AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.6.1 REPRODUCTION (PACK 2)

SCORE	PERCENTAGE
/117	%

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Q1.

(a) Mr and Mrs Smith both have a history of cystic fibrosis in their families.
Neither of them has cystic fibrosis.
Mr and Mrs Smith are concerned that they may have a child with cystic fibrosis.

Use a genetic diagram to show how they could have a child with cystic fibrosis.

Use the symbol **A** for the dominant allele and the symbol **a** for the recessive allele.

(3)

(b) Mr and Mrs Smith decided to visit a genetic counsellor who discussed embryo screening.

Read the information which they received from the genetic counsellor.

- Five eggs will be removed from Mrs Smith's ovary while she is under an anaesthetic.
- The eggs will be fertilised in a dish using Mr Smith's sperm cells.
- The embryos will be grown in the dish until each embryo has about thirty cells.
- One cell will be removed from each embryo and tested for cystic fibrosis.
- A suitable embryo will be placed into Mrs Smith's uterus and she may become pregnant.
- Any unsuitable embryos will be destroyed.

(i) Suggest why it is helpful to take five eggs from the ovary and not just one egg.

_____

_____

(1)

(ii) Evaluate the use of embryo screening in this case.

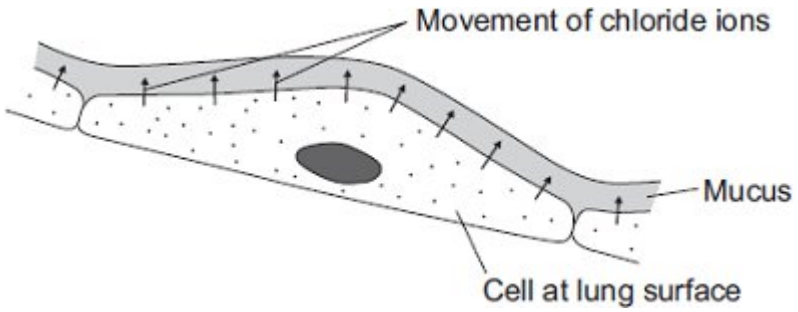
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Remember to give a conclusion to your evaluation.

(4)

(c) In someone who has cystic fibrosis the person's mucus becomes thick.

The diagram shows how, in a healthy person, cells at the lung surface move chloride ions into the mucus surrounding the air passages.



The movement of chloride ions causes water to pass out of the cells into the mucus.

Explain why.

(3)

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(Total 11 marks)

Q2.

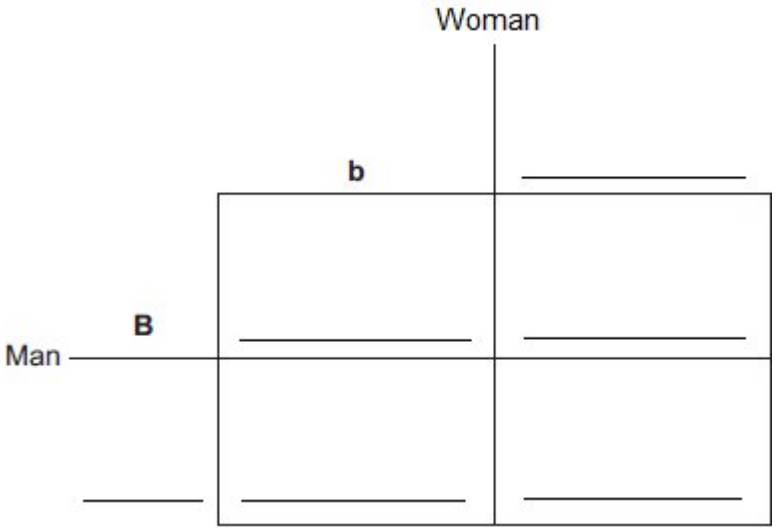
Eye colour is controlled by genes.

The dominant allele of the gene **(b)** produces brown eyes. The recessive allele (**b**) produces blue eyes.

A homozygous blue-eyed woman married a homozygous brown-eyed man.

All of their three children had brown eyes.

(a) (i) Complete the genetic diagram.



(2)

(ii) Give the reason why all of the children had brown eyes.

_____

_____

(1)

(b) The couple's brown-eyed son and his brown-eyed partner had five children. Two of the children had blue eyes and three of the children had brown eyes.

Use a genetic diagram to show how two of their children came to have blue eyes.

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_____

_____

_____

(3)

(Total 6 marks)

Q3.

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

body cells.

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called | 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.

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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)

Q4.

Plant hormones are used in horticulture.

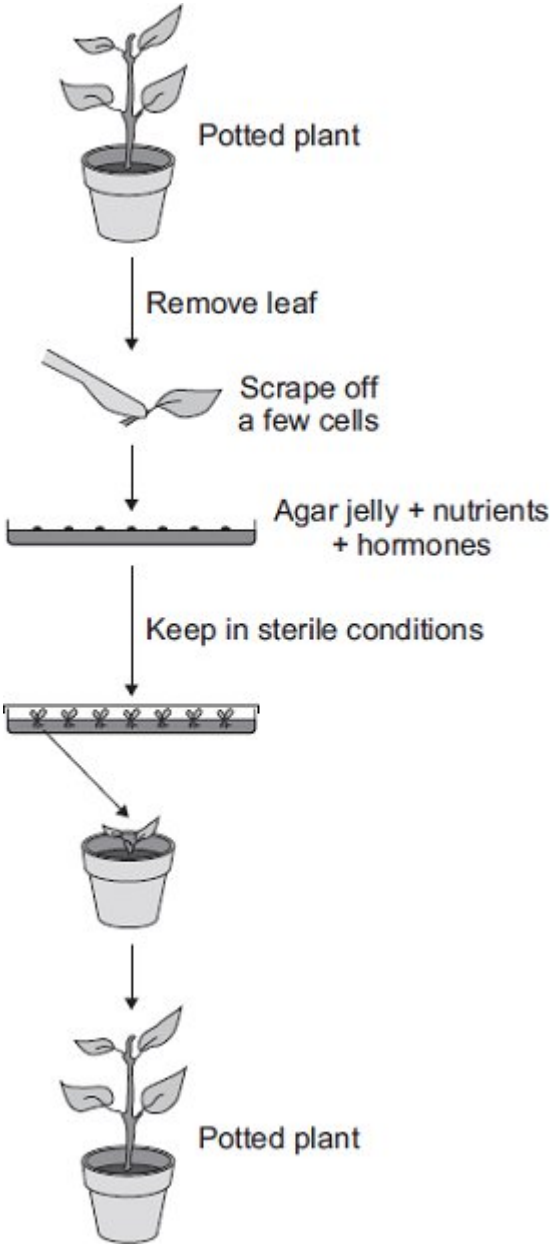
(a) Name **one** plant hormone.

_____

(1)

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

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

Give the main features of *asexual reproduction* .

_____

_____

_____

_____

_____

_____

(3)

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

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

_____

_____

_____

(1)

(Total 5 marks)

Q5.

(a) (i) Mitosis and meiosis are types of cell division.

For each feature in the table, tick (✓) **one** box to show if the feature occurs:

- only in mitosis
- only in meiosis.

Feature	Only in mitosis (✓)	Only in mitosis (✓)
Produces new cells during growth and repair		
Produces gametes (sex cells)		
Produces genetically identical cells		

(2)

(ii) Name the organ that produces gametes (sex cells) in:

a man _____

a woman _____

(2)

(b) **X** and **Y** chromosomes are the sex chromosomes. They determine a person's sex.

What sex chromosomes will be found in the body cells of:

(i) a man _____

(1)

(ii) a woman? _____

(1)

(c) A man and a woman decide to have a child.

What is the chance that the child will be a boy? _____

(1)

(Total 7 marks)

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Q6.

Polydactyly is an inherited condition. Polydactyly is controlled by a dominant allele.

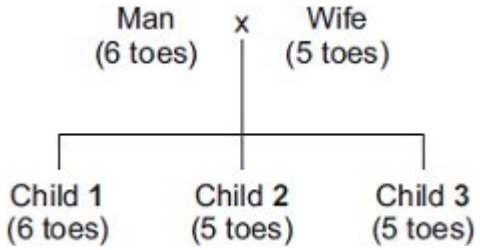
The photograph shows the foot of a baby with polydactyly.



CNRI/Science photo library

A man and his wife have three children. The man has polydactyly.

The diagram shows the inheritance of polydactyly in this family.
The diagram also shows the number of toes each person has on each foot.



In the rest of this question, the following symbols are used to represent alleles.

D = allele for polydactyly (6 toes on each foot)
d = allele for 5 toes on each foot

(a) (i) How many alleles for the number of toes will there be in **one** sperm cell?

☐

(1)

(ii) Complete the sentence.

A sperm cell joins with an egg cell in a process called _____

(1)

(b) (i) What combination of alleles does the man have?

Tick (✓) **one** box.

DD ☐

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Dd ☐

dd ☐

(1)

(ii) What combination of alleles does the man's wife have?

Tick (✓) **one** box.

DD ☐

Dd ☐

dd ☐

(1)

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

(i) The man and his wife plan to have a fourth child.

The probability that this child will have 6 toes on each foot is

1 in 2.

1 in 3.

1 in 4.

(1)

(ii) When Child **2** grows up, he marries a woman with 5 toes on each foot.

The probability that their first child will have 6 toes on each foot is

0.

1 in 2.

1 in 4.

(1)

(Total 6 marks)

Q7.

A certain gene codes for the production of an enzyme called 'HEXA'.

One human genetic disorder causes damage to nerve cells in the brain.
This disorder is caused by a small change in the DNA of the HEXA gene.
People with this disorder make a changed HEXA enzyme that does not work.

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(a) Explain how a change in the DNA of the HEXA gene can result in the production of a changed HEXA enzyme that does not work.

_____

_____

_____

_____

_____

_____

(3)

(b) The gene coding for the HEXA enzyme is found on chromosome number 15.

(i) How many chromosomes are there in the nucleus of a human nerve cell?

_____

(1)

(ii) A boy had the changed HEXA gene on the chromosome number 15 that he inherited from his father.
The changed HEXA gene coded for a HEXA enzyme that does not work.
The boy did **not** develop the genetic disorder.

Explain why the boy did **not** develop the genetic disorder.

_____

_____

_____

_____

(2)

(iii) The boy grew up and got married.

A blood test showed that his wife had also inherited the same changed HEXA gene.

There is a 1 in 4 chance that this couple's first child will have the genetic disorder.

Use a genetic diagram to explain why.

Use the following symbols in your explanation:

H = allele for making the normal HEXA enzyme
h = allele for making a HEXA enzyme that does not work.

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(3)
(Total 9 marks)

Q8.

The photographs show the flowers of two closely-related species of plant.

Species A



Species B



Images: © iStock/Thinkstock

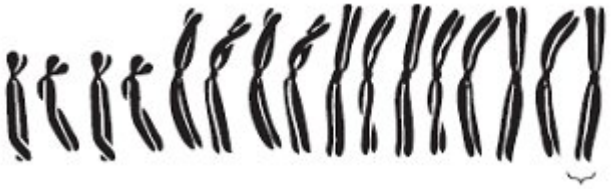
The drawings show chromosomes from one cell in the root of each plant during cell division.

Species A



One chromosome

Species B



One chromosome

(a) The drawings show that each chromosome has two strands of genetic material.

(i) How does a chromosome become two strands?

_____

_____

(1)

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(ii) Explain why each chromosome must become two strands before the cell divides.

_____

_____

_____

_____

(2)

(b) For sexual reproduction, the plants produce gametes.

(i) Name the type of cell division that produces gametes. _____

(1)

(ii) How many chromosomes would there be in a gamete from each of these two plant species?

Species A ☐ **Species B** ☐

(1)

(iii) It is possible for gametes from **Species A** to combine with gametes from **Species B** to produce healthy offspring plants.

How many chromosomes would there be in each cell of one of the offspring plants?

☐

(1)

(c) (i) Look back at the information at the start of the question and the information from part (b).

What evidence from these two pieces of information supports the belief that **Species A** and **Species B** evolved from a common ancestor?

_____

_____

_____

_____

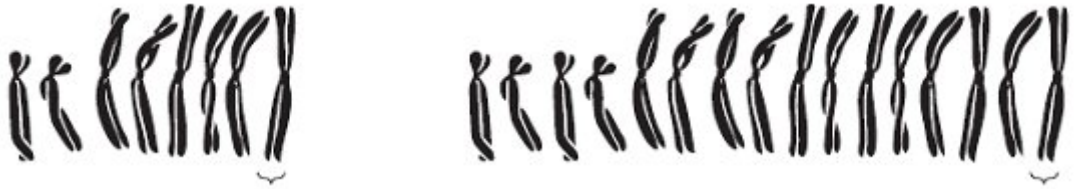
(2)

(ii) For successful gamete production to take place, chromosomes that contain the same genes must pair up.

The drawings showing the chromosomes of **Species A** and of **Species B** are repeated below.

Species A **Species B**

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The offspring plants cannot reproduce sexually.

Suggest an explanation for this.

_____

_____

_____

_____

_____

_____

(2)

(Total 10 marks)

Q9.

The photograph shows a zorse.



By Kumana @ Wild Equines [CC-BY-2.0], via Wikimedia Commons

A zorse is a cross between a male zebra and a female horse.
The zorse has characteristics of both parents.

(a) The zorse was produced by *sexual reproduction.*

(i) What is *sexual reproduction?*

_____

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_____

(1)

(ii) The zorse has characteristics of a zebra and a horse.
Why?

_____

_____

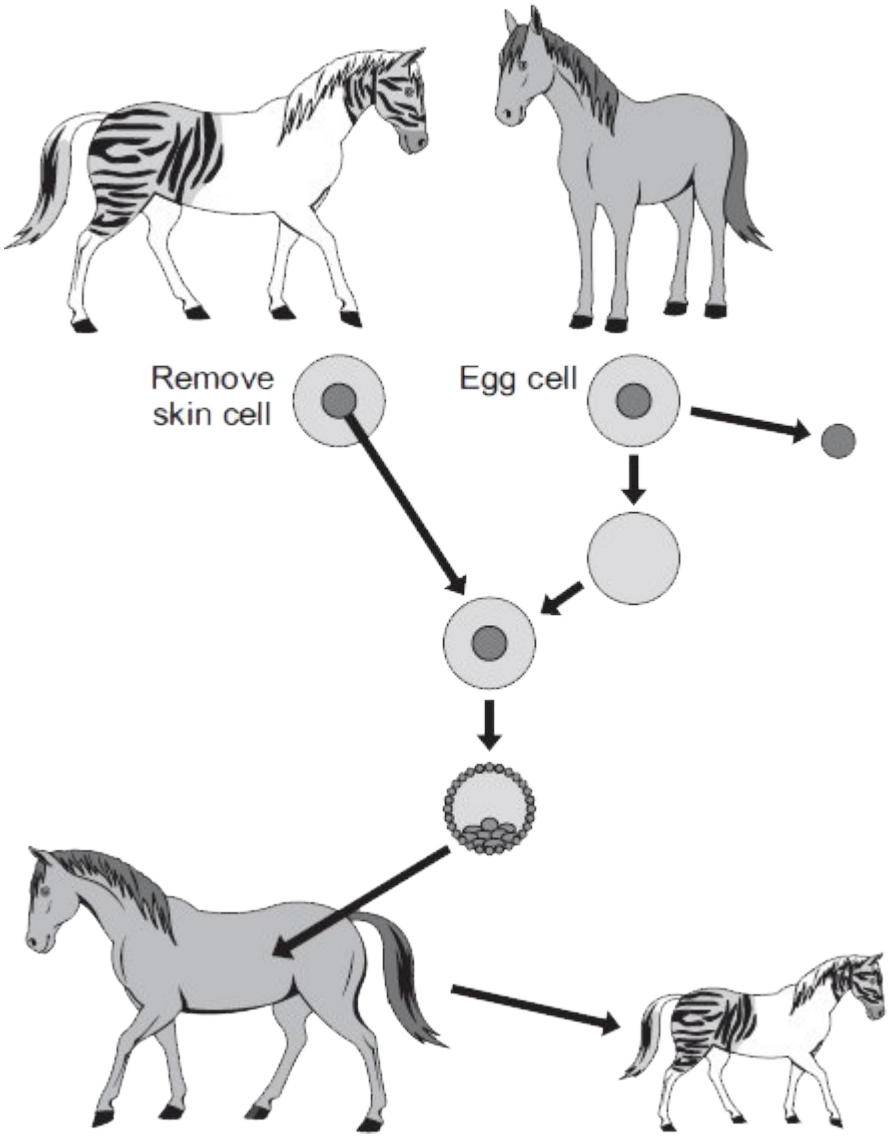
_____

_____

(2)

(b) Zorses are **not** able to breed.
Scientists could produce more zorses from this zorse by adult cell cloning.

The diagram shows how the scientists might clone a zorse.



In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

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Use information from the diagram and your own knowledge to describe how adult cell cloning could be used to clone a zorse.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 9 marks)

Q10.

The Blue-moon butterfly lives on a small island called Samoa, in the Pacific Ocean.



By Emoke Dénes [CC-BY-SA-2.5], via Wikimedia Commons

In 2006 Blue-moon butterflies almost became extinct.

Wolbachia bacteria killed males before they could hatch from eggs. Only females were resistant to the bacteria.

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In 2006 the number of male Blue-moon butterflies had decreased to only 1 per cent of the population. Two years later, the number of males was equal to the number of females.

(a) Scientists believe that a change in a gene suddenly occurred to make some males resistant to the bacteria.

What scientific term describes a change in a gene?

_____

(1)

(b) The numbers of male Blue-moon butterflies in the population increased quickly after the new form of the gene had appeared.

Suggest why.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 5 marks)

Q11.

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**

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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)

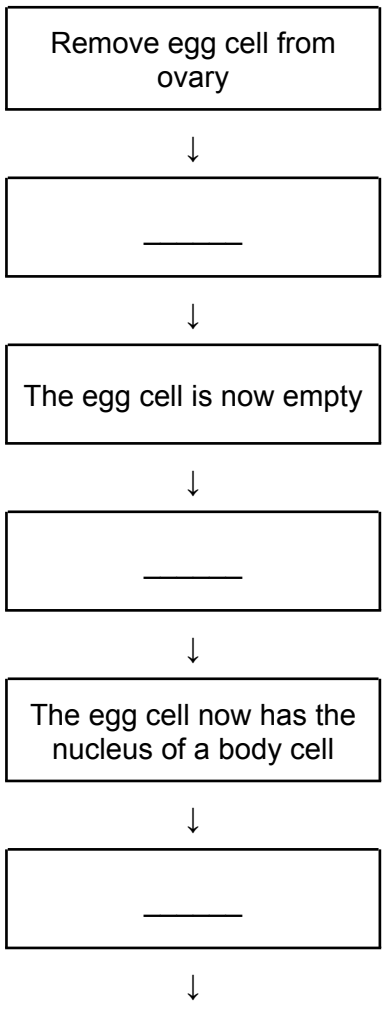
(b) Some animals similar to kangaroos are endangered species.

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.



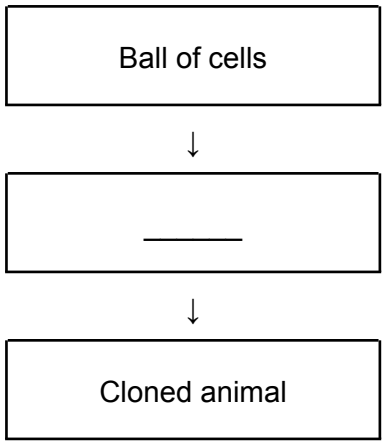
1 Give a small electric shock

2 Transfer nucleus from body cell

3 Remove nucleus from egg cell

4 Insert embryo into womb of female

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(3)

(Total 7 marks)

Q12.

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

How does sexual reproduction produce variation?

_____

_____

_____

_____

(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.

_____

_____

_____

_____

_____

_____

(3)

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

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Suggest **one** reason why.

_____

_____

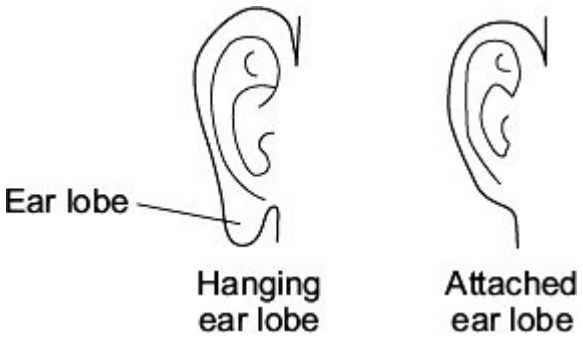
(1)

(Total 6 marks)

Q13.

People have different shaped ear lobes, either 'hanging' or 'attached'.

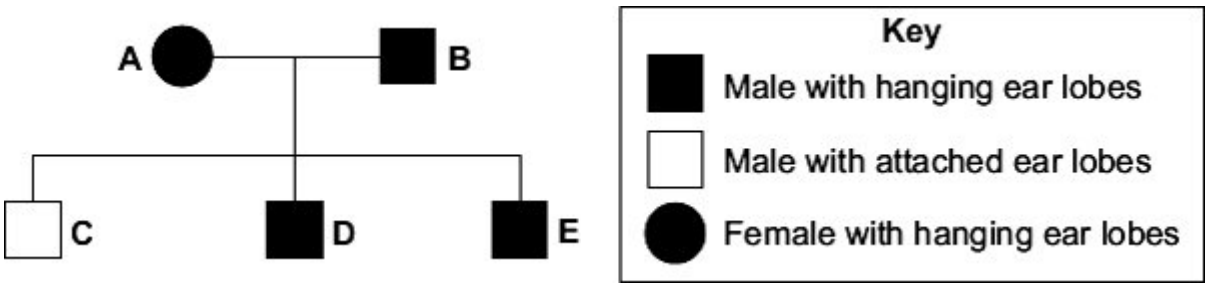
The diagrams show the two shapes of ear lobe.



A gene controls the shape of a person's ear lobes.

The diagram shows a family tree.

Parents **A** and **B** both have hanging ear lobes.



(a) The key does **not** show the symbol for a female with attached ear lobes.

Draw the symbol for the key to show a female with attached ear lobes.

Use information in the family tree and the key.

Symbol = _____

(1)

(b) Look at the family tree.

What does the information in the family tree tell you about the allele for hanging ear lobes?

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Draw a ring around the correct word to complete the sentence.

The allele for hanging ear lobes is

dominant.

weak.

recessive.

(1)

(c) (i) Parents **A** and **B** have three children, **C**, **D** and **E**.
All three children are boys.

What are the chances that the next child of parents **A** and **B** will be a girl?

Draw a ring around **one** answer.

no chance (0 %) **a half (50 %)** **certain (100 %)**

(1)

(ii) Which statement explains your answer to part (c)(i)?

Tick (✓) **one** box.

Some of **B**'s sperm cells have an X chromosome. ☐

Some of **A**'s egg cells have a Y chromosome ☐

All of **B**'s sperm cells have an X chromosome. ☐

(1)
(Total 4 marks)

Q14.

A molecule of DNA contains four different bases, **W**, **X**, **Y** and **Z**.

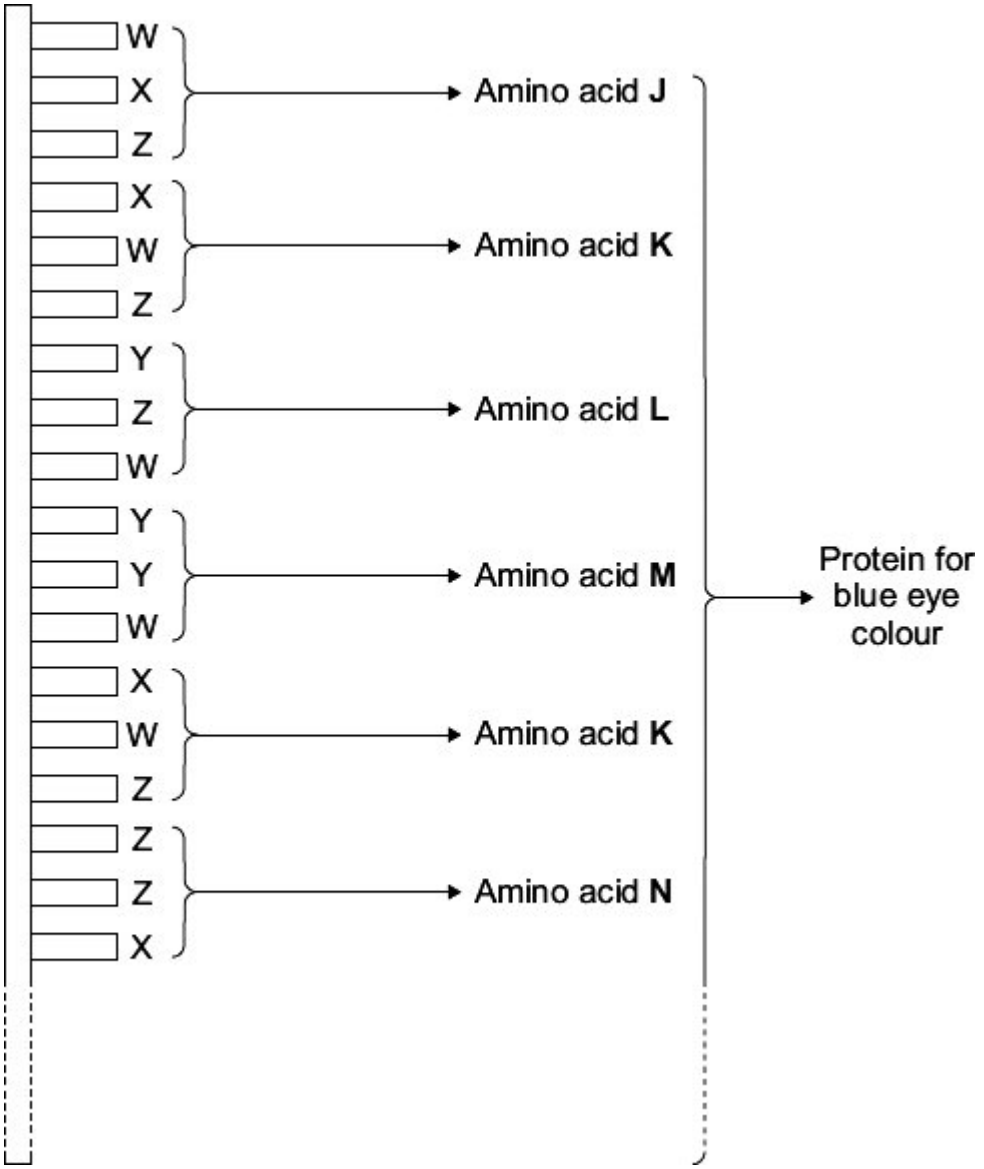
The four bases are arranged in a long chain.

The chain of bases controls the synthesis of a protein.

The diagram shows a small section of a DNA molecule.

This section is responsible for synthesising the protein for blue eye colour.

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(a) What word is used to describe *a small section of a DNA molecule that controls the synthesis of a protein*'?

_____

(1)

(b) In the cell, where are proteins synthesised?

_____

(1)

(c) Describe how the protein for blue eye colour is synthesised.

To gain full marks you must use information from the diagram.

_____

_____

_____

_____

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_____

_____

_____

(3)

(d) Mistakes sometimes occur when DNA molecules are copied during cell division.

Suppose that one of the **W** bases shown in the diagram was substituted by an **X** base.

(i) What would happen to the structure of the protein synthesised by this part of the DNA molecule?

_____

_____

(1)

(ii) What might be the effect of this change in structure of the protein?

_____

_____

(1)

(Total 7 marks)

Q15.

(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**.

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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)

Q16.

Cystic fibrosis is an inherited disorder.

Mr and Mrs Brown do **not** have cystic fibrosis but they have a child with cystic fibrosis.

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

(i) The allele for cystic fibrosis is a

carrier allele.
dominant allele.
recessive allele.

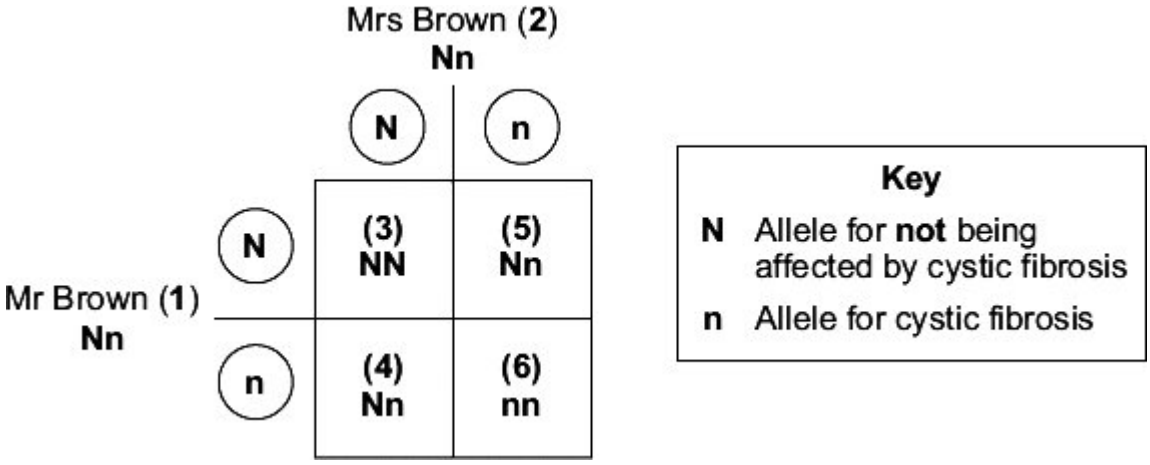
(1)

(ii) Mr and Mrs Brown are both

carriers.
immune.
infected.

(1)

(b) The diagram shows how the allele for cystic fibrosis can be inherited by Mr and Mrs Brown's children.



(i) Give the number of **one** person in the diagram who has

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cystic fibrosis. ☐

(1)

(ii) The chance that Mr and Mrs Brown's next child will have cystic fibrosis is

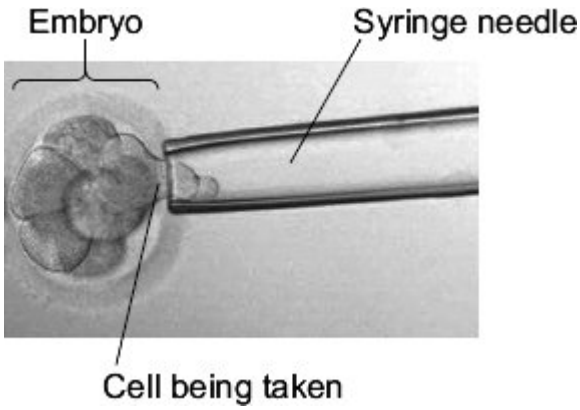
_____

(1)

(c) A genetic counsellor describes to Mr and Mrs Brown one way of screening embryos for cystic fibrosis.

- Some eggs are collected from Mrs Brown.
- The eggs are then fertilised in a dish.
- Several embryos may start to develop.

The photograph shows how doctors take one cell from each embryo when it is only 3 days old.



©Pascal Goetgheluck/Science Photo Library

- The DNA in the cell from each embryo is tested for cystic fibrosis.
- Doctors select one embryo that is unaffected and place it in Mrs Brown's uterus.
- The embryo then develops into a baby.

Use the information to suggest **one** advantage and **one** disadvantage of screening embryos in this way.

Advantage _____

_____

Disadvantage _____

_____

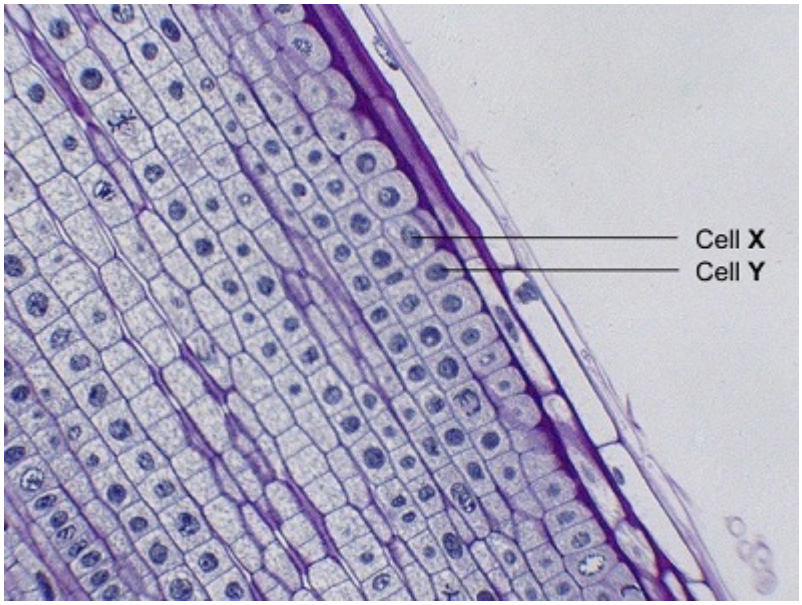
(2)

(Total 6 marks)

Q17.

The photograph shows some cells in the root of an onion plant.

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By UAF Center for Distance Education [CC BY 2.0], via Flickr

(a) Cells **X** and **Y** have just been produced by cell division.

(i) Name the type of cell division that produced cells **X** and **Y**.

_____

(1)

(ii) What happens to the genetic material before the cell divides?

_____

(1)

(b) A gardener wanted to produce a new variety of onion.

Explain why sexual reproduction could produce a new variety of onion.

_____

_____

_____

_____

_____

_____

(3)

(Total 5 marks)

Q18.

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People with cystic fibrosis make large amounts of thick, sticky mucus in their lungs. Cystic fibrosis is caused by the inheritance of recessive alleles.

(a) What do each of the following mean?

(i) Alleles

_____

_____

(1)

(ii) Recessive

_____

_____

(1)

(b) Mr and Mrs Brown have a child with cystic fibrosis. They hope to have another child. They want to know the probability that their next child will have cystic fibrosis. They visit a genetic counsellor who explains, "You are both heterozygous for cystic fibrosis. There is a 1 in 4 (25%) chance that your next child will have cystic fibrosis."

Use the following symbols in answering the questions.

N = allele for being unaffected by cystic fibrosis
n = allele for cystic fibrosis

(i) Mr and Mrs Brown both have the same genotype.

What is their genotype? _____

(1)

(ii) There is a 1 in 4 chance that Mr and Mrs Brown's next child will have cystic fibrosis.
Use a genetic diagram to explain why.

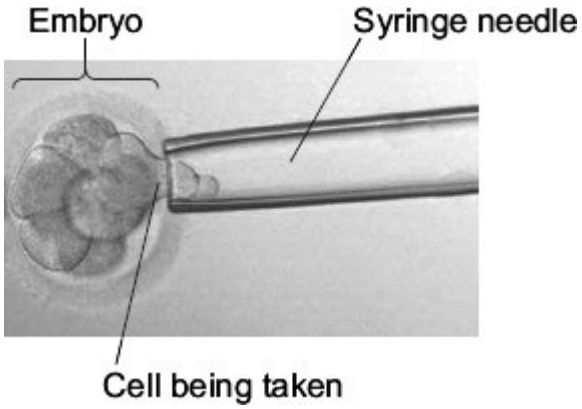
(3)

(c) Mr and Mrs Brown do **not** want to have another child with cystic fibrosis. The genetic counsellor explains two different methods for finding out whether an embryo has cystic fibrosis. The methods are:

- pre-implantation genetic diagnosis (**PGD**)
- chorionic villus sampling (**CVS**).

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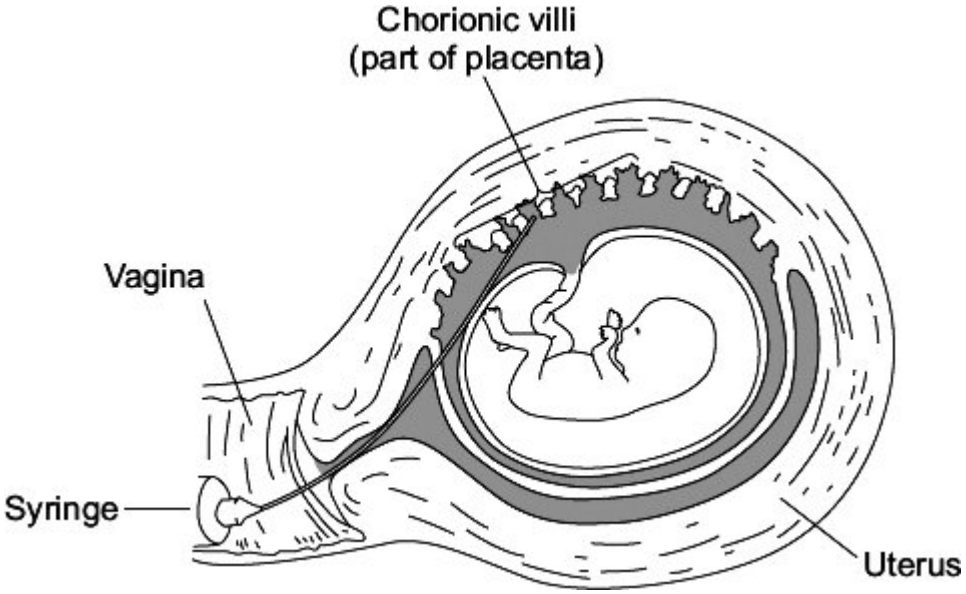
In **PGD**, eggs are fertilised in dishes and allowed to grow into embryos. A cell is taken from each embryo when the embryo is 3 days old. The photograph shows how the cell is taken.



Photograph:© Pascal Goetgheluck/
Science Photo Library

The DNA in the cell can then be tested. The possibility of a false positive result is about 1 in 6. An unaffected embryo can then be placed in the woman's uterus. The procedure costs about £6000.

CVS can only be done after 9 weeks of pregnancy. A tiny piece of the placenta is taken out using a tube attached to a syringe. This is grown in tissue culture for about 7 days. The diagram below shows how **CVS** is done.



The DNA in the cells can then be tested. About 2 in every 100 women have a miscarriage because of **CVS**. The possibility of a false positive result is about 1%. The procedure costs about £600. Following a positive result, the parents must then decide whether to terminate the pregnancy.

The genetic counsellor thinks that **PGD** is a better method than **CVS** for detecting cystic fibrosis in an embryo.

Evaluate this opinion.

_____

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_____

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_____

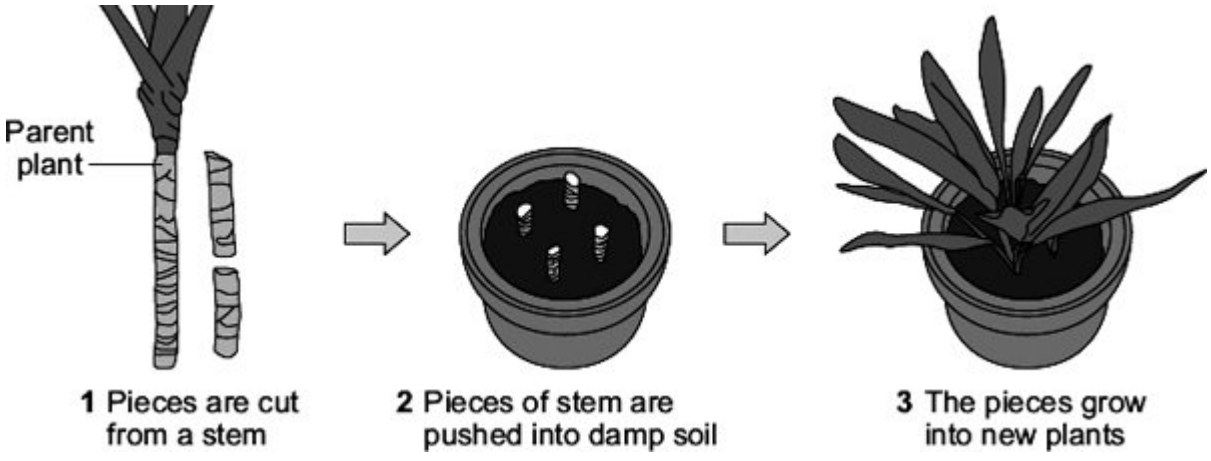
_____

(4)

(Total 10 marks)

Q19.

(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

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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)

Q20.

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.

_____

_____

_____

_____

_____

(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.

_____

_____

(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)

Q21.

The diagram shows a strawberry plant.

The parent plant grows side shoots.

New plants grow on the side shoots.



© D.G. Mackean

The new plants will all have the same inherited characteristics as the original parent plant.

Complete the sentences to explain why.

Use words from the box.

asexual	**differentiation**	**embryos**	**fertilisation**
gametes	**genes**	**mitosis**	**sexual**

(a) The new plant is produced by _____ reproduction.

(1)

(b) In this type of reproduction, body cells divide by _____

(1)

(c) The new plant has the same _____ as the parent plant.

(1)

(Total 3 marks)

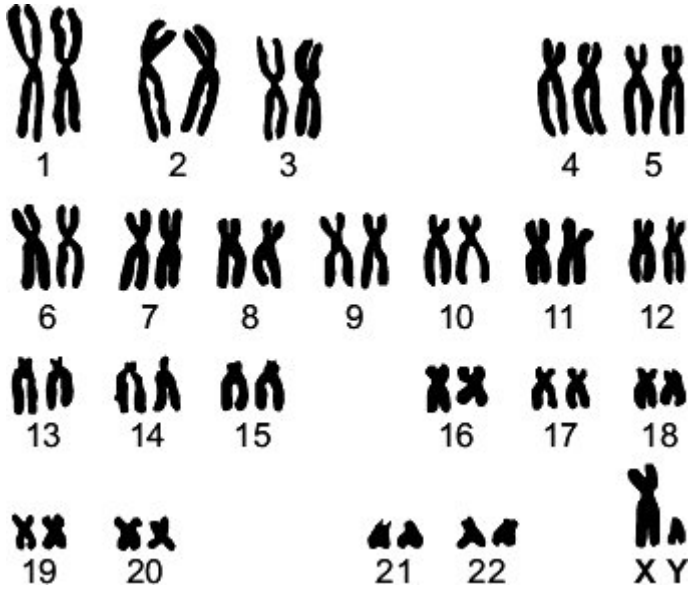
Q22.

When scientists look at dividing cells under a microscope, they can see strands that contain a chemical called DNA.

A photograph of these strands can be cut up and re-arranged.

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The diagram shows an arrangement of the strands from a human cell.



(a) What name is given to the strands containing DNA shown in the diagram?

Draw a ring around **one** answer.

alleles **chromosomes** **genes**

(1)

(b) Look carefully at the diagram.

(i) The cell was taken from a man and not from a woman.

How can you tell?

_____

(1)

(ii) What evidence is there that the strands are from a body cell, and not from a gamete?

Tick (✓) **one** box.

The strands are arranged in order of size. ☐

The strands are in pairs. ☐

Gametes are made in the testes and ovaries. ☐

(1)

(iii) When a human cell is not dividing the strands containing DNA are **not** clearly visible.

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

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In a human cell, the DNA is normally found in the

cell membrane.
cytoplasm.
nucleus.

(1)
(Total 4 marks)

Q23.

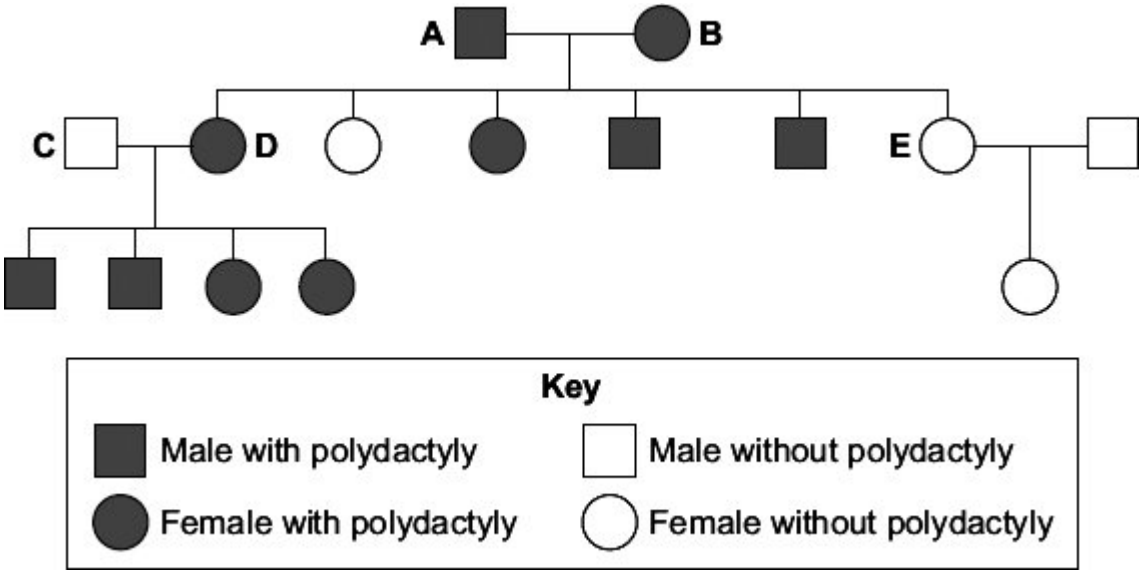
Cats normally have four toes on each back paw.

The picture shows the back paw of a cat with an inherited condition called polydactyly.



By Onyxrain (Own work) [Public domain], via Wikimedia Commons

The family tree shows the inheritance of polydactyly in three generations of cats.



(a) What combination of alleles did the original parents, **A** and **B**, have?

Explain how you work out your answer.

You may use a genetic diagram in your answer.

Use the symbol **H** to represent the dominant allele.

Use the symbol **h** to represent the recessive allele.

_____

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_____

_____

_____

_____

_____

A = _____ **B =** _____

(4)

(b) (i) Give **two** possible combinations of alleles for cat **D**.

1. _____ 2. _____

(1)

(ii) You cannot be sure which one of these two is the correct combination of alleles for cat **D**.

Why?

_____

_____

_____

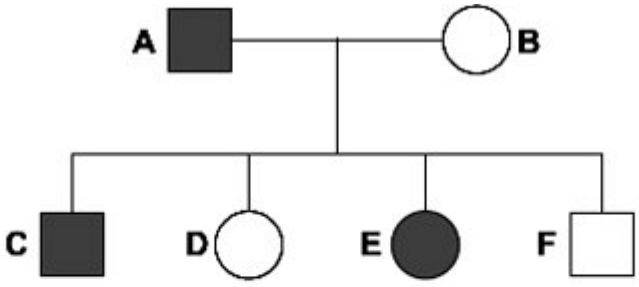
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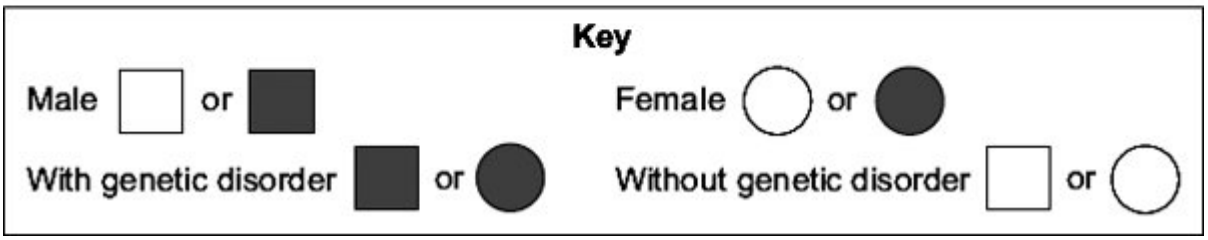
(Total 6 marks)

Q24.

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:

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(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.

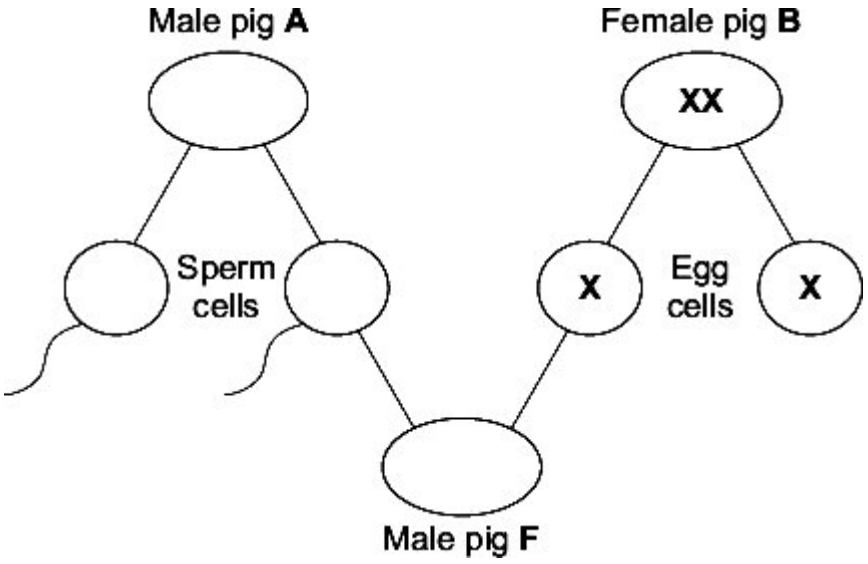
a gamete.

(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.



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(3)
(Total 7 marks)

Q25.

A certain allele increases the chance of women developing one type of breast cancer.

A woman has this allele. She wants to be sure that she will not have daughters who also have the allele.

Doctors:

- collect several eggs from her ovaries
- fertilise the eggs with sperm, in dishes.

(a) The doctors expect half the embryos produced to be female.

Explain why.

_____

_____

_____

_____

(2)

(b) The embryos grow to around 100 cells.

Doctors:

- remove one cell from each embryo
- check the cell for the allele.

Complete the sentence.

This process is known as embryo _____ .

(1)

(c) One of the female embryos did not have the allele.
This female embryo was implanted into the woman's uterus.

Evaluate the advantages and disadvantages of the whole procedure.

Use information from all parts of this question and your own knowledge.

Remember to give a conclusion to your evaluation.

_____

_____

_____

_____

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_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 7 marks)

Q26.

Cystic fibrosis and Huntington's disease are inherited disorders.

(a) Someone can be a carrier of cystic fibrosis.

Explain how.

You may include a genetic diagram in your answer.

_____

_____

_____

_____

(2)

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(b) Why does only one parent need to have the Huntington's disease allele for a child to inherit Huntington's disease?

_____

_____

(1)

(Total 3 marks)

Q27.

Soay sheep live wild on an island off the north coast of Scotland. No people live on the island.



By Owen Jones = Jonesor [CC-BY-SA-2.5], via Wikimedia Commons

Over the last 25 years, the average height and mass of the wild Soay sheep have decreased.

The scientists think that climate change might have affected the size of the sheep.

(a) More Soay sheep are now able to survive winter than 25 years ago.

What change in the climate may have helped more Soay sheep to survive winters?

_____

_____

(1)

(b) Complete the sentences.

(i) Soay sheep show variation in size because of differences in their

_____

(1)

(ii) The change in the size of the Soay sheep over 25 years can be explained by Darwin's

theory of _____

(1)

(Total 3 marks)

Q28.

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

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

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1. _____

_____

2. _____

_____

(2)

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

Explain why.

_____

_____

_____

_____

(2)

(Total 4 marks)

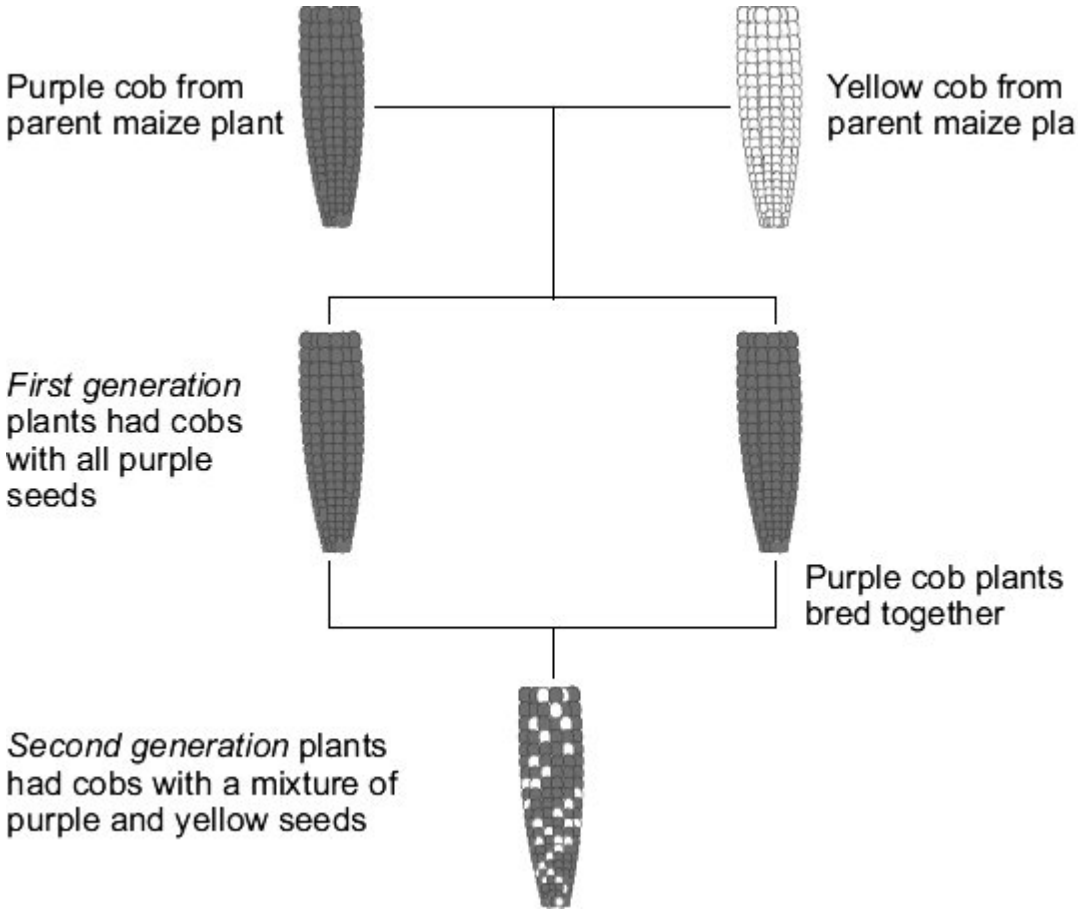
Q29.

Maize plants reproduce sexually to form maize cobs.
Each maize cob has many seeds.

The colour of the seeds is controlled by a gene.
The gene has two alleles, purple and yellow.

The diagram shows the cobs produced by breeding maize plants.

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

dominant	**environmental**	**recessive**

(i) The first generation plants show that the purple allele is

_____

(1)

(ii) The second generation plants show that the yellow allele is

_____

(1)

(b) The allele for purple can be represented by the letter **A**.
The allele for yellow can be represented by the letter **a**.

(i) What alleles does a yellow seed have?

Draw a ring around **one** answer.

AA **Aa** **aa**

(1)

(ii) What alleles does a purple seed from a *first* generation plant have?

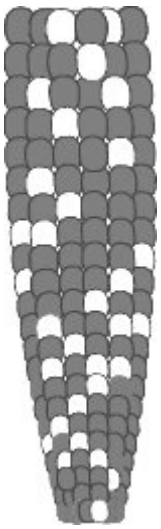
Draw a ring around **one** answer.

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AA **Aa** **aa**

(1)

(c) The drawing shows a cob from one of the *second generation* plants.



A student counted 334 purple seeds and 110 yellow seeds on this maize cob.

What is the approximate ratio of purple seeds to yellow seeds on the cob?

Tick (✓) **one** box.

3 purple : 1 yellow ☐

1 purple : 3 yellow ☐

1 purple : 1 yellow ☐

(1)

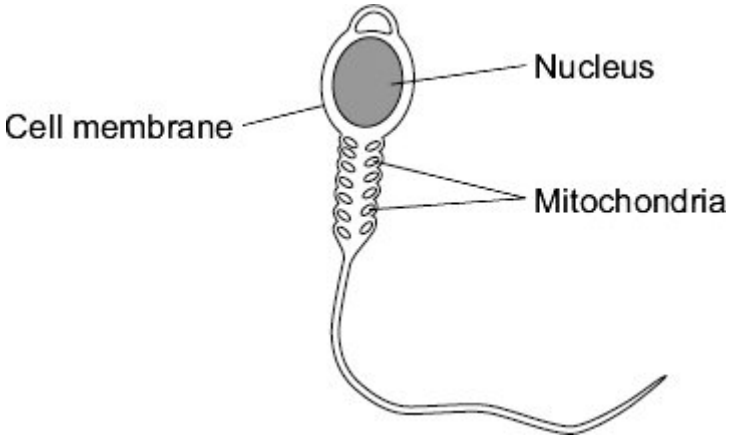
(Total 5 marks)

Q30.

Cells in the human body are specialised to carry out their particular function.

(a) The diagram shows a sperm cell.

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The sperm cell is adapted for travelling to, then fertilising, an egg.

(i) How do the mitochondria help the sperm to carry out its function?

_____

_____

(1)

(ii) The nucleus of the sperm cell is different from the nucleus of body cells.

Give **one** way in which the nucleus is different.

_____

_____

(1)

(b) Stem cells from human embryos are used to treat some diseases in humans.

Explain why.

_____

_____

_____

_____

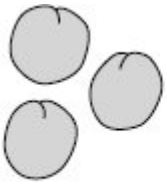
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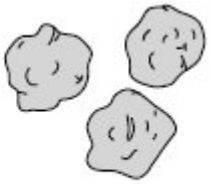
Q31.

In the 1860s, Gregor Mendel studied inheritance in nearly 30 000 pea plants. Pea plants can produce either round seeds or wrinkled seeds.

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Round pea seeds



Wrinkled pea seeds

(a) Mendel crossed plants that always produced round seeds with plants that always produced wrinkled seeds.

He found that all the seeds produced from the cross were round.

Use the symbol **A** to represent the dominant allele and **a** to represent the recessive allele.

Which alleles did the seeds from the cross have?

_____

(1)

(b) Mendel grew hundreds of plants from the seeds of the offspring.
He crossed these plants with each other.

(i) Mendel's crosses produced 5496 round pea seeds and 1832 wrinkled pea seeds.

Explain why Mendel's crosses gave him these results.

In your answer you should use:

- a genetic diagram
- the symbols **A** and **a**.

(3)

(ii) One of Mendel's crosses produced 19 round seeds and 16 wrinkled seeds.

These numbers do **not** match the expected ratio of round and wrinkled seeds.

Suggest why.

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_____

_____

(1)

(c) The importance of Mendel's discovery was not recognised until many years after his death.

Give **one** reason why.

_____

_____

(1)

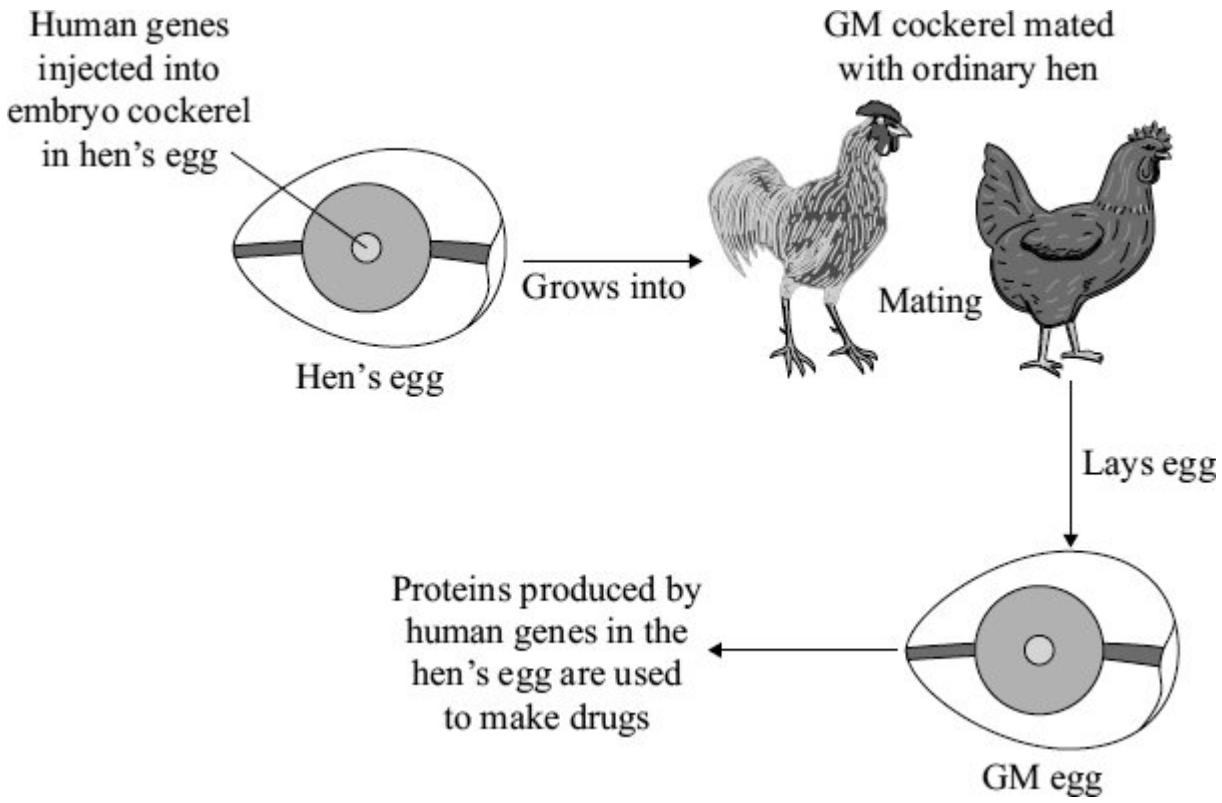
(Total 6 marks)

Q32.

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 ☐

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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)

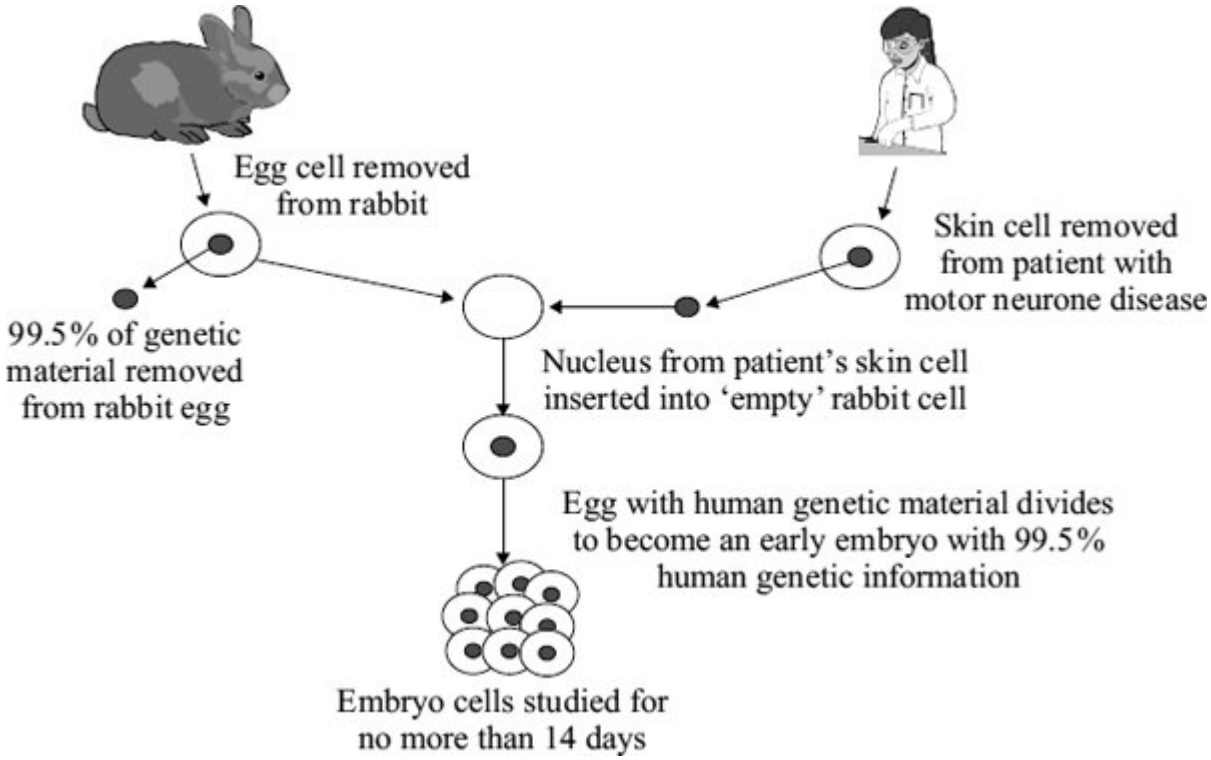
(Total 6 marks)

Q33.

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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?

_____

(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)

Q34.

Humans reproduce sexually.

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

(a) (i) At fertilisation | chromosomes / genes / sex cells | join together.

(1)

(ii) At fertilisation a single cell forms, which has new pairs of | chromosomes. / nuclei. / sex cells. |

(1)

(b) Cystic fibrosis can be inherited by children whose parents do not have it.

(i) A person who has cystic fibrosis has | two / three / four | copies of the cystic fibrosis allele.

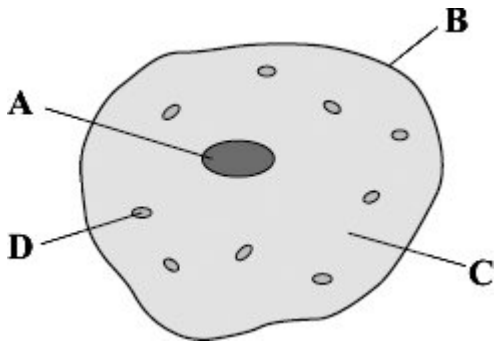
(1)

(ii) The cystic fibrosis allele is | large. / recessive. / strong. |

(1)

(c) The diagram shows a human body cell.

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Choose the correct answer from the box to complete each sentence.

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

(i) The part of the cell labelled **B** is the _____

(1)

(ii) The part of the cell labelled **C** is the _____

(1)

(d) Which part of the cell, **A**, **B**, **C** or **D**:

(i) contains the allele for cystic fibrosis ☐

(1)

(ii) is affected by cystic fibrosis? ☐

(1)

(Total 8 marks)

Q35.

(a) Mr and Mrs Smith both have a history of cystic fibrosis in their families.
Neither of them has cystic fibrosis.
Mr and Mrs Smith are concerned that they may have a child with cystic fibrosis.

Use a genetic diagram to show how they could have a child with cystic fibrosis.

Use the symbol **A** for the dominant allele and the symbol **a** for the recessive allele.

(3)

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(b) Mr and Mrs Smith decided to visit a genetic counsellor who discusses embryo screening.

Read the information which they received from the counsellor.

- Under an anaesthetic five eggs will be removed from Mrs Smith's ovary.
- The eggs will be fertilised in a dish using Mr Smith's sperm cells.
- The embryos will be grown in the dish until each embryo has about thirty cells.
- One cell will be removed from each embryo and tested for cystic fibrosis.
- A suitable embryo will be placed into Mrs. Smith's uterus and she may become pregnant.
- Any unsuitable embryos will be killed.

(i) Suggest why it is helpful to take five eggs from the ovary, rather than just one.

_____

_____

(1)

(ii) Evaluate the use of embryo screening in this case.

Remember to give a conclusion as part of your evaluation.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 8 marks)

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