**Topic 3.3: Meiosis**

**Essential Idea: Alleles segregate during meiosis allowing new combinations to be formed by the fusion of gametes.**

**Statements & Objectives:**

**3.3.U1 One of diploid nucleus divides by meiosis to produce four haploid nuclei.**

Compare divisions of meiosis I and meiosis II.​

(**Compare** Give an account of the similarities and differences between two (or more) items or situations, referring to both (all) of them throughout.)

**3.3.U2 The halving of the chromosomes number allows a sexual life cycle with fusion of gametes.**

Compare sexual and asexual life cycles.

(**Compare** Give an account of the similarities and differences between two (or more) items or situations, referring to both (all) of them throughout.)

Explain why meiosis must occur as part of a sexual life cycle.​

(**Explain**: Give a detailed account including reasons or causes)

**3.3.U3 DNA is replicated before meiosis so that all chromosomes consist of two sister chromatids.**

State that DNA is replicated in interphase before meiosis.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Given a diploid number (for example 2n=4), outline the movement and structure of DNA through the stages of meiosis.​

(**Outline** Give a brief account or summary.)

**3.3.U4 The early stages of meiosis involves pairing of homologous chromosomes and crossing over followed by condensation.**

​List three events that occur in prophase 1 of meiosis.

**(List**: Give a sequence of brief answers with no explanation.)

Define bivalent and synapsis.

**(Define**: Give the precise meaning of a word, phrase, or physical quantity.)

Outline the process and result of crossing over.​

(**Outline** Give a brief account or summary.)

**3.3.U5 Orientation of pairs of** synapsis

**prior to separation is random.**

Describe the attachment of spindle microtubules to chromosomes during meiosis I.

**Describe**: Give a detailed account)

Describe random orientation of chromosomes during meiosis I.

**Describe**: Give a detailed account)

**3.3.U6 Separation of pairs of homologous chromosomes in the first division** spindle microtubules **of meiosis halves the chromosome number.**

Explain why meiosis I is a reductive division.

(**Explain**: Give a detailed account including reasons or causes)

State that cells are haploid at the end of meiosis I.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

**3.3.U7 Crossing over and random orientation promotes genetic variation.**

​Explain how meiosis leads to genetic variation in gametes.

(**Explain**: Give a detailed account including reasons or causes)

State the number of chromosome combinations possible due to random orientation is 2^n.​

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

**3.3.U8 Fusion of gametes from different parents promotes genetic variation.**

Outline the role of fertilization as a source of genetic variation.​

(**Outline** Give a brief account or summary.)

**3.3.A1 Non-disjunction can cause Down syndrome and other chromosome abnormalities. Studies showing age of parents influences chances of non-disjunction.**

Define non-disjunction.

**(Define**: Give the precise meaning of a word, phrase, or physical quantity.)

State the result of nondisjunction.

**(State**: Give a specific name, value or other brief answer without explanation or calculation)

Describe the cause and symptoms of Down syndrome.

**Describe**: Give a detailed account)

Explain the relationship between parental age and chances of non-disjunction.​​

(**Explain**: Give a detailed account including reasons or causes)

**3.3.A2 Description of methods used to obtain cells for karyotype analysis e.g. chorionic villus sampling and amniocentesis and the associated risks.**

Describe the two procedures for obtaining fetal cells for production of a karyotype.

**Describe**: Give a detailed account)

**3.3.S1 Drawing diagrams to show the stages of meiosis resulting in the formation of four haploid cells.**

Outline the events of prophase, metaphase, anaphase and telophase in meiosis I and meiosis II.

(**Outline** Give a brief account or summary.)

Draw diagrams of cells in prophase, metaphase, anaphase and telophase in meiosis I and meiosis II.​

(**Draw**: Represent by means of pencil lines)

**3.3.NOS Making careful observations- meiosis was discovered by microscope examination of dividing germ-line cells.**

Discuss difficulties in microscopic examination of dividing cells.

(**Discuss** Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.)

Describe the discovery of meiosis.

**Describe**: Give a detailed account)

**Key Terms**

Meiosis

Chromosome

Karyotype

somatic cell

non-sister chromatids

bivalents

reduction division

​gametes

random orientation

homologous chromosomes

​spindle microtubules

reductive division

diploid

crossing over

chorionic villus

gamete

recombinant chromatid

disintegrates

amniocentesis

chorionic villus sampling

​variation

haploid

non-disjunction

amniocentesis

gene

spindle fibers

​crossing over

​germ-line cell

sister chromatid

Meiosis I

​Interphase

fertilization

​

nuclei

Down's Syndrome

pre-natal

n

prophase

telophase

haploid

non-disjunction

Meiosis II

​Bivalent

​random orientation

homologous

trisomy

abnormalities

2n

metaphase

chromatid

allele

sexual

asexual

synapsis

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