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

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	

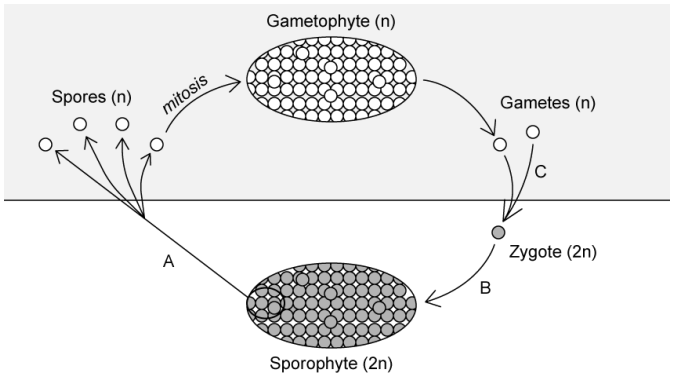
Complete the table by indicating whether each statement is **true** or **false**. The first row has been completed for you.

[2 marks]

[2 marks]

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]

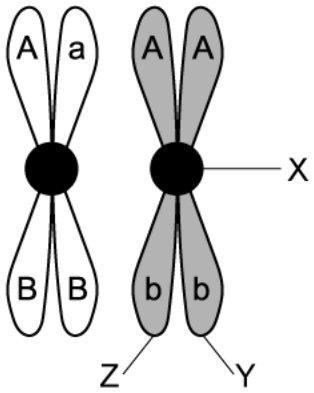
ii)
Describe an observation that would have led to the discovery of meiosis.

[1 mark]

[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]

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.

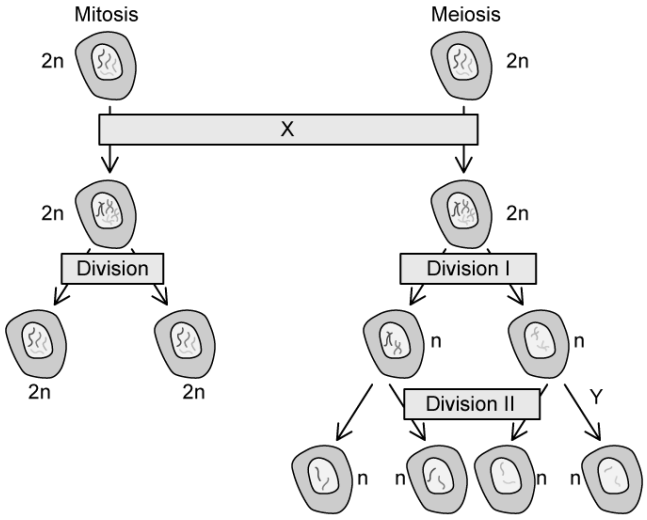
[1 mark]

[1 mark]

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]

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.

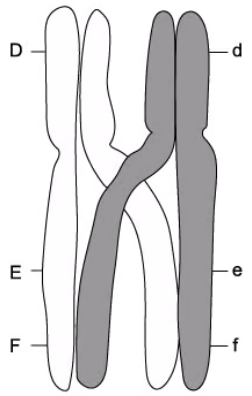
Other than crossing over, identify **one** other process that generates genetic variation during sexual reproduction.

[1 mark]

[1 mark]

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]

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]

[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]