

Model Answers: Easy

1

The correct answer is **B**

- Root hair is a **diploid** cell (somatic cell) and therefore contains **2** sets of chromosomes (one from each parent)
- **Haploid** cells (gametes/sex cells) have only **1** set of chromosomes as when they join in fertilisation the result cell is diploid

A is incorrect as haploid cells only contain one set of chromosomes therefore should be half of the diploid number

C is incorrect as the haploid number is double the diploid number NOT half

D is incorrect as a root cell is not a gamete and therefore the haploid number is not 24

2

The correct answer is **C**

- Telomeres are short repeated sequences of DNA and proteins
- Telomeres are located at both ends of chromosomes and function to ensure all coding DNA is replicated as DNA polymerase cannot perform all the way to the end of a DNA molecule

Telomeres are short sections of repeating sequences that do not code for polypeptides. As a differentiated cell replicates the telomeres shorten and this is thought to contribute to aging (senescence).

3

The correct answer is **A** as **centrosomes** are formed from **2 centrioles** located near the nucleus (this organelle is absent from plant cells). Centrosomes are the base from which the mitotic spindle is formed.

B is incorrect as the function of the nucleolus is to produce ribosomes.

C is incorrect as centrioles are the generalised term for **any** microtubules that is part of the cytoskeleton.

D is incorrect as a **centromere** is the narrow region where two chromatids are held together

4

The correct answer is **B** as mitosis is the division of the nucleus from which two genetically identical daughter cells are produced. This occurs for growth of an organism (e.g. from a fertilised egg to form an embryo, to repair cells that are damaged or lost as in the skin or as a form of asexual reproduction).

A is incorrect as semi-conservative replication is associated with the replication of DNA not the division of the nucleus

C & D are incorrect as they include **reduction division** which occurs in **meiosis I** to halve the number of chromosomes to create haploid nuclei

5

The correct answer is **C** because:

- The **centromere** is the narrow region where two **chromatids** are held together
- The chromatid forms when a chromosome replicates in the S phase (interphase)
 - At the beginning of cell division there are 2 identical sister chromatids attached by a centromere within each chromosome molecule
 - Each chromatid is **one** DNA molecule

A is incorrect as the **centromere** is the location that joins the two chromatids.

B & D are incorrect as **centrioles** are microtubules that are part of the cytoskeleton.

6

The correct answer is **A** as **semi-conservative** DNA replication (one strand is used as a template along which new bases pair to form two molecules of DNA), occurs during **interphase** of the cell cycle (before mitosis). – DNA is replicated before mitosis which is the process of nuclear division where replicated chromosomes are separated into what will form two nuclei and eventually two new daughter cells.

B is incorrect as mitosis results in two genetically identical daughter cells; thus, the DNA **will** normally be unchanged (apart from the rare mutation)

C is incorrect as mitosis **does** produce genetically identical daughter cells

D is incorrect as the nucleus divides during mitosis by replication division, the chromosomes lined up at the equator during metaphase

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The correct answer is **A** as mitosis is required for growth, tissue repair, asexual reproduction and cloning of immune cells.

B & C are incorrect as genetic variation is a result of meiosis.

D is incorrect as mitosis **is** required for growth (increase in cell number).

8

The correct answer is **B** because:

- During mitosis chromosomes (each containing sister chromatids) line up at the equator and are then separated to form the two genetically identical daughter cells.
- Mitosis is required for the growth of new cells, asexual reproduction, tissue repair and cloned immune cells.

A is incorrect as mitosis is used to increase the number of cells, one parent cell splits to form a total of 2 daughter cells.

C is incorrect as cells with half the amount of DNA are a result of meiosis and occurs during the formation of gametes (egg and sperm cells).

D is incorrect as the parent cell nucleus divides into two resulting in the 2 daughter cells.

9

The correct answer is **B** because the **G₁ phase** is when protein synthesis is occurring and the production of mRNA occurs during **transcription** (the first part of protein synthesis).

A is incorrect as mitosis is the stage where the nucleus **divides** into two

C is incorrect as S (synthesis) phase this is the stage where DNA is **replicated**

D is incorrect as during G₂ phase the replicated **DNA is checked** and errors repaired and the cell is prepared for nuclear division

10

The correct answer is **B** because there are different types of stem cells: embryonic stem cells and adult stem cells in animals, and cells of the meristems in plants.

A is incorrect as white blood cells (cells required in the immune system) **are** produced by stem cells in the **bone marrow**

C is incorrect as stem cells produce cells that are capable of **differentiating** (they can turn into different cell types). Embryonic stem cells can differentiate into any type of cell whereas adult stem cells only produce a cell of a certain lineage, for example, blood cells.

D is incorrect as stem cells are capable of dividing continually.