**Topic 3.2: Chromosomes**

**Essential Idea: Chromosomes carry genes in a linear sequence that is shared by members of a species.**

**Statements & Objectives:**

**3.2.U1 Prokaryotes have one chromosome consisting of a circular DNA molecule.**

Describe the arrangement of prokaryotic DNA (nucleoid and plasmid).

**Describe**: Give a detailed account)

Define the term “naked” in relation to prokaryotic DNA.​

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

**3.2.U2 Some prokaryotes also have plasmids but eukaryotes do not.**

Describe the structure and function of plasmid DNA.​

**Describe**: Give a detailed account)

**3.2.U3 Eukaryote chromosomes are linear DNA molecules associated with histone proteins.**

Describe the structure of eukaryotic DNA and associated histone proteins during interphase (chromatin).

**Describe**: Give a detailed account)

Explain why chromatin DNA in interphase is said to look like “beads on a string.”

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

**3.2.U4 In a eukaryote species there are different chromosomes that carry different genes.**

List three ways in which the types of chromosomes within a single cell are different.

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

State the number of nuclear chromosome types in a human cell.​

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

**3.2.U5 Homologous chromosomes carry the same sequence of genes but not necessarily the same alleles of those genes.**

Define homologous chromosome.

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

State a similarity and a difference found between pairs of homologous chromosomes.

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

**3.2.U6 Diploid nuclei have pairs of homologous chromosomes.**

Define diploid.

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

State the human cell diploid number.

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

Outline the formation of a diploid cell from two haploid gametes.

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

State an advantage of being diploid.​

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

**3.2.U7 Haploid nuclei have one chromosomes of each pair.**

Define haploid.

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

State the human cell haploid number.

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

List example haploid cells.​

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

**3.2.U8 The number of chromosomes is a characteristic feature of member of a species.**

State that chromosome number and type is a distinguishing characteristic of a species.

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

List mechanisms by which a species chromosome number can change.​

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

**3.2.U9 A karyogram shows the chromosomes of an organism in homologous**

**pairs of decreasing length.**

Describe the process of creating a karyogram.

**Describe**: Give a detailed account)

List the characteristics by which chromosomes are arranged on the karyogram.​

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

**3.2.U10 Sex is determined by sex chromosomes and autosomes are chromosomes that do not determine sex.**

Outline the structure and function of the two human sex chromosomes.

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

Outline gender determination by sex chromosomes.

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

**3.2.A1 Cairns’ technique for measuring the length of DNA by autoradiography.**

Describe Cairn’s technique for producing images of DNA molecules from E. coli.

**Describe**: Give a detailed account)

Outline conclusions drawn from the images produced using Cairn’s autoradiography technique.

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

**3.2.A2 Comparison of genome size in T2 phage, Escherichia coli, Drosophila melanogaster, Homo sapiens, Paris japonica.**

Describe the relationship between the genome size of a species and the species complexity in structure, physiology and behavior.​

**Describe**: Give a detailed account)

**3.2.A3 Comparison of diploid chromosome numbers of Homo sapiens, Pan troglodytes, Canis familiaris, Oryza sativa, Parascarsis equorum.**

State the minimum chromosome number in eukaryotes.

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

Explain why the typical number of chromosomes in a species is always an even number.

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

Explain why the chromosome number of a species does not indicate the number of genes in the species.

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

Explain the relationship between the number of human and chimpanzee chromosomes.​

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

**3.2.A4 Use karyograms to deduce sex and diagnose Down Syndrome in humans.**

Distinguish between a karyogram and a karyotype.

(**Distinguish** Make clear the differences between two or more concepts or items.)

Deduce the sex of an individual given a karyogram.

(**Deduce** Reach a conclusion from the information given)

Describe the use of a karyogram to diagnose Down syndrome.

**Describe**: Give a detailed account)

**3.2.S1 Use of databases to identify the focus of a human gene and its polypeptide product.**

Search NCBI or OMIM for a given gene.

Determine the gene locus, abbreviated gene name, and description of the gene.​

(**Determine** Obtain the only possible answer)

**3.2.NOS Developments in research follow improvements in techniques- autoradiography was used to establish the length of DNA molecules in chromosomes.**

Outline the advancement in knowledge gained from the development of autoradiography techniques.​

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

**Key Terms**

Chromosomes

Allele

Autosomes

Autoradiography

Chromatid

​Staining

​Cairn

​sex chromosomes

*Paris japonica*

gene

genome

mutation

base deletion

centromere

circular DNA

​prokaryotic

​autoradiography

*Canis* family

​hitsone

diploid cells

Down syndrome

Sequence

haploid cells

gene

​nuclei

​nucleoid

T2 phage

*Oryza sativa*

Y chromosome

Chistone

homologous chromosomes

karyogram

karyotype

​loci

​Non-sister chromatids

​chromatin

​*E. coli*

​*P. equorum*

sex determination​

naked DNA

plasmid

sex chromosomes

sister chromosome

autosome

​autoradiography

karyogram

​*Drosophila*

karyotype

​X chromosome