**Topic 1.6: Cell Division**

**Essential Idea: Cell division is essential but must be controlled.**

**Statements & Objectives:**

**1.6.U1 Mitosis is division of the nucleus into two genetically identical daughter nuclei.**

State the function of mitosis.

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

List four processes which involve mitosis.

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

State the names of the four phases of mitosis.

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

Draw typical eukaryotic cells as they would appear during the interphase and the four phases of mitosis.

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

Outline four events that occur during prophase.

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

Outline the process of metaphase, inclusive of the role of microtubules and the kinetochore.

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

Outline the process of anaphase.

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

Outline four events that occur during telophase.​

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

**1.6.U2 Chromosomes condense by supercoiling during mitosis.**

Describe the structure of a replicated chromosome, include the centromere and sister chromatids.

**(Describe**: Give a detailed account)

Explain why chromosomes must condense during mitosis.

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

**1.6.U3 Cytokinesis occurs after mitosis and is different in plants and animal cells.**

Define cytokinesis.

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

State the difference between mitosis and cytokinesis.

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

Contrast cytokinesis in plant and animal cells.

Describe the formation of the cleavage furrow in animal cell cytokinesis.

**(Describe**: Give a detailed account)

Describe the formation of the middle lamella and cell wall in plant cell cytokinesis.​

**(Describe**: Give a detailed account)

**1.6.U4 Interphase is a very active phase of the cell cycle with many processes occurring in the nucleus and cytoplasm.**

List example metabolic reactions occurring during cell interphase.

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

Outline events of G1, S, G2 and G0 phases of interphase.​

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

**1.6.U5 Cyclins are involved in the control of the cell cycle.**

Explain the role of cyclin and cyclin-CDK complexes in controlling the cell cycle.

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

State the role of cyclins D, B, A and E in the cell cycle.​

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

1.6.U6 Mutagens, oncogenes and metastasis are involved in the development of primary and secondary tumors.

Define tumor, benign, malignant, metastasis, cancer, mutagen and carcinogen.

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

Describe why mutagens are not necessarily carcinogens.

**(Describe**: Give a detailed account)

Describe how cancer arises, referring to accumulation of mutations over time.

**(Describe**: Give a detailed account)

Explain the relationship between oncogenes, tumor suppressor genes and cancer.​

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

**1.6.A1 The correlation between smoking and incidence of cancers.**

Explain the use of correlations to determine the relationship between two variables (inclusive of positive and negative correlations).

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

Explain why the existence of a correlation does not necessitate a causal relationship between two variables.

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

Calculate a correlation coefficient using Pearson's R.

(**Calculate:** Find a numerical answer showing the relevant stages in the working.)

Determine if a correlation coefficient value is significant.

(**Determine:** Find the only possible answer)

Define significant as related to the relationship between two variables.

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

Use epidemiological case study information to outline the relationships between smoking and cancer.​

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

**1.6.S1 Identification of phases of mitosis in cells viewed with a microscope or in a micrograph.**

Determine the phase of mitosis of a cell viewed in a micrograph or with a microscope.

(**Determine:** Find the only possible answer)

**1.6.S2 Determination of a mitotic index from a micrograph**

State the formula for calculation of a mitotic index.

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

Calculate the mitotic index of a tissue as seen in a micrograph.

(**Calculate:** Find a numerical answer showing the relevant stages in the working)

Outline the use of mitotic index calculations in diagnosis and treatment of cancer

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

**1.6.NOS Serendipity and scientific discoveries- the discoveries of cyclins was accidental.**

Outline the discovery of cyclins including the role of serendipity.

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

**Key Terms**

Anaphase

binary fission

cell plate

centromere

chromatid

daughter cell

solenoid

mutagens

Cyclins

CDK

Chromosome

cleavage furrow

cytokinesis

interphase

spindle

colchicine

​mitotic index

kinetochore

microtubule

metaphase

mitosis

G1 phase

G2 phase

Nucleosomes

​Metastasis

chromatin

S phase

Telophase

Tumor

Reproduction

Embryonic

Asexual

chromatin fiber

oncogenes

cell division

prophase

nuclei

homologous

histone

nucleosome