

# **Meiosis Part 2**

# **Exam Questions**

Life Sciences

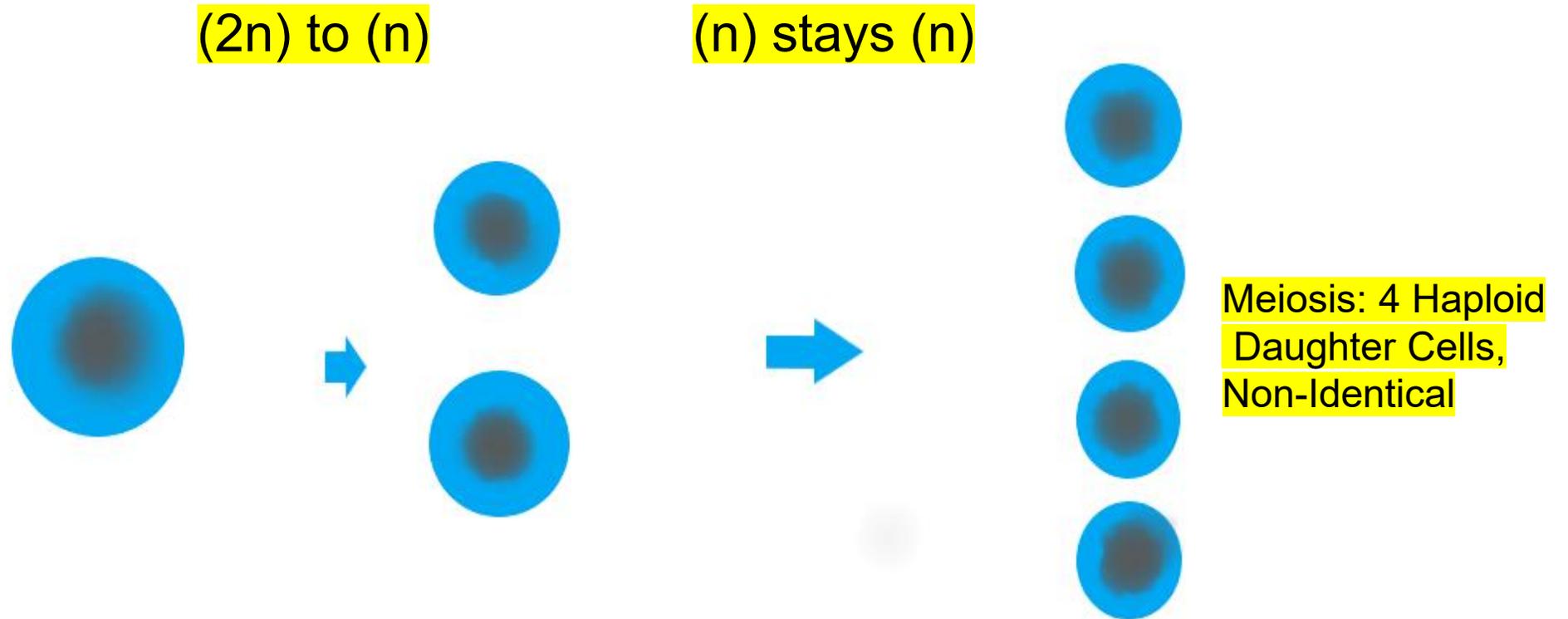
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## Key Points: Meiosis

- Meiosis vs Mitosis
- Differences Meiosis I and II
- Non-disjunction and Down Syndrome
- Past Paper Questions

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## Meiosis vs Mitosis



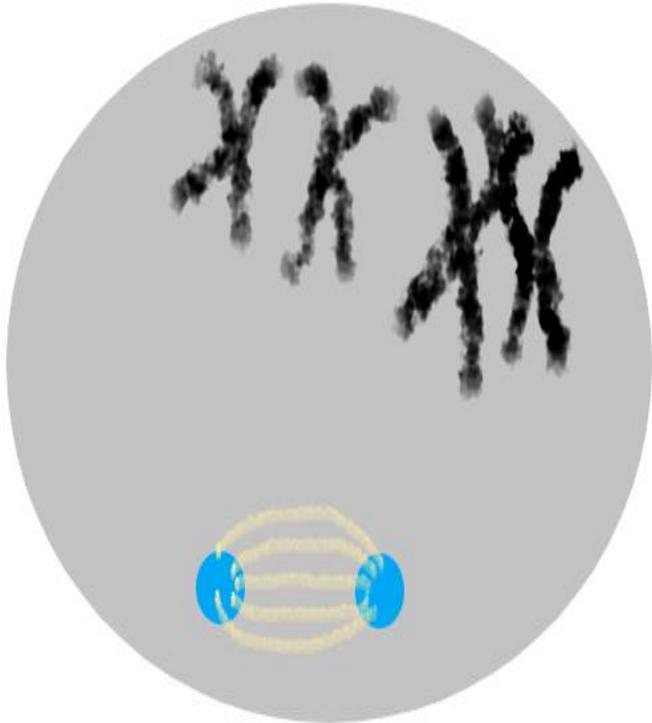
# Differences Between Meiosis and Mitosis

<b>Meiosis</b>	<b>Mitosis</b>
Product: 4 <b>Non-identical</b> daughter cells	Product: 2 <b>Identical</b> daughter cells
Chromosome number changes from diploid to haploid	Chromosome number stays the same
Occurs in testes and ovaries only	Occurs in all body cells (somatic cells)
For production of gametes	For growth and repair

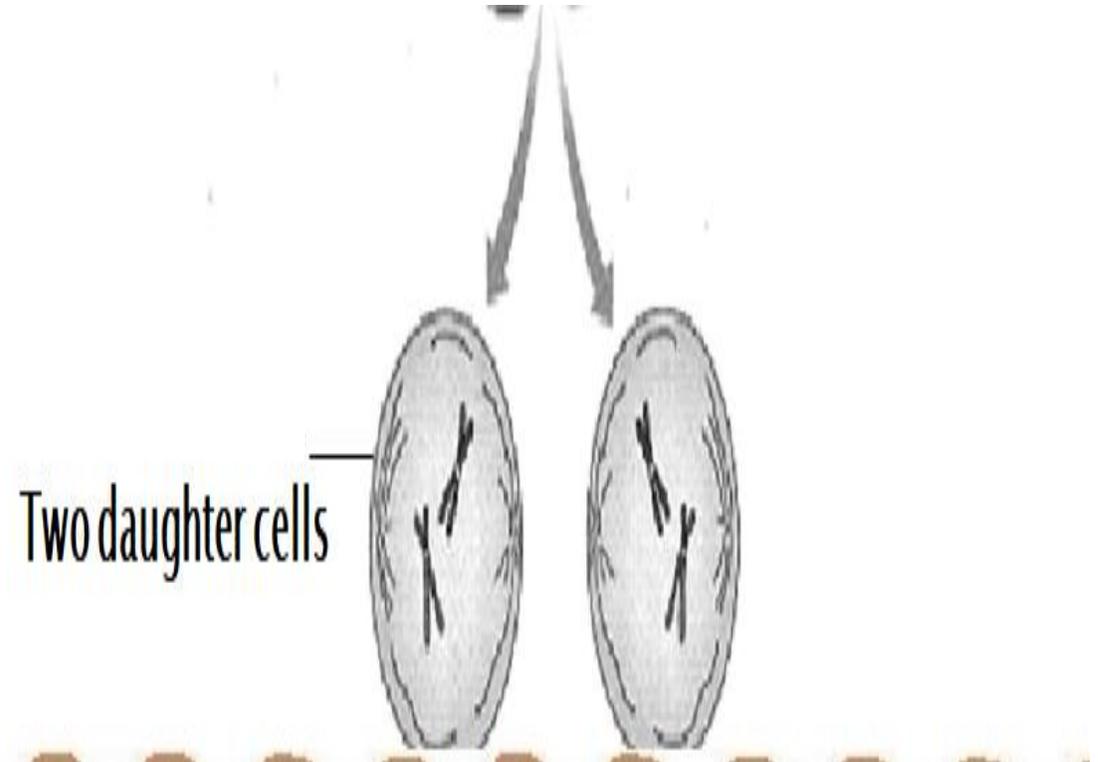
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## Difference

### Prophase I



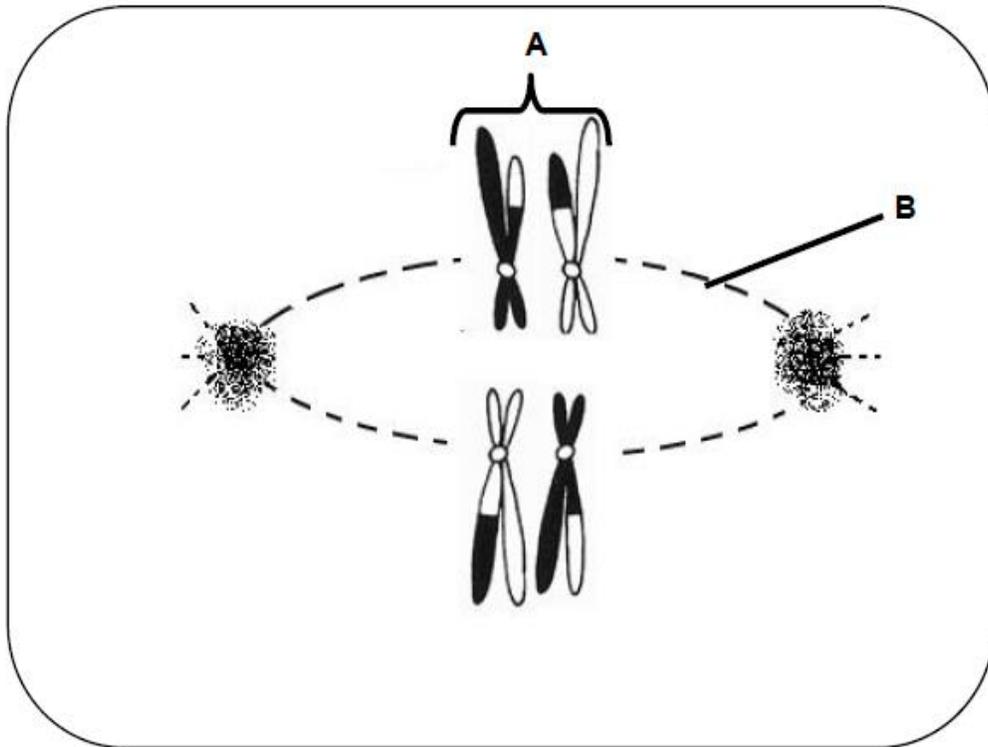
### Prophase II



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## Difference

Metaphase I - **P**



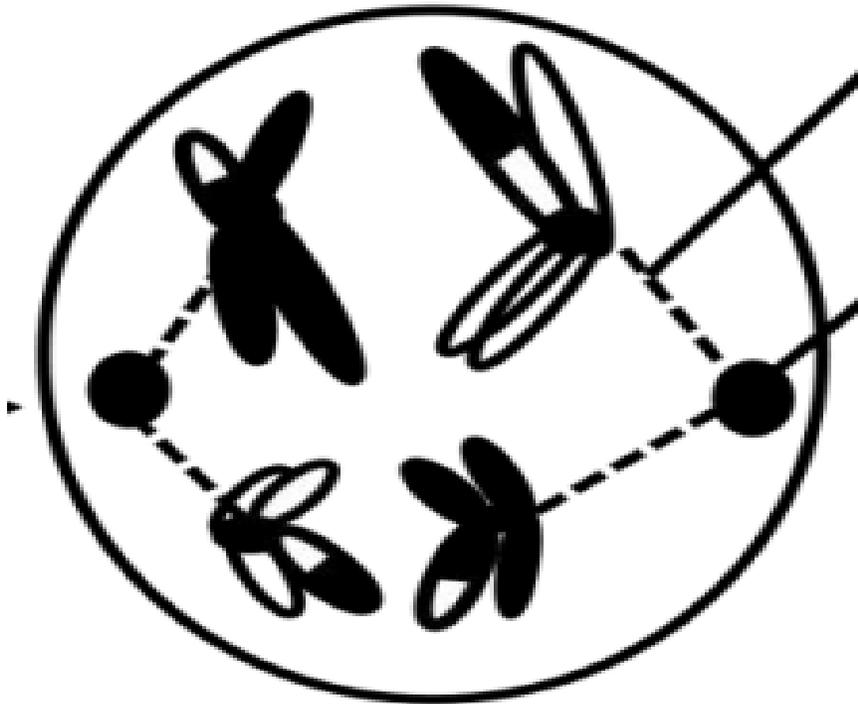
Metaphase II - **S**



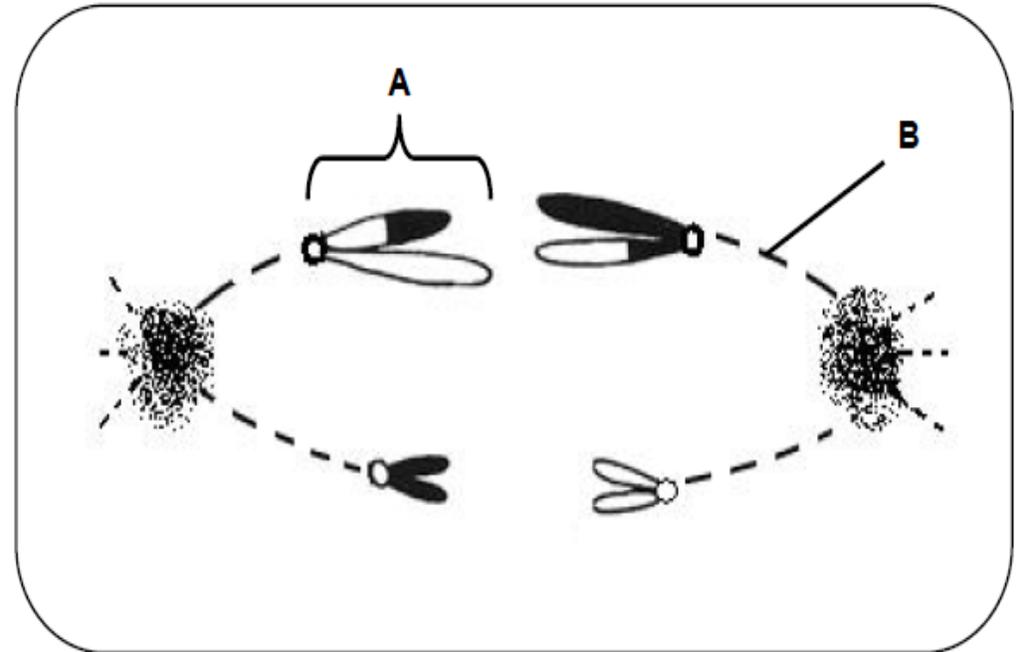
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## Difference

Anaphase I – C



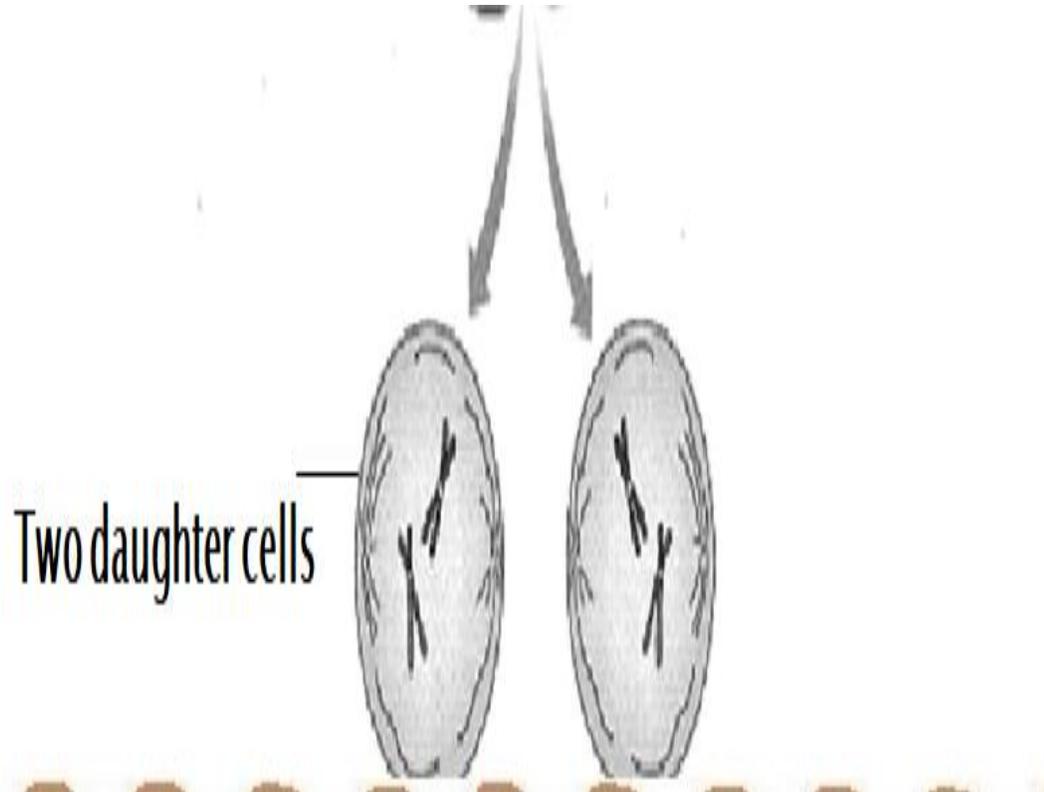
Anaphase II – C



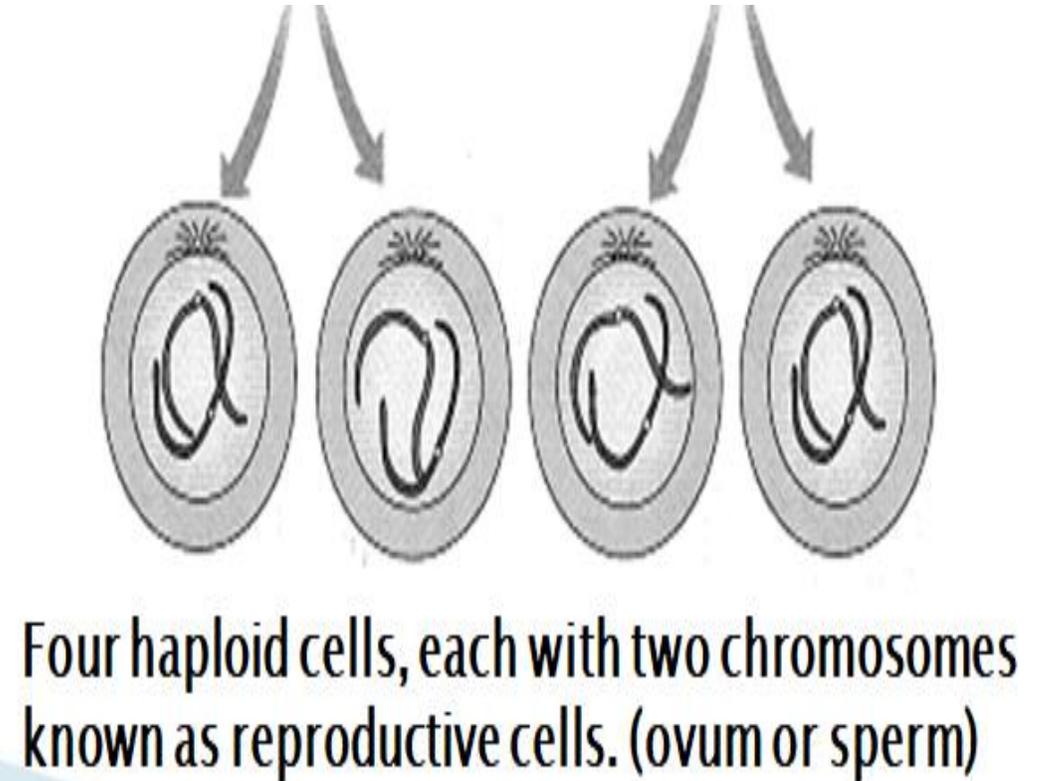
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## Difference

### Telophase I

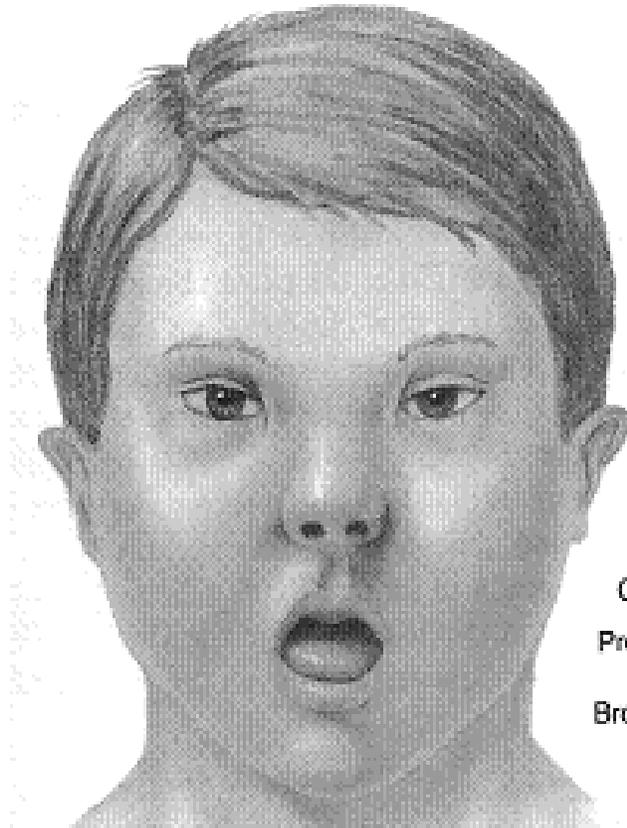


### Telophase II



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## Down Syndrome



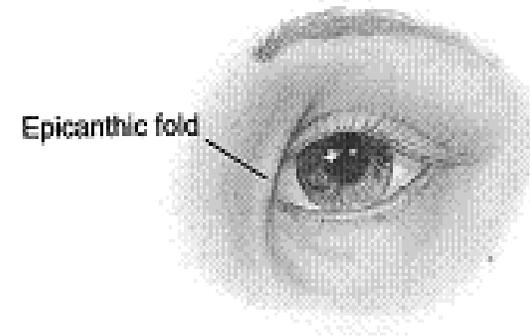
Small, oblique eyes

Flattened, nasal bridge

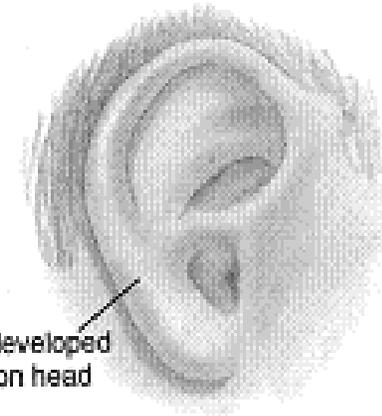
Open mouth

Protruding tongue

Broad neck



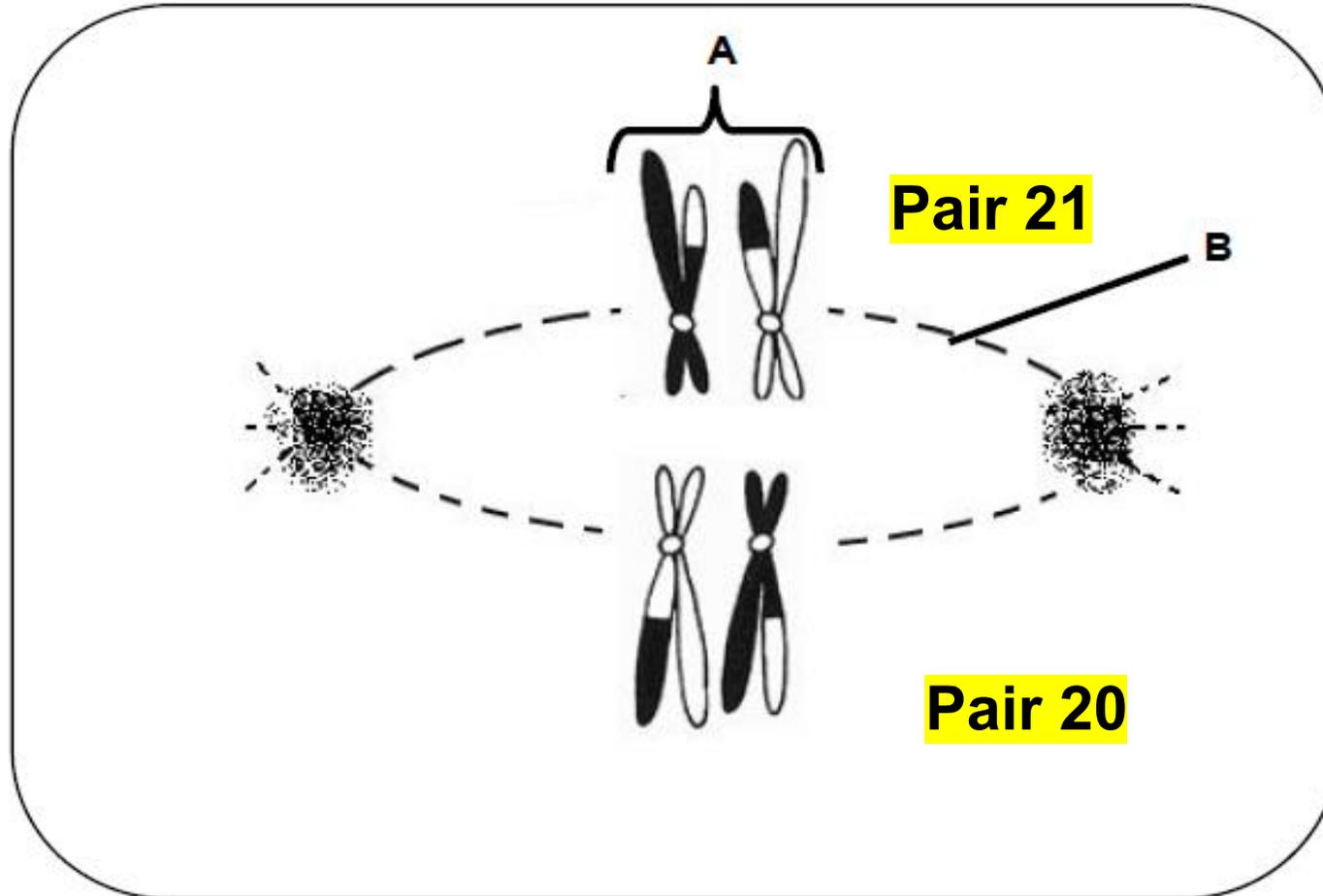
Epicanthic fold



Small underdeveloped  
ears set low on head

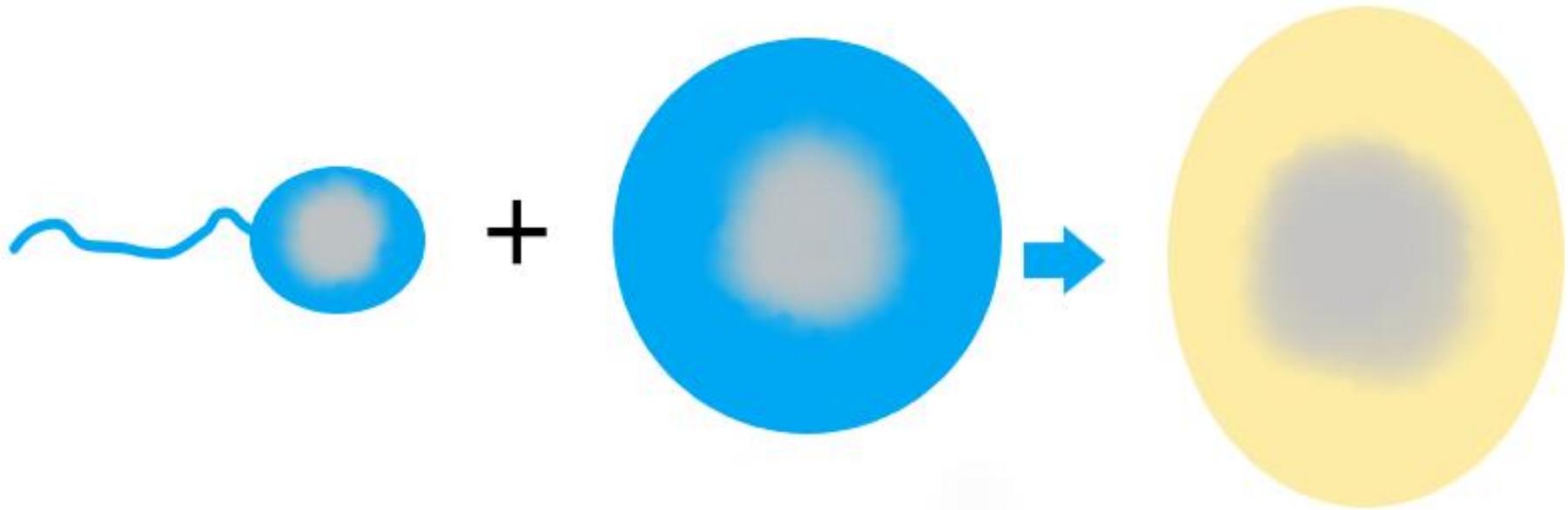
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## Non-disjunction of chromosome pair 21



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## The result of non-disjunction



**23 Chromosomes + 24 Chromosomes = 47 Chromosomes in Zygote**

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**Trisomy – 21** leads to Down Syndrome



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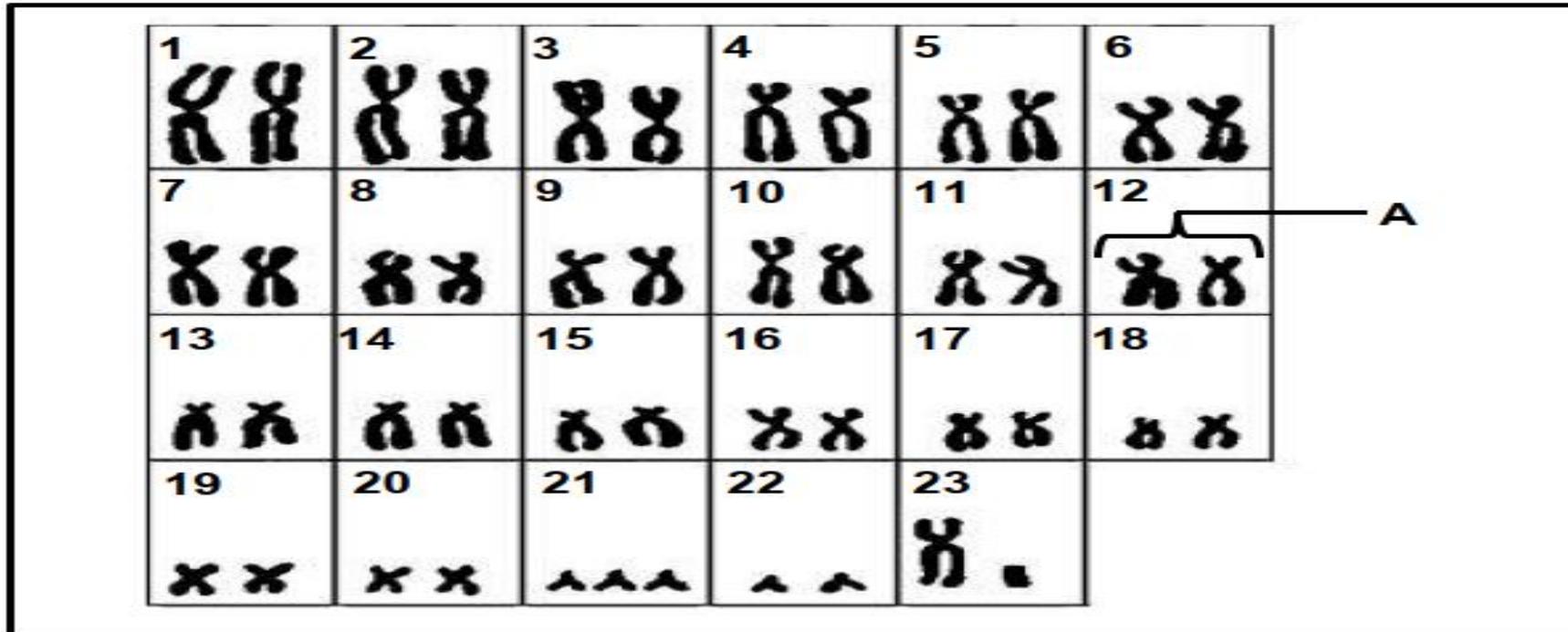
## Down Syndrome

- Women above 40 have an increased risk of abnormal meiosis.
- During Anaphase 1, chromosomes of pair 21 do NOT separate.
- Both chromosomes move to same pole.
- This is called non-disjunction.
- The ovum that is formed now contains 24 chromosomes instead of 23.

When this ovum is fertilised by a normal sperm cell, the zygote has 47 chromosomes. One extra at pair 21, Trisomy - 21

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## 4.3 Examine the diagram below of a human karyotype



- 4.3.1 Give the label for A. (1)
- 4.3.2 How many autosomes are there in a nucleus of this cell? (1)
- 4.3.3 Name the type of chromosomes at position 23. (1)
- 4.3.4 What evidence suggests that this is a karyotype of a male? (1)
- 4.3.5 Name the type of mutation represented in the diagram. (1)
- 4.3.6 Describe the events that led to Down syndrome. (6)

Nr = 45

Gonosomes

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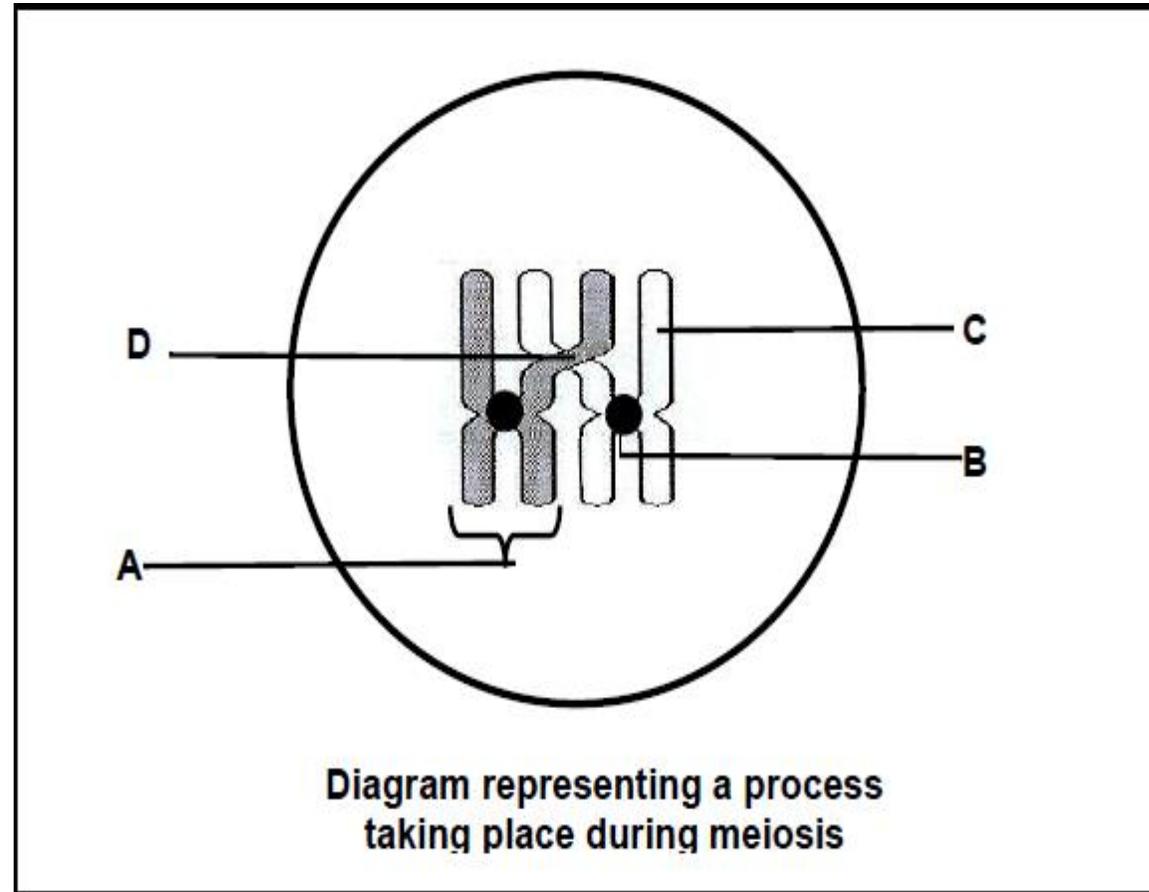
**Question: Describe how Meiosis contributes to variety in a population. (6)**

**1. Crossing Over**

**2. Random Arrangement of  
Chromosomes on The Equator  
during Metaphase I**

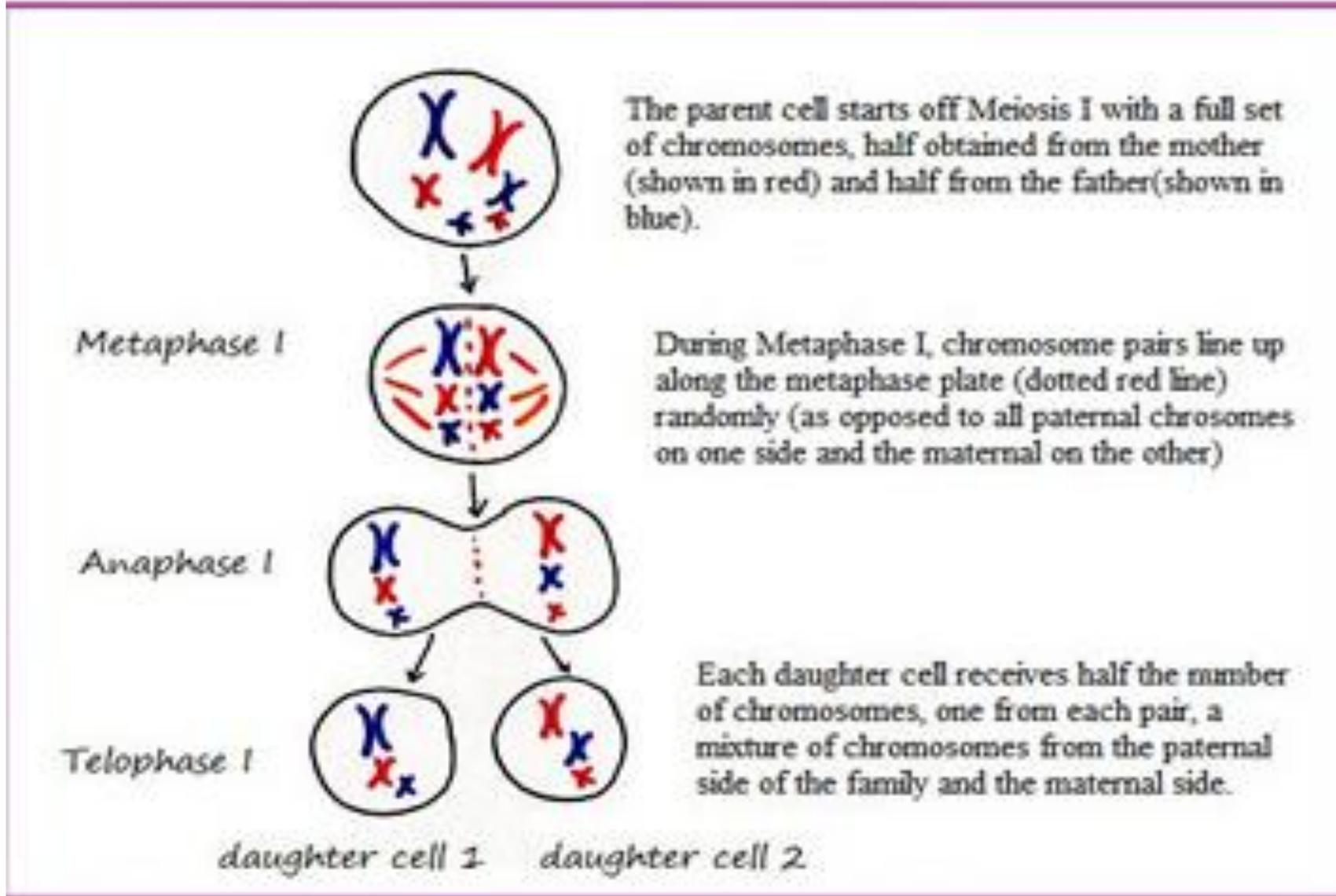
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## Prophase I: Crossing Over



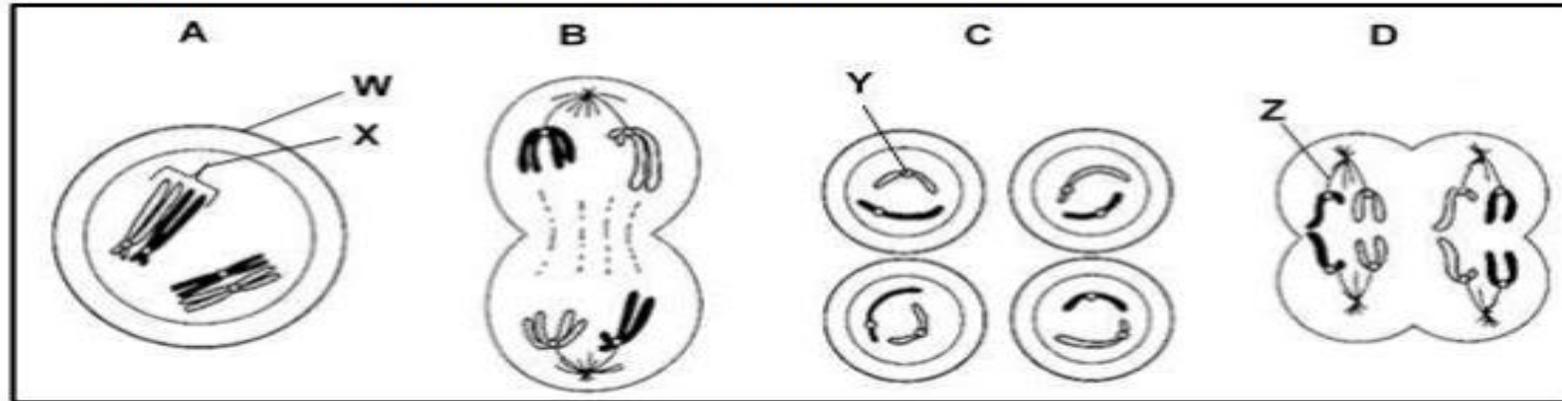
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## Random Arrangement of Chromosomes



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4.4 The diagrams below show different phases in meiosis.



4.4.1 Label the structures **W** and **X**.

(2)

4.4.2 How many chromosomes are present in each cell in:

(a) Phase **A**

(1)

(b) Phase **C**

(1)

4.4.3 Give only the LETTER of the diagram that represents anaphase II.

(1)

4.4.4 State the function of structure **Y** and structure **Z**.

(2)

4.4.5 Identify phase **C**.

(1)

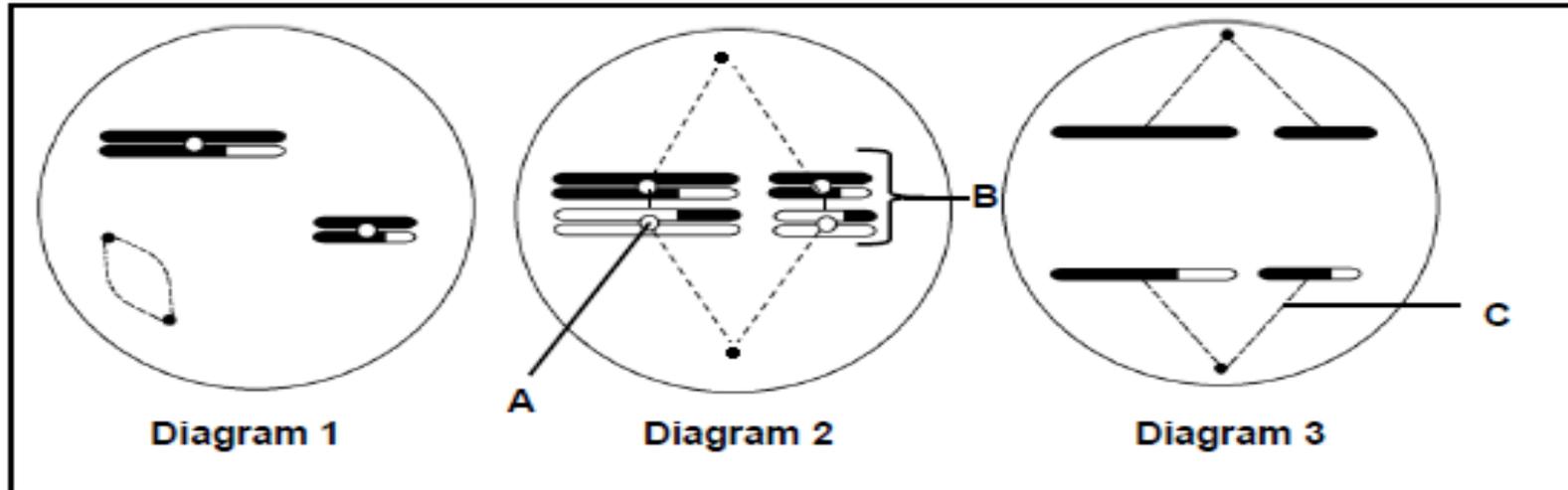
**(8)**

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## Past Paper Questions – NSC P1 2019

### QUESTION 2

2.1 The diagrams below represent different phases of meiosis in an organism.



2.1.1 Identify:

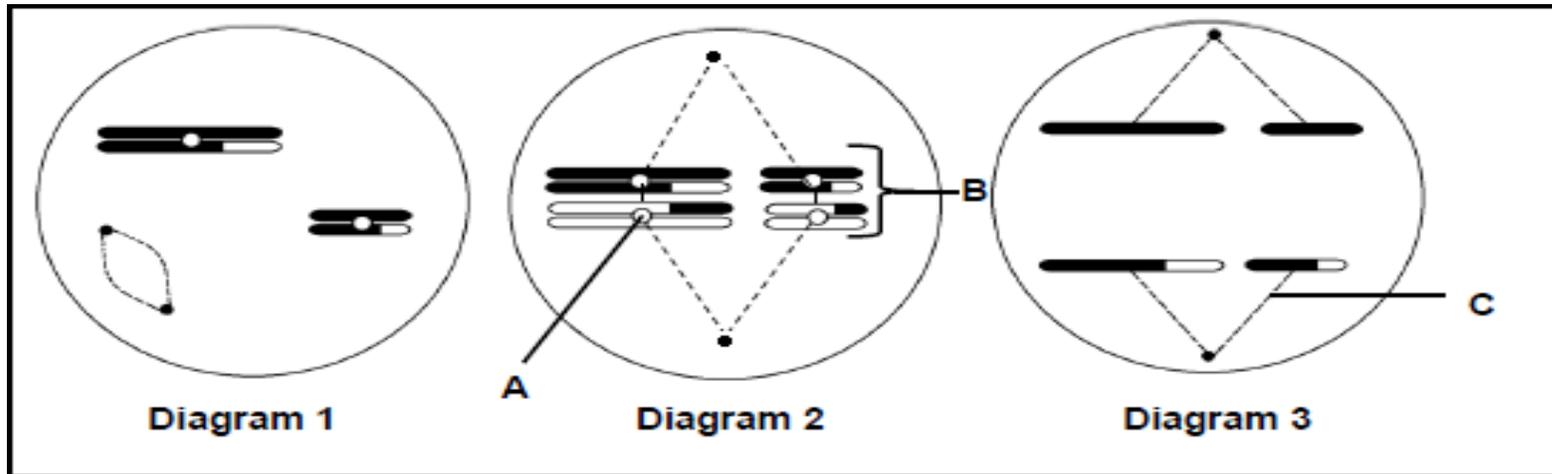
(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

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## Past Paper Questions – NSC P1 2019



- 2.1.2 Identify the phase represented in DIAGRAM 3. (1)
- 2.1.3 Write down the numbers of the diagrams to show the sequence in which the phases occur. (2)
- 2.1.4 State ONE difference between metaphase I and metaphase II. (2)
- (8)

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## Past Paper Questions NSC P2 2017

### Question

Describe the behaviour of chromosomes during the different phases of meiosis I. (9)

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## Past Paper Questions NSC P2 2017

### BEHAVIOUR OF CHROMOSOMES IN MEIOSIS I

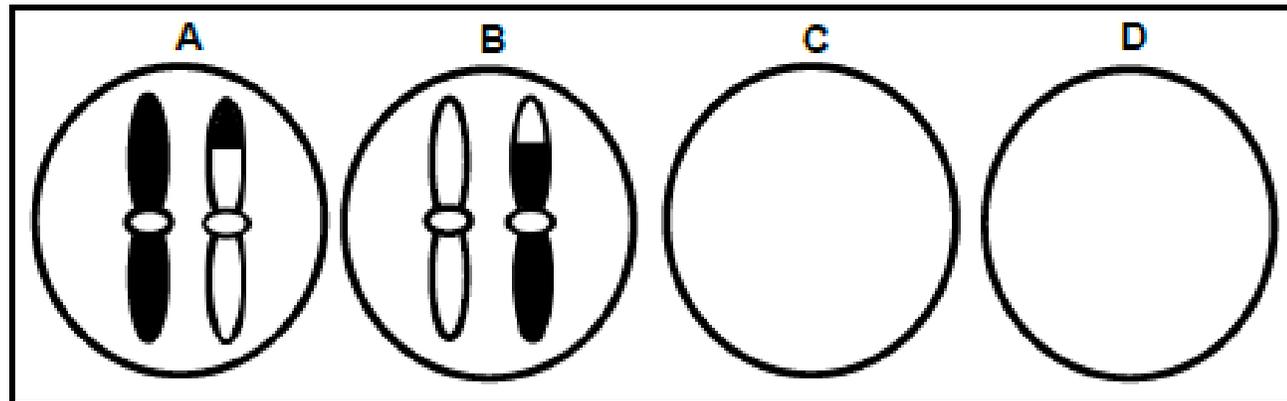
- During prophase<sup>✓</sup> I
- chromosomes pair<sup>✓</sup> up/homologous pairs/bivalents form
- Crossing over<sup>✓</sup>/exchange of genetic material occurs
- between chromatids<sup>✓</sup>/adjacent chromosome pairs
- During metaphase<sup>✓</sup> I of meiosis
- homologous chromosomes<sup>✓</sup>/chromosome pairs are arranged
- at the equator<sup>✓</sup> of the cell
- in a random<sup>✓</sup> way
- with the chromosome attached to the spindle fibre<sup>✓</sup>
- During anaphase<sup>✓</sup> I
- chromosome pairs separate<sup>✓</sup>/chromosomes move to opposite poles
- During telophase<sup>✓</sup> I
- the chromosomes reach the poles of the cell<sup>✓</sup>

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## Past Paper Questions NSC P2 2018

### QUESTION 2

- 2.1 The diagrams below represent the distribution of chromosome pair 21 as it appears in gametes at the end of meiosis II in a human male.



- 2.1.1 Explain why the gametes represented by diagrams C and D do not have any chromosomes. (3)
- 2.1.2 If gamete A is involved in fertilisation, describe how this may result in Down syndrome. (3)



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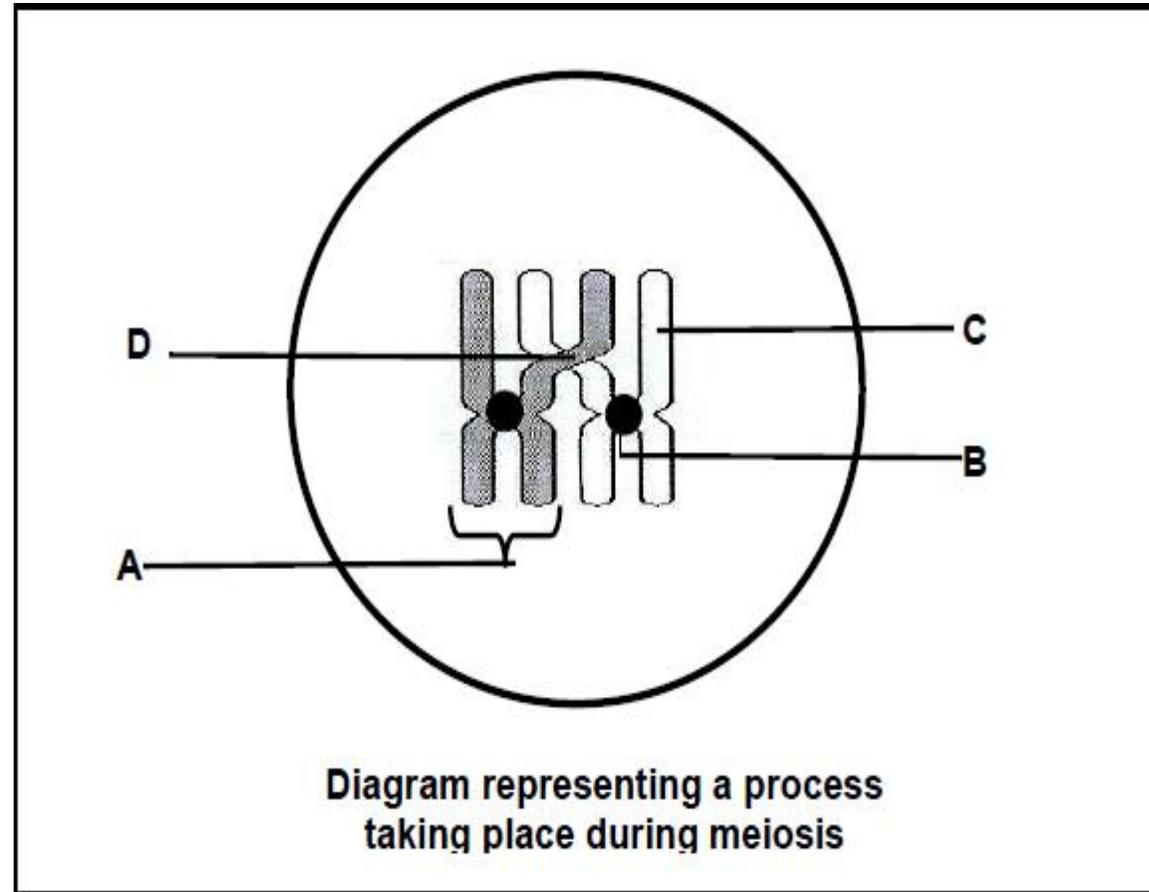
## Past Paper Questions NSC P2 2018

2.1.3 Due to the process of crossing over, the chromosomes in diagrams **A** and **B** appear different to each other.

- (a) Identify the phase of meiosis during which crossing over occurs. (1)
  - (b) Describe the events during crossing over. (3)
  - (c) Explain the significance of crossing over in natural selection. (3)
- (13)

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## Prophase I: Crossing Over



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## Past Paper Questions NSC P2 2018 – ANSWERS

2.1.3 (a) Prophase I ✓ (1)

- (b) – Adjacent chromatids of homologous chromosomes cross ✓  
– at a point called the chiasma ✓  
– There is an exchange of DNA segments ✓ / genetic material (3)

- (c) – Crossing over introduces genetic variation ✓ in gametes  
– Genetic variation may result in favourable characteristics ✓  
– that ensure a better chance of survival ✓  
– when environmental conditions change ✓

OR

- Crossing over introduces genetic variation ✓ in gametes  
– Genetic variation may result in unfavourable  
– characteristics ✓  
– that reduce the chance of survival ✓  
– when environmental conditions change ✓ Any (3)  
(13)

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