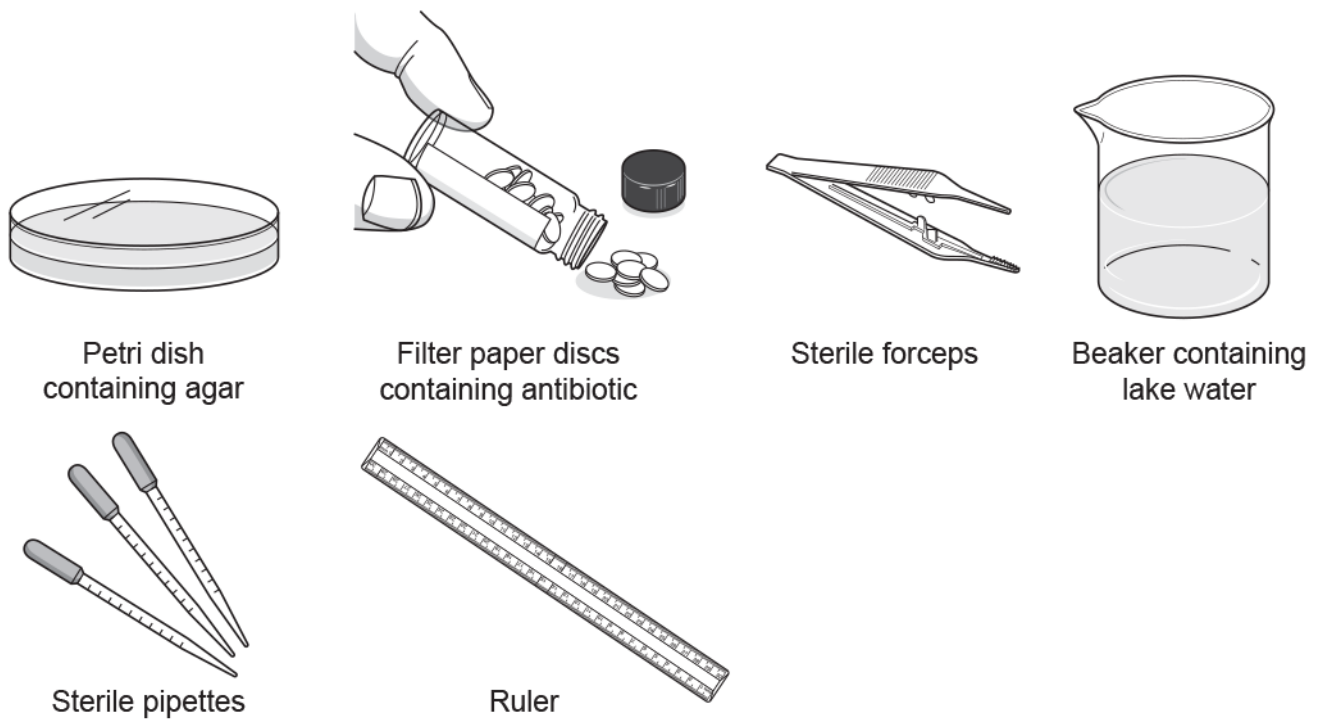


Fig. 22.2

Describe how the scientists could use **this** apparatus to **measure** how resistant the bacteria are to antibiotics.

[4]

- (b) The scientists also counted how many species of bacteria were resistant to antibiotics and how many species of bacteria were killed by antibiotics.

The scientists found these results.

	Number of different species of bacteria	
	In Lake Bellandur	In Lake Jakkur
Resistant to antibiotics	53	35
Killed by antibiotics	28	37

Which lake has the **highest** levels of antibiotic pollution?

Tick (✓) **one** box.

Lake Bellandur

☐

Lake Jakkur

☐

Explain your answer.

[2]

12(a) Scientists investigate antibiotic pollution in two different lakes.

They collect samples of water from the two lakes. The scientists then use aseptic techniques to investigate how resistant the bacteria in the water are to antibiotics. **Fig. 16.2** shows the apparatus they use.

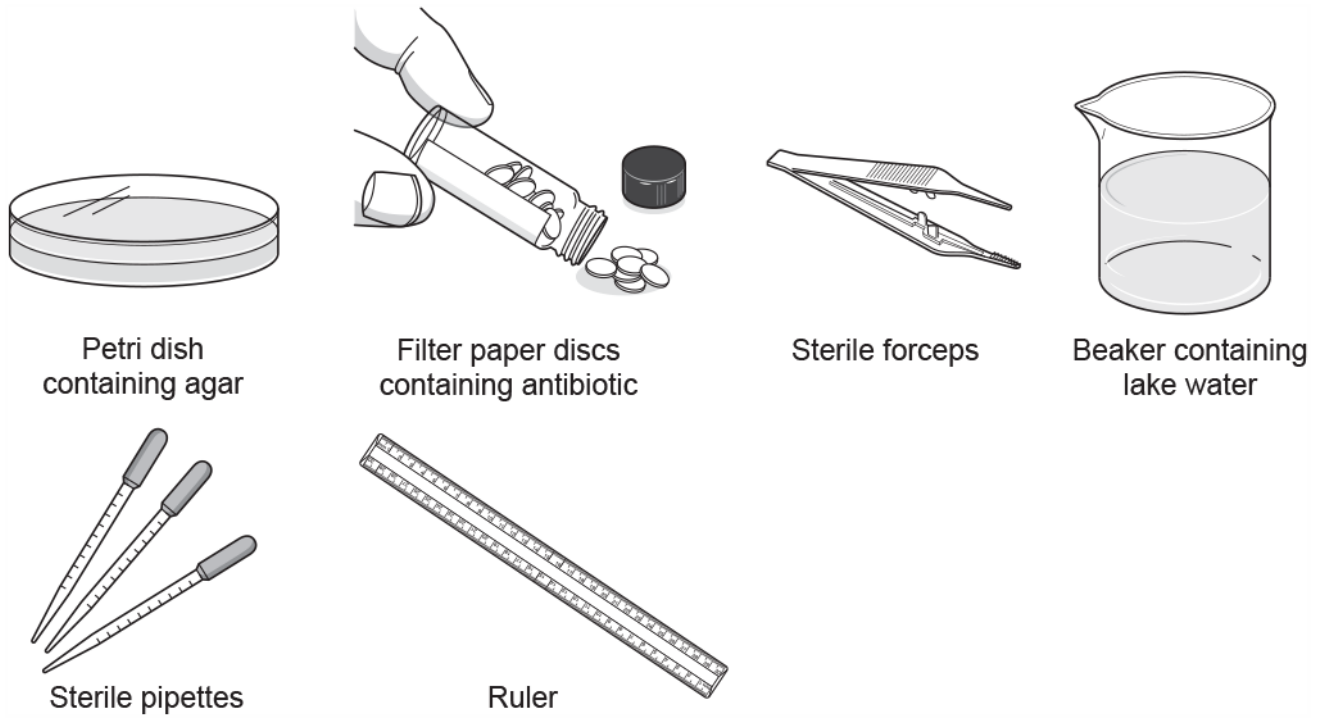


Fig. 16.2

Describe how the scientists could use **this** apparatus to **measure** how resistant the bacteria are to antibiotics.

[4]

(b) The scientists also counted how many species of bacteria were resistant to antibiotics and how many species of bacteria were killed by antibiotics.

The scientists found these results.

	Number of different species of bacteria	
	In Lake Bellandur	In Lake Jakkur
Resistant to antibiotics	53	35
Killed by antibiotics	28	37

Which lake has the **highest** levels of antibiotic pollution?

Tick (✓) **one** box.

Lake Bellandur ☐

Lake Jakkur ☐

Explain your answer.

[2]

END OF QUESTION PAPER

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
1			A ✓	1 (AO1.1)	
			Total	1	
2			B ✓	1 (AO1.1)	
			Total	1	
3		i	Any two from: idea it affects enzymes (action/structure) ✓ high temperature causes active site to change shape / active site denatures ✓ stops them working ✓	2 (AO1.1)	ALLOW enzymes are heat sensitive/denature ALLOW enzymes cannot bind to substrate molecules IGNORE cells denature ALLOW enzymes no longer catalyse reaction

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
		ii	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. Level 3 (5–6 marks) Demonstrates knowledge of homeostasis. AND Applies knowledge of a skin mechanism for maintaining body temperature in different environments. AND Analyses information to comment on the effect of exposing skin. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Level 2 (3–4 marks) Demonstrates knowledge of homeostasis and applies knowledge of a skin mechanism for maintaining body temperature in different environments. OR Demonstrates knowledge of homeostasis and analyses information to comment on the effect of exposing the skin. OR Applies knowledge of a skin mechanism for maintaining body temperature in different environments and analyses information to comment on the effect of exposing skin. <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i> Level 1 (1–2 marks) Demonstrates knowledge of homeostasis. OR Applies knowledge of a skin mechanism for maintaining body temperature in different environments. OR Analyses information to comment on the effect of exposing skin.	6 (AO2 x 1.1) (AO2 x 2.1) (AO2 x 3.1a)	AO1.1 Demonstrate knowledge and understanding of skin and homeostasis • need to keep constant internal temperature, despite the different external temperatures • person A needs to lose heat to the environment / person B needs to reduce heat lost to the environment • person A gains heat from the environment / person B loses heat to the environment • person A will be in danger of overheating / person B will be in danger of becoming too cold. AO2.1 Apply knowledge and understanding of the mechanisms in skin for maintaining body temperature in different environments • cold environment reduces sweating /decreases blood flow to the skin (vasoconstriction) / shivering / body hairs rise • warm environment increases sweating / increases blood flow to the skin (vasodilation) / body hairs on skin lie flat AO3.1a Analyse information and ideas to interpret the effect of exposing / covering skin in different environments • person A body less covered/more exposed skin in warmer conditions increases heat loss/allows sweat to evaporate • person B body covered/less exposed skin in colder conditions reduces heat loss/stops sweat evaporating

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
			<i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i> 0 marks <i>No response or no response worthy of credit.</i>		
			Total	8	
4		i	genetic engineering / genetic modification ✓	1 (AO1.1)	ALLOW GM / Gene Therapy
		ii	worried about possible side effects / ethically / morally / religiously wrong ✓	1 (AO3.2a)	IGNORE playing God / not natural
			Total	2	
5			B ✓	1 (AO1.1)	
			Total	1	
6			B ✓	1 (AO1.1)	
			Total	1	
7			C ✓	1 (AO2.1)	
			Total	1	
8			B ✓	1 (AO2.1)	
			Total	1	

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
9	a	i	Any two from: contains (plant) hormones ✓ causes excessive/rapid cell elongation/growth ✓ only affects broadleaved plants ✓	2 (AO2 x 1.1)	ALLOW auxins IGNORE just plants grow faster ALLOW effects some plants/weeds and not others/the crop
		ii	B because B causes highest percentage death of horsenettle ✓ A/C do not kill other broadleaved plants/weeds / A/C not suitable as field contains other weeds / A/C only kills horsenettle ✓ D does not kill roots / much less effective at killing horsenettle ✓ Spring treatment because buds just growing and flowering yet to happen ✓	4 (AO3.1b)	No mark for B on its own. NEED a choice of B or D to score any marks Mark first choice Need reference to both buds and flowering ALLOW D for three marks if B is not chosen first: because D kills more species of weeds ✓ D much cheaper than B ✓ spring treatment because buds just growing and flowering yet to happen ✓
	b	i	breaks seed dormancy / elongation of shoots ✓	1 (AO1.1)	ALLOW (stimulates) flowering/ fruit development / fruit growth / seed formation / germination / growth of shoots / seedless fruits DO NOT ALLOW fruit ripening / seed growth
		ii	Idea that the ripeness colour scale can be used for comparison ✓ idea that a numerical estimate/quantitative measure for level of ripeness is better / idea that it gives multiple measures and not just two/ripe or unripe / removes objectivity / allows reproducibility ✓	2 (AO2 x 3.3a)	ALLOW can be used to choose from a selection of ripeness levels

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
			Total	9	
10		i	Any four from: plasmid used to insert the gene ✓ restriction enzyme to cut open the plasmid / for removing the gene ✓ ligase enzyme to insert the gene / join ends of gene and plasmid ✓ correct reference to sticky ends ✓ correct reference to selection using antibiotic markers ✓	4 (AO4 x 1.1)	enzyme and role must be correct link
		ii	idea (this method) does not use mice / ORA ✓ people may think original method is cruel / unethical / killing mice ✓	2 (AO2.1)	ALLOW does not use animals IGNORE references to religion/playing god etc.
		iii	to repeat the work / make sure it is reproducible ✓ to make sure it worked / was safe ✓	2 (AO2 x 1.1)	ALLOW make sure work was valid ALLOW check for errors/mistakes ALLOW was correct ALLOW was reliable ALLOW was ethical ALLOW make sure work was original / authentic ALLOW recognise significance of work ALLOW to improve quality of report/published work
			Total	8	

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
11	a		idea that water is added from (each) lake to a (separate) Petri dish using (sterile) pipette ✓ filter paper/antibiotic disc is placed in (the centre of) each dish with the (sterile) forceps ✓ Petri dishes are incubated ✓ idea that the inhibition zone/clear area/area with no bacteria growth around the discs is measured ✓	4 (AO4 x 1.2)	ALLOW idea of repeats ALLOW idea of setting up a control
	b		Lake Bellandur– no mark Any two from: more (antibiotic) resistant bacteria / more species of bacteria are resistant to antibiotics / ORA ✓ Lower number of bacteria killed by antibiotics / less species of bacteria killed by antibiotics / ORA ✓ this lake contains a higher ratio of resistant bacteria compared to bacteria killed by antibiotics✓ (antibiotic) resistant bacteria more likely to survive/reproduce with more (antibiotic) pollution ORA✓	2 (AO2 x 3.2a)	Incorrect or no lake given then no marks ALLOW bacteria are more resistant (antibiotic) DO NOT ALLOW more resistant to bacteria IGNORE immune ALLOW only 28 species are killed ALLOW idea of natural selection causing increased resistant bacteria with more (antibiotic) pollution
			Total	6	

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
12	a		idea that water is added from (each) lake to a (separate) Petri dish using (sterile) pipette ✓ filter paper/antibiotic disc is placed in (the centre of) each dish with the (sterile) forceps ✓ Petri dishes are incubated ✓ idea that the inhibition zone/clear area/area with no bacteria growth around the discs is measured ✓	4 (AO4 x 1.2)	ALLOW idea of repeats ALLOW idea of setting up a control
	b		Lake Bellandur– no mark Any two from: more (antibiotic) resistant bacteria / more species of bacteria are resistant to antibiotics / ORA ✓ Lower number of bacteria killed by antibiotics / less species of bacteria killed by antibiotics / ORA ✓ this lake contains a higher ratio of resistant bacteria compared to bacteria killed by antibiotics✓ (antibiotic) resistant bacteria more likely to survive/reproduce with more (antibiotic) pollution ORA ✓	1 (AO2 x 3.2a)	Incorrect or no lake given then no marks ALLOW bacteria are more resistant (antibiotic) DO NOT ALLOW more resistant to bacteria IGNORE immune ALLOW only 28 species are killed ALLOW idea of natural selection causing increased resistant bacteria with more (antibiotic) pollution
			Total	6	