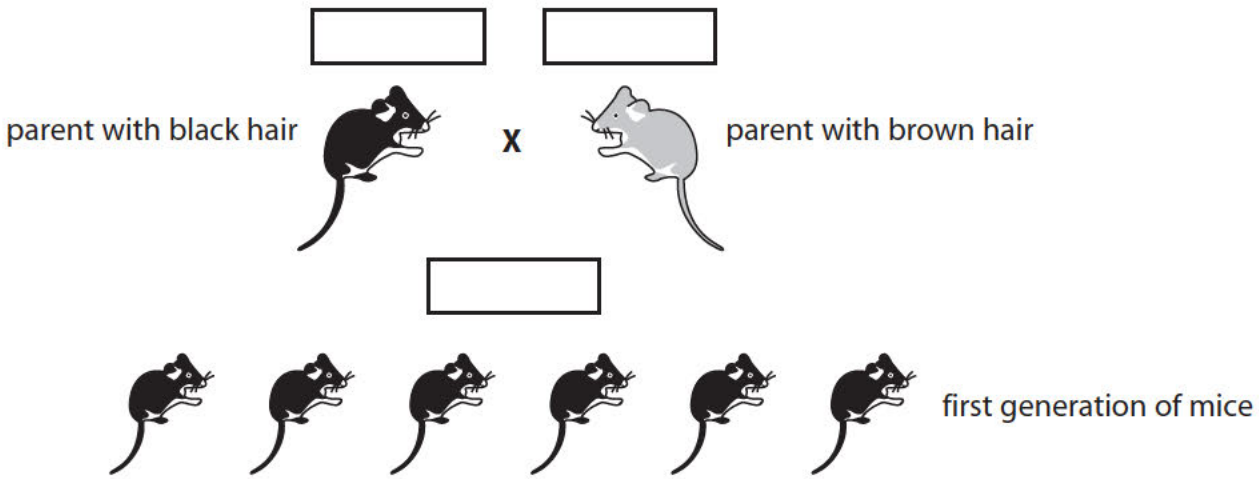
1 Mice can have black hair or brown hair in their fur.

The allele for black hair (B) is dominant to the allele for brown hair (b).

A homozygous black haired mouse mated with a homozygous brown haired mouse to produce the first generation of offspring. The cross is shown in the diagram.



(a) Complete the diagram by writing the genotype of each parent and the offspring in the boxes.

(2)

(b) The first generation mice mated with each other and produced a second generation.

Complete the Punnett square to show the gametes involved and the genotypes of the possible second generation mice.

(2)

female / male		

(c) The passage describes part of the process of reproduction in mice.

Complete the passage by writing a suitable word in each blank space.

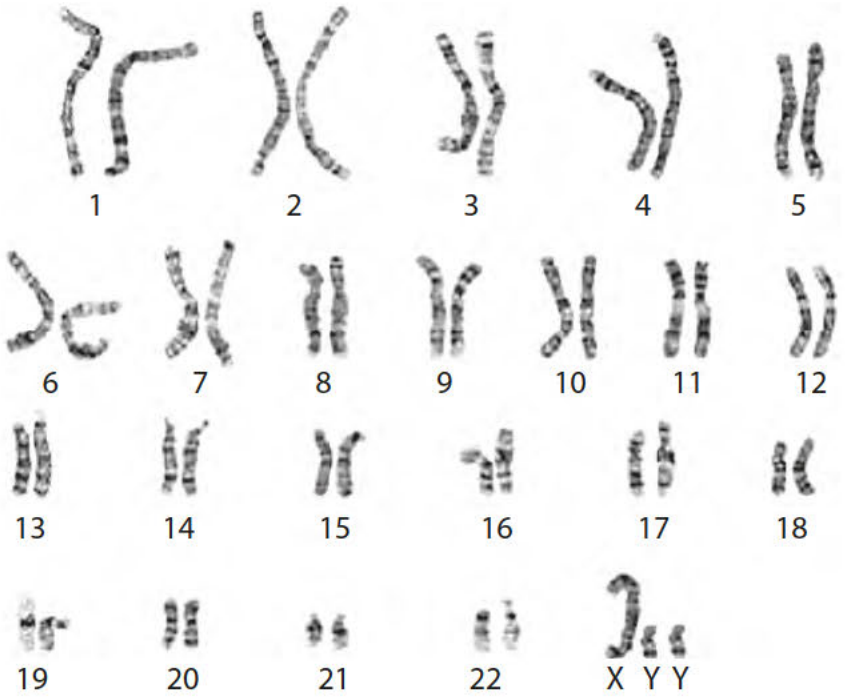
(6)

The male mouse produces gametes called ..... that swim to the female gamete. Each gamete has the haploid number of chromosomes, which is 20 in mice. The gametes join in a process called ..... . The single cell produced is called a ..... and contains the ..... number of chromosomes.

This cell divides by ..... into an embryo. Each cell in the embryo contains ..... chromosomes.

(Total for Question = 10 marks)

2 The photograph shows the chromosomes from a body cell of a person. This person has a rare condition that affects their chromosomes.



(a) (i) How many chromosomes are shown in this photograph?

(1)

.....

(ii) State the sex of the person the chromosomes were taken from.

(1)

.....

.....

(b) Describe how the chromosomes in the photograph differ from those found in a typical human body cell.

(2)

.....

.....

.....

.....

(c) The rare condition leads to the formation of abnormal sperm cells.

(i) Name the cell division that produces sperm cells.

(1)

.....

(ii) Suggest how an individual with the chromosomes shown could be produced.

(2)

.....

.....

.....

.....

.....

.....

(Total for Question = 7 marks)

3 Marfan syndrome is a rare genetic condition of the body's connective tissues. It can result in a person being tall with abnormally long and slender limbs, fingers and toes. It may also affect the heart and eyes.

Children with the condition usually inherit it from one of their parents. It is caused by a dominant allele (M) and not the recessive allele (m).

(a) A homozygous recessive male mates with a heterozygous female.

Use a genetic diagram to show the parental genotypes, the gametes produced and the possible genotypes and phenotypes of the offspring.

(4)

Parents genotypes

Gametes

Offspring genotypes

Offspring phenotypes

(b) A person wanted to find out if he had Marfan syndrome. He asked his doctor for advice.

(i) Use the information about the symptoms of Marfan syndrome to explain why it is difficult for the doctor to decide if the person has the condition.

(1)

.....

.....

(ii) Suggest what other information the doctor could use to decide if the person has Marfan syndrome.

(2)

.....

.....

.....

.....

.....

(c) Many genetic disorders are caused by a recessive allele rather than a dominant allele.

Explain how examining a family pedigree would enable you to tell if a condition was caused by a recessive allele.

(3)

.....

.....

.....

.....

.....

.....

(Total for Question = 10 marks)

4 Polydactyly is a genetic disorder in which people inherit an extra digit.

The X-ray image shows the left hand of someone with polydactyly. The person has six digits, five fingers and one thumb.



Polydactyly is caused by a dominant allele (D). The table describes the different genotypes for polydactyly.

(a) Complete the table by giving the correct genotype, alleles of each genotype and the expected number of digits per hand.

(4)

Genotype	Alleles	Expected number of digits per hand
homozygous dominant		six
	dd	
heterozygous	Dd	

(b) The table lists possible matings between parents. Complete the table by writing the probability of each mating producing a child with polydactyly. One has been done for you.

(2)

Parent genotypes	Probability of child with polydactyly
Dd × DD	
Dd × dd	0.5
Dd × Dd	

(Total for Question = 6 marks)

5 Describe an investigation to find out if leaves growing at the bottom of trees are greener than leaves growing at the top of trees.

Your answer should include experimental details and be written in full sentences and paragraphs.

(6)

(Total for Question = 6 marks)

6 Flies lay their eggs in the urine and faeces that sticks to the wool on sheep. The eggs hatch and the larvae damage the skin of the sheep leading to infection.

To reduce this problem, farmers in New Zealand have been developing sheep that have no wool growth on their legs, their backside or on the underside of their abdomen.

(a) Suggest why flies are attracted to urine and faeces.

(1)

.....

.....

(b) Farmers have crossed different breeds of sheep to produce offspring with desired characteristics. The characteristics of different breeds of sheep are shown in the table.

Breed of sheep	Characteristic
Cheviot	bare heads and legs
East Friesian	bare backsides
Wiltshire	bare abdomens

Describe how farmers could use selective breeding to develop sheep with bare legs and bare backsides.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

(c) Describe two differences between selective breeding and natural selection.

(2)

1 .....

.....

2 .....

.....

(d) Farmers sometimes use pesticides to prevent flies attacking sheep.
Give two problems with the use of chemical pesticides.

(2)

1 .....

.....

.....

2 .....

.....

.....

(Total for Question = 9 marks)

7 The passage describes selective breeding.

Complete the passage by writing a suitable word in each of the spaces.

(4)

Selective breeding involves ..... choosing organisms

with desired ..... .

These organisms are allowed to breed and produce ..... .

The process is ..... for several generations.

(Total for Question = 4 marks)