Q1. The photographs show a zorse and its parents, a zebra and a horse.

Horse

Zebra

Zorse

(a) Draw a ring around the correct answer to complete the sentence.

The zorse was produced by

cloning
asexual reproduction
sexual reproduction

.

(1)

(b) Explain the appearance of the zorse.

Use **both** words from the box in your explanation.

gametes	**genes**

.....

.....

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.....

.....

(3)
(Total 4 marks)

Q2. Scientists have produced many different types of GM (genetically modified) food crops.

(a) Use words from the box to complete the sentence about genetic engineering.

clones	**chromosomes**	**embryos**	**genes**

GM crops are produced by cutting ..... out of the ..... of one plant and inserting them into the cells of a crop plant.

(2)

(b) Read the information about GM food crops.

- Herbicide-resistant GM crops produce higher yields.
- Scientists are uncertain about how eating GM food affects our health.
- Insect-resistant GM crops reduce the total use of pesticides.
- GM crops might breed naturally with wild plants.
- Seeds for GM crops can be bought from only one manufacturer.
- The numbers of bees will fall in areas where GM crops are grown.

Use this information to answer these questions.

(i) Give **two** reasons why some farmers are in favour of growing GM crops.

1 .....

.....

2 .....

.....

(2)

(ii) Give **two** reasons why many people are against the growing of GM crops.

1 .....

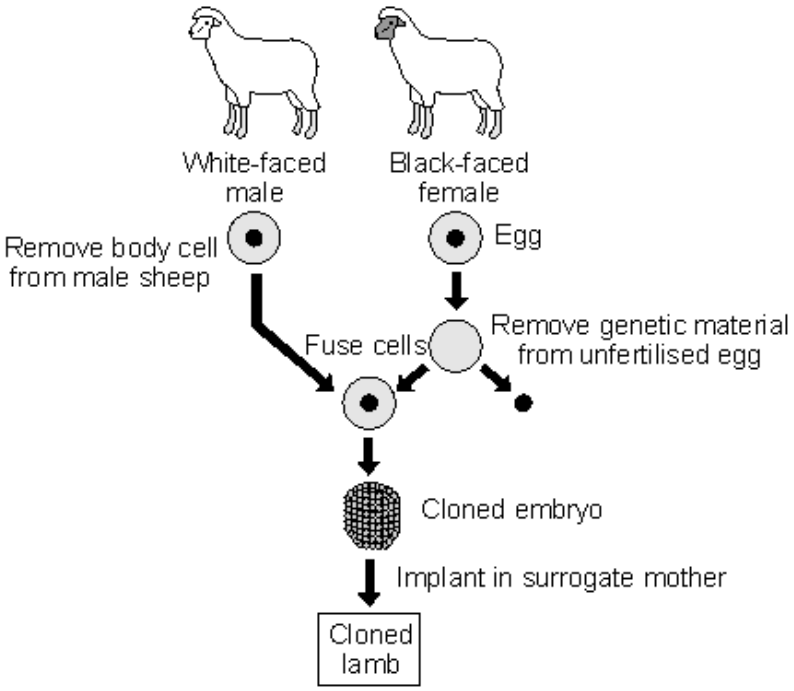
.....

2 .....

.....

(2)
(Total 6 marks)

Q3. The diagram shows one method of cloning sheep.



(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.

.....

.....

.....

.....

.....

(2)

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

Gender .....

Face colour .....

(1)

(ii) Give the reasons for your choice.

.....

.....

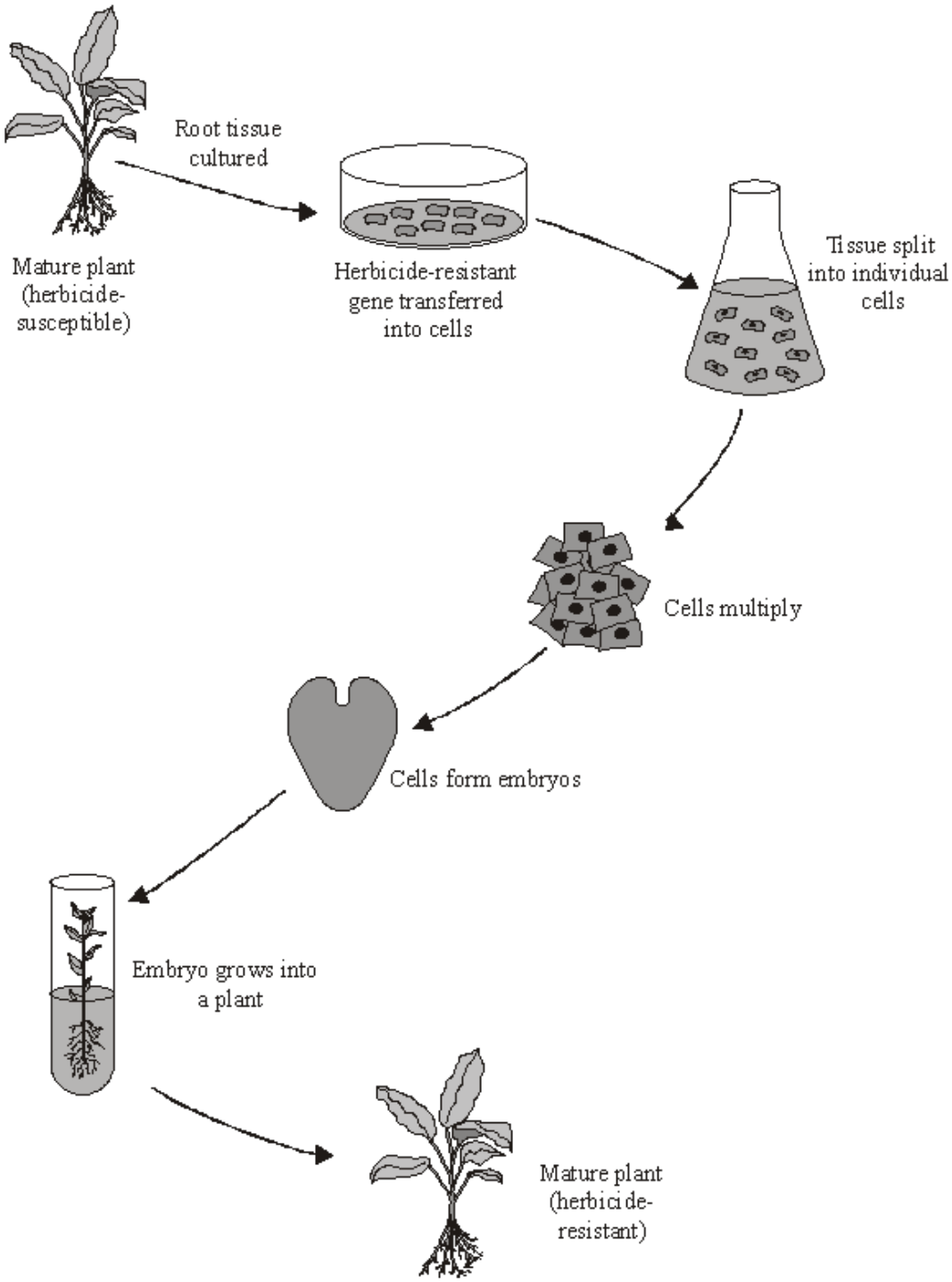
.....

.....

(2)

(Total 5 marks)

Q4. The diagram shows one method of producing herbicide-resistant crop plants.



(a) (i) The herbicide-resistance gene is obtained from a herbicide-resistant plant.

Which structure in a cell carries the genes?

.....

(1)

(ii) How is the herbicide-resistance gene cut out of this structure?

.....

.....

(1)

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

Explain why.

.....

.....

.....

.....

(2)

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

.....

.....

(1)

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

Suggest **one** reason why.

.....

.....

(1)

(Total 6 marks)

Q5. The use of cloned animals in food production is controversial.

It is now possible to clone ‘champion’ cows.

Champion cows produce large quantities of milk.

(a) Describe how adult cell cloning could be used to produce a clone of a ‘champion’ cow.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4)

(b) Read the passage about cloning cattle.

> The Government has been accused of 'inexcusable behaviour' because a calf of a cloned American 'champion' cow has been born on a British farm. Campaigners say it will undermine trust in British food because the cloned cow's milk could enter the human food chain.
>
> But supporters of cloning say that milk from clones and their offspring is as safe as the milk we drink every day.
>
> Those in favour of cloning say that an animal clone is a genetic copy. It is not the same as a genetically engineered animal. Opponents of cloning say that consumers will be uneasy about drinking milk from cloned animals.

Use the information in the passage and your own knowledge and understanding to evaluate whether the government should allow the production of milk from cloned 'champion' cows.

Remember to give a conclusion to your evaluation.

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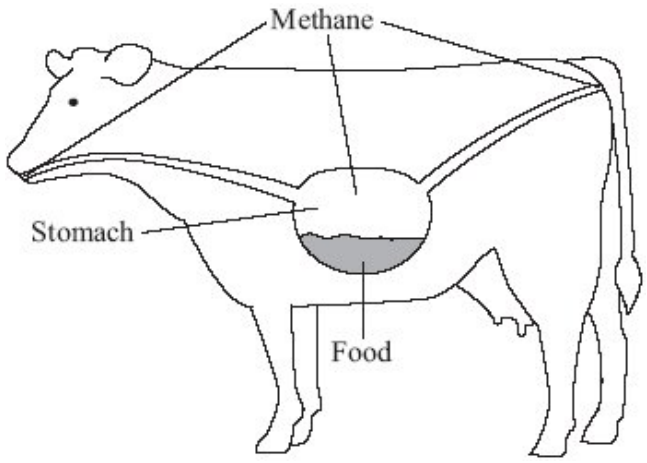
.....

.....

(5)
(Total 9 marks)

Q6. Scientists are investigating how to reduce methane emissions from cattle.

Most of this methane is emitted by the cows belching.



Scientists have found that less methane is belched if the cows eat high-sugar rye grass.

This rye grass has been produced by genetic engineering.

(i) Suggest how the high-sugar rye grass might have been produced by genetic engineering.

.....

.....

.....

.....

.....

.....

(3)

(ii) Some people might object to the growing of genetically-engineered, high-sugar rye grass for feeding cattle.

Give **two** reasons why.

1 .....

.....

.....

2 .....

.....

.....

(2)

(Total 5 marks)

M1. (a) sexual reproduction

1

(b) any **three** from:

- coat colour inherited / controlled by genes
- it has horse and zebra features
- gets gametes from both parents
- genes / DNA / chromosomes / genetic information in gametes
- zorse receives genes / DNA / chromosomes / genetic information from parents

3

[4]

M2. (a) genes

1

chromosomes

1

(b) (i) higher yield

1

less use of pesticides

1

(ii) any **two** from:

- uncertain about effects on health
- fewer bees
- might breed with wild plant
- seeds only from one manufacturer

2

[6]

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) (i) chromosomes

allow DNA

ignore nucleus

1

(ii) 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 – <u>only weeds</u> killed

crop survives herbicide insufficient

1

(d) any **one** from:

- fears / lack of knowledge about effects of GM food on health

  allow 'think that GM food is bad for health'

  *ignore not natural **or** against religion*

- crop plants may pass on gene to wild plants
- encourages use of herbicides

1

[6]

M5. (a) any **four** from:

- nucleus / DNA / chromosomes / genetic material removed (from egg)
- from (unfertilised) egg / ovum
  linked to second point
  *allow 'empty egg cell' for first **two** marks*
  *do **not** allow fertilised egg*
  allow egg from champion cow
- nucleus from body cell of champion (cow)
- inserted into egg / ovum
- electric shock
- to make cell divide **or** develop into embryo
- (embryo) inserted into womb / host / another cow
  allow this point if wrong method eg embryo splitting

4

(b) any **four** from:

Pros: Max 3 marks

- economic benefit eg increased yield / more profit
- clone calf not genetically engineered
- genetic material not altered
- milk safe to drink / same as ordinary milk

Cons: Max 3 marks

- consumer resistance
- caused by misunderstanding process
- not proved that milk is safe
  *ignore 'God would not like it' **or** 'it's not natural'*
- ethical / religious argument
- reduce gene pool / eg

4

Conclusion:

sensible conclusion for or against, substantiated by information from the passage and / or own knowledge

conclusion at end

1

[9]

M6. (i) any **three** from:

ignore references to other methods eg tissue culture and embryo transplantation

- remove gene
- use of enzymes
- from plant with high sugar production

allow from bacteria

- insert gene into rye grass

3

(ii) any **two** from eg

- concern about effect on (health) of cow
- concern about effects on human (health)
- concern about food chain effects **or** effects on ecosystem
- effect on gene pool

*ignore not natural **or** cost*

ignore ethical / religious arguments

if no other marks awarded

'we don't know the long term effects' = 1 mark

2

[5]