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.

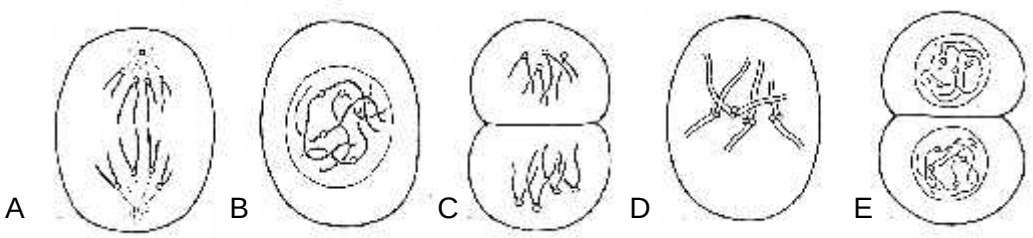
12 Exposure to ultraviolet light, X-rays, radioactive emissions, mutagenic chemicals may increase the rate of mutation.

13 Pathogenic bacteria will become more dangerous to us if mutations make them more virulent or resistant to drugs (antibiotics).

21 Cell division and chromosomes

1 A cell in the basal layer of the skin contains 46 chromosomes and divides by mitosis to produce new skin cells. After ten successive divisions, how many chromosomes will the basal cell have?

2 The drawings below depict stages in the mitotic division of a cell



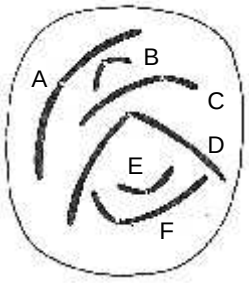
(a) Write the letters in the order in which these stages occur.
(b) How many pairs of chromosomes are there in the cell?
(c) What is the diploid number of chromosomes in these cells?

3 Choose the most appropriate word to complete the sentence.
When chromosomes replicate, they produce ……...
tissues, nuclei, chromatids, somatic cells

4 In which three of the following cells is mitosis unlikely to occur?
a sperm cell, an epithelial cell of a villus, a hair cell, a cell in the red bone marrow, a red blood cell, a lymphocyte, a cell in the basal layer of the skin

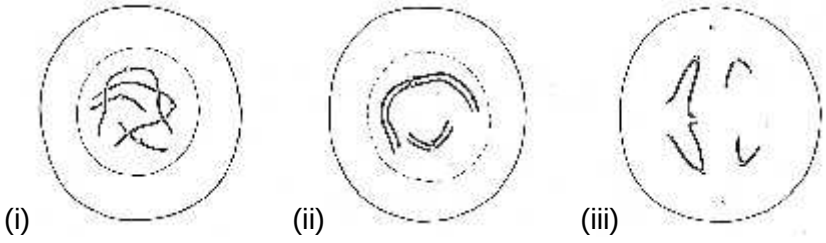
5 An animal has 36 chromosomes in each of its body cells. How many of these chromosomes came from its male parent?

6 Which pairs of chromosomes in the cell shown here are homologous?



7 Fill in the missing words.
The ….. A ….. of a cell contains a fixed number of chromosomes. Before mitosis, each chromosome ….. B ….. to produce two ….. C …...

8 The following drawings-show the sequence of events early in cell division.
(a) Is the division meiotic or mitotic?
(b) How do you know?



9 Give two examples in each case of organs or tissues in which you would expect
(a) meiosis, (b) mitosis to be taking place.

Cell division and chromosomes (continued)

10 A fruit fly has four pairs of chromosomes in its cells. At meiosis, how many different combinations of maternal and paternal chromosomes are possible in the gametes?

11 From the list below, choose the most suitable words to complete the sentence.
Mutations are changes which occur in a ….. A …..or a ….. B ….. If a mutation occurs in a cell which is going to form a ….. C ….., the mutation may affect the whole ….. D ….. which develops.

Down's syndrome results from a ….. E ….. mutation In the ….. F…..

Sickle cell anaemia results from a ….. G ….. mutation which affects ….. H ….. of the blood system.

cells, gene, gamete, chromosome, nucleus, ovum, organism

12 Exposure to ….. A ….., ….. B ….. or ….. C ….. may increase the rate of mutation
Suggest words or phrases for A - C

13 What kinds of mutation in disease-causing bacteria might make them more dangerous?