Solutions

Each answer shows the steps, then the **result**.

2.1

- Four cells; haploid

2.2

- Homologous pairs of chromosomes

2.3

- Any one: meiosis has two divisions / makes four haploid varied cells vs mitosis' one division making two identical diploid cells

2.4

- homologous chromosomes pair up (synapsis)
- crossing over between homologues at chiasmata

2.5

- any one: both use a spindle to move chromosomes; both follow DNA replication; both have prophase, metaphase, anaphase and telophase stages

3.1 B

- haploid and varied

3.2

(a)

- 4 chromosomes

(b)

- At fertilization two gametes fuse; if they were diploid the chromosome number would double each generation, so they must be haploid to keep it constant

3.3

- Mitosis: 2 cells, diploid, genetically identical; meiosis: 4 cells, haploid, genetically varied

3.4

After replication: 8 chromosomes and 16 chromatids; each final product: 4 chromosomes and 4 chromatids; replicated sister chromatids share a centromere and are counted as one chromosome before separation; meiosis I separates homologues and meiosis II separates sister chromatids.

3.5

(a)

- P metaphase I, Q anaphase II, R anaphase I, S metaphase II (all four B2; two or three B1)

(b)

- **P → R → S → Q**

(c)

- in R homologous chromosomes separate, each still made of two sister chromatids joined at the centromere
- in Q the centromeres have divided and single sister chromatids separate

3.6 B

- meiosis I separates homologues, halving the number, but sister chromatids stay joined until anaphase II