

Quality of written communication is awarded a maximum of 2 marks in this section. [2]

8 (a) Describe the behaviour of the chromosomal material during a cell cycle involving mitosis. [8]

(b) Describe how the behaviour of chromosomes differs during the processes of mitosis and meiosis. Explain the consequences of these differences. [5]

8 (a) Behaviour of chromosomes during a cell cycle with mitosis:

Any eight points

- during G1/and G2 of interphase the chromosomal material is unwound/ appears as chromatin
- some of this is inactive, heterochromatin
- while some is active, euchromatin
- during the S phase of interphase DNA is replicated
- chromosomes are replicated as new histones bind to the DNA/DNA replication is semi-conservative
- during prophase chromosomes condense (coil and fold up) and become apparent
- each chromosome appears as a pair of chromatids
- during metaphase chromosomes attach to the spindle fibres at the cell equator
- attachment occurs via their centromeres
- during anaphase chromatids are pulled apart/separate
- and move to opposite poles
- during telophase chromosomes begin to unwind again/change to diffuse active form/chromatin
- cells divide into two during cytokinesis halving the amount of chromosomal material
- daughter cells contain the same chromosome number as the parent cell

[8]

(b) Different behaviour of chromosomes during mitosis and meiosis:

Any five points

- mitosis involves the separation of the chromatids into new daughter cells
- thus maintaining the same chromosome number as the parent cell (allow if not awarded in part (a))
- the daughter cells are genetically identical to the parent cell
- during prophase I of meiosis the homologous chromosomes pair to form bivalents
- while chiasmata (points of fusion) occur between chromatids of the homologous pair
- the consequence of this is the recombination/crossing-over of alleles on different chromosomes
- during the first division of meiosis the homologous chromosomes are separated into two intermediary daughter cells
- since the homologous pairs arrive randomly on the spindle/the chromosomes are independently assorted when subsequently separated
- in the second division of meiosis the chromatids are separated
- meiosis results in the production of haploid cells
- which are genetically variable

[5]