1 **(a)** Table 2.1 compares some features of animal cells, plant cells, yeast cells and bacterial cells.

Complete the table.

Feature	Animal	Plant	Yeast	Bacterium
Means of cell division	cytokinesis	cytokinesis		binary fission
Presence of nucleus				
Material in cell wall	none		chitin	
Presence of ribosomes				

[4]

Table 2.1

(b) Fig. 2.1 shows some undifferentiated plant cells, such as those found at the tips of roots and shoots.

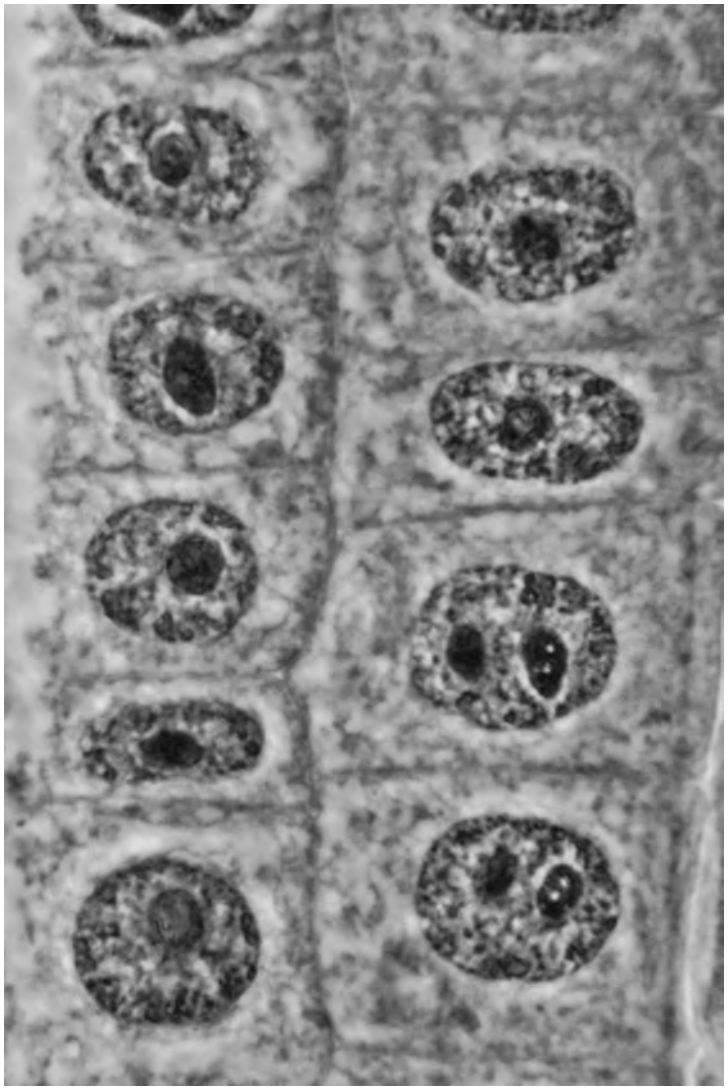

Fig. 2.1

(i) Name the type of tissue that undergoes cell division to form these undifferentiated plant cells.

..... **[1]**

(ii) State the features shown in Fig. 2.1 that would **not** be found in mature xylem vessels.

.....

.....

..... **[2]**

(iii) Describe how the structure of the cell walls in xylem vessels would differ from the cell walls shown in Fig. 2.1.

.....

.....

.....

..... **[2]**

(c) Name **two** types of cell that can be found in **phloem** tissue.

.....

..... **[2]**

[Total: 11]

2 **(a)** Fig. 1.1 shows changes over time in the mass of nuclear DNA in some of the cells of the testes of a diploid organism.

During this time period, two different types of nuclear division occurred.

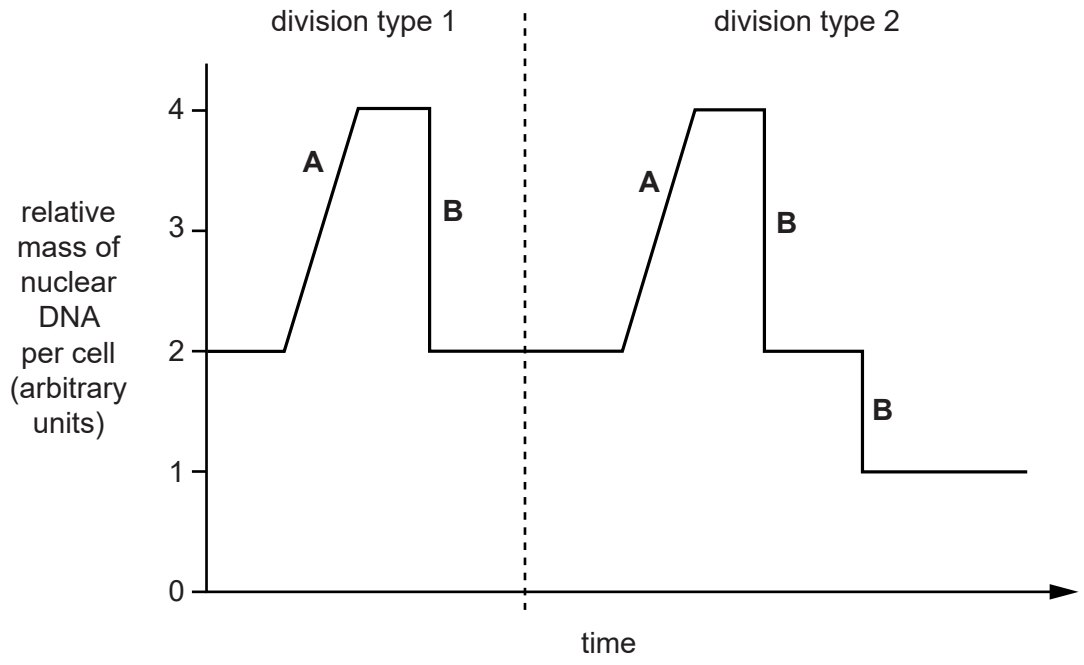

Fig. 1.1

(i) Identify the two types of division represented in Fig. 1.1.

division type 1 .....

division type 2 .....

[1]

(ii) Name the processes that are occurring at the points labelled **A** and **B**, which cause the change in the mass of DNA per cell.

A .....

B .....

[2]

(b) Discuss the ways in which genetic variation is produced, including the role of nuclear division.

In your answer you should link the processes to the ways in which the genetic variation is produced.

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.... **[9]**

[Total: 12]

3 A group of microorganisms called slime moulds includes the species *Dictyostelium discoideum*.

The life cycle of *D. discoideum* is shown in Fig. 5.1.

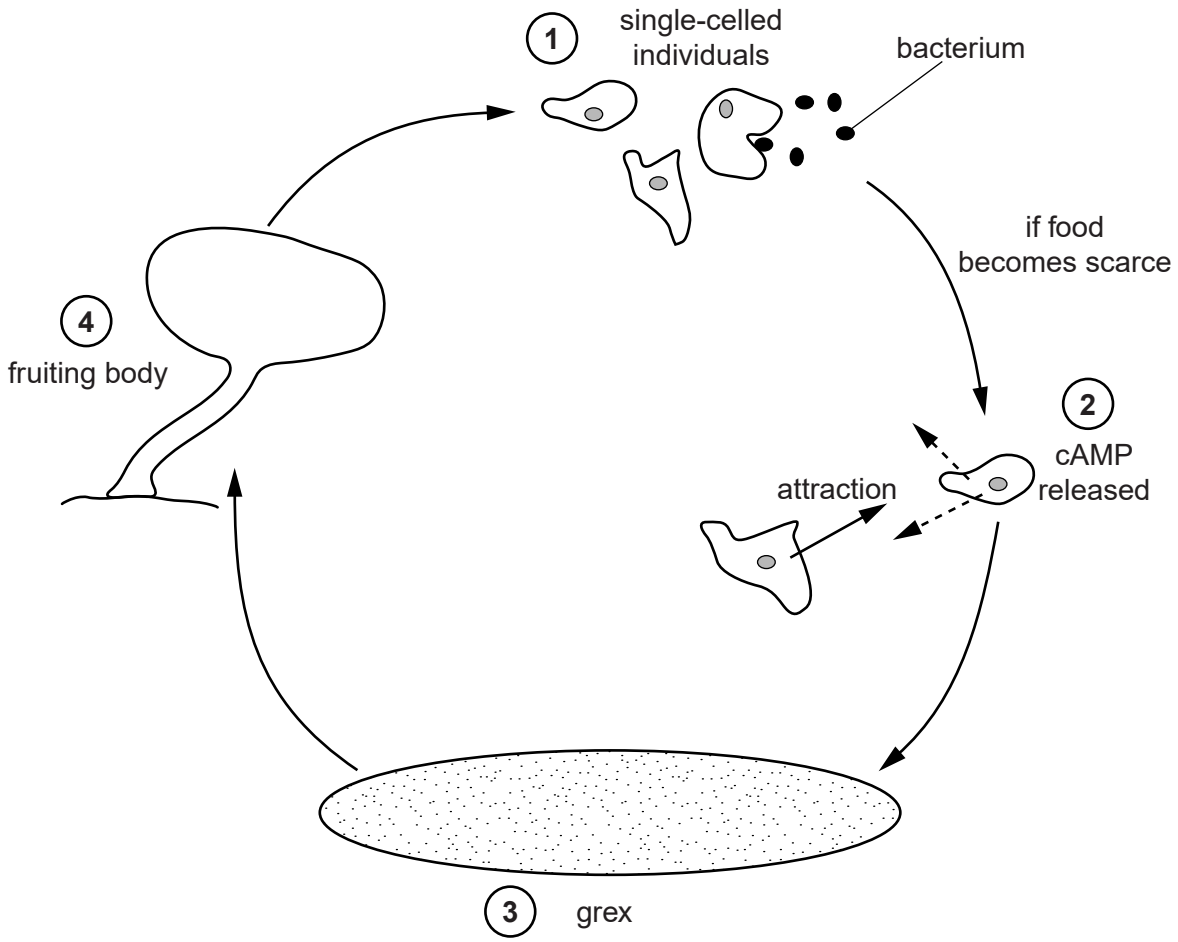


Fig. 5.1

(1) When plenty of food is available this slime mould exists as single-celled individuals which feed and reproduce asexually.
The slime mould cells feed on bacteria.
The slime mould cells are attracted to folic acid which has been released by the bacteria.

(2) When food becomes scarce the slime mould cells release a chemical (cAMP) which attracts other slime mould cells.

(3) The slime mould cells then group and stick together to form a multicellular mass called a grex.
The grex moves in a coordinated way in search of a more suitable environment.
As the grex moves, the cells release the chemical DIF. DIF causes some cells to become stalk cells and others to become spore cells.

(4) When the grex reaches suitable conditions, it forms a fruiting body consisting of a stalk and spores.
These spores are released and develop into new, individual, slime mould cells.

(a) **(i)** Suggest the type of cell division used by *D. discoideum* for reproduction during stage (1) of its life cycle.

..... **[1]**

(ii) At what stage of the life cycle does differentiation begin?

..... **[1]**

(b) Communication and cooperation between cells is essential for the survival of *D. discoideum*.

(i) State the correct term for communication between cells.

..... **[1]**

(ii) Describe **two** examples of communication between cells that occur during the life cycle of *D. discoideum*.

.....

.....

.....

.....

..... **[2]**

(iii) The plasma membranes of the slime mould cells are specially adapted for communication.

Using the information on page 12, and your biological knowledge, suggest how the plasma membrane of *D. discoideum* is adapted for cell communication.

.....

.....

.....

..... **[2]**

(c) Individual cells of *D. discoideum* can divide once every hour. A grex may consist of 100 000 individual cells.

Calculate how many hours it would take for one cell to produce enough cells to form a grex.

Answer = ... hours **[1]**

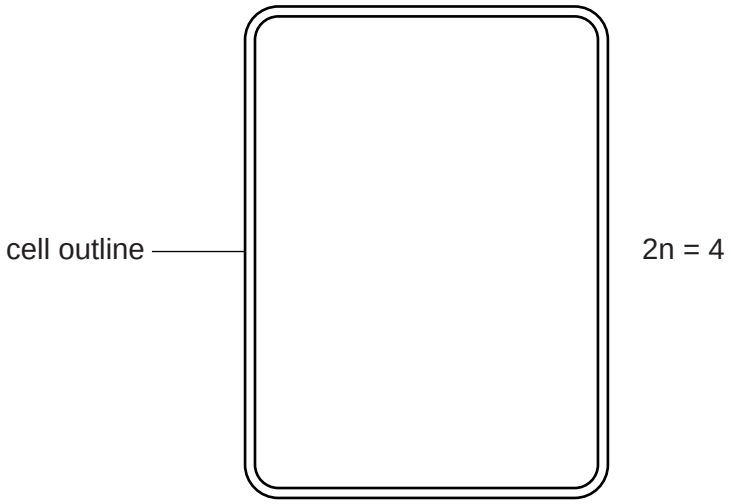
[Total: 8]

4 (a) (i) Name the type of nuclear division that occurs in plant growth.

..... **[1]**

(ii) Draw the **chromosomes** within the cell outline below as they would appear during **metaphase** of nuclear division.

Assume the diploid number of chromosomes is **four**.

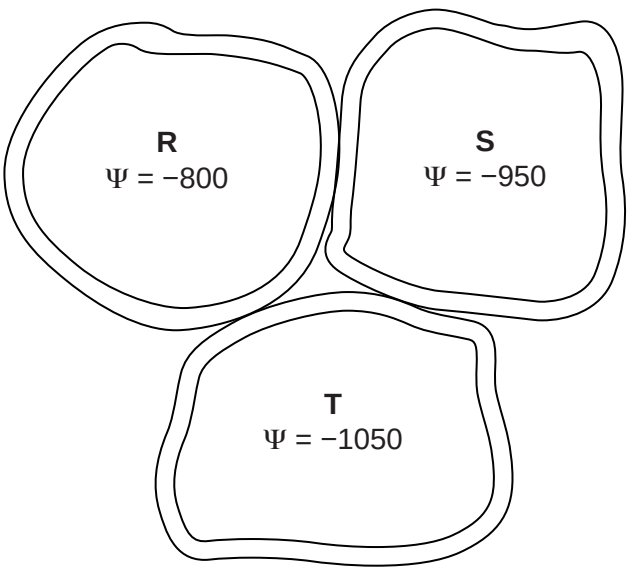


[2]

(iii) Cytokinesis follows nuclear division. After cytokinesis, the cells elongate due to water uptake by osmosis.

Fig. 3.1 shows three plant cells. The value shown in each cell refers to the water potential, Ψ, in kPa.

Draw arrows on Fig. 3.1 below to show the movement of water between cells **R**, **S** and **T**.



[2]

Fig. 3.1

(b) Fig. 3.2, **on the insert**, shows the stump of a tree with new branches growing from the stump.

New growth in a stem or trunk comes from the **cambium**, which is situated between the xylem and phloem tissues.

Explain why the new branches in Fig. 3.2 are seen growing from a position just under the bark of the cut surface.

.....

.....

.....

.....

..... **[2]**

(c) Name **one** other location where growth occurs in a plant.

..... **[1]**

(d) Look at the areas labelled **L** on Fig. 3.2. These are areas of loosely packed cells in the bark called lenticels. Lenticels allow gases to diffuse into the living tissues of the trunk.

Suggest why lenticels are essential to the survival of large multicellular plants **and** explain why similar structures are not found in large multicellular animals.

.....

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.....

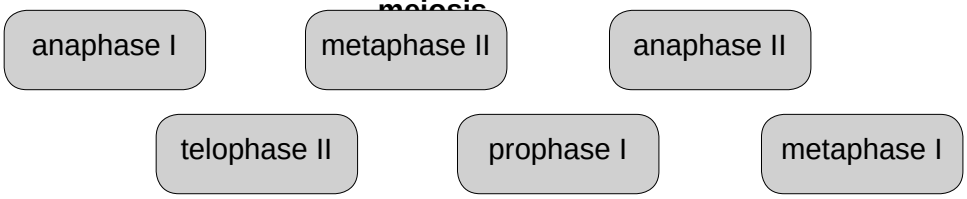
.....

.....

..... **[2]**

[Total: 10]

5 **(a)** The following boxes show the names of different stages that occur during meiosis.



State the stage(s) in which the following events occur:

independent assortment .....

formation of the spindle apparatus .....

separation of sister chromatids .....

formation of nuclear membranes .....

chromosomes pulled to opposite poles .....

[5]

(b) Meiosis is used in many organisms for the production of gametes.

Explain why meiosis needs to have twice as many stages as mitosis.

.....

.....

.....

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.....

.....

[2]

(c) Meiosis is a source of genetic variation. Mutation is another source of variation.

(i) What feature of the DNA molecule is changed as a result of mutation?

..... **[1]**

(ii) Discuss the possible effects that mutation can have on the structure and function of a protein.

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..... **[3]**

[Total: 11]