



Exampro GCSE Biology

B1 Chapter 6 Variation
Higher tier

Name:

Class:

Author:

Date:

Time: 63

Marks: 63

Comments:

Q1. Read the information.

Insects can be both useful and harmful to crop plants.
Insects such as bees pollinate the flowers of some crop plants. Pollination is needed for successful sexual reproduction of crop plants.
Some insects eat crops and other insects eat the insects that eat crops.

Corn borers are insects that eat maize plants.
A toxin produced by the bacterium *Bacillus thuringiensis* kills insects.
Scientists grow *Bacillus thuringiensis* in large containers. The toxin is collected from the containers and is sprayed over maize crops to kill corn borers.

A company has developed genetically modified (GM) maize plants. GM maize plants contain a gene from *Bacillus thuringiensis*. This gene changes the GM maize plants so that they produce the toxin.

(a) Describe how scientists can transfer the gene from *Bacillus thuringiensis* to maize plants.

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(3)

(b) Would you advise farmers to grow GM maize plants?

Justify your answer by giving advantages and disadvantages of growing GM maize plants.

Use the information from the box and your own knowledge to help you.

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(4)
(Total 7 marks)

Q2. Scientists have brought an extinct species of mountain goat, the Pyrenean ibex, 'back to life'. These scientists used skin cells from preserved Pyrenean ibex in cloning experiments.

The Scientists:

- removed the nuclei from domestic goat egg cells
- transferred cell nuclei from the skin cells of the Pyrenean ibex into domestic goat egg cells
- used the domestic goats as surrogate mothers for the embryos that developed.

The scientists made 439 cloned embryos, but only 57 were suitable for transfer into the surrogate goat mothers. Only seven of the goats got pregnant and only one live offspring was born.

Some biologists are very worried about using cloning to preserve endangered animals, because cloned animals often have developmental problems. Some endangered animals are difficult to breed in captivity. For these animals cloning is another way to continue the genetic line.

The biggest threats to endangered animals today are habitat loss, illegal hunting, pollution and climate change. Many scientists say that cloning is not as important as trying to preserve the wild places on Earth. The wild places are being lost very quickly and the animals and plants living in the wild places are dying out.

(a) The Pyrenean ibex was 'brought back to life'.

How is this process different from using adult cell cloning to clone a pet animal?

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(1)

- (a) The fusion of the body cell from the male sheep and the egg from the female sheep is an example of asexual reproduction.

Explain why.

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(2)

- (b) (i) Give the gender and face colour of the cloned lamb.

Gender

Face colour

(1)

- (ii) Give the reasons for your choice.

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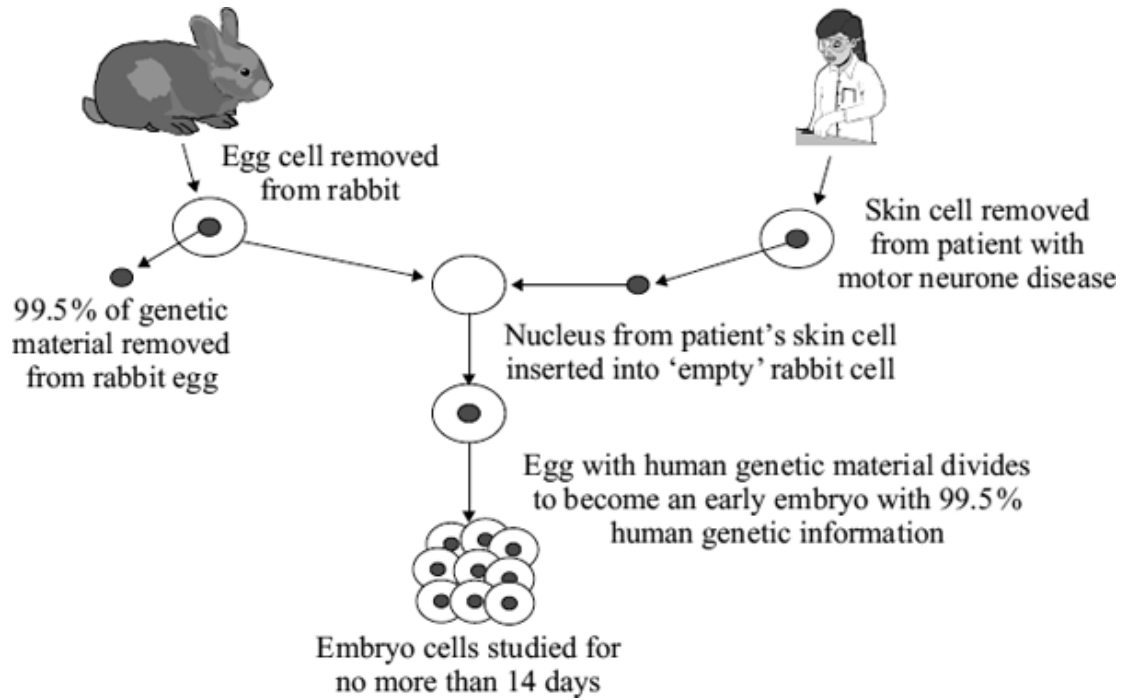
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(2)

(Total 5 marks)

Q4. Scientists in Korea have discovered a method of producing rabbit–human embryos. Rabbit–human embryos could provide cells for research into human diseases such as motor neurone disease. Rabbits produce large numbers of eggs. Rabbit–human embryos could overcome a shortage of human embryo cells for research.

The diagram shows how rabbit–human embryos are produced.



(a) Which structures in the nucleus contain 99.5% of a cell's genetic information?

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(1)

- (b) Use the above information and your own knowledge and understanding to evaluate how the production of rabbit–human embryos may help research into human diseases.

Remember to give a conclusion as part of your evaluation.

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(4)
(Total 5 marks)

Q5. Scientists have recently cloned a mouse that had died and been frozen for 16 years.

- (a) Explain what is meant by a clone.

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(2)

- (b) The scientists used an egg cell from a living mouse and the genetic material from a brain cell of the frozen mouse.

Describe how the process of adult cell cloning could be used to clone the frozen mouse.

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(3)

- (c) People could ask scientists to use this technique to clone long-dead relatives, whose bodies have been deep-frozen.

Most people would be opposed to cloning a human from a deep-frozen, long-dead relative.

Give **one** reason why.

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.....

(1)

(Total 6 marks)

Q6. Organisms can be produced by asexual reproduction and by sexual reproduction.

- (a) Give **two** differences between asexual reproduction and sexual reproduction.

1

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2

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(2)

(b) Adult cell cloning is a type of asexual reproduction.

Explain why.

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(2)
(Total 4 marks)

Q7. A child saved apple seeds from an apple she ate. She planted the seeds in the garden. A few years later the apple trees she had grown produced apples.

(a) The apples from the new trees did **not** taste like the original apple.

Explain why.

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(2)

(b) (i) Apple trees can be reproduced so that the apples from the new trees will taste the same as the apples from the parent trees.

Give **one** method used to reproduce apple trees in this way.

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(1)

- (ii) Explain why the method you have suggested in part **(b)(i)** will produce apples that taste the same as the apples from the parent trees.

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(2)
(Total 5 marks)

Q8. The picture shows a zebra fish.

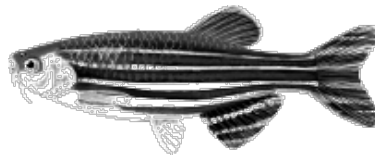


Illustration © Emily S. Damstra

Zebra fish are small freshwater fish that usually have black and silver stripes. Zebra fish can tolerate a wide range of environmental conditions.

- (a) Scientists have genetically modified zebra fish to act as pollution indicators. The genetically modified zebra fish have a gene transferred from a jellyfish. The gene allows the stripes of the zebra fish to change colour.

Describe how the scientists produced the genetically modified zebra fish.

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(3)

(b) Some scientists are worried about the production of genetically modified zebra fish.

Suggest reasons why.

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(2)
(Total 5 marks)

Q9. (a) Animal breeders use sexual reproduction to produce new strains of animals.

How does sexual reproduction produce variation?

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(2)

(b) A salmon is a type of fish.

Scientists have created a GM (genetically modified) 'super' salmon.

The scientists transferred a gene from a fish called a pout into a salmon. The gene increases the secretion of growth hormone in the salmon. The GM salmon grows much faster than an ordinary salmon, reaching market size up to one year earlier. Many more GM salmon will be grown in fish farms.

(i) Describe how a gene can be transferred from a pout into a salmon.

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(3)

(ii) The government might not allow the production of GM salmon.

Suggest **one** reason why.

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(1)
(Total 6 marks)

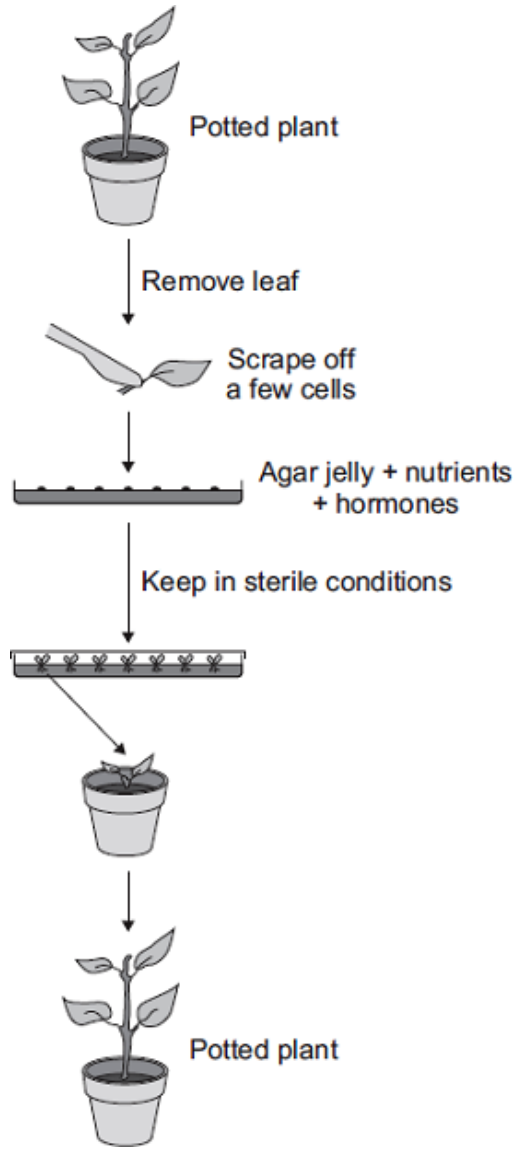
Q10. Plant hormones are used in horticulture.

(a) Name **one** plant hormone.

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(1)

(b) The diagram shows how new plants are produced using tissue culture.



(i) Tissue culture is a type of *asexual reproduction* .

Give the main features of *asexual reproduction* .

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(3)

(ii) Another method of producing new plants is by taking cuttings.

Suggest **one** advantage of using tissue culture and **not** using cuttings to produce plants.

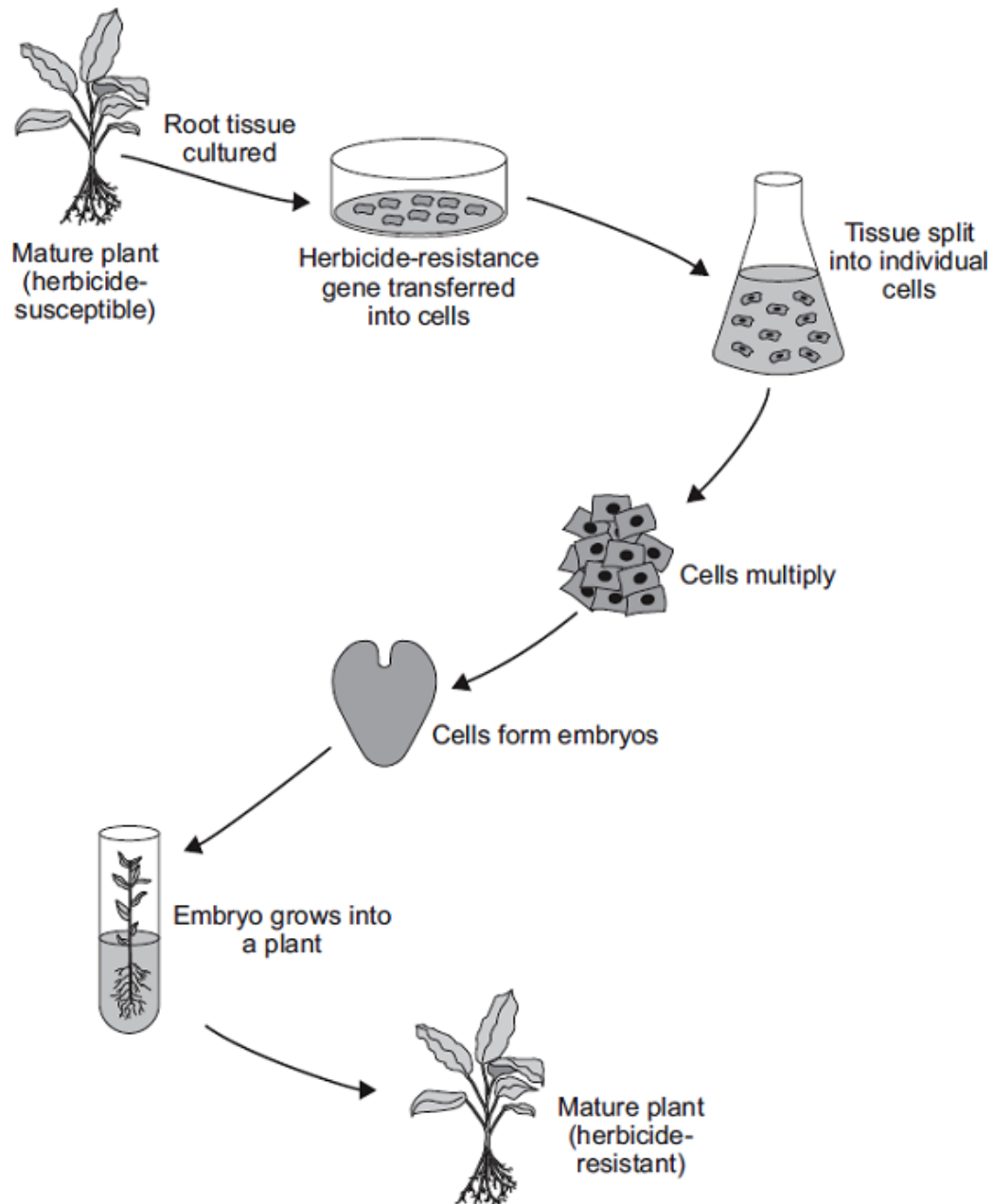
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(1)
(Total 5 marks)

Q11. The diagram shows one method of producing herbicide-resistant crop plants.



(a) The herbicide-resistance gene is cut out of a chromosome of a herbicide-resistant plant.
How is the herbicide-resistance gene cut out of the chromosome?

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(1)

- (b) Apart from having the herbicide-resistance gene, the herbicide-resistant plants are identical to the herbicide-susceptible plants.

Explain why.

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(2)

- (c) Suggest **one** advantage to a farmer of growing herbicide-resistant crops.

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(1)

- (d) Many people are opposed to the growing of herbicide-resistant crops produced in this way.

Suggest **one** reason why.

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(1)

(Total 5 marks)

Q12. The drawings show two different species of butterfly.



Amauris



Hypolimnas

- Both species can be eaten by most birds.
- *Amauris* has an unpleasant taste which birds do **not** like, so birds have learned **not** to prey on it.
- *Hypolimnas* does **not** have an unpleasant taste but most birds do **not** prey on it.

(a) Suggest why most birds do **not** prey on *Hypolimnas*.

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(2)

(b) Suggest an explanation, in terms of natural selection, for the markings on the wings of *Hypolimnas*.

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(3)

(Total 5 marks)

M1. (a) any **three** from:

- (gene) cut out
- (gene / cut out) from (bacterial) chromosome / DNA
accept (gene / cut out) from (bacterial) plasmid
- ref to enzymes (at any point)
- (gene spliced) into maize chromosome / DNA
- (gene added) at an early stage of development

3

(b) any **four** from:

- justification based on comparison of the relative merits of at least one advantage and one disadvantage
max 3 marks if only advantages or disadvantages given

Advantages:

- less effort for farmer **or** less likely to harm farmer
ignore ref to cost
- (pesticide) always there **or** doesn't wash away
allow examples eg no need to spray
- less insects to eat crop / maize **or** carry disease
allow pesticide doesn't contaminate water courses
- so greater crop production / yield

Disadvantages:

- (toxin) kills other insects
ignore ref to cost
- so (some) crops don't get pollinated / (sexually) reproduce
allow maize not pollinated
- possible harm when eaten by humans / animals
allow may have unpleasant taste
- damage to food chains
allow reduced biodiversity
- gene may spread to other species

4

[7]

M2. (a) two species / types involved

1

(b) *full marks only if at least **one** pro, **one** con and an attempt at a conclusion*

any **three** from:

pros (max **two** pros)

- useful if species difficult to breed
- prevents extinction / continues genetic line

cons (max **two** cons)

ignore reference to ethical issues / cruelty

- low success rate **or** figures given
- development problems
- diverts attention from habitat conservation / poaching / pollution / climate change
- cloning reduces gene pool

3

conclusion

argued conclusion

*must include references to **both** pros and cons and must be at end of answer*

1

[5]

M3. (a) there was no mixing of genes / genetic material

1

because the nucleus was removed from the egg cell before fusion

1

(b) (i) male **and**

white-faced

***both** required*

1

(ii) because the genetic material / genes

1

comes from the white-faced male only

1

[5]

M4. (a) chromosomes

ignore gene / DNA

1

- (b) to obtain **3 marks** candidates must give **one** reasonable pro **and one** reasonable con

pros eg

any **two** from:

- overcomes shortage of human eggs / rabbits produce lots of eggs
ignore all embryos identical
- ethical / religious issues with using human embryos
- reduces tests on (adult) humans
- may provide cure for / cause of disease
- embryo not allowed to develop beyond 14 days
- no harm to rabbit
- 99.5 % human genetic information so very similar to human or will react in the same way

max 2

cons eg

any **two** from:

- ethical / religious objections to mixture of human and rabbit genes
- ethical issues with experimenting with rabbits
allow some people object to using rabbits / cruel to rabbits
- ethical / religious objections to killing embryos
- 0.5% of rabbit genetic information might affect results
- 14 days too short a time to get results

max 2

plus

conclusion eg

- possibility of cure does / does not outweigh ethical / religious objections
Note: *the conclusion mark cannot be given unless both an advantage and a disadvantage have (already) been given*
- cure does not justify mixing human and animal genes / killing embryos
*do **not** award the mark if the conclusion only states that advantages outweigh disadvantages*

1

[5]

- M5.** (a) genetically identical / same DNA / same chromosomes
gains 2 marks
accept identical without reference to genetic material for 1 mark 2
- (b) remove nucleus from egg
allow use empty egg cell 1
- insert genetic material / nucleus /DNA / chromosomes from frozen mouse
*do **not** allow if reference to sperm* 1
- electric shock **or** allow to divide **or** insert into womb / uterus 1
- (c) ethical / religious / emotional reasons
or
 not known if it is safe / long term effects not known
ignore playing God / unnatural / immoral 1

[6]

- M6.** (a) any **two** from:
assume it refers to asexual
- no fusion in asexual **or** sexual involves fusion
*accept no fertilisation in asexual **or** fertilisation in sexual*
 - or** no mixing of genetic information in asexual **or** mixing of genetic information in sexual
accept genes / alleles / chromosomes / genetics for genetic information
 - or** asexual involves splitting (of one individual)
 - no gametes in asexual **or** sexual involves gametes
accept named gametes
 - only one parent in asexual **or** sexual involves two parents
 - no variation in asexual
or asexual produces clones
or sexual leads to variations
allow offspring of sexual have characteristics of both parents for this point
ignore sexual intercourse
ignore external / internal
ignore plants / animals
ignore mitosis / meiosis

2

- (b) nucleus of egg removed **or** involves empty egg cell
- so only one nucleus **or** one set of genetic information / genes / chromosomes
or
 so genetic information / genes / chromosomes from one parent only

1

1

[4]

- M7.** (a) seeds produced by sexual reproduction / fusion of gametes / fertilisation
allow produced by pollination / crossing
- mixture of genes / genetic information / chromosomes / DNA
or from two parents / apple trees
if no other mark obtained allow 1 mark for apples had different genes / genetic information / chromosomes / DNA
or
mutation occurred
ignore environmental effects / cloned

1

1

- (b) (i) cuttings / tissue culture
accept grafting
allow adult cell cloning
ignore cloning unqualified
ignore genetic engineering
ignore asexual reproduction 1
- (ii) asexual reproduction
allow produced by cloning / mitosis 1
- have identical genes / genetic information / chromosomes / DNA
or no mixing of genes / genetic information / chromosomes / DNA 1

[5]

- M8.** (a) (jellyfish) gene(s) cut out 1
- ref to enzymes (at any stage) 1
- (gene) transferred to zebra fish at early stage of development / embryo / egg
ignore removal of zebra fish genes 1

- (b) any **two** from:
ignore unethical / religious / unnatural
- could transfer gene to other (fish) species
 - effects on food chains
accept effects on other species / humans who eat them
 - effects on zebra fish themselves, eg may out compete non GM zebra fish 2

[5]

- M9.** (a) fusion of gametes / named gametes
allow meet / join / fertilise 1
- results in mixing of genetic information / DNA / chromosomes
accept genetic information / DNA / chromosomes from two parents 1
- (b) (i) use enzyme 1

to cut gene from pout chromosome / DNA

1

insert gene into salmon chromosome / DNA / egg / embryo / nucleus
accept use of plasmid as carrier
ignore salmon / cell

1

(ii) eg fear of gene transfer to wild salmon / extinction of wild salmon /
fear of harmful effect on consumers / unsure of long term effects
ignore cruel / ethics / morals / religion / unnatural / economics

1

[6]

M10. (a) auxin

accept other named plant hormones

1

(b) (i) any **three** from:

- no (fusion of) gametes / fertilisation
*allow no meiosis **or** new cells only produced by mitosis*
- only one parent
allow not two parents
- no mixing of genetic material
- no genetic variation **or** genetically identical offspring
allow clones

3

(ii) more / many offspring / plants (produced from one parent plant)
allow less damage to parent plant
ignore speed / cost

1

[5]

M11. (a) (use of) enzymes

1

(b) asexual reproduction / no gametes / no fusion / only one parent
ignore clones

1

cells all contain same genetic information / same genes (as parent) / same DNA

1

(c) can spray crop with herbicide – only weeds killed
crop survives herbicide insufficient

1

(d) any **one** from:

allow 'think that GM food is bad for health'

- fears / lack of knowledge about effects of GM food on health
ignore not natural or against religion
- crop plants may pass on gene to wild plants
- encourages use of herbicides

1

[5]

M12. (a) wing pattern similar to *Amauris*

allow looks similar to Amauris

1

birds assume it will have an unpleasant taste

1

(b) mutation / variation produced wing pattern similar to *Amauris*

*do **not** accept breeds with Amauris*

*do **not** accept idea of intentional adaptation*

1

these butterflies not eaten (by birds)

1

these butterflies breed **or** their genes are passed to the next generation

1

[5]

