

3.3 Inheritance

Question Paper

Course	DP IB Biology
Section	3. Genetics
Topic	3.3 Inheritance
Difficulty	Easy

Time allowed: 60
Score: /42
Percentage: /100

Question 1a

a)
Huntington's disease is a disease caused by a dominant allele.

State what is meant by the term **dominant**, in the context of alleles.

[1 mark]

[1 mark]

Question 1b

b)
Gregor Mendel conducted experiments that established the basis of modern genetics.

i)
State the type of organism that Mendel used in his studies.

[1 mark]

ii)
State why the organism you named in part (i) was a good choice for Mendel's experiments.

[2 marks]

[3 marks]

Question 1c

c)
As well as Mendel discovering modern genetics, his experiments also set an important precedent that defines all good scientific experiments. In particular, his methods demonstrated good practice in the collection of reliable data.

Which aspect of Mendel's experimental set-ups can claim to have achieved this?

[2 marks]

[2 marks]

Question 1d

d)

In snapdragon plants, a cross between a red and white flowered plant results in pink flowered offspring due to codominance of alleles.

In the species that Mendel used for his experiments, a cross between a red-flowered plant and a white-flowered plant, did not result in any pink flowered plants in the next generation.

Suggest why.

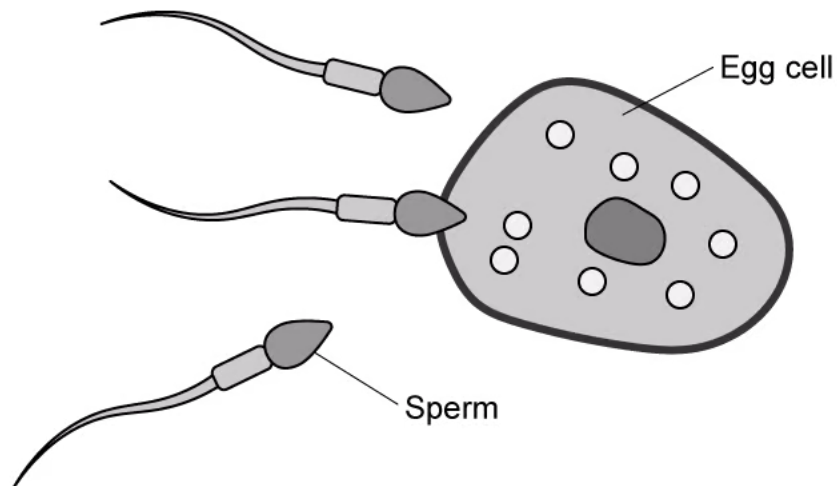
[2 marks]

[2 marks]

Question 2a

a)

The diagram shows a human egg and three sperm cells at the moment of fertilisation.



Suggest why the egg is so much larger than one sperm, even though they carry the same amount of genetic information as each other.

[2 marks]

[2 marks]

Question 2b

b)

State the number of chromosomes in a human egg.

[1 mark]

[1 mark]

Question 2c

c)

Name the cell that forms when a sperm fertilises an egg.

[1 mark]

[1 mark]

Question 2d

d)

In a genetic diagram where **H** denotes the dominant allele responsible for causing Huntington's disease, and **h** denotes the recessive allele, state:

i)

the meaning of the genotype **Hh**

ii)

the phenotype that **Hh** will display

[2 marks]

[1 mark]

Question 3a

a)
The diploid number of a species of rodent is 64.

The table below has been incorrectly completed; some of the numbers in the second column are correct, while others are not.

Cell Type	Number of chromosomes
Zygote	64
Sperm cell	64
Muscle cell	32
Fur-producing cell	16

Complete the table below with correct numbers in the second column.

[2 marks]

Cell Type	Number of chromosomes
Zygote	
Sperm cell	
Muscle cell	
Fur-producing cell	

[2 marks]

Question 3b

b)
A genetic cross is performed between two heterozygous parents with the genotype Qq.

Complete the Punnett grid for this cross.

	Q	q
Q		
q		

[2 marks]

[2 marks]

Question 3c

c)

When writing out genetic crosses by hand, which of the following pairs of letters is the best choice for denoting the dominant and recessive alleles?

Give a reason for your answer.

- Cc
- Oo
- Hh
- Vv

[2 marks]

[2 marks]

Question 3d

d)

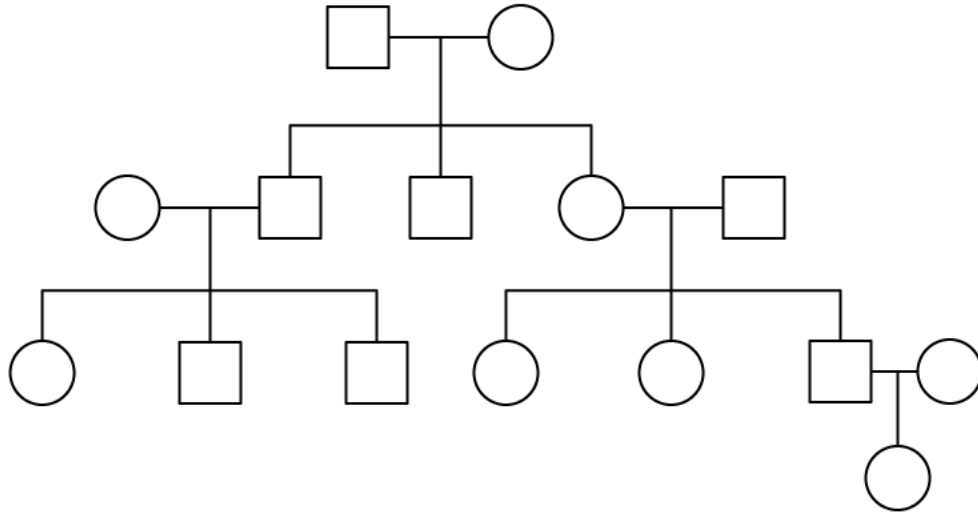
State the name used to describe different alleles of the same gene, that have a combined effect on the phenotype of the organism.

[1 mark]

[1 mark]

Question 4a

a)
A pedigree chart is shown below.



i)
State the number of generations shown in the pedigree chart.

[1 mark]

ii)
State the numbers of males and females shown in the pedigree chart.

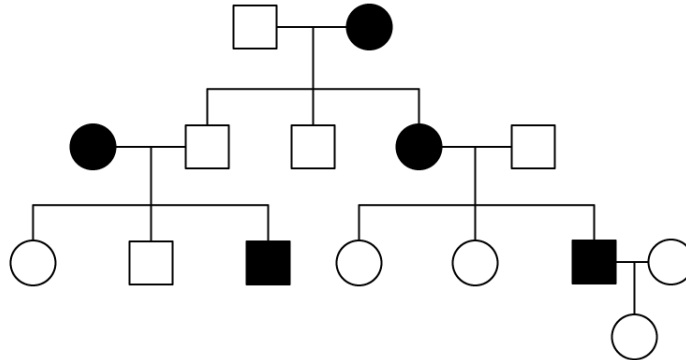
[1 mark]

[2 marks]

Question 4b

b)

The pedigree chart from part (a) can be adapted with shading as follows:



Suggest a meaning for the shaded squares and circles.

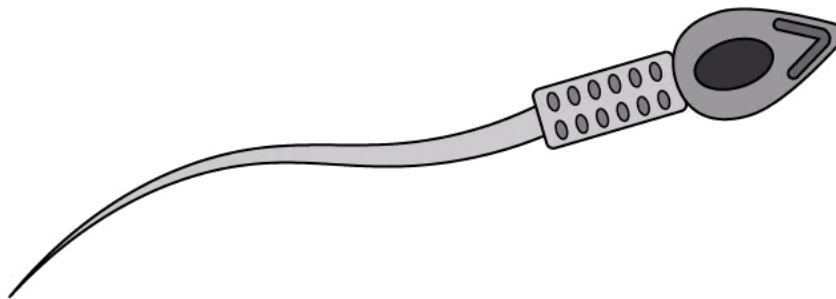
[1 mark]

[1 mark]

Question 4c

c)

A sperm cell is shown below.



i)

Label the diagram with an X to show the position of mitochondria in this cell.

[1 mark]

ii)

State the purpose of the mitochondria in a sperm cell

[1 mark]

[2 marks]

Question 4d

d)

Define the term sex linkage.

[2 marks]

[2 marks]

Question 5a

One mark is available for clarity of communication throughout this question.

a)

State the differences between the terms phenotype and genotype.

Give **one** example of **each**.

[4 marks]

[4 marks]

Question 5b

b)

8000 offspring were produced from a cross between two heterozygous parents, Hh and Hh.

Calculate how many of these offspring would have the genotype hh. Show your working.

[3 marks]

[3 marks]

Question 5c

c)

i)

Define the term mutation.

[2 marks]

ii)

List **four** factors that can increase the rate of mutation within cells. Describe the possible consequence of exposure to that factor.

[6 marks]

[8 marks]

