

Solutions

2.1 In the nucleus; genes are sections of DNA that code for a protein / a characteristic.

2.2 Growth and DNA replication stage: the cell grows and replicates its DNA / increases sub-cellular structures such as ribosomes and mitochondria.

2.3 Benefit: stem cells with the patient's own genes are not rejected / can replace damaged tissue; risk: transfer of viral infection.

3.1 The chromosomes are copied before mitosis; one set of chromosomes is pulled to each end of the cell and the nucleus divides; the cytoplasm and cell membrane divide to form two identical cells.

3.2 (a) Tumour growth depends on cells dividing by mitosis; the drug stops mitosis so no new tumour cells form. (b) Cells that normally divide rapidly are also stopped – e.g. hair cells, skin cells, blood-producing marrow; so hair falls out / wounds heal slowly / fewer blood cells.

3.3 (a) Meristem cells are undifferentiated stem cells; they retain the ability to differentiate into any plant cell throughout the plant's life. (b) Rare species cloned quickly and economically, protecting them from extinction; large numbers of identical plants with special features such as disease resistance can be produced for farmers.