AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.6.1 REPRODUCTION (PACK 4)

SCORE	PERCENTAGE
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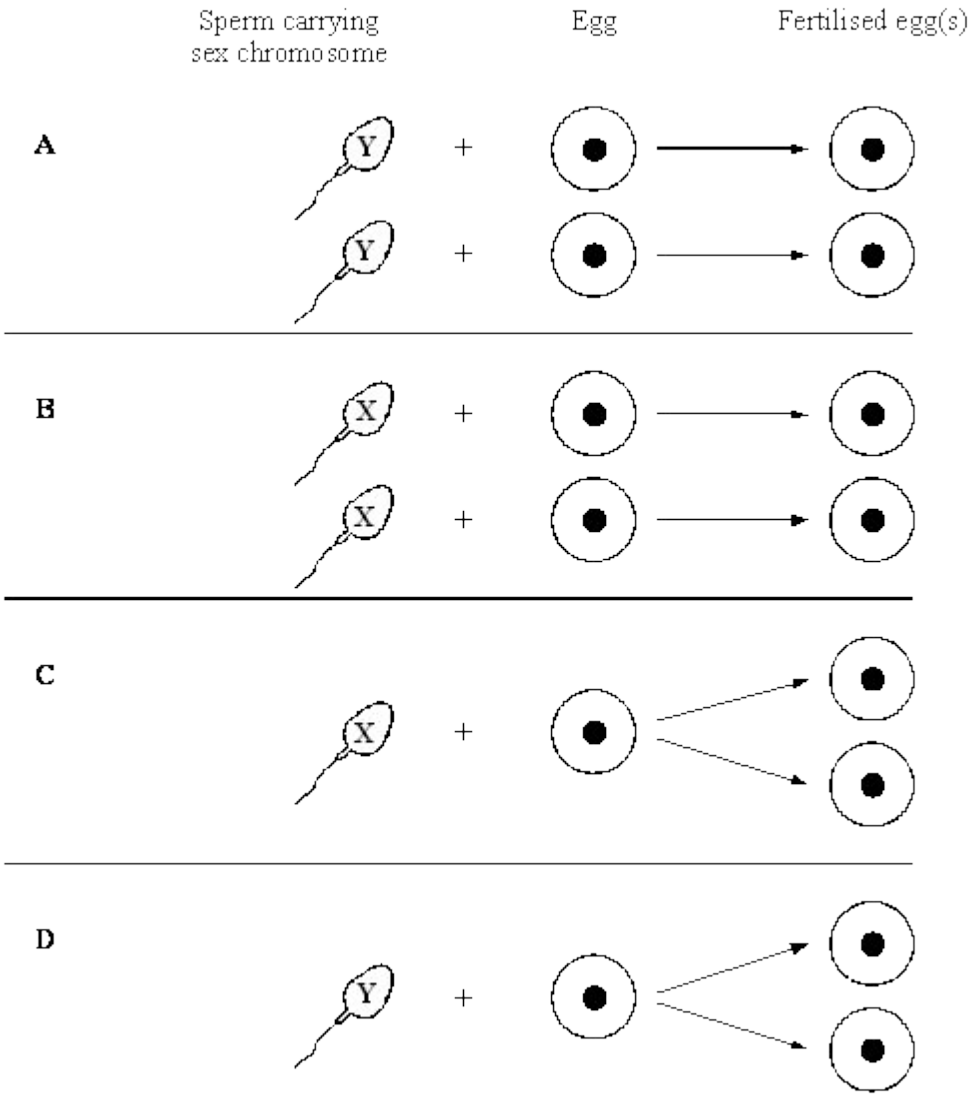
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Q1.

The diagrams show four ways in which human twins may be formed.



Which diagram, **A**, **B**, **C** or **D**, shows the process which will produce genetically identical twin boys?

_____

Explain the reason for your choice.

_____

_____

_____

_____

_____

_____

(Total 3 marks)

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Q2.

The black pigment in human skin and eyes is called melanin. Production of melanin is controlled by a single pair of genes. A person who is homozygous for a recessive allele of the gene has no melanin and is said to be albino.

(a) A man is albino. His wife is heterozygous for the melanin-producing allele.

(i) The fertilised egg cell produced by the couple divides to form two cells.

Name the process of cell division involved.

_____

(1)

(ii) How many albino genes would there be in each of these two cells?

_____

Explain you answer.

_____

_____

_____

(3)

(b) (i) Albino people are more likely than people with melanin to suffer mutations that cause cancer in their skin. Suggest why albino people have an increased chance of mutation in their skin cells.

_____

_____

(1)

(ii) Sometimes, mutation in skin cells leads to cancers in other organs, such as the liver.

Explain how.

_____

_____

_____

_____

(2)

(Total 7 marks)

Q3.

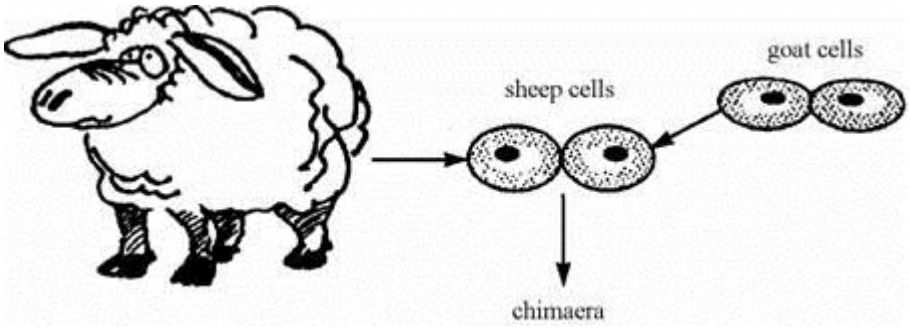
Read the passage.

One reason for cloning animals is to prevent rare breeds from becoming extinct. Early embryos can be divided into four to produce identical quads. Dividing a young embryo into

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more than four parts is a problem because each part may not have enough cells to create both an embryo and a placenta.

The problem can be overcome by adding cells from another embryo, to make a mixture of cells called a chimaera. The two sets of cells may be from two different breeds of animals, or even two different species, such as sheep and goats.



The aim is not to create freaks but chimaeras in which the added cells form the placenta only. The sheep embryos are given cells to make goat placentas and are carried to full term in the uteri of goats. They are born as pure sheep.

(a) Explain why the sheep embryos with added goat placental cells develop into sheep, not goats.

_____

_____

_____

_____

_____

(2)

(b) Use information from the passage and your own knowledge and understanding to evaluate the use of cloning techniques in agriculture.

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 8 marks)

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Q4.

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

alleles **chromosomes** **gametes** **genes** **mutations**

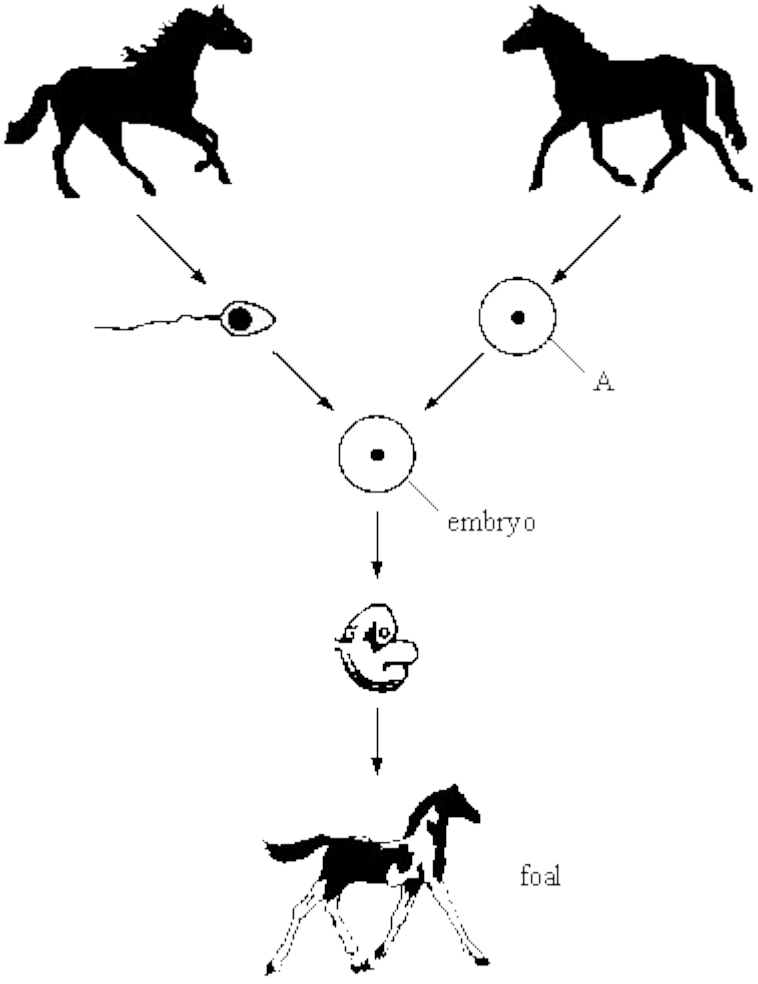
The nucleus of a cell contains thread-like structures called _____ .

The characteristics of a person are controlled by _____

which may exist in different forms called _____ .

(3)

(b) The drawing shows some of the stages of reproduction in horses.



(i) Name this type of reproduction _____

(1)

(ii) Name the type of cell labelled **A** _____

(1)

(c) When the foal grows up it will look similar to its parents but it will **not** be identical to either parent.

(i) Explain why it will look similar to its parents.

_____

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_____

(1)

(ii) Explain why it will **not** be identical to either of its parents.

_____

_____

_____

_____

(2)

(Total 8 marks)

Q5.

This couple has just found out that the woman is pregnant. They wonder whether the child will be a boy or a girl.



Sex chromosomes _____	Sex chromosomes _____

(a) Fill in the boxes to show the sex chromosomes of the woman and the man.

(2)

(b) The couple already has one girl. What is the chance that the new baby will be another girl?

_____

Explain the reason for your answer. You may use a genetic diagram if you wish.

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_____

_____

_____

_____

_____

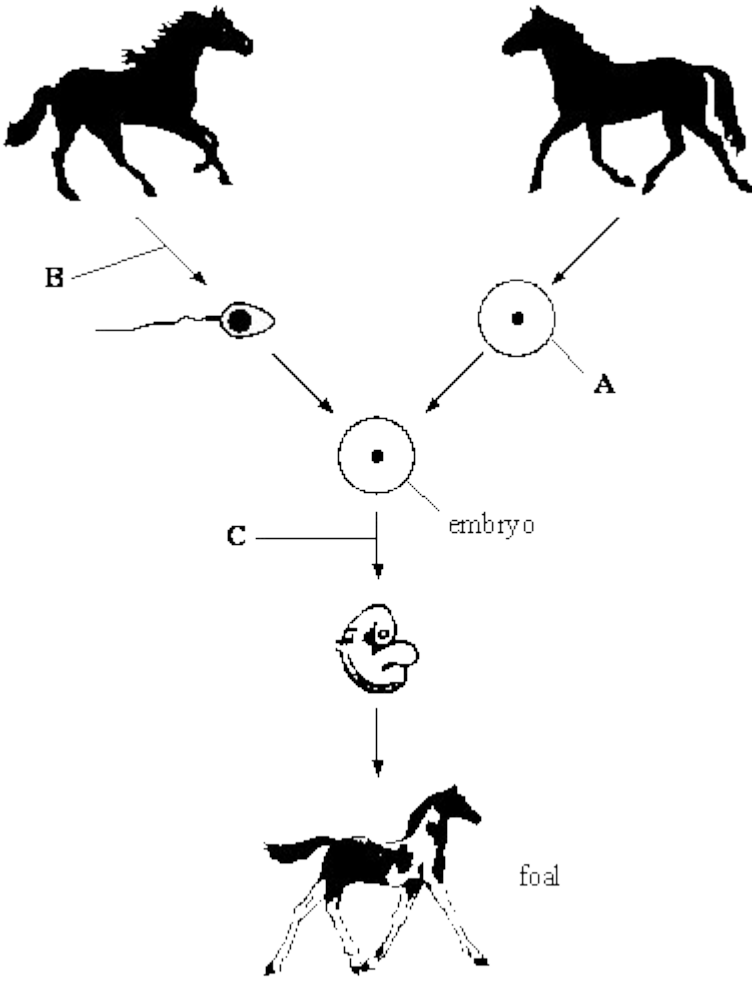
_____

(3)

(Total 5 marks)

Q6.

The drawing shows some of the stages of reproduction in horses.



(a) (i) Name this type of reproduction _____

(1)

(ii) Name the type of cell labelled **A** _____

(1)

(b) Name the type of cell division taking place at the stage labelled:

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(i) **B** _____

(ii) **C** _____

(2)

(c) How does the number of chromosomes in each cell of the embryo compare with the number of chromosomes in cell **A**?

_____

(1)

(d) When the foal grows up it will look similar to its parents but it will **not** be identical to either parent.

(i) Explain why it will look similar to its parents.

_____

_____

(1)

(ii) Explain why it will **not** be identical to either of its parents.

_____

_____

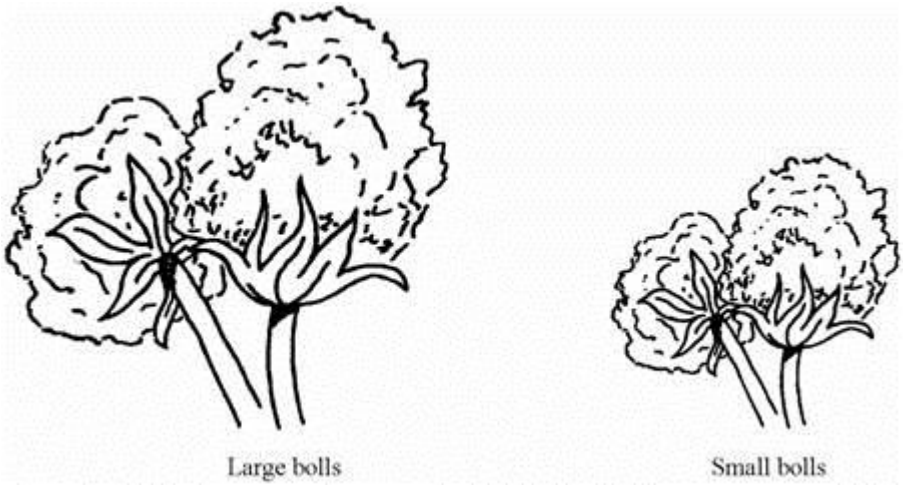
_____

(2)

(Total 8 marks)

Q7.

The drawings show bolls on cotton plants. Cotton thread is made from these bolls.



The size of the bolls is controlled by a single gene. This gene has two alleles. The dominant allele **B** is the allele for large bolls. The recessive allele **b** is the allele for small bolls.

Use a genetic diagram to show how two cotton plants with large bolls may produce a cotton plant with small bolls.

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(Total 4 marks)

Q8.

Read the passage.

> **Designer Denim Genes**
>
> USA scientists have successfully used genetic engineering to insert genes for blue pigment into cotton plants. Their aim is to get cotton plants which produce blue cotton so that denims can be manufactured without the need for dyeing. The scientists have also inserted genes that prevent cotton fibres twisting, with the aim of producing drip dry shirts made from natural fibres. Other cotton plants are being genetically engineered to produce their own insecticides. When they have perfected these new types of cotton plants, the scientists will use cloning techniques to produce large numbers of them.

(i) Name the substance in cells which carries genetic information.

_____

(1)

(ii) Explain how molecules of this substance control characteristics such as blue colour in cotton plants.

_____

_____

_____

_____

_____

_____

(3)

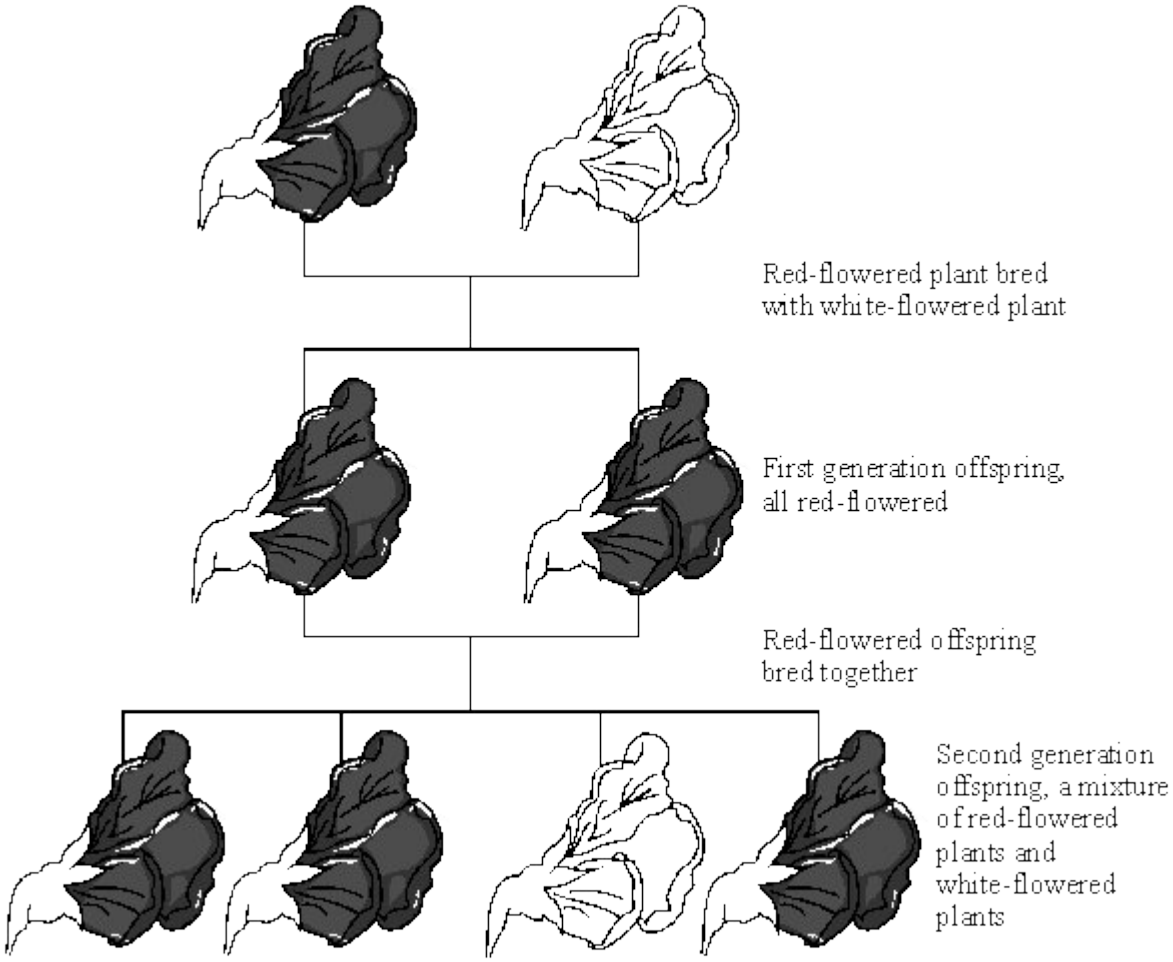
(Total 4 marks)

Q9.

The diagrams show one of the experiments performed by a scientist called Mendel.

He bred sweet pea plants.

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

Mendel proposed that flower colour was controlled by inherited factors.

The first generation plants show that the red factor is

dominant
environmental
recessive

The second generation plants show that the white factor is

dominant
environmental
recessive

We now call inherited factors

chromosomes
gametes
genes

These factors are passed from generation to generation in

gametes
glands
organs

The red-flowered sweet pea plants did not all grow to the same height.

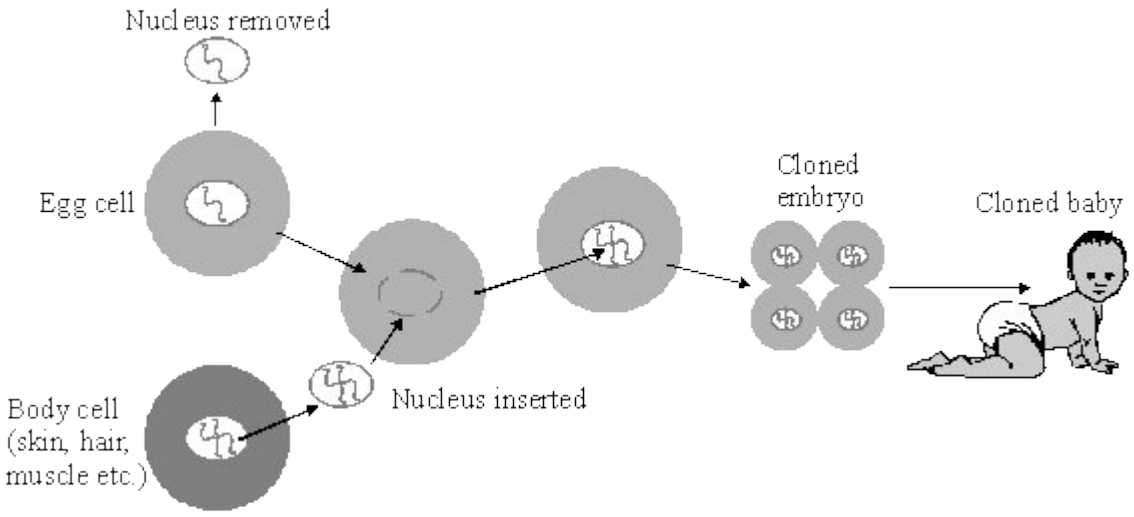
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This was due to [dominant / environmental / recessive] factors.

(Total 5 marks)

Q10.

It is now possible to clone humans. The diagram shows one way in which this can be done.



(a) What type of reproduction is this?

_____

(1)

(b) Will the baby have the characteristics of the egg cell or the body cell?

_____

Explain the reason for your answer.

_____

_____

_____

_____

(2)

(c) The procedure in the diagram could be used to produce several cloned embryos.

Suggest how this might be done.

_____

_____

(1)

(Total 4 marks)

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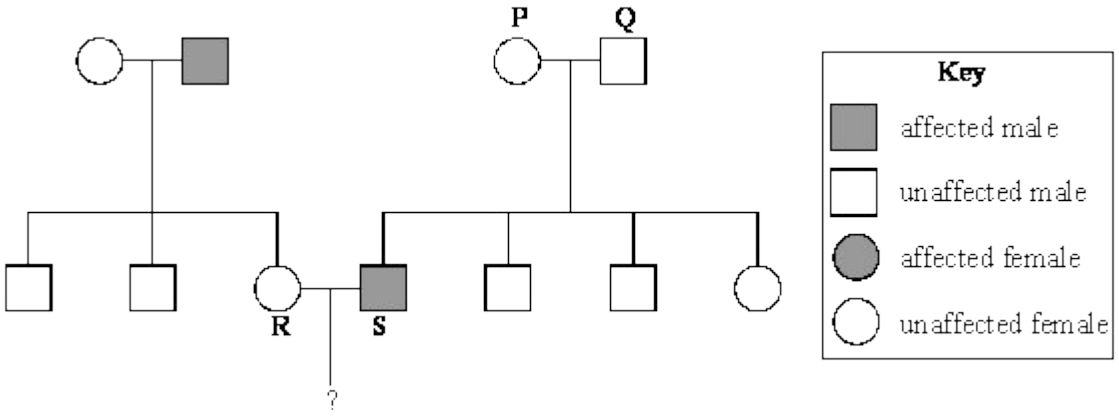
Q11.

The black pigment in human skin and eyes is called melanin.

A single gene controls the production of melanin.

A person who is homozygous for the recessive allele of the gene has no melanin and is said to be albino.

The diagram shows the inheritance of albinism in a family.



(a) Use a genetic diagram to explain the inheritance of the albino allele by children of parents **P** and **Q**.

(3)

(b) **R** and **S** decide to have a child.

What is the chance that this child will be an albino? _____

Use a genetic diagram to explain your answer.

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(3)

(Total 6 marks)

Q12.

In humans, one of the pairs of chromosomes in each cell carries the genes which determine sex.

What is the difference between the sex chromosomes of a man and a woman?

_____

_____

_____

_____

(Total 2 marks)

Q13.

(a) Sex cells are produced by meiosis.

Describe what happens to the chromosomes when a cell divides by meiosis.

_____

_____

_____

_____

(2)

(b) Darwin's theory of natural selection depends on the fact that individual organisms within a species may show a wide range of variation.

Explain how meiosis and sexual reproduction give rise to variation.

_____

_____

_____

_____

(2)

(c) Mutation may also give rise to variation.

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(i) What is meant by mutation?

_____

_____

(1)

(ii) Are all mutations harmful? Explain the reason for your answer.

_____

_____

_____

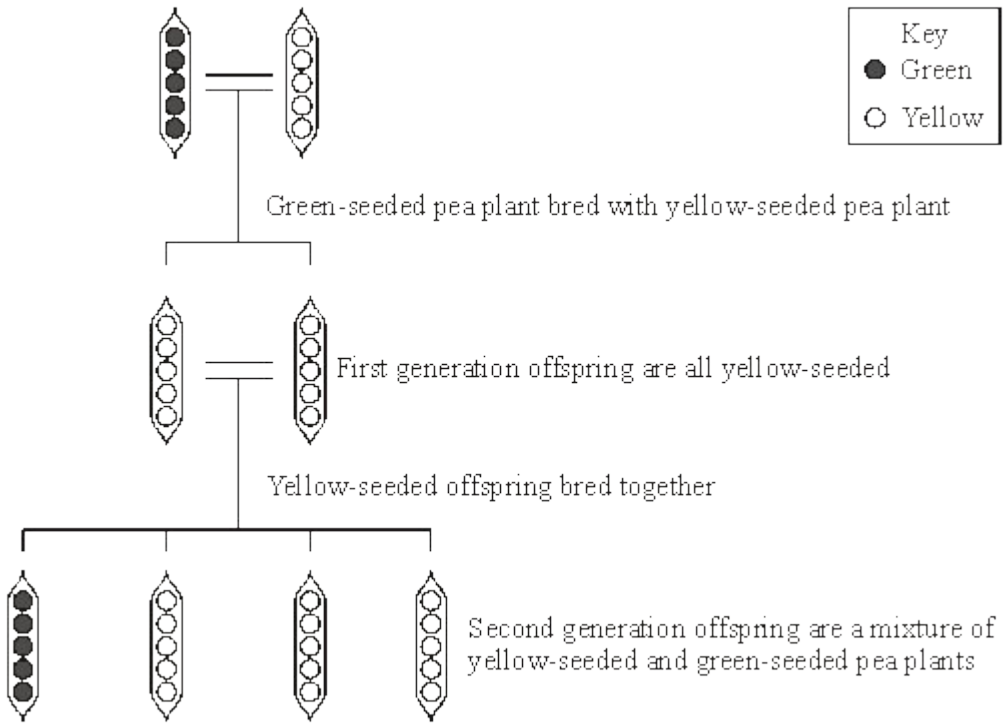
_____

(2)

(Total 7 marks)

Q14.

The diagram shows one of the experiments performed by a scientist called Mendel in the 1850s. He bred pea plants which had different coloured pea seeds.



(a) Use words from the box to help you to explain the results of this experiment.

dominant	**factor**	**recessive**

_____

_____

_____

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_____

_____

_____

(3)

(b) Mendel explained these results in terms of *inherited factors*.

(i) What do we now call *inherited factors*?

_____

(1)

(ii) Where, in a cell, are these *inherited factors* found?

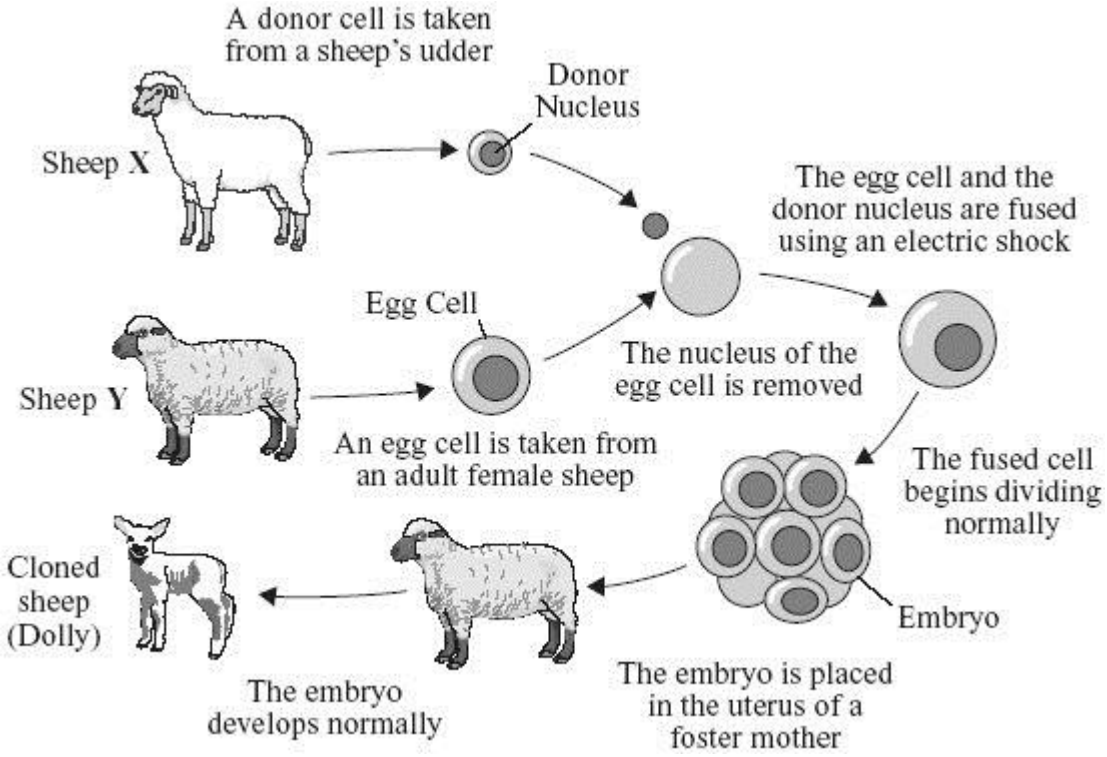
_____

(1)

(Total 5 marks)

Q15.

The diagram shows how Dolly the sheep was cloned.



(a) Name the type of cell division that occurs:

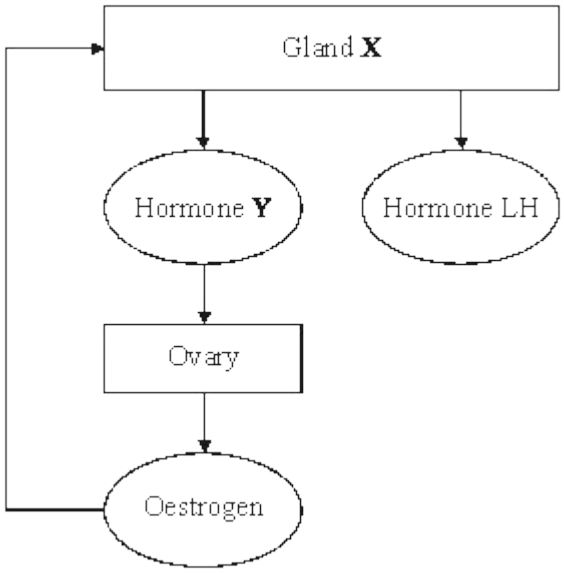
(i) as the egg cell is produced; _____

(ii) as the fused cell begins to divide normally. _____

(2)

(c) The diagram below shows the relationships between the glands and hormones that control the menstrual cycle of a woman.

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(i) Name:

gland **X**; _____

hormone **Y**. _____

(2)

(ii) Give **two** effects of the hormone oestrogen on gland **X**.

1. _____

_____

2. _____

_____

(2)

(Total 6 marks)

Q16.

(a) In sexual reproduction a sperm cell joins with an egg cell.

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

bladder	**kidney**	**liver**	**lung**	**ovary**	**testis**

(i) The organ in which a sperm cell is made is the _____

(1)

(ii) The organ in which an egg cell is made is the _____

(1)

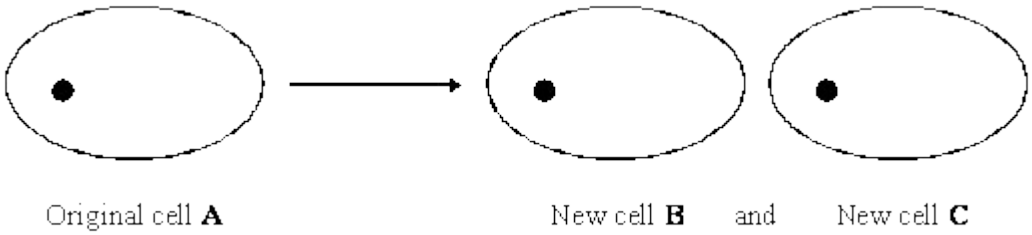
(b) What name is given to the process in which sperm cells and eggs cells join together?

_____

(1)

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(c) Two new cells are formed from one cell by **asexual** reproduction.



How, genetically, does the nucleus of new cell **C** compare with:

(i) the nucleus of the other new cell **B**;

_____

(1)

(ii) the nucleus of the original cell **A**?

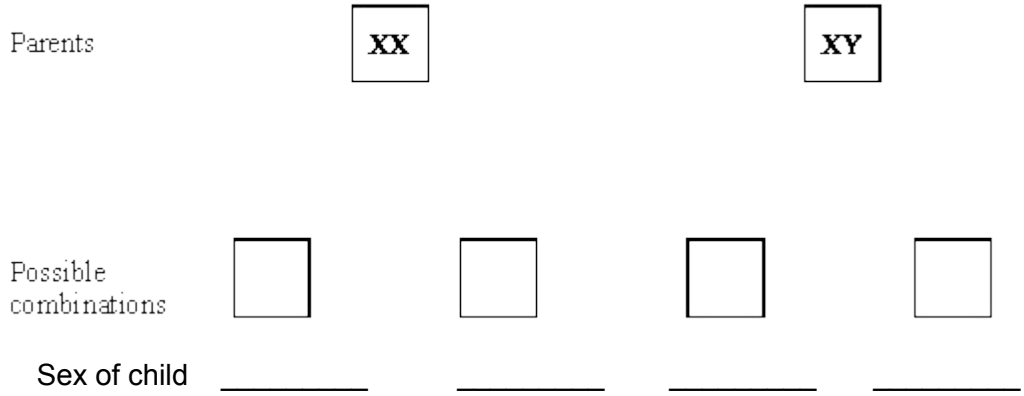
_____

(1)

(Total 5 marks)

Q17.

(a) (i) Complete the genetic diagram to show the possible combinations of gametes for the four children and state the sex of the child for each combination.



(1)

(ii) What name is given to the process when a cell divides to produce gametes?

_____

(1)

(iii) How many pairs of chromosomes are there in each human body cell?

_____

(1)

(iv) How many chromosomes are present in a human ovum?

_____

(1)

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(b) (i) Give **two** advantages to living things of reproducing sexually rather than asexually.

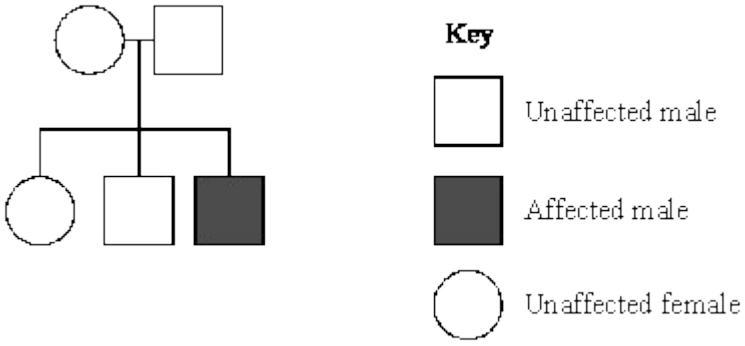
_____

_____

_____

(2)

(ii) The genetic diagram shows two parents and three children.



Only the son has cystic fibrosis, which is caused by a recessive allele. What conclusion may be made about the parents' genes?

_____

_____

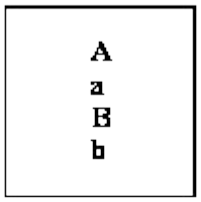
(1)

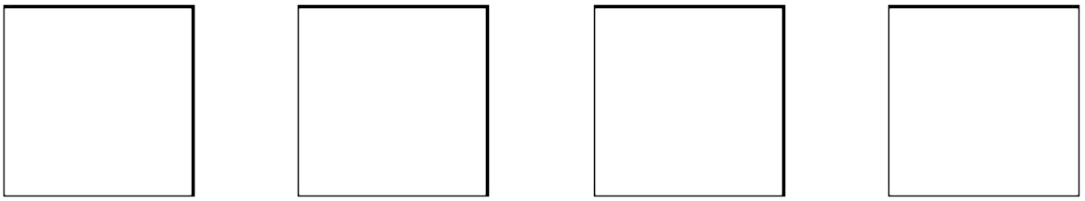
(Total 7 marks)

Q18.

In the cell shown in the diagram as a box, one chromosome pair has alleles **Aa**. The other chromosome pair has alleles **Bb**. The cell undergoes meiosis.

(a) Complete the diagram of the four gametes to show the independent assortment, or reassortment, of genetic material during meiosis.

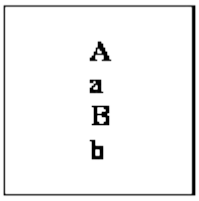


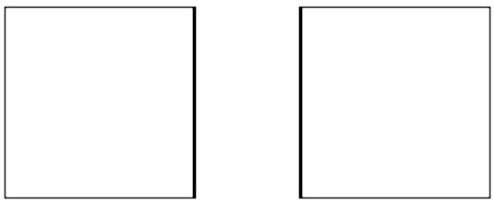


(2)

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(b) If the cell undergoes mitosis instead of meiosis, draw the two daughter cells which result to show the chromosomes in each.





(2)

(c) State the number of chromosomes in:

(i) a normal human cell;

_____

(1)

(ii) a human gamete;

_____

(1)

(iii) the daughter cell from mitosis of a human cell.

_____

(1)

(Total 7 marks)

Q19.

Two heterozygous parents, with alleles Rr, produce offspring.

(i) Draw a genetic diagram to show all the possible arrangements of alleles in their offspring.

(2)

(ii) One of the offspring is dominant homozygous. What is the chance of this occurring?

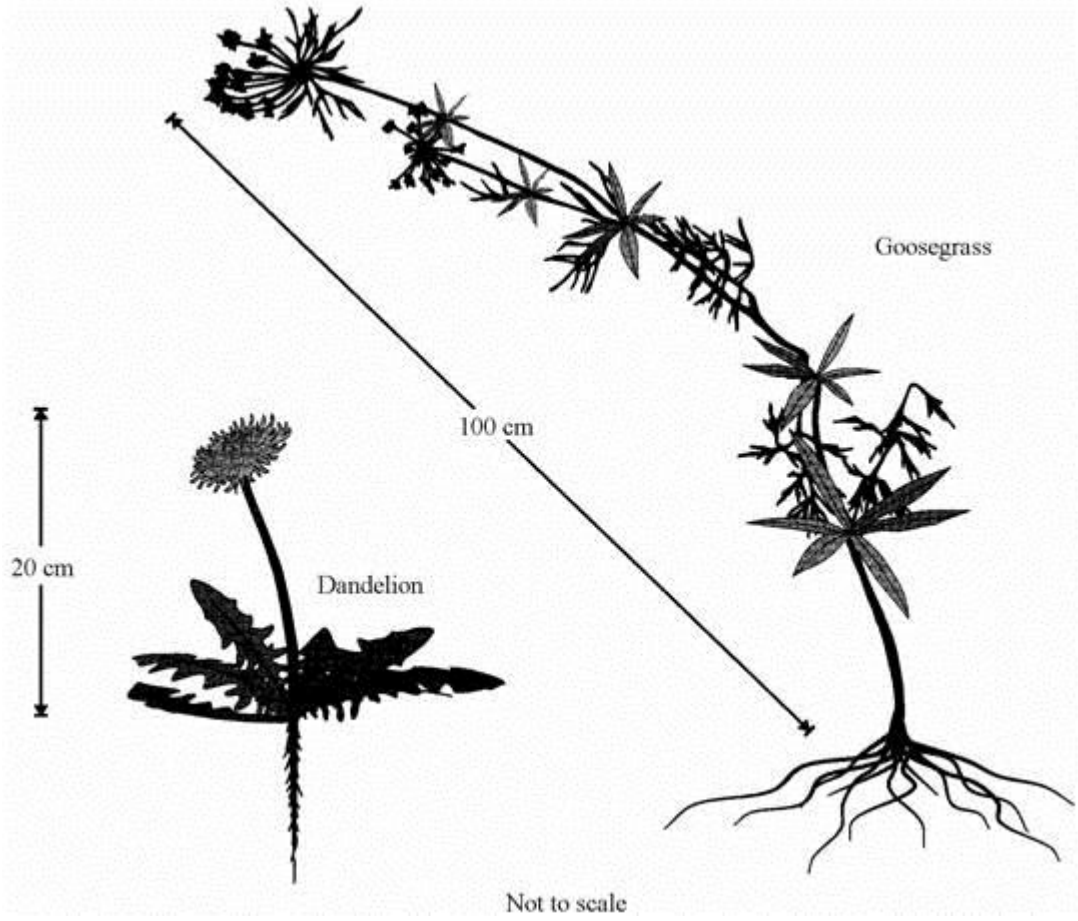
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(1)
(Total 3 marks)

Q20.

Dandelions have become adapted to live in lawns and grass areas where animals graze. Goosegrass, however, has become adapted to live alongside hedgerows and cannot survive being mown.



(a) Use the information in the drawings to suggest **one** advantage of each of the following adaptations.

(i) Dandelion leaves lie flat on the ground.

_____

_____

(1)

(ii) A dandelion has a thick tapered root.

_____

_____

(1)

(iii) Goosegrass stems are long.

_____

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_____

(1)

(iv) Goosegrass roots are thin and very long.

_____

_____

(1)

(b) Dandelions and goosegrass are different species of plants.

(i) What name is given to the unit of inheritance which controls one particular characteristic of a plant or animal?

_____

(1)

(ii) Why would you be unlikely to succeed if you tried to breed a new species of plant by crossing a dandelion with goosegrass?

_____

_____

(1)

(c) Animals as well as plants have become adapted to live in different environments.

State **one** way a polar bear has become adapted to living in the Arctic, and the reason for the adaptation.

_____

_____

_____

_____

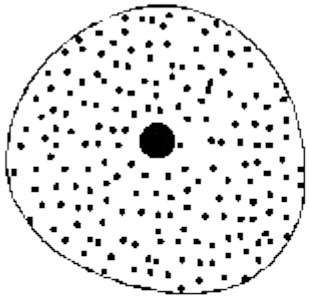
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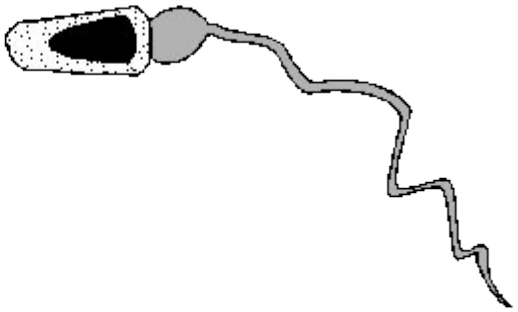
Q21.

Men and women produce different gametes (sex cells).

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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)

Q22.

One of Mendel's original experiments was to cross pure-breeding, red-flowering pea plants with pure-breeding white-flowering pea plants. The next year he grew the seed he had collected. This first generation, $\mathbf{F_1}$, of pea plants all had red flowers. Mendel then made each flower on these plants self-pollinate. He collected the seed from these flowers and grew them. The second generation, $\mathbf{F_2}$, gave the following result:

705 red-flowering plants and 224 white-flowering plants.

(a) Which flower colour is due to the recessive allele?

_____

(1)

(b) Draw a genetic diagram to show the inheritance of flower colour in the first generation ($\mathbf{F_1}$) of plants.

Use the letters **r** and **R** to represent the alleles for flower colour.

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(3)

(c) Explain why Mendel made the first generation of plants self-pollinate.

_____

_____

_____

(2)

(d) If Mendel had taken any two of his white-flowering peas and crossed them, what would have been the colour of the flowers of the next generation of plants?

_____

(1)

(e) It is very difficult to get red-flowering pea plants that breed true. Explain why you cannot guarantee to breed, by self-pollination, pea plants that only have red flowers.

_____

_____

_____

_____

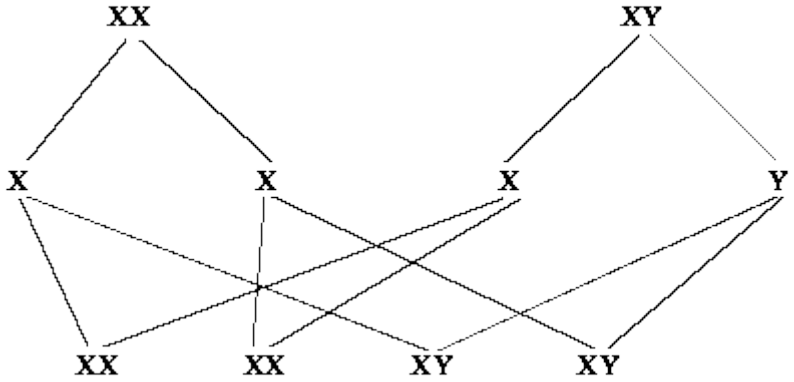
(2)

(Total 9 marks)

Q23.

The genetic diagram shows how the chromosomes divide and combine in human reproduction.

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(a) Draw circles around the symbols for the **two** male gametes.

(2)

(b) State the chance of a child being a girl.

_____

(1)

(c) (i) How many pairs of chromosomes are there in a human body cell?

_____

(1)

(ii) How many chromosomes are there in a human egg cell?

_____

(1)

(d) Chromosomes contain genes. From what substance are genes made?

_____

(1)

(e) In the process of mitosis, how do the number of chromosomes in the daughter cells compare to that in the original cell?

_____

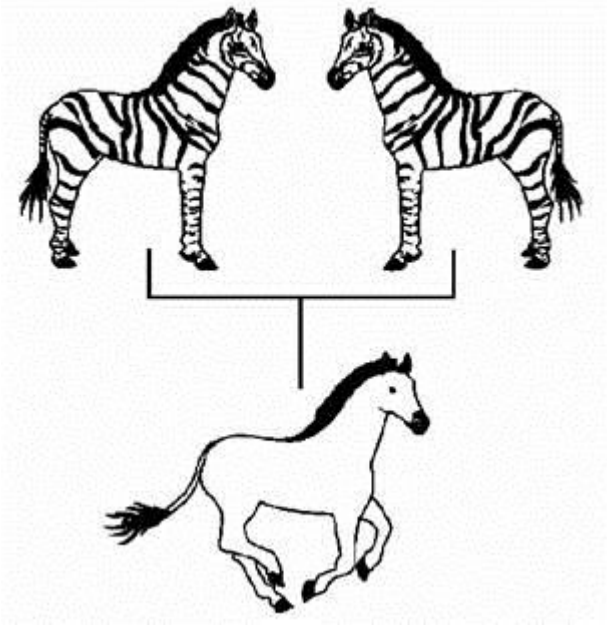
(1)

(Total 7 marks)

Q24.

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

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(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)

Q25.

(a) How many pairs of chromosomes are there in a body cell of a human baby?

_____

(1)

(b) Place the following in order of size, **starting with the smallest,** by writing numbers **1** – **4** in the boxes underneath the words.

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chromosome	nucleus	gene	cell
☐	☐	☐	☐

(1)

(c) For a baby to grow, its cells must develop in a number of ways.

Explain how each of the following is part of the growth process of a baby.

(i) Cell enlargement

_____

(1)

(ii) The process of cell division by mitosis

_____

_____

_____

_____

_____

_____

(3)

(d) Why is cell specialisation (differentiation) important for the development and growth of a healthy baby from a fertilised egg?

_____

_____

(2)

(Total 8 marks)

Q26.

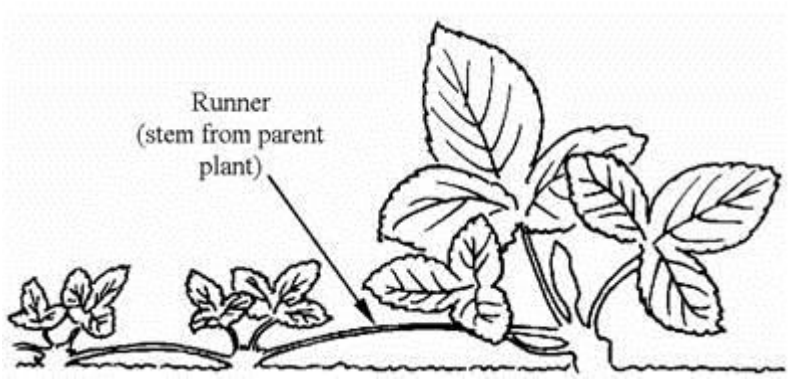


A grower found some small strawberries with a nice taste, growing on a strawberry plant.

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

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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)

Q27.

Cystic fibrosis is a disease which affects 1 in 1600 babies.

(a) What are the symptoms of cystic fibrosis?

_____

_____

_____

_____

_____

_____

(3)

(b) Two parents with normal characteristics have a child who was born with cystic fibrosis.

Explain, as fully as you can, how this can happen.

You may use a genetic diagram if you wish.

_____

_____

_____

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_____

_____

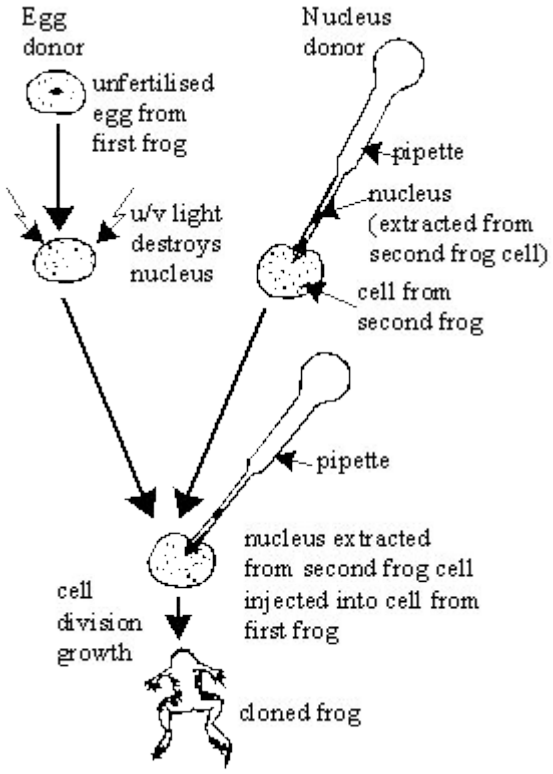
_____

_____

(4)
(Total 7 marks)

Q28.

The diagram shows how a frog can be cloned.



(a) In the example shown, will the cells of the cloned frog be the same as those of frog 1 or frog 2?

Explain your answer as fully as possible.

_____

_____

_____

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_____

_____

_____

(4)

(b) Discuss the advantages and disadvantages of cloning compared to sexual reproduction.

_____

_____

_____

_____

_____

_____

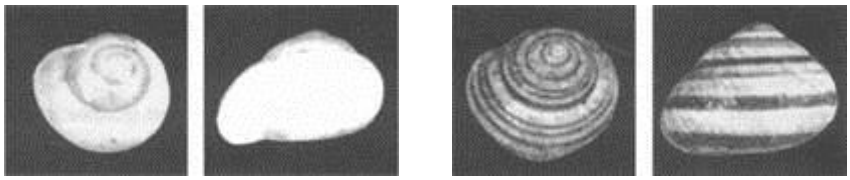
_____

(5)

(Total 9 marks)

Q29.

Cepaea nemoralis is a snail which is found on sand dunes. It may have a plain or banded shell. The snails are found on grass stalks and leaves.



Plain Banded

A scientist collected young unbanded snails and kept them until they were fully grown and mated them.

The eggs laid produced 35 unbanded and 12 banded snails.

(a) Explain these figures as fully as you can. You may use a genetic diagram if you wish to make your answer clearer.

_____

_____

_____

_____

_____

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_____

_____

_____

_____

_____

_____

_____

(7)



Variation in colour

Variation in banding

(b) The snail shells show a lot of variation in colour. They are yellowy/green, brown, pink or cream. The banding varies from a single wide band to a mixture of thick and thin bands.

Describe briefly the factors which have produced this variation and explain how these factors may themselves have arisen.

_____

_____

_____

_____

_____

(4)

(Total 11 marks)

Q30.

Many insecticides contain “active” ingredients called pyrethrins. These are extracted from pyrethrum daisies. These plants are grown in Kenya, a developing country in Africa. They provide income for farmers and valuable exports.

An American biotechnology company has now transferred the gene for making a specific pyrethrin to brewers’ yeast. This can be grown easily, so this pyrethrin can be produced cheaply. However, insect populations can build up resistance to specific pyrethrins.

(a) What are the advantages and disadvantages of using brewers’ yeast to produce pyrethrins?

_____

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(6)

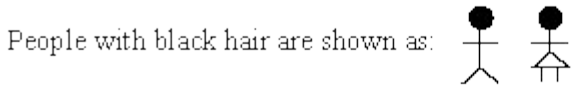
(b) Describe, as fully as you can, how a gene for making pyrethrins is transferred from daisy to yeast.

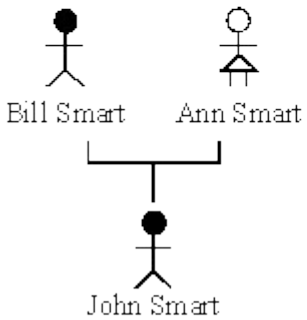
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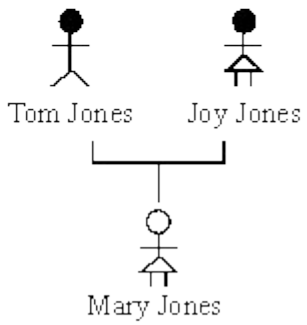
(Total 9 marks)

Q31.

The family trees below show the inheritance of hair colour in two families.

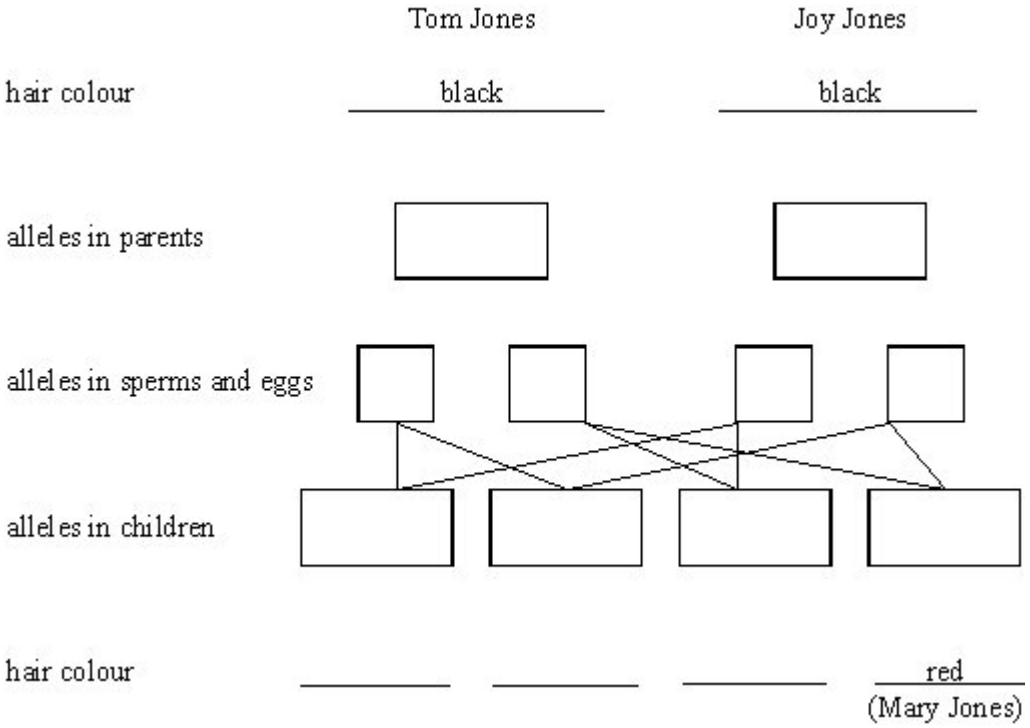






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(a) The allele for black hair is dominant over the allele for red hair.
Use the letter **B** as the allele for black hair.
Use the letter **b** as the allele for red hair.
Complete the diagram below to show the chances of Mary Jones inheriting red hair.



(4)

(b) John Smart and Mary Jones grew up, got married and had a child.
What would the chances be that the child had red hair?

_____

(1)

Explain your answer. Use a genetic diagram if it makes your answer clearer.

_____

_____

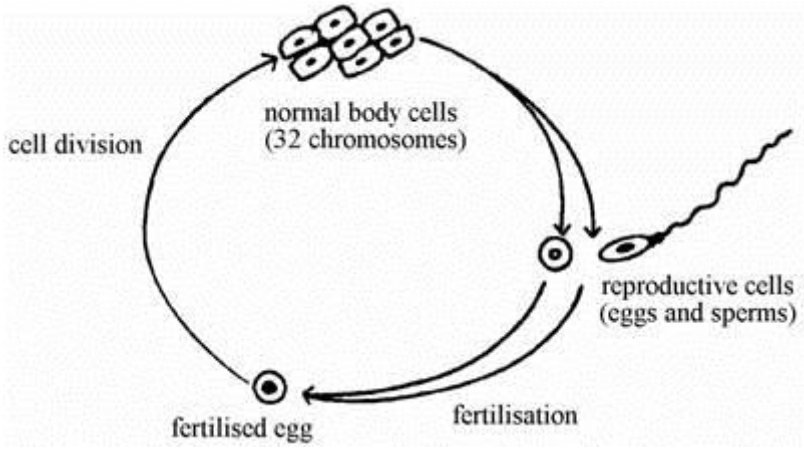
_____

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(3)
(Total 8 marks)

Q32.

The diagram shows three types of cells in a life history of a simple animal.



(a) How do the chromosomes of the body cells compare with the chromosomes in the fertilised egg from which they came?

_____

_____

(1)

(b) Describe what happens to chromosomes in the nucleus of a body cell when it forms reproductive cells.

_____

_____

_____

_____

_____

(4)
(Total 5 marks)

Q33.

Spiders produce a protein thread which is extremely strong compared to man-made fibres of the same diameter.



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Explain how genes control the way the protein is made in the spider's body.

_____

_____

_____

_____

_____

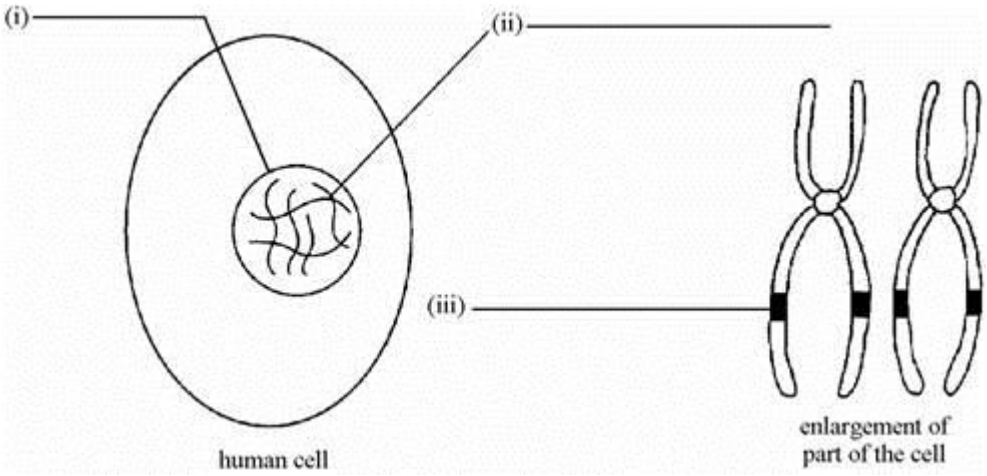
(Total 4 marks)

Q34.

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

_____

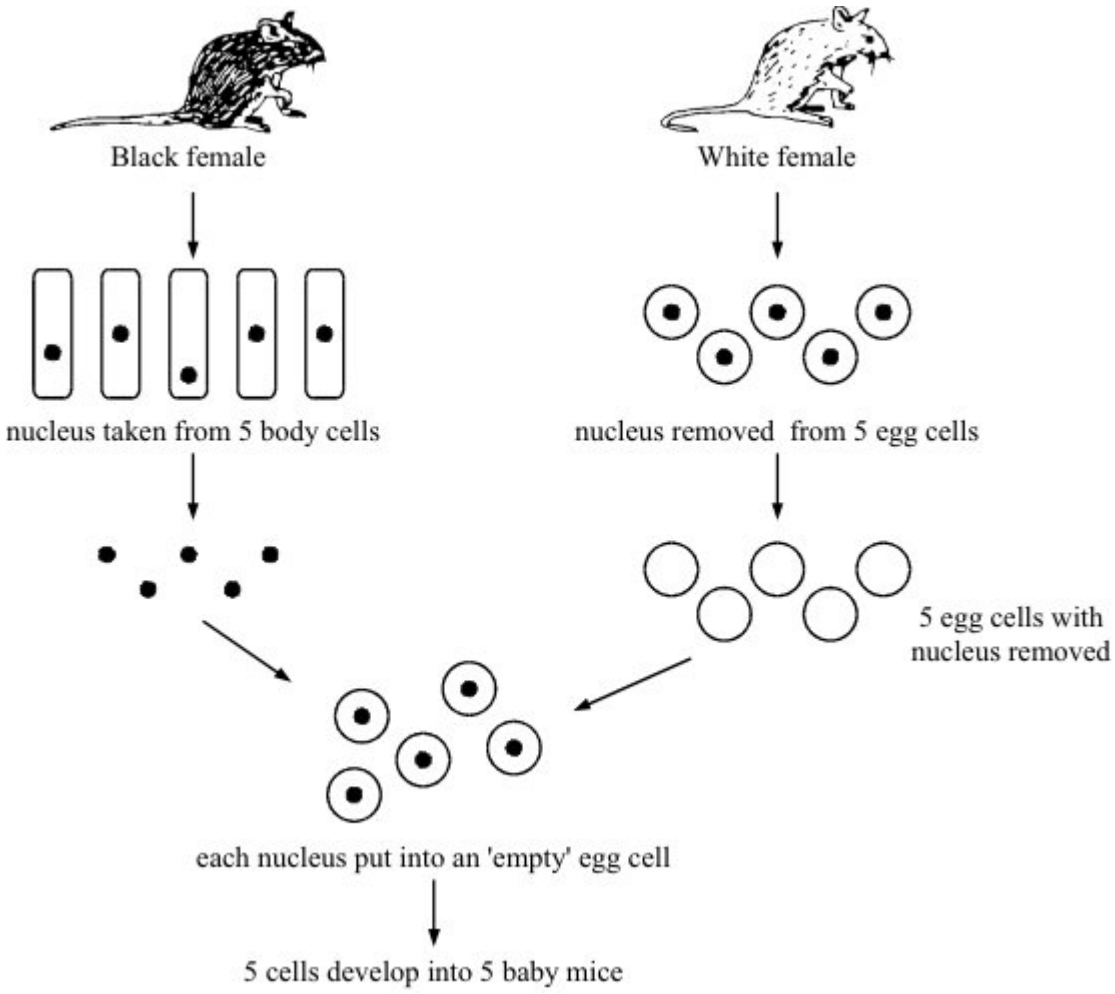
(1)

(Total 4 marks)

Q35.

The diagram shows how you can breed mice without using male sex cells.

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(a) (i) What type of reproduction is shown above?

_____

(1)

(ii) Which part of the nucleus carries the information to make a mouse black or white?

_____

(1)

(iii) Carefully describe how the baby mice

(A) compare with each other, _____

_____

(B) compare with the parent mice _____

_____

(3)

(b) Mice normally reproduce in a similar way to humans.

(i) Which organs in the white mouse released the five egg cells?

_____

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(1)

(ii) What treatment could you give the white mouse to make her release more eggs?

_____

_____

(1)

(Total 7 marks)

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