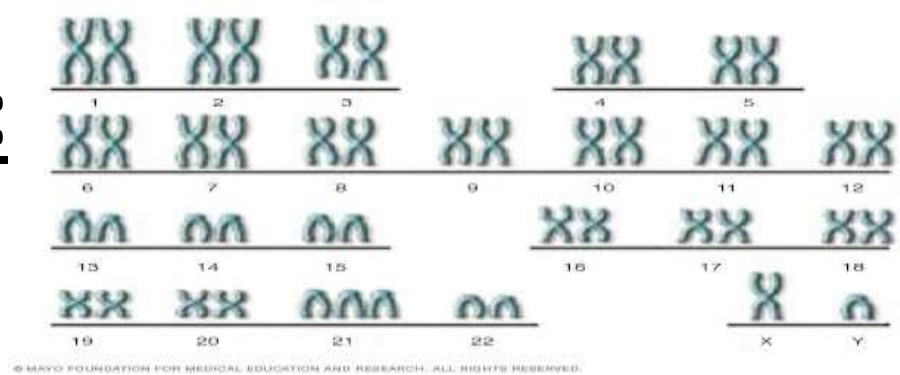
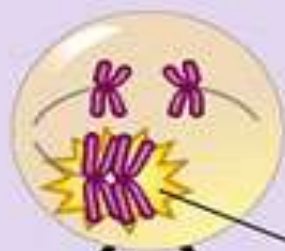


# ABNORMAL MEIOSIS: DOWN'S SYNDROME

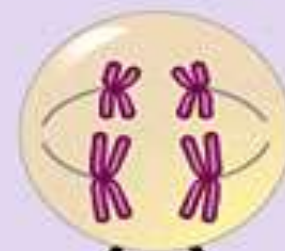


- Down's Syndrome is usually when the Mom's egg has an extra plan of **Chromosome 21**.
- Fertilisation occurs, the baby is formed and born.
- **Symptoms**: Mental retardation. Big thyroid glands. Problems in sight, hearing, heart, lungs. Leukaemia. Blocked intestines. Abnormalities in face – see ***these details in your book***.
- Babies **can** be born with extra Chromosomes for numbers 13 and 18, but will die within one year.

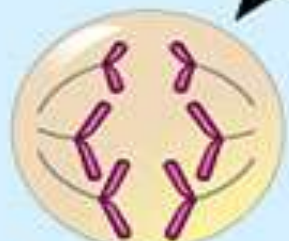
## Meiosis I



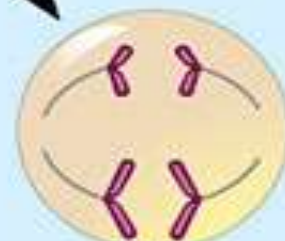
Nondisjunction



## Meiosis II



Nondisjunction



## Gametes



$n + 1$



$n + 1$



$n - 1$



$n - 1$



$n + 1$



$n - 1$



$n$



$n$

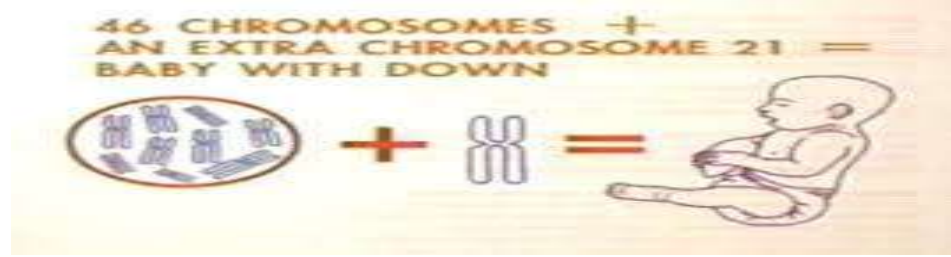
Number of chromosomes

(a) Nondisjunction of homologous chromosomes in meiosis I

(b) Nondisjunction of sister chromatids in meiosis II

# CAUSES OF

# DOWN'S SYNDROME



- NonDisJunction can happen in AnaPhase 1 or in AnaPhase 2. The chromosomes have met at the equator in the MetaPhase. They should then be pulled to opposite poles. But both Chromosomes 21 go to the same pole. One resulting cell has zero plans for chromosome 21, the other has two plans. When it is fertilised, there are **three** of these plans in the child.
- TransLocation in an egg (or sperm) is when a piece of Chromosome 21 breaks off and attaches to another chromosome. It grows there. The mother does **not** suffer from Down's, but is carrying it in that egg. If it is fertilised, the child will have that extra Chromosome 21 and will be born with Down's Syndrome.



## **A CHILD SUFFERING FROM DOWN'S SYNDROME**

**VISIBLE SYMPTOMS:** Flat Face. Upwardly slanting eyes. Weak eyesight. Large tongue. Small broad nose. Low ears with abnormal shape, and deaf.

**ALSO:** Mental retardation. Poor immunity. Heart and Lung problems. Etc.

# QUESTIONS Page 10

## Question 1

10 X [2] = [20]

1. B   2. C   3. A   4. B   5. D   6. C   7. D   8. C   9. D   10. C

## Question 2

10 X [1] = 10

1. Chiasma      2. AutoSomes      3. CytoKinesis      4. Prophase 1  
5. Non-disjunction      6. AnaPhase      7. Down's Syndrome  
8. MetaPhase      9. GonoSomes      10. Centriole

## Question 3

1. ProPhase 1      [1]


2. Genetic material is exchanged between chromatids of an homologous pair. Where they cross, they each take over the characteristics from each other.      [3]

3. Produces variety in the plans so that no two gametes will ever have the same identical plan.      [2]

4. Chromatid Y:      \_\_\_\_\_D\_\_r\_\_\_\_\_b      [2]



### Question 4

1. X=Chiasma                      Y=Centromere                      [2]
2. Each homologue is held together by a centromere.                      [1]
3. Random arrangement of chromosomes at the equator in the MetaPhases.                      [1]
4. 20 pairs (= 40)                                            [1]

### Question 5

1. SpermatoGenesis                      [1]
2. Testis                      [1]
3. (a) 23 pairs = 46                      (b) 23                      [2]
4. Crossing over. Random arrangements of chromosomes.                      [2]
5. Two                      [1]
6. Spermatozoa [1]

### Question 6

1. W=Homologous pair                      X=Cell membrane                      [2]
2. (a) Four                      (b) Two                      [2]
3. D                      [1]
4. Y=Centromere – spindle fibres attach to them.  
Z=Spindle fibres – shorten to pull chromatids to poles.                      [2]
5. TeloPhase 2                      [1]

## Question 7

Drawing will have two pairs lined up at equator, with spindle fibres attached [2]. Heading [1]. Labels [4].



## Question 8

1. TeloPhase 1

[1]

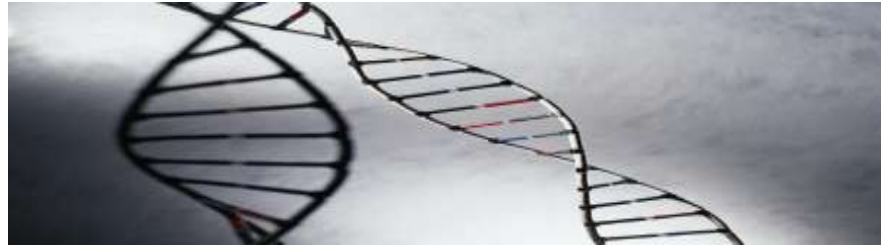
2. (a) D=Centriole (b) B=ChromoSomes (c) E=Centromere

[3]

3. (a) 4

(b) 2

[2]



## Question 9

1. A=Homologous pair of chromosomes B=Spindle fibres  
C=Centromere

[3]

2. MetaPhase 2

[1]

3. Chromosomes are meeting at equator Spindle fibres become attached to their centromeres.

[2]

4. *Diagram of next phase.*

[4]

## Question 10

1. Heading [1]. Histogram [1]. Age on X [1]. Number on Y [1]. Ages grouped on X [1]. Even spacing on Y [1]. Shape of graph [1]. [6]
2. Non-disjunction [1]
3. Meiosis 1 [1]
4.  $1,9 \div (1,9 + 5,9) \times 44 = \underline{10,72}$  [3]



## Question 11

1. MetaPhase 1 [1]
2. Crossing-Over occurred in ProPhase 1. Each strand swapped details with its compatible partner. [2]
3. AnaPhase 2 [1]
4. Spindle fibres shorten. This pulls each chromatid in the opposite direction, to opposite poles. [3]
5. Testis [1]



## Question 12

1. Meiosis [1]
2. ***Its heading!*** Crossing-over has happened. All cells will be genetically different. [2]
3. They cross-over in ProPhase 1, and swap genetic details. The bivalents arrange themselves randomly at the equator in MetaPhase 1 – there is no set order to result in predictable structures. [4]
4. 2=MetaPhase 1. 1=AnaPhase 1. 3=AnaPhase 2. [6]
5. Chromosome number is halved, so these sex cells can join to form one full cell in reproduction. No two sperms (or eggs) can be exactly the same. Simple plants need meiosis **after** sex to regain their simple form – called alternating generations. [3]
6. Ovary [1]

