

21 Cell division and chromosomes - answers

- 1 After ten successive mitotic divisions, a basal cell will still have 46 chromosomes.
- 2 (a) The correct sequence is B, D, A, C, E.
(b) There are two pairs of chromosomes in the cell.
(c) The diploid number of chromosomes is four.
- 3 When chromosomes replicate, they produce *chromatids*.
- 4 Mitosis is unlikely to occur in a sperm cell (once sperm cells are formed they do not divide again), a hair cell (they are dead) and a red blood cell (they have no nuclei).
- 5 If an animal species has 36 chromosomes in its cells, 18 of these came from each parent.
- 6 The homologous chromosomes are A and D, B and E, C and F.
- 7 The *nucleus* (A) of a cell contains a fixed number of chromosomes. Before mitosis, each chromosome *replicates* (B) to produce two *chromatids* (C).
- 8 (a) The cell division is meiotic.
(b) In (ii) the homologous chromosomes have paired up and in (iii) they are separating to form daughter cells with half the diploid number of chromosomes.
- 9 (a) Meiosis is likely to be taking place in testes and ovaries.
(b) Mitosis may be occurring in the red bone marrow of the skeleton (to produce blood cells), in the basal layer of the skin including hair follicles, in tissue where growth is occurring, e.g. ends of bone shafts, in the lining epithelium of the gut.
- 10 In gametes derived from a cell with four pairs of chromosomes there are $2^4 = 16$ possible combinations of maternal and paternal chromosomes.
- 11 Mutations are changes which occur in a *chromosome* (A) or a *gene* (B). If a mutation occurs in a cell which is going to form a *gamete* (C), the mutation may affect the whole *organism* (D) which develops.
Down's syndrome results from a *chromosome* (E) mutation in the *ovum* (F).
Sickle cell anaemia results from a *gene* (G) mutation which affects *cells* (H) of the blood system.
- 12 Exposure to ultraviolet light, X-rays, radioactive emissions, mutagenic chemicals may increase the rate of mutation.
- 13 Pathogenic bacteria will become more dangerous to us if mutations make them more virulent or resistant to drugs (antibiotics).

