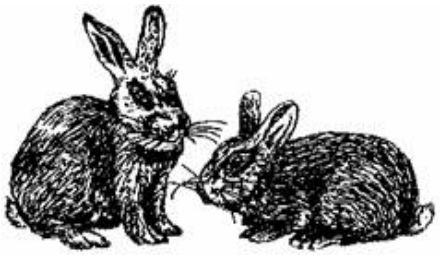
Q1. These young rabbits look like their parents. This is because information about characteristics such as fur colour is passed from parents to their young.



Choose words from this list to complete the sentences below.

body **chromosomes** **clones** **cytoplasm**

genes **nucleus** **sex**

Information is passed from parents to their young in ..... cells.

Each characteristic, e.g. fur colour, is controlled by ..... .

The structures which carry information for a large number of characteristics are

called ..... .

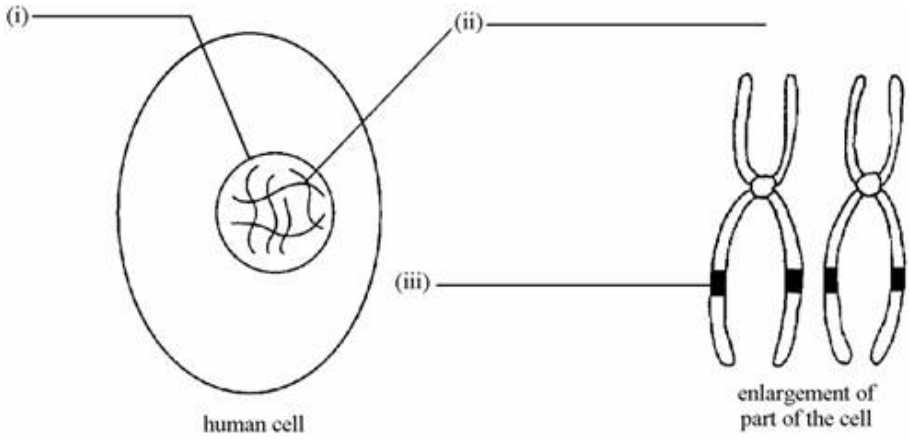
The part of the cell which contains these structures is called the ..... .

(Total 4 marks)

Q2. The diagram shows a human cell and some of its contents.

(a) Choose words from this list to label the diagrams.

chromosome **cytoplasm** **gene** **nucleus**



(3)

(b) Choose words from this list to complete the sentence.

a body cell **an egg cell** **a gamete** **a sperm cell**

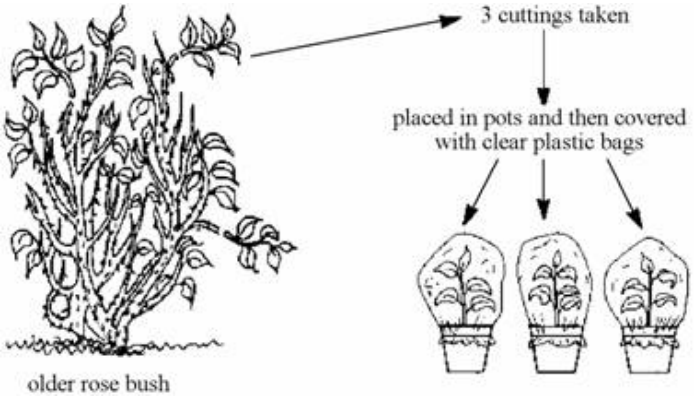
In the cell above, the chromosomes are found in pairs so this cell must be

.....

(1)

(Total 4 marks)

Q3. A rose grower can produce new rose bushes by taking cuttings from an older plant.



Choose words from this list to complete the sentences below.

cheap **disease-free** **sure to work** **quick**

damp **dry** **cold**

flowers **leaves** **roots**

The advantages of making rose bushes in this way are that it is .....

and .....

The cuttings need to be in a ..... atmosphere until the

..... grow.

(Total 4 marks)

Q4. Choose words from this list to complete the sentences below.

genes pollen grains seeds sperm(s)

A young animal looks like its parents. This is because of information passed on in the egg and ..... from which it formed.

These reproductive cells carry information in ..... .

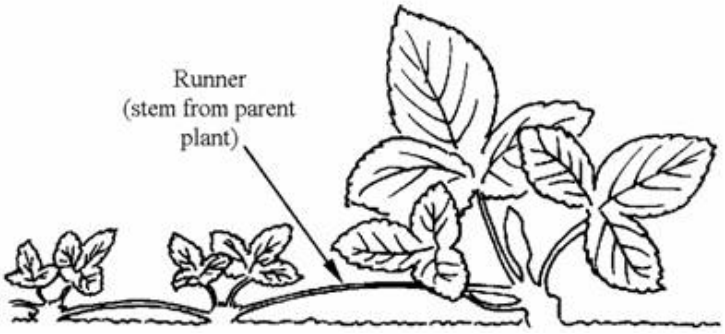
(Total 2 marks)

Q5.

A grower found some small strawberries with a nice taste, growing on a strawberry plant.

The grower then developed plants with strawberries which were larger but had the same nice taste.

Once the grower had developed his new plants, he could use runners to produce more plants which had the new large and tasty strawberries.



(i) What type of reproduction is this called?

.....

(1)

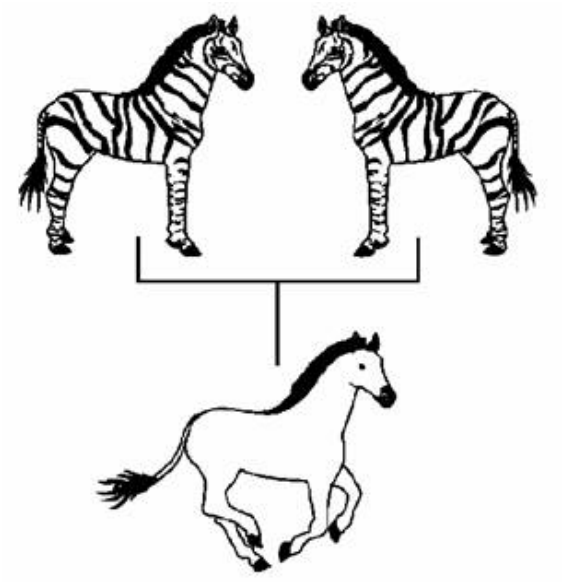
(ii) Why would he use this type of reproduction to produce more new plants?

.....

(1)

(Total 2 marks)

Q6. Sometimes an adult offspring will show a distinct variation from its parents, like a zebra appearing to have no stripes.



(a) (i) Changes of this sort are called.....

(1)

(ii) Which part of the cell has chemically changed to cause this variation? Circle the correct answer.

Cytoplasm gene membrane nucleus

(1)

(b) Give a cause of this type of chemical change in a cell.

.....

(1)

(c) Use zebras as an example to explain the term *species.*

.....

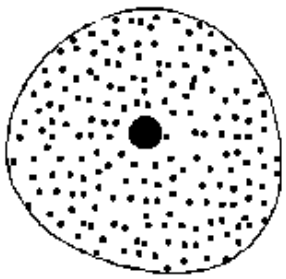
.....

.....

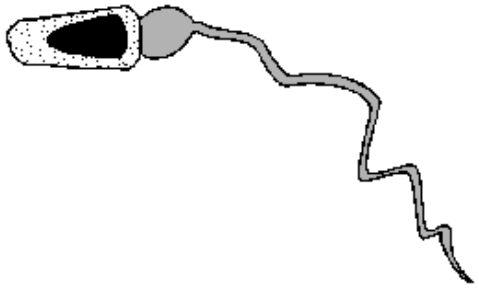
(2)

(Total 5 marks)

Q7. Men and women produce different gametes (sex cells).



Female gamete



Male gamete

Not to scale

(a) In sexual reproduction the male and female gametes join together.

What is the name for this process?

.....

(1)

(b) Complete the sentences about sex cells.

(i) Male gametes are called .....

They are produced in the .....

(2)

(ii) Female gametes are called .....

They are produced in the .....

(2)

(Total 5 marks)

Q8. Carnation plants have attractive flowers.

(a) Carnation plants are grown from cuttings.

Complete the sentences by using the correct words from the box.

asexual	**clones**	**genes**	**mutation**	**sexual**

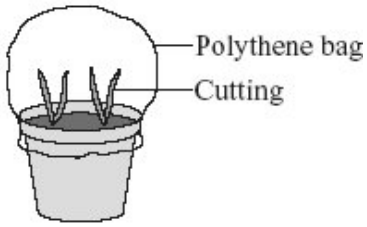
Carnations grown from cuttings have the same ..... as their parents.

This type of reproduction is ..... .

The new plants are known as ..... .

(3)

(b) Gardeners usually cover the cuttings with a polythene bag as shown in the diagram below.



Why do the cuttings grow better if gardeners do this?

.....

.....

(1)

(Total 4 marks)

Q9. Genetic engineering is being used to help sufferers of cystic fibrosis.

In the sentence below, cross out the **two** lines which are wrong in each box.

In genetic engineering, genes are cut out of	cell membranes chromosomes cytoplasm	using	drugs enzymes hormones	

(Total 2 marks)

##

These are all dogs. They are *in the same species.*

Type:	Great Dane	Yorkshire Terrier	Standard Dachshund
Weight:	54 kg	3.5 kg	9 kg
Height to shoulder:	57 cm	25 cm	20 cm

(a) What does it mean to be *in the same species?*

.....

.....

(2)

(b) Complete the following sentences.

- When dogs reproduce the ..... produces sperm in the ..... and the female produces eggs in the .....
- Sperm and eggs are also called .....
- During mating, the sperm and eggs fuse together. This is known as .....
- Once this has happened the ..... starts to develop in the uterus of the mother.

(6)

(c) Explain why puppies have some of the characteristics of both parents.

.....

.....

.....

(2)

(Total 10 marks)

Q11. There are two types of reproduction, asexual and sexual. Use the words in the box to complete the sentences about reproduction.

You may use each word once or not at all.

asexual	eggs	gametes	fertilisation	inheritance
ovaries	sexual	sperms	testes	variation

The genetic information from the mother is carried in the .....

which are made in the ..... .

The genetic information from the father is carried in the .....

which are made in the ..... .

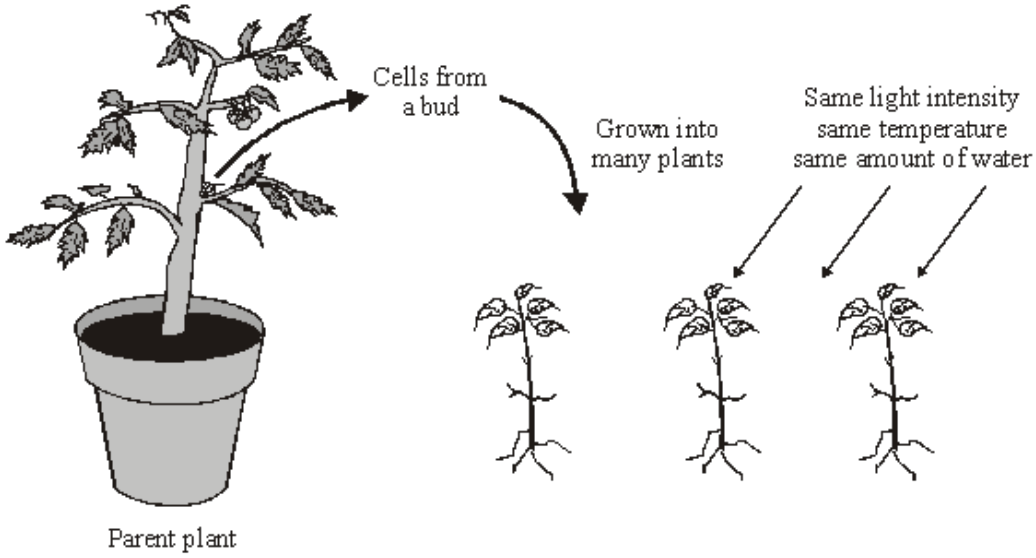
In ..... reproduction, offspring are produced that are genetically different from either parent.

This happens because genetic information from each parent is carried in the ..... and joined together during ..... to develop into a fetus.

In ..... reproduction, genetically identical offspring are produced because no mixing of genetic material takes place.

(Total 8 marks)

Q12. The diagram shows a method of producing a large number of plants which all look the same. Cells taken from the bud can be split into many groups. Each group of cells is then grown under the same conditions.



(i) What do scientists call organisms which are all produced from one parent and which all look the same?

Draw a ring around **one** answer.

clones **communities** **populations**

(1)

(ii) Give **two** reasons why plants produced by this method will all look the same.

1 .....

.....

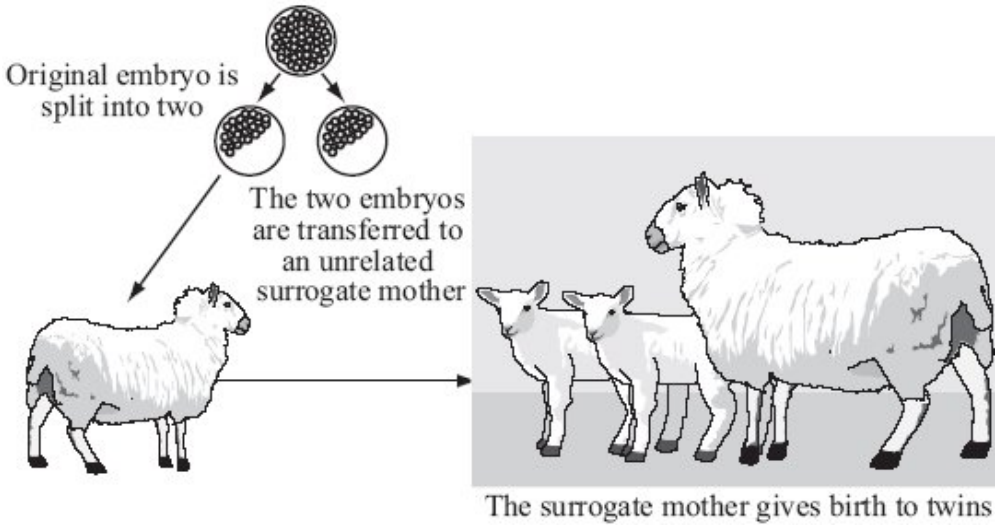
2 .....

.....

(2)

(Total 3 marks)

Q13. The diagram shows one way of cloning sheep.



Use words from the box to complete the sentences.

asexual	**clones**	**different**	**gametes**
identical	**joining**	**sexual**	**splitting**

The original embryo in the diagram developed following the ..... of an egg and a sperm. This is called ..... reproduction. The twins in the diagram have ..... genetic information. This is because the two embryos were produced by ..... reproduction. Because of this they are known as .....

(Total 5 marks)

Q14. 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)

Q15. Some organisms are in danger of extinction.

The photograph shows an African elephant feeding on tree leaves.

(a) Read the information about elephants and humans in Africa.

- The African elephant is the largest land animal.
- The African elephant feeds on lots of leaves.
- Adult African elephants have no natural predators.
- Elephants are killed by poachers for their ivory tusks.
- African elephants live for about 70 years.
- Most African elephants live in large herds.
- Land available to elephants is disappearing rapidly.

The African elephant is now extinct in many parts of Africa.

Use information from the list to give **three** reasons why.

1 .....

.....

2 .....

.....

3 .....

.....

(3)

(b) Organisms that are in danger of extinction can be cloned.

List A gives the names of three different cloning techniques.

List B gives information about these techniques.

Draw a line from each technique in **List A** to the correct information about it in **List B**.

List A Technique	List B Information
	Small groups of cells from parts of a plant are grown on a special jelly.
Adult cell cloning	
	Cells from a developing animal are separated before they become specialised and then placed into host mothers.
Embryo transplanting	
	Genes are cut out from chromosomes and inserted into other organisms.
Tissue culture	
	A nucleus is removed from an unfertilised egg cell. The nucleus from a body cell is inserted into the egg cell. An electric shock causes the egg to start to divide.

(3)

(Total 6 marks)

Q16. 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**

.....

.....

.....

.....

.....

.....

.....

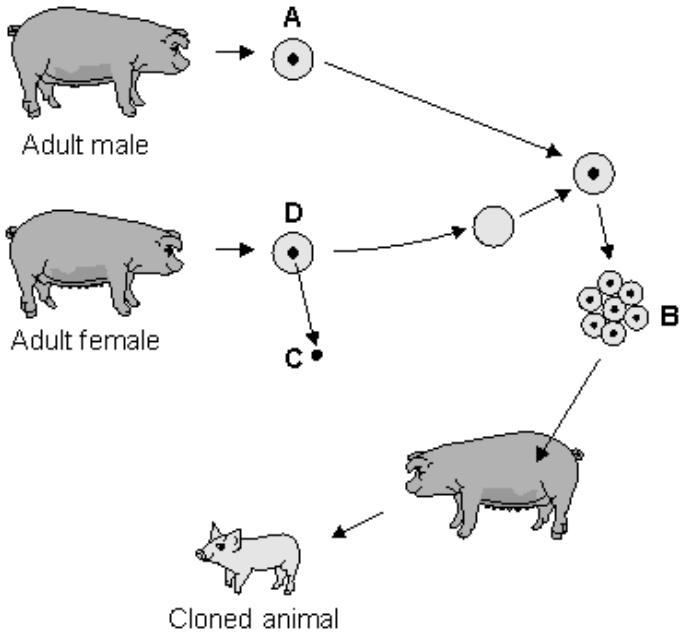
.....

.....

.....

(3)
(Total 4 marks)

Q17. (a) The diagram shows how pigs can be cloned.



For each question write the correct letter in the box.

Which structure, **A**, **B**, **C** or **D** is:

(i) an egg cell ☐ **(1)**

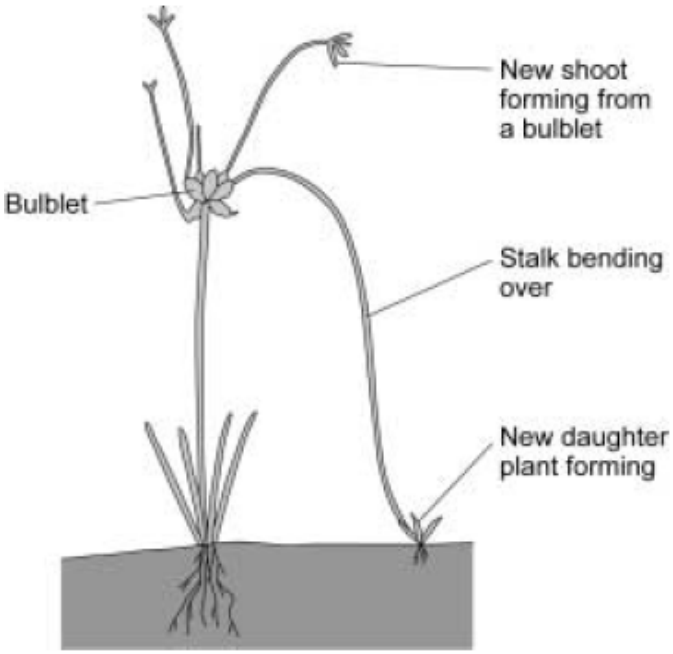
(ii) a nucleus ☐ **(1)**

(iii) an embryo? ☐ **(1)**

(b) Walking onion plants grow a bunch of bulblets (tiny bulbs).

The bulblets start to grow and the stalks bend over with the weight of the new growth.

This makes the onion plant seem to walk across the garden.



Producing plants in this way is called asexual reproduction.

Use words from the box to complete the following sentences.

chromosome	clone	gamete	gene	parent

Asexual reproduction needs only one ..... .

Asexual reproduction does not involve production of a ..... .

The daughter plant is called a ..... .

(3)
(Total 6 marks)

Q18. We breed animals with the characteristics that we prefer.

(a) The photograph shows a rabbit with some of its babies.

Photograph supplied by iStockphoto/Thinkstock

Use words from the box to complete the sentences about inheritance in rabbits.

characteristic	chromosome	gene	gamete

(i) The colour of a rabbit's fur is known as a .....

(1)

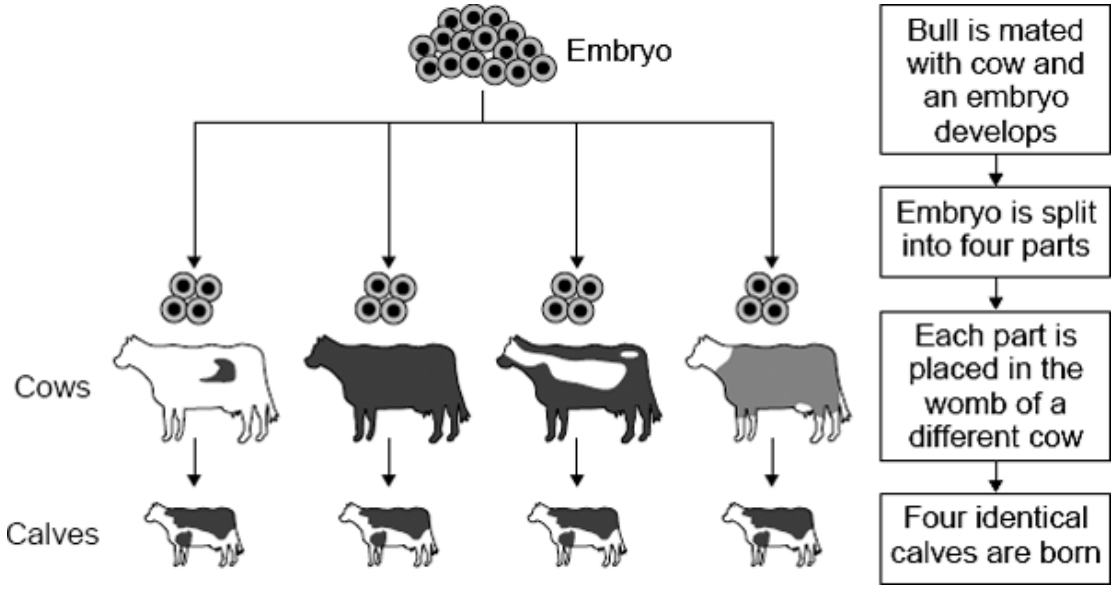
(ii) This colour is controlled by a .....

(1)

(iii) Each sex cell of a rabbit is known as a .....

(1)

(b) The diagram shows one way of producing calves.



Use words from the box to complete the sentences.

asexual	**clones**	**cuttings**	**gametes**	**genetic**	**sexual**

A bull was mated with a cow.

This is ..... reproduction.

The embryo produced was split into four parts.

The calves in the diagram have identical genetic information.

This is because the calves were produced by ..... reproduction.

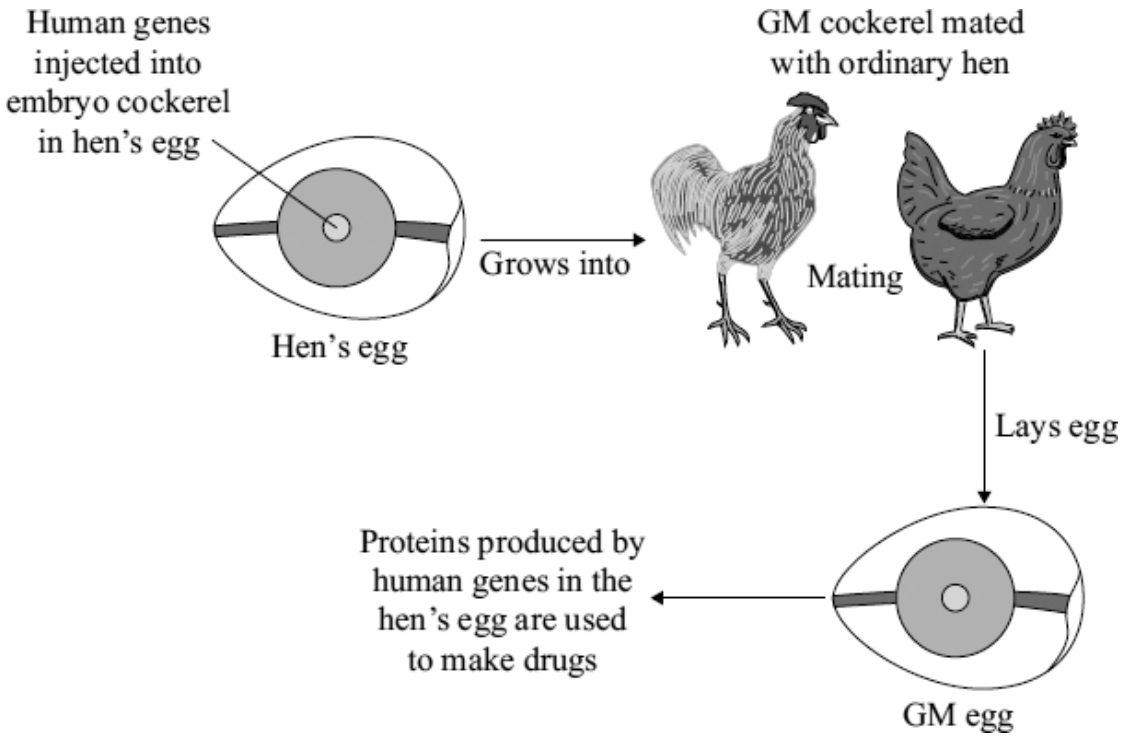
The identical calves are known as .....

(3)
(Total 6 marks)

Q19. Scientists have discovered how to produce genetically modified (GM) hens' eggs.

Some proteins produced in GM eggs can be used as drugs to treat humans.

The diagram shows how this is done.



(a) Which type of reproduction is involved when the cockerel mates with the hen?

Tick (✓) **one** box.

Asexual ☐

Cloning ☐

Sexual ☐

(1)

(b) From which part of a human are the genes cut?

Tick (✓) **one** box.

Chromosome ☐

Embryo ☐

Glands ☐

(1)

(c) Read the information about genetically modified animals.

- GM animals might escape and breed with wild animals.
- Genetic modification can produce fast-growing animals for food.
- Genetic modification can be used to clone animals in danger of extinction.
- Using GM animals can reduce the number of animals used in medical research.
- Animals have the right to be free from genetic modification.

Use **only** this information to answer these questions.

(i) Give **two** reasons why many people are in favour of genetically modified animals.

1 .....

2 .....

(2)

(ii) Give **two** reasons why many people are against genetically modified animals.

1 .....

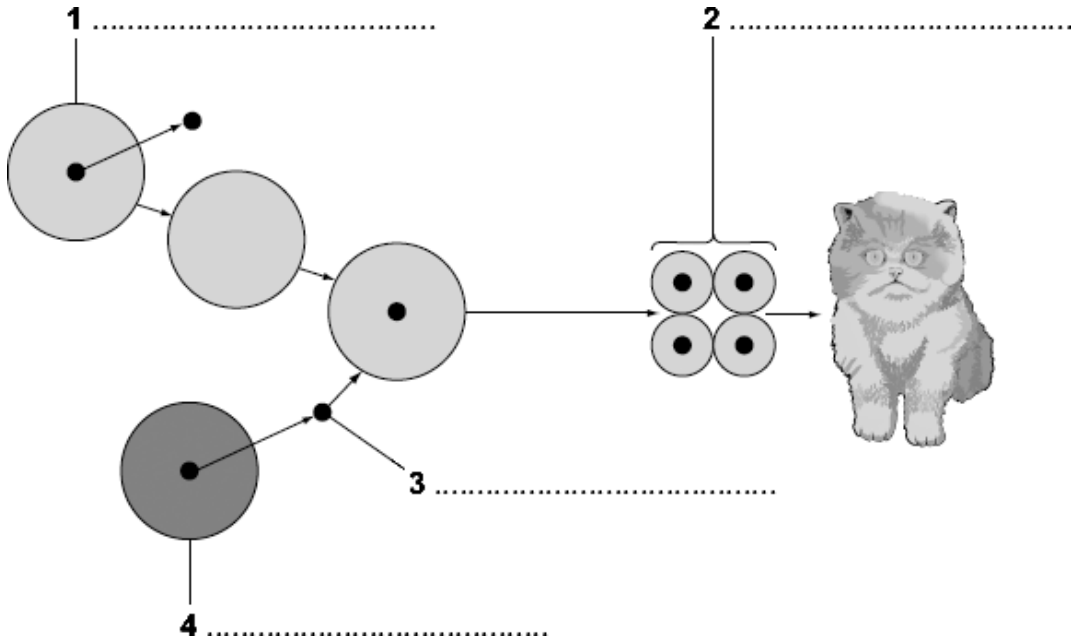
2 .....

(2)

(Total 6 marks)

Q20. It is possible to clone pets.

The diagram shows one way of cloning a pet cat, using the nucleus from a cat skin cell.



embryo	**egg**	**nucleus**	**skin cell**	**sperm**

(a) Use words from the box to label structures **1**, **2**, **3** and **4** on the diagram.

(4)

(b) The cloning of humans is not allowed.

Tick (✓) **one** box to complete the sentence.

One **ethical** reason for banning the cloning of humans is that . . .

the method used in animal cloning has not been evaluated. ☐

the method is very expensive. ☐

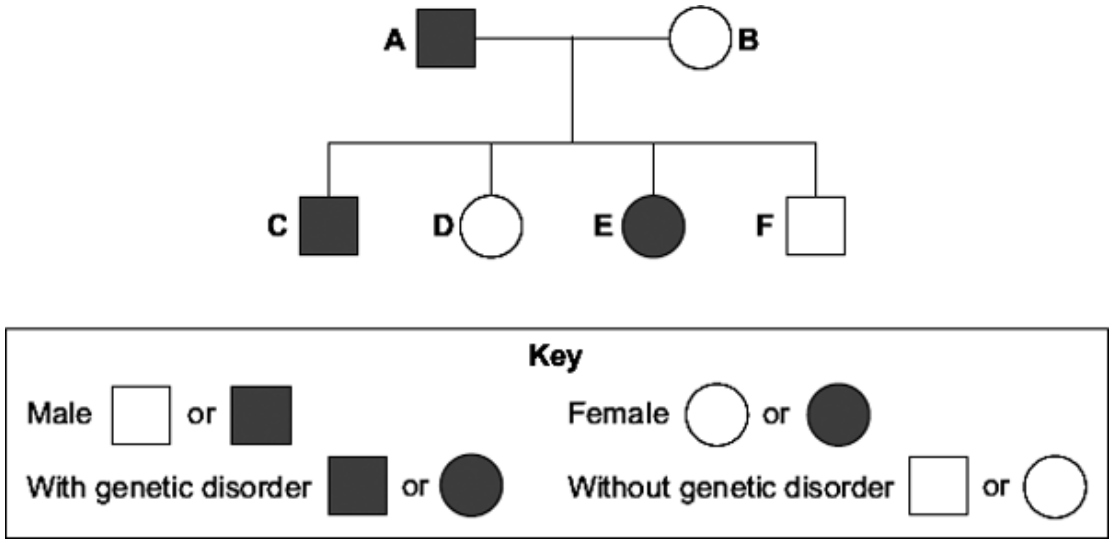
the child created by cloning would not have been able to give permission. ☐

(1)

(Total 5 marks)

Q21. The diagram shows the family tree of a pair of pigs, **A** and **B**.
Pigs **A** and **B** have four offspring, **C**, **D**, **E** and **F**.

Some of the pigs have a genetic disorder.



(a) Which pig, **A**, **B**, **C**, **D**, **E** or **F**, is:

(i) a male pig with the genetic disorder

(1)

(ii) a female pig without the genetic disorder?

(1)

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

Pig **C** has the genetic disorder.

(i) Pig **C** inherited the genetic disorder from

pig **A**.
pig **B**.
pig **E**.

(1)

(ii) The gene for the genetic disorder was passed on in

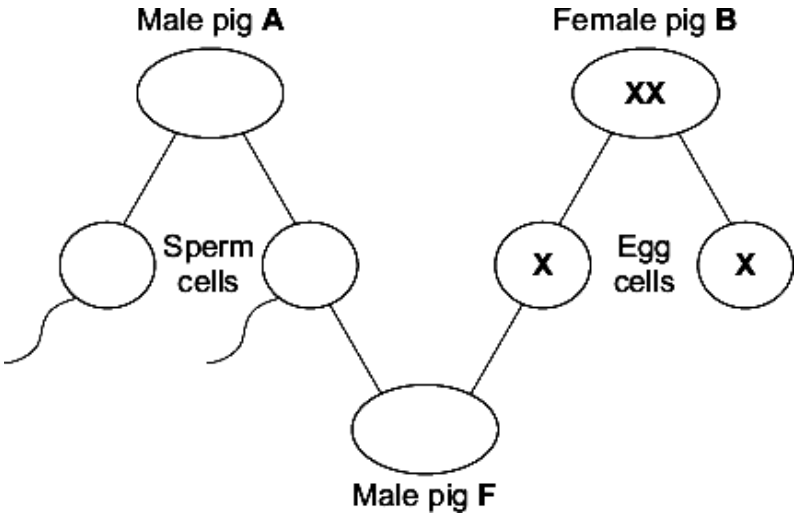
an embryo.
an enzyme.
a gamete.

(1)

(c) Pig **F** is a male.

Complete the diagram to show how the sex of pig **F** depends on the inheritance of the sex chromosomes **X** and **Y**.

The sex chromosomes of pig **B** and the egg cells have been completed for you.



(3)
(Total 7 marks)

Q22. We can now produce organisms with the characteristics we want the organisms to have.

List A gives the names of four ways of producing organisms.

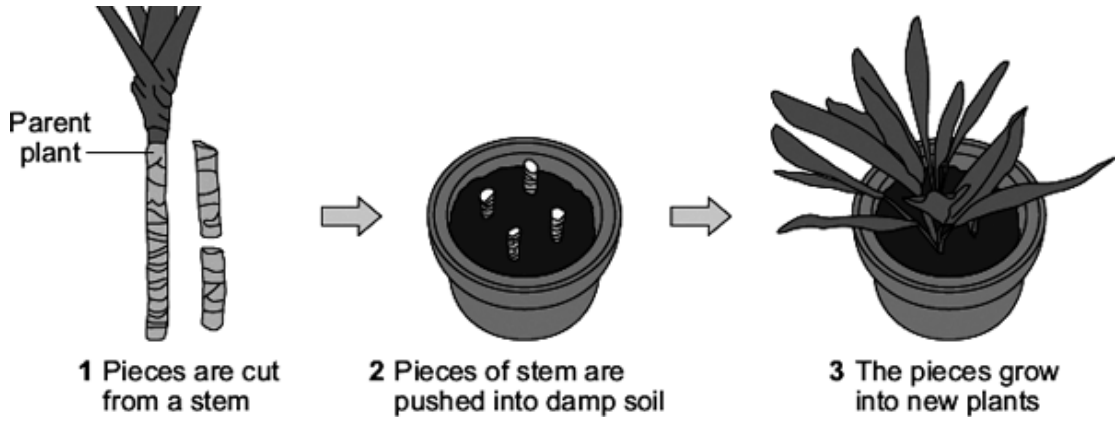
List B gives information about the ways of producing organisms.

Draw **one** line from each way of producing organisms in **List A** to the correct information in **List B**.

List A **Ways of producing organisms**	**List B** **Information**
	Taking part of the stem from a plant, then putting this part of the stem in wet soil in a plant pot.
Embryo transplantation	
	Growing groups of cells from a plant on special jelly.
Genetic engineering	
	Transferring genes from one organism to a different organism.
Taking cuttings	
	Growing plants from seeds in a garden.
Tissue culture	
	Separating groups of cells from a very young developing animal then putting the groups of cells into host mothers.

(4)
(Total 4 marks)

Q23. (a) The drawings show one way of producing new plants. The new plants are identical to the parent plant.



Use words from the box to complete the sentences.

asexual	characteristics	clones	engineering	genes	sexual

The colour and shape of the leaves are known as .....

The information for leaf colour is stored in parts of chromosomes

called .....

The new plants are known as .....

The new plants have been produced by .....reproduction.

(4)

(b) (i) Name **one** other way of producing plants that are identical to their parents.

.....

(1)

(ii) Name **one** way of producing animals that are identical to each other.

.....

(1)

(Total 6 marks)

Q24. (a) Human body cells contain 46 chromosomes.

(i) How many chromosomes are there in a human sperm cell?

(1)

(ii) Name the part of the sperm cell that contains the chromosomes.

.....

(1)

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

(i) In human females, the sex chromosomes are

X and **X**.
X and **Y**.
Y and **Y**.

(1)

(ii) In human males, the sex chromosomes are

X and **X**.
X and **Y**.
Y and **Y**.

(1)

(c) A man might release 300 million sperm cells at a time.

How many of these sperm cells would contain an **X** chromosome?

.....

(1)

(Total 5 marks)

Q25. Insecticides are chemicals which kill insects.
Insecticides may be sprayed onto crops to increase crop yield.

(a) Killing insects on crops increases crop yield.

Suggest why.

.....

.....

(1)

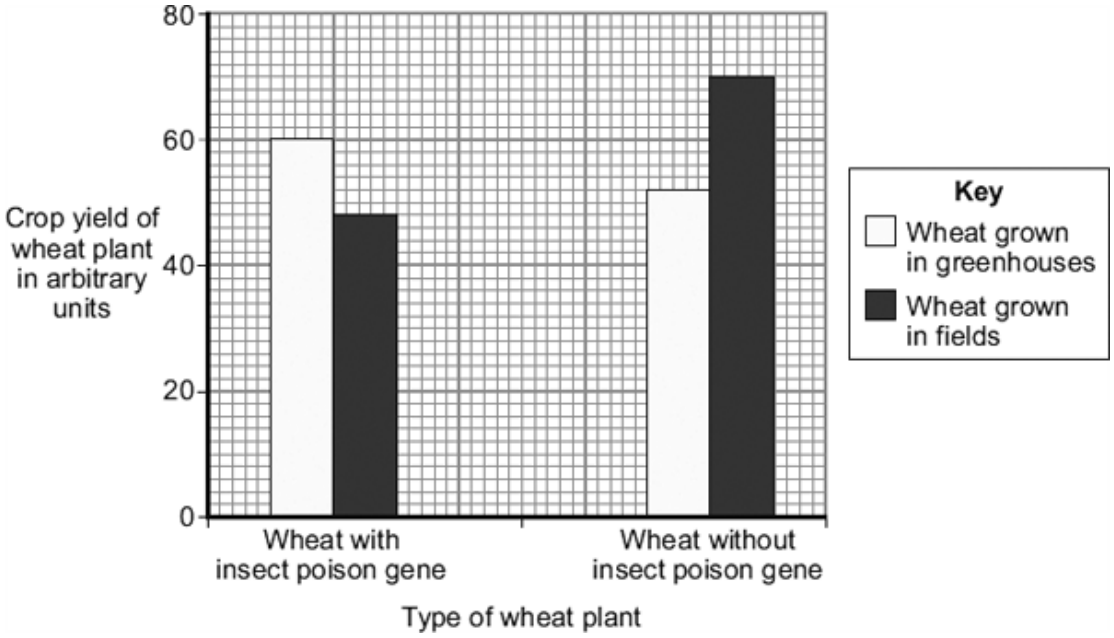
(b) A microorganism contains a gene which causes the production of an insect poison.

Scientists transferred the gene for production of the insect poison into wheat plants. This makes genetically modified (GM) wheat.

The scientists:

- grew wheat plants with the insect poison gene in fields and in greenhouses
- grew wheat plants without the insect poison gene in fields and in greenhouses
- measured the crop yield of the wheat plants.

The bar chart shows the results.



(i) What was the yield of the wheat with the insect poison gene grown in greenhouses?

..... arbitrary units

(1)

(ii) The yield from wheat without the insect poison gene grown in greenhouses was different from the yield you gave in (b)(i).

Describe this difference in yield.

.....

.....

.....

.....

(2)

(iii) Look again at the bar chart.

What advice would you give to a farmer about the type of wheat to grow in fields?

Give a reason for your answer.

.....

.....

.....

.....

(2)

(c) Some people are concerned about the use of GM crops.

Why?

.....

.....

.....

.....

.....

(2)

(Total 8 marks)

Q26. When animals die, they usually fall to the ground and decay.
In 1977 the body of a baby mammoth was discovered.
The baby mammoth died 40 000 years ago and its body froze in ice.

The picture shows the mammoth.

By Thomas Quine [CC BY-SA 2.0], via Wikimedia Commons

(a) Explain why the body of the baby mammoth did **not** decay.

.....

.....

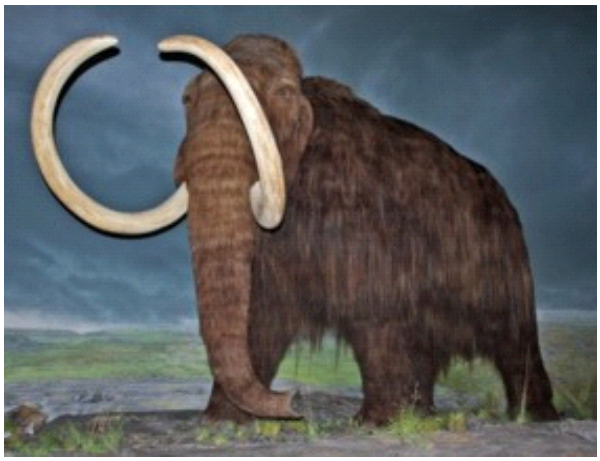
.....

.....

(2)

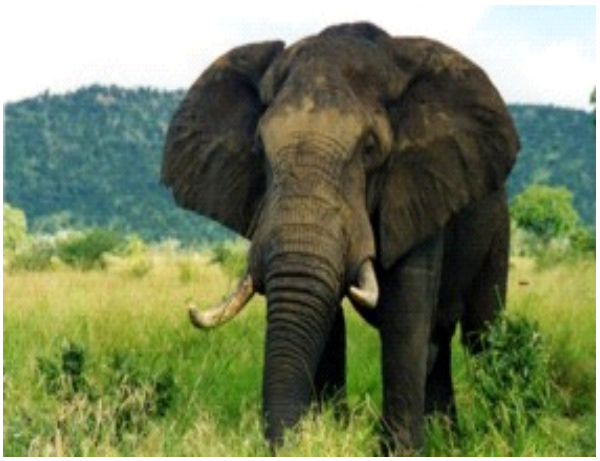
(b) Mammoths are closely related to modern elephants.
The pictures show these two animals.

What scientists think a mammoth looked like



By WolfmanSF (Own work) [CC-BY-SA-3.0], via Wikimedia Commons

Modern elephant



By Caitlin from Hertfordshire, UK [CC-BY-2.0], via Wikimedia Commons

Mammoths are *extinct*. What does *extinct* mean?

.....

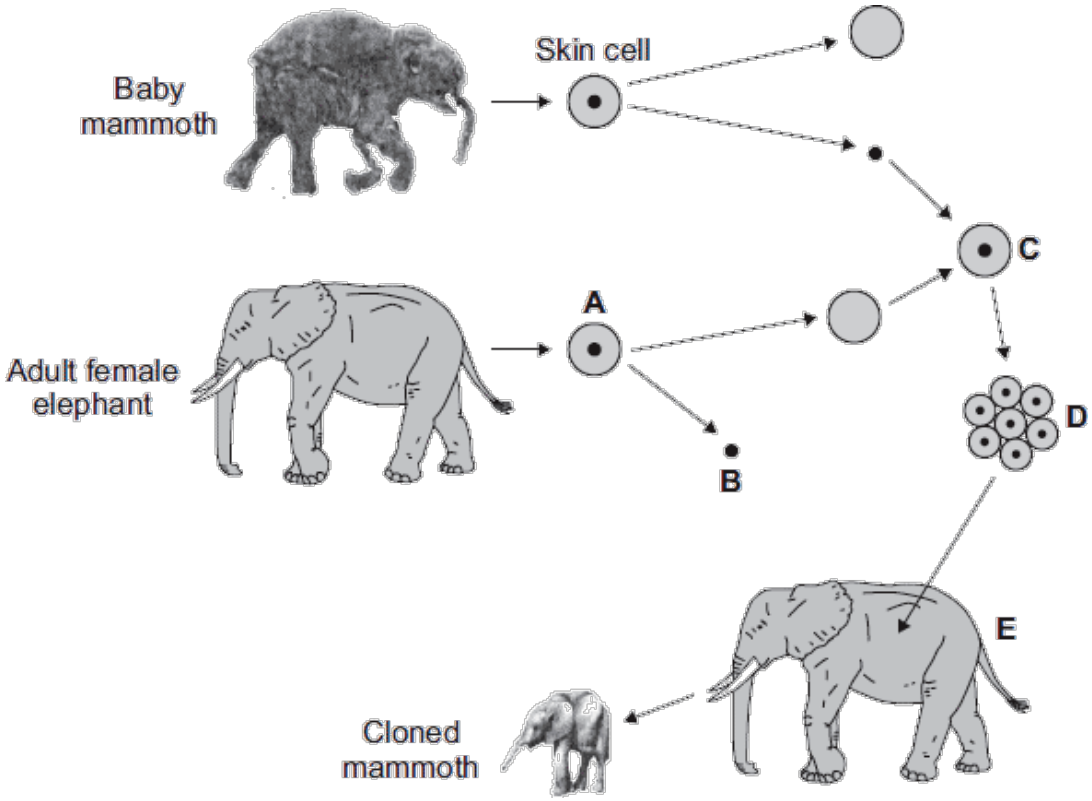
.....

(1)

(c) Scientists believe they may be able to use adult cell cloning to recreate a living mammoth.

The scientists will use a skin cell from the baby mammoth.

The diagrams show how the skin cell will be used.



In each question, draw a ring around the correct answer.

(i) What type of cell is cell **A**?

skin cell **egg cell** **sperm cell**

(1)

(ii) Part **B** is removed from cell **A**.

What part of the cell is part **B**?

nucleus **cytoplasm** **cell membrane**

(1)

(iii) After cell **C** is formed, it divides into embryo cells.

What is done to cell **C** to make it divide?

Cell **C** is

treated with enzymes.
mixed with sperm cells.
given an electric shock.

(1)

(iv) The embryo cells form a ball of cells. The ball of cells will be put into female elephant, **E**.

Which part of elephant **E** is the ball of cells put into?

womb **stomach** **ovary**

(1)

(d) The scientists expect any offspring of the adult cell cloning to look like a mammoth and **not** like an elephant.

Why?

.....

.....

(1)
(Total 8 marks)

Q27. Kangaroos have brown coats. The two parent kangaroos in the photograph produced a baby kangaroo with a white coat.

Photographs supplied by iStockphoto/Thinktsock

(a) Use words from the box to complete the sentences.

asexual	**characteristic**	**chromosome**
mutation	**nucleus**	**sexual**

The baby kangaroo was produced by ..... reproduction.

The coat colour of the adult kangaroo is a .....

The different coat colour of the baby kangaroo is the result of a

..... of a gene.

The gene is found on a thread-like structure called a .....

(4)

(b) Some animals similar to kangaroos are endangered species.

Cloning is one way of making sure that endangered species do not die out.
The flowchart below shows one way of cloning an animal.

The four statements needed to complete the flowchart are numbered **1**, **2**, **3** and **4**.

Complete the flow chart by writing the **number** of the correct statement in the empty box.

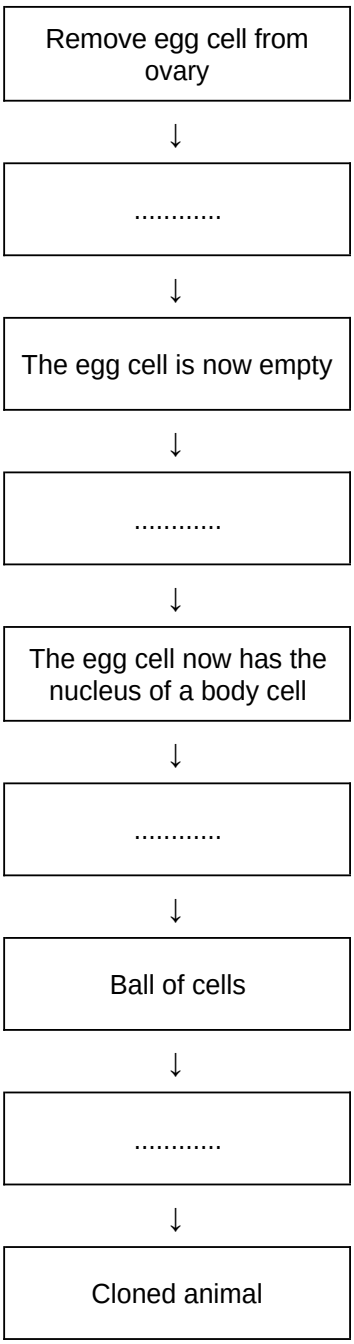
Each number should be used **once** only.

1 Give a small electric shock

2 Transfer nucleus from body cell

3 Remove nucleus from egg cell

4 Insert embryo into womb of female



(3)
(Total 7 marks)

Q28. 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 a GM crop can only be bought from 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)

Q29. The photographs show two breeds of cow.

Friesian cow

By Keith Weller/USDA (www.ars.usda.gov: Image Number K5176-3) [Public domain], via Wikimedia Commons

Jersey cow

By Jamain (Own work) [CC-BY-SA-3.0-2.5-2.0-1.0], via Wikimedia Commons

In parts (a) and (b) draw a ring around the correct answer to complete each sentence.

(a) Cows produce their young (calves) by

asexual reproduction.
cloning.
sexual reproduction.

(1)

(b) Cows and their calves have many similar characteristics.

(i) The information for characteristics is carried by

clones.
embryos.
genes

(1)

(ii) The information for characteristics is passed to the next generation in cells

called

body cells.
gametes.
neurones.

(1)

(c) Friesian and Jersey cows can both be used for meat or to produce milk.

The information shows features of Friesian and Jersey cows.

Friesian cows	Jersey cows
Body mass up to 600 kg	Body mass up to 400 kg
Milk contains 3.4% protein	Milk contains 3.8% protein
Can be milked for 325 days after giving birth	Can be milked for 250 days after giving birth
Produce no milk for 55 days before having a calf	Produce no milk for 45 days before having a calf
Produce > 30 litres of milk per day	Produce < 30 litres of milk per day

Use **only** the information above to answer these questions.

In your answers you must make comparisons between the two breeds of cow.

(i) Give **two** advantages of a farmer keeping Friesian cows and **not** Jersey cows.

1.....

.....

2.....

.....

(2)

(ii) Give **two** advantages of a farmer keeping Jersey cows and **not** Friesian cows.

1.....

.....

2.....

.....

(2)

(d) Cow's milk is different from human milk. Cow's milk should **not** be given to young human babies.

Scientists in China have *genetically engineered* cows to produce human milk. Milk from these cows can be fed to young human babies.

(i) What is *genetic engineering* ?

Tick (✓) **one** box.

Genes from one organism are transferred to a different organism ☐

Cells are separated from an embryo and are transferred to host mothers ☐

The nucleus from a body cell is transferred to an egg cell ☐

(1)

(ii) Some people are worried about using milk from genetically engineered cows, to feed human babies.

Give **one** reason why.

.....

.....

(1)

(Total 9 marks)