

1 (a) What is meant by the term **gene**?

(2)

The section of DNA that codes for a protein.

.....

.....

.....

(b) A gene is made from 1000 base pairs. The table shows the percentage of each base found in the gene.

(i) Complete the table by giving the name of the missing base.

(1)

Percentage of base	Name of base
29	adenine
21	guanine
29	thymine
21	cytosine

(ii) Calculate how many cytosine bases you would expect to find in this gene.

(1)

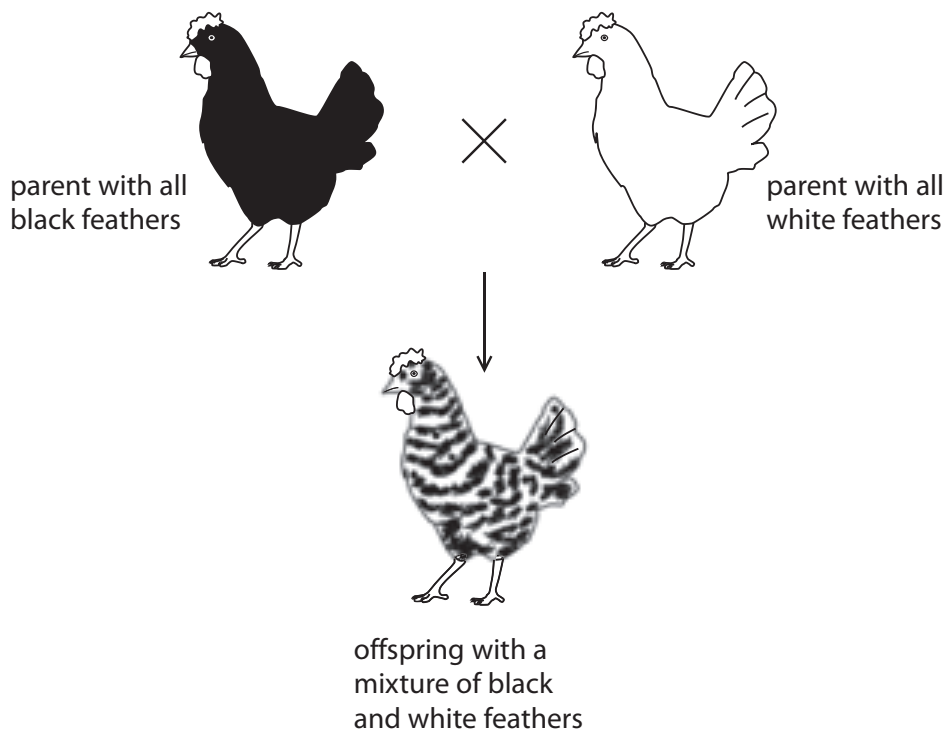
$$1000 * 0.21 = 210$$

Answer

(c) The photograph shows a chicken with a mixture of black feathers and white feathers.



In chickens the inheritance of feather colour is controlled by codominant alleles. The allele for black feathers is C^B , and the allele for white feathers is C^W . The diagram shows a parent with all black feathers and a parent with all white feathers. It also shows one of their offspring with a mixture of black and white feathers.



- (i) Complete the table by writing the genotype of the chickens shown in the diagram.

(1)

Chicken	Genotype
parent with all black feathers	Cb Cb
parent with all white feathers	Cw Cw
offspring with a mixture of black and white feathers	Cb Cw

- (ii) Two of the offspring with a mixture of black and white feathers mated. What is the probability that their offspring would also have a mixture of black and white feathers?

(1)

50%

(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)

They provide nutrients to their larvae

- (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)

breed a population of cheviots with a population of East Friesians, some of the young will likely have nearly bare legs and backsides. Next breed those young together. In the next generation choose those sheep with the barest legs and backsides, continue this process of selective breeding until your population has the desired characteristics.

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

(2)

1 **In natural selection, selective pressures are determined by nature, not the farmers.**

2 **In selective breeding, there is an intended preferred characteristic such as hair length. In natural selection there is no preferred characteristic.**

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

(2)

1 **They may kill pollinating insects, harming the lifecycle of plants, especially crops.**

2 **They may be harmful to the sheep, or damage the sheep's wool.**

(Total for Question = 9 marks)

2 The following passage describes inheritance.

Complete the passage by writing a suitable word or words on each dotted line.

(6)

A gene is a section of a double-stranded molecule known as DNA.

This molecule is found within the nucleus of the cell,

contained in threadlike structures called chromosomes.

The two strands form a double helix linked by a series of paired bases.

The base adenine is always linked to thymine and the base cytosine

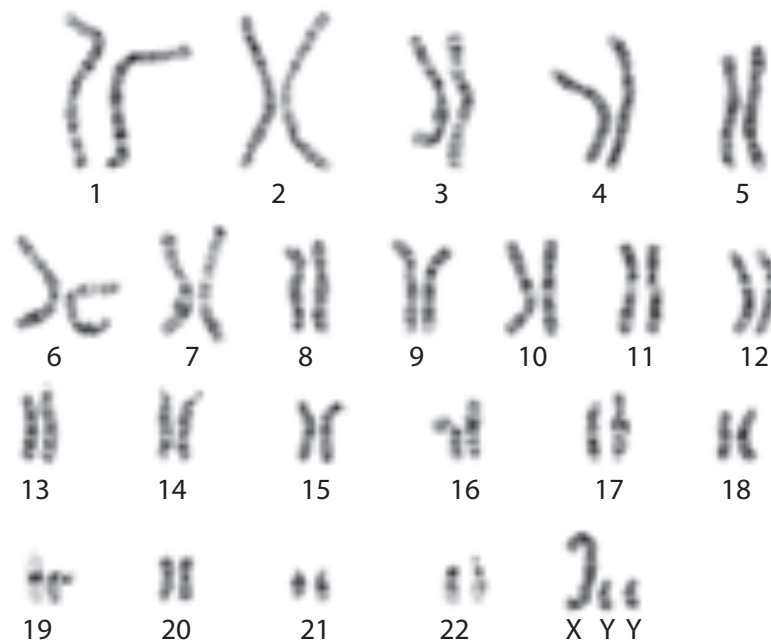
is always linked to guanine.

Sometimes the genetic material of a cell changes. This is known as a mutation.

These changes occur very rarely but their incidence can be increased by chemicals or ionising radiation.

(Total for Question = 6 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)

47

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

(1)

male

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

(2)

a typical human cell has 23 pairs, so 46 chromosomes. Men have an XY for their 23rd pair whereas this person has XYY.

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

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

(1)

meiosis

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

(2)

if one of the gametes, either egg or sperm accidentally had an extra chromosome from the 23rd pair this individual would have ended up with 3 chromosomes in their 23rd set.

(Total for Question = 7 marks)
