# 3.2 Meiosis

## Question Paper

| | |
|---|---|
| Course | DP IB Biology |
| Section | 3. Genetics |
| Topic | 3.2 Meiosis |
| Difficulty | Easy |

**Time allowed:** 50

**Score:** /36

**Percentage:** /100



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## Question 1a

a)

Outline the purpose of meiosis in living organisms.

**[2 marks]**

**[2 marks]**

## Question 1b

b)

The table below contains a series of statements about meiosis in human cells.

| Statement | True / False |
|---|---|
| 2 daughter cells are produced | False |
| Homologous pairs of chromosomes are separated | |
| Daughter cells have the full number of chromosomes | |
| Two cycles of division take place | |
| DNA replication occurs before the process begins | |

Complete the table by indicating whether each statement is **true** or **false**. The first row has been completed for you.

**[2 marks]**

**[2 marks]**



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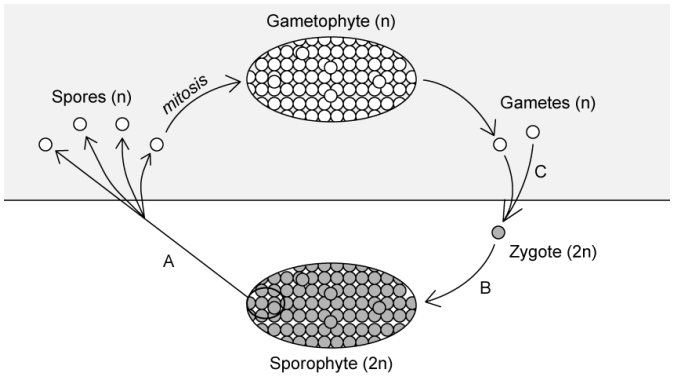
## Question 1c

c)
The diagram below shows a simplified life cycle of a fern plant.




Identify the types of cell division taking place at the positions marked **A** and **B**.

**[2 marks]**

**[2 marks]**

## Question 1d

d)
Identify the process taking place at the position marked **C** in the diagram in part c).

**[1 mark]**

**[1 mark]**

## Question 2a

a)
The process of meiosis was discovered in the late 1800s.

i)
State **one** challenge that would have been faced by the scientists studying cell division at this time.

**[1 mark]**

ii)
Describe an observation that would have led to the discovery of meiosis.

**[1 mark]**



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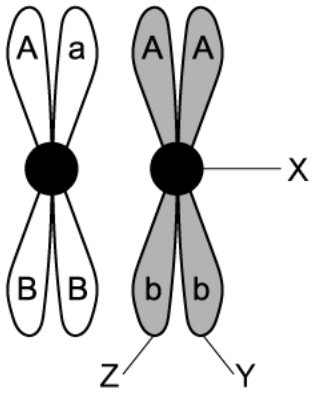
**[2 marks]**

## Question 2b

b)
The image below shows two chromosomes.




i)
Identify the structures labelled **X** and **Y**.

**[2 marks]**

ii)
Structures **Y** and **Z** are identical.

State why this is the case.

**[1 mark]**

**[3 marks]**



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## Question 2c

c)
The two chromosomes shown in part b) can be described as homologous chromosomes.

Define the term **homologous chromosome**.

**[2 marks]**

**[2 marks]**

## Question 2d

d)
During meiosis the homologous chromosomes shown in part b) are separated.

Identify the stage of meiosis during which the homologous chromosomes are separated.

**[1 mark]**

**[1 mark]**



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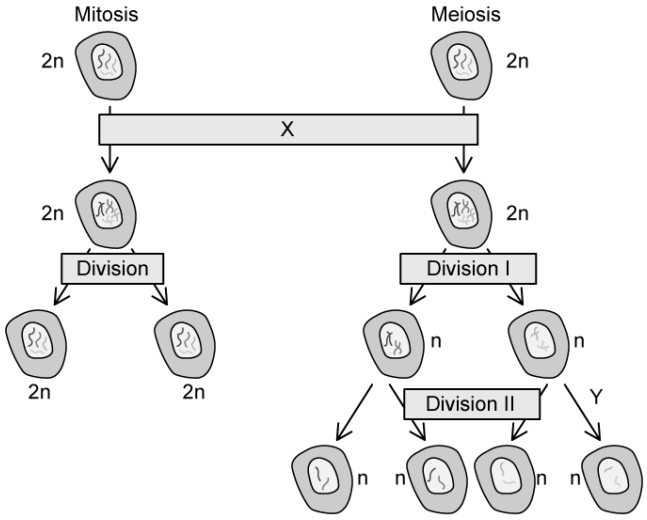
## Question 3a

a)

The image below shows a summary of the events during mitosis and meiosis.




Identify the process taking place at the stage marked **X**.

**[1 mark]**

**[1 mark]**

## Question 3b

b)

The stage marked **Y** on the image in part a) shows a change in the amount of genetic material in the cells.

Describe the events that take place in order for this change to occur.

**[2 marks]**

**[2 marks]**



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## Question 3c

c)
During division 1 shown in the image in part a) a process known as crossing over takes place.

Outline the events that take place during crossing over.

**[2 marks]**

**[2 marks]**

## Question 3d

d)
Crossing over generates genetic variation.

**Other than** crossing over, identify **one** other process that generates genetic variation during sexual reproduction.

**[1 mark]**

**[1 mark]**



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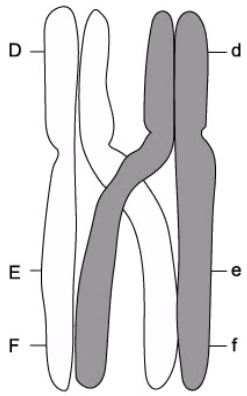
## Question 4a

a)
The image below shows a pair of chromosomes during meiosis.




i)
Identify the process taking place in the image.

**[1 mark]**

ii)
Label the image with an **X** to show the location of the chiasmata.

**[1 mark]**

**[1 mark]**

## Question 4b

b)
State the alleles that will be present on each of the **grey** shaded chromatids at the end of the process shown in part a).

**[2 marks]**

**[2 marks]**



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## Question 4c

c)
There are many different possible combinations of chromosomes that can be found in the daughter cells produced during meiosis.

Use the formula $2^n$ to calculate the number of possible chromosome combinations that can be generated in domestic cat gametes. Note that the adult cells of domestic cats contain 38 chromosomes.

**[2 marks]**

**[2 marks]**

## Question 4d

d)
Another source of variation during meiosis is a chromosome mutation that results from an event known as chromosome non-disjunction.

i)
State the meaning of the term **non-disjunction**.

**[1 mark]**

ii)
Identify **one** factor that increases the risk of chromosome non-disjunction occurring during meiosis.

**[1 mark]**

**[2 marks]**

## Question 5a

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

a)
Draw an annotated diagram of a cell in telophase I. The chromosomes should be clearly defined in your diagram.

**[3 marks]**



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**[3 marks]**

## Question 5b

b)
Outline the production of a karyogram for the purpose of screening the chromosomes of a developing embryo.

**[5 marks]**

**[5 marks]**



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