

Reproduction 4

Q:1 The photographs show the flowers of two closely-related species of plant.

Species A

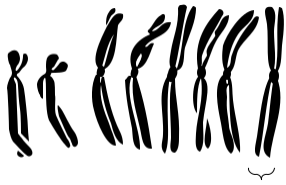


Species B



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.

(a) (i) How does a chromosome become two strands?

(1 mark)

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

(2 marks)

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

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

(1 mark)

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

Species A Species B

(1 mark)

(b) (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 mark)

(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 marks)

(c) (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.



The offspring plants cannot reproduce sexually.

Suggest an explanation for this.

(2 marks)

Q:2(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 meiosis (✓)
Produces new cells during growth and repair		
Produces gametes (sex cells)		
Produces genetically identical cells		

(2 marks)

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

a man _____

a woman. _____

(2 marks)

(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:

(b) (i) a man _____

(1 mark)

(b) (ii) a woman? _____

(1 mark)

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

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

(1 mark)

Q:3 In sexual reproduction, an egg fuses with a sperm.

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

An egg and a sperm fuse together in the process of

- cloning.
- fertilisation.
- mitosis.

[1 mark]

(a) (ii) Egg cells and sperm cells each contain the structures given in the box.

chromosome gene nucleus

List these three structures in size order, starting with the smallest.

- 1 _____ (smallest)
- 2 _____
- 3 _____ (largest)

[2 mark]

(a) (iii) The egg and the sperm contain genetic material.

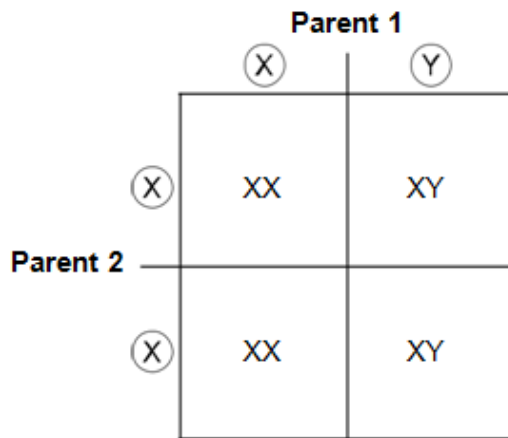
Draw a ring around the correct answer to complete the sentence.

The genetic material is made of

- carbohydrate.
- DNA.
- protein.

[1 mark]

(b) Figure 8 shows the inheritance of X and Y chromosomes.



(b) (i) On Figure 8, draw a tick (☑) on the part of the diagram that shows a sperm cell.

(b) (ii) What is the chance of having a female child?

Give the reason for your answer.

[2 mark]

Q:4 DNA is the genetic material of human cells.

Figure 4 shows the structure of part of a DNA molecule.



(a) (i) Describe where DNA is found in a human cell.

[2 marks]

(a) (ii) When a cell divides by mitosis the new cells are genetically identical.

What causes the cells to be genetically identical?

[1 mark]

(b) Many genes have different forms called alleles.

(b) (i) A person has polydactyly (extra fingers or toes). Polydactyly is caused by a dominant allele.

What is the smallest number of copies of the dominant allele for polydactyly that could be found in a body cell of this person?

[1 mark]

(b) (ii) Another person has cystic fibrosis. Cystic fibrosis (CF) is caused by a recessive allele. How many copies of the recessive CF allele are there in a body cell of this person?

[1 mark]

(c) A burglar broke into a house. The burglar cut his hand on some broken glass.

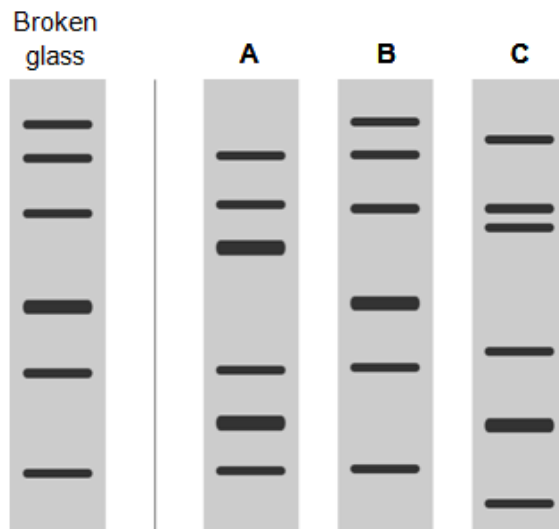
Scientists extracted DNA from the blood on the broken glass.

The scientists analysed the DNA from the glass and DNA from three suspects,

A, B and C. The scientists used a method called DNA fingerprinting.

Figure 5 shows the scientists' results.

Figure 5



Which suspect, A, B or C, is most likely to have been the burglar?

Tick (☑) one box.

A

B

C

[1 mark]

TOTAL MARKS=29