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# GCSE BIOLOGY

Topic Paper: 6.1 Genetic Inheritance  
Part 1

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Time allowed: 35 minutes

## Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

## Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

## Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
  - is clear, logical, sensibly structured
  - fully meets the requirements of the question
  - shows that each separate point or step supports the overall answer.



**30 Marks**



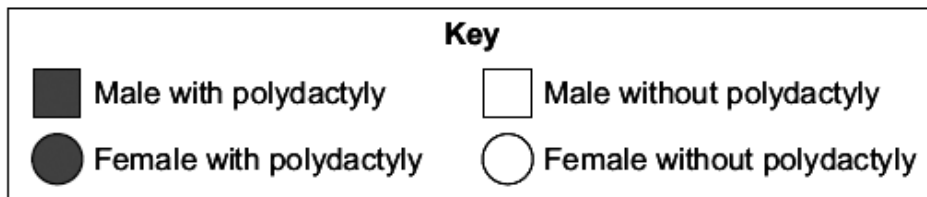
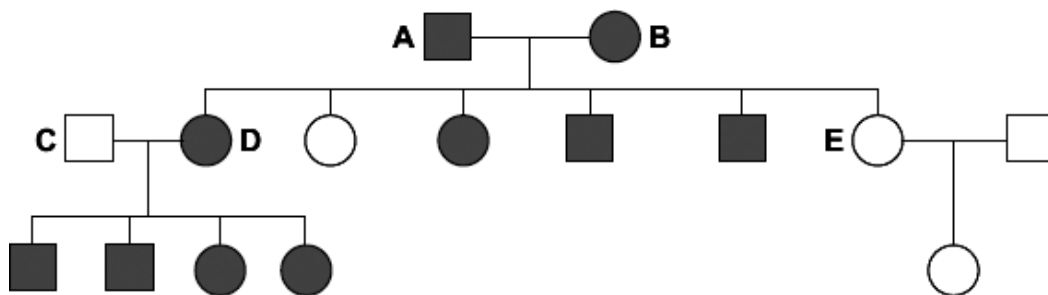
**Q1.** Cats normally have four toes on each back paw.

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?

.....  
.....  
.....

(1)

(Total 6 marks)

**Q2.**

(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 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.

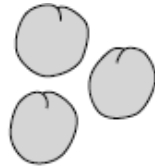
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(4)

(Total 8 marks)



**Q3.** In the 1860s, Gregor Mendel studied inheritance in nearly 30 000 pea plants. Pea plants can produce either round seeds or wrinkled seeds.



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)

**Questions continue on the next page**



- (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.

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(1)

(Total 6 marks)

**Q4.** 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.

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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?

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.....

(1)  
(Total 3 marks)

**Q5.** 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.

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.....  
.....  
.....

(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)

