**1** **(a)** Fig. 1.1 is a diagram of a bacterium as seen under an electron microscope.

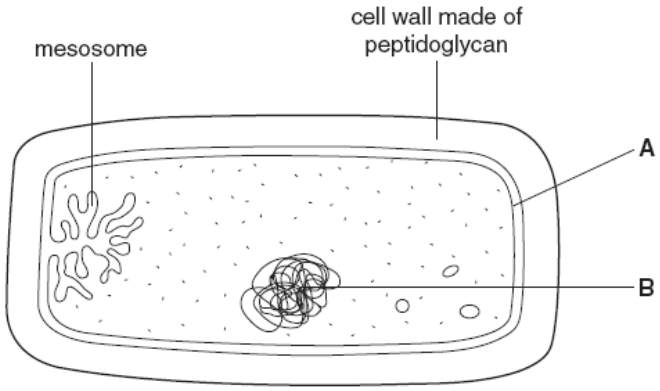



**Fig. 1.1**

**(i)** Name the structures labelled **A** and **B**.

**A** .....

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

**(ii)** It has been suggested that the mesosome has the same role as mitochondria in eukaryotic cells.

Suggest the role of the mesosome in prokaryotic cells, such as bacteria.

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

**(iii)** Eukaryotic cells, such as *Euglena*, contain membrane-bound organelles. Each organelle has a specific function in the cell.

State the **process** that is carried out in each of the organelles listed below.

ribosome .....

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

2)

A student carried out an investigation involving uptake of the stain methylene blue by yeast cells.

The investigation involved adding methylene blue to a suspension of yeast cells. Samples of the stained yeast cells were heated to different temperatures.

The student then observed the cells at high power under a light microscope.

The results are shown in Table 3.1.

**Table 3.1**

| temperature (°C) | cells observed stained blue (%) | colour of solution surrounding cells |
|---|---|---|
| 10 | 98 | colourless |
| 20 | 96 | colourless |
| 30 | 97 | colourless |
| 40 | 96 | colourless |
| 50 | 73 | colourless |
| 60 | 12 | light blue |
| 70 | 2 | blue |
| 80 | 0 | blue |

**(a) (i)** Yeast cells take up methylene blue by active transport.

Using **only** the information provided in Table 3.1, outline the evidence that supports this statement.

.....

.....

.....

.....

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

**(ii)** Suggest why some cells did **not** stain blue at 20 °C.

.....

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

**(b)** **(i)** Suggest **one** change that occurred to the plasma (cell surface) membranes of the yeast cells at temperatures above 60 °C.

.....

.....

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

**(ii)** Explain why the stained yeast cells lost their colour at higher temperatures.

.....

.....

.....

.....

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

**(c)** The student concluded that yeast cells are killed between 50 °C and 70 °C.

Suggest **one** way in which the student could have improved the **accuracy** of this experiment and **one** way in which he could have improved the **reliability**.

*accuracy* .....

.....

.....

*reliability* .....

.....

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

**(d)** The student placed a small sample of the yeast suspension on a microscope slide and observed it under high power.

Fig. 3.1 shows what the student observed.

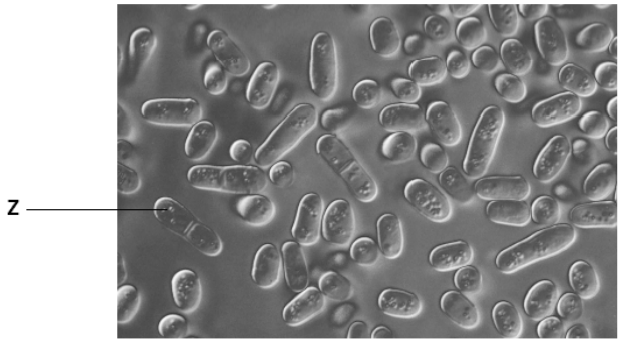



**Fig. 3.1**

Cell **Z** is undergoing a process called *budding*.

Outline the process of budding in yeast.

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

..... **[Total: 10]**

3)

Fig. 4.1 shows diagrams of two different types of cells, **X** and **Y**.

The cells are **not** drawn to scale.

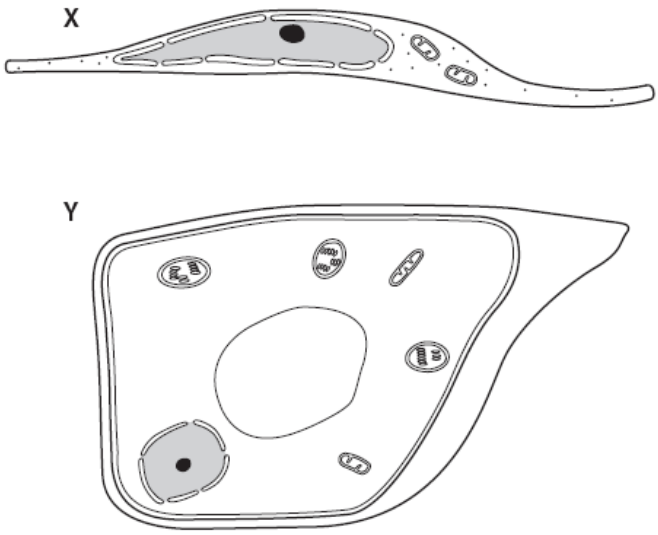



**Fig. 4.1**

**(a) (i)** State, using **only the information in Fig. 4.1**, two **differences** between plant cells and animal cells.

1 .....

.....

2 .....

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

**(ii)** Cell **Y** is a guard cell.

State, using **only the information in Fig. 4.1**, one adaptation of this cell and explain how the adaptation allows the cell to carry out its function.

adaptation .....

explanation .....

**(b)** Fig. 4.2 shows drawings of the six chromosomes inside an animal cell viewed during late prophase of mitosis.

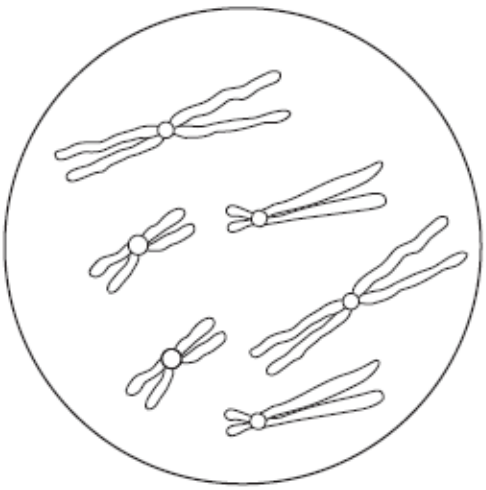
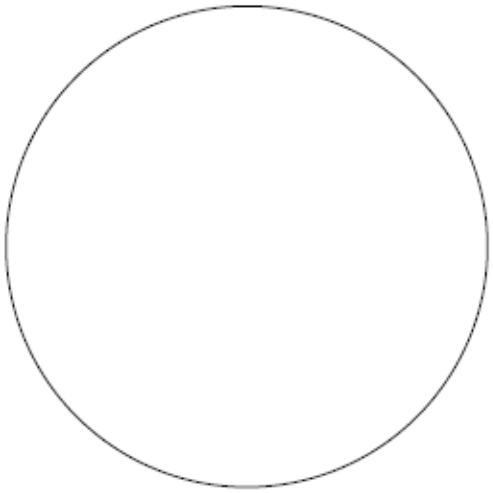


**Fig. 4.2**

**(i)** Identify **one pair** of *homologous chromosomes* in Fig. 4.2 by drawing around each chromosome in the pair **on the diagram**. **[1]**

**(ii)** The nucleus of a sperm cell is produced by **meiosis**.

Draw a diagram in the space below to represent the chromosomes that are present in the nucleus of a sperm cell from **the same animal**.



**[2]**

**[Total: 7]**

4)

**(i)** Complete Table 1.1 by

- naming the molecule being tested for
- stating whether this molecule is present or absent.

The first row has been completed for you.

**Table 1.1**

| reagent | observation | molecule being tested for | present or absent |
|---|---|---|---|
| ethanol and water | white emulsion | lipid | present |
| Benedict's solution | brick-red precipitate | | |
| biuret I and II | lilac colour | | |
| iodine solution | yellow / brown | | |

**[3]**

**(ii)** Although the student entered 'present' for lipid in the first row of the table, he was unsure whether the result was correct.

Suggest why the student was unsure if the positive result for lipid was correct for the milk sample.

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

**(iii)** Triglycerides are a type of lipid found in milk.

Describe the structure of a triglyceride molecule.

. **[3]**

**(b)** State **three** roles of lipids in living organisms.

1 .....

.....

2 .....

.....

3 .....

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

**(c)** Human populations with diets high in animal fats have a lower life expectancy than those with diets high in vegetable oils.

**(i)** Suggest **one** difference between lipids from animals and those from plants.

.....

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

Animal fats are thought to raise blood cholesterol levels. High blood cholesterol levels can lead to premature death.

Fig. 1.1 shows the relationship between blood cholesterol level and annual death rate per 10 000 of the population.

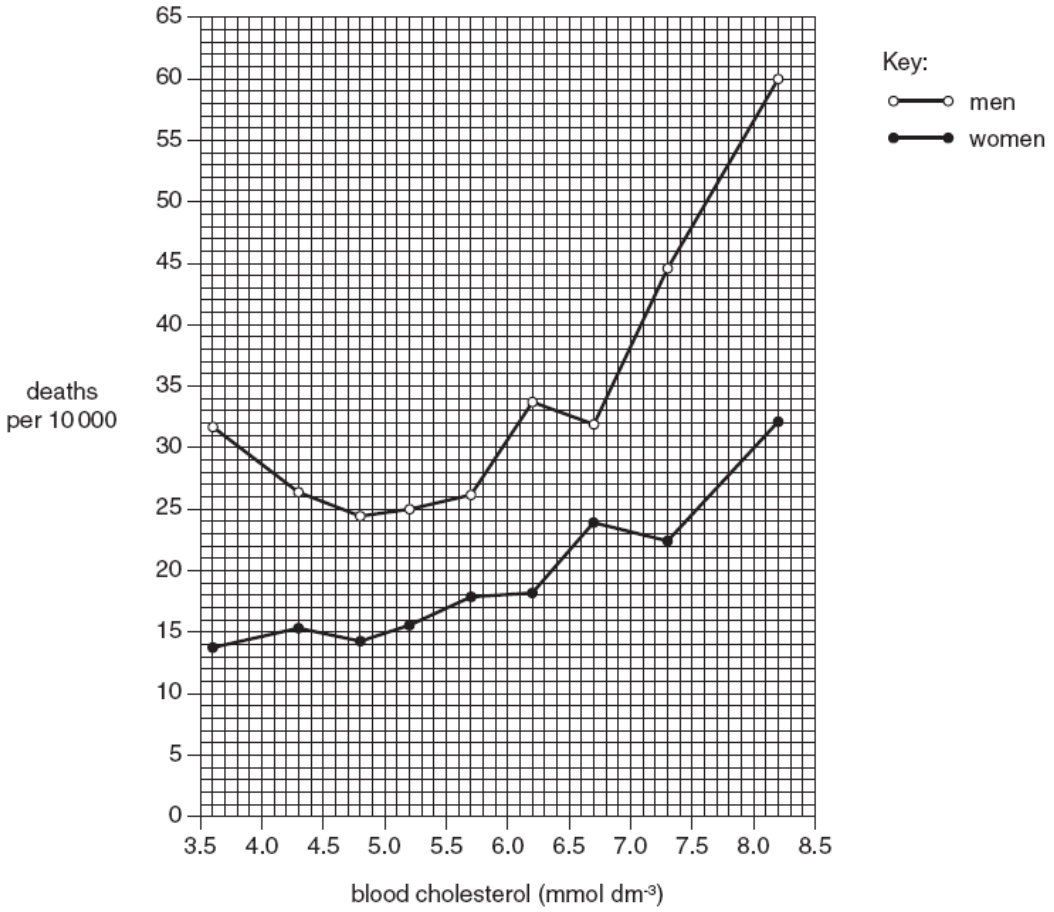



**Fig. 1.1**

**(ii)** Describe the trends shown in Fig. 1.1.

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

**(iii)** Increased blood cholesterol levels are associated with certain medical conditions.

Suggest **two** medical conditions that may be associated with increased blood cholesterol levels.

.....

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

**[Total: 16]**

.....

5)

**(a)** Fig. 4.1 is a drawing that represents molecules of DNA and messenger RNA (mRNA).

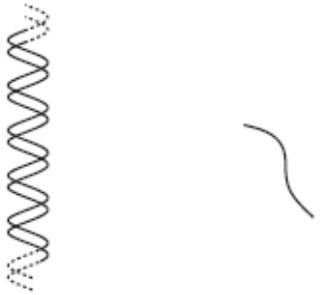



**Fig. 4.1**

The mRNA molecule is shorter than the DNA molecule.

**(i)** State, using **only** the information in Fig. 4.1, **one other** way to distinguish between DNA and mRNA.

.....

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

**(ii)** Give **one** further difference in **structure** between DNA and RNA.

.....

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

DNA and mRNA are both involved in protein synthesis. The mRNA molecule, carrying the code for protein, leaves the nucleus and attaches to a ribosome. The ribosome is the site where a protein molecule is formed.

**(iii)** Complete the following statement:

*A sequence of DNA nucleotides that codes for a protein is a* ..... **[1]**

**(iv)** Suggest why DNA is not able to leave the nucleus.

.....

.....

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

**(v)** Explain why the mRNA molecule is shorter than a DNA molecule.

.....

.....

.....

.....

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



**Turn over**

**(b)** Enzymes are involved in the production of mRNA in eukaryotic cells. One enzyme is inhibited by the toxin, α-amanitin.

Fig. 4.2 shows the effect when α-amanitin attaches to this enzyme.

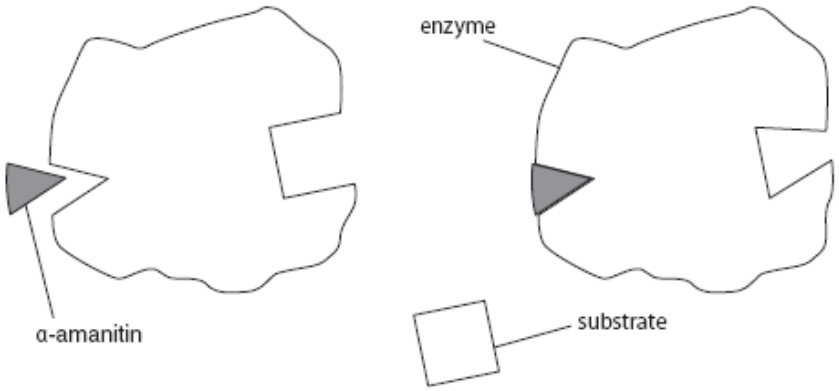



**Fig. 4.2**

**(i)** Explain how α-amanitin stops the formation of an enzyme-substrate complex during RNA production.

.....

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

**(ii)** The Roman Emperor Claudius was poisoned by his wife Agrippina when she gave him death cap fungus to eat. The death cap fungus contains α-amanitin.

Suggest how the toxin α-amanitin may lead to the death of an organism.

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



.....

**(c)** **(i)** Enzymes are globular proteins with a specific three dimensional shape. The shape is determined by the primary structure.

State the meaning of the term *primary structure*.

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

Fig. 4.3 shows some of the chemical bonds that hold the **tertiary** structure of a protein together.

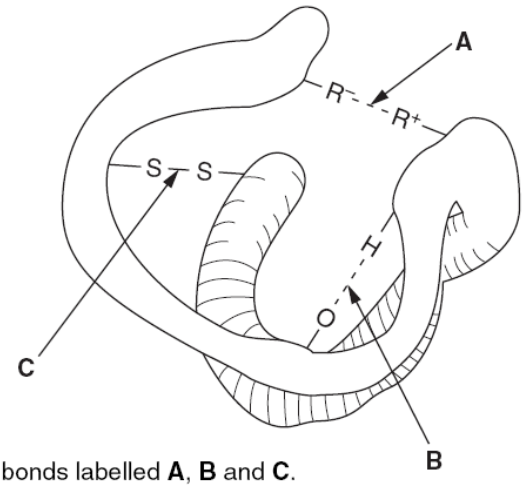



**Fig. 4.3**

**(ii)** Name the bonds labelled **A**, **B** and **C**.

**(d)** When proteins are heated to a high temperature, their tertiary structure is disrupted.

Explain how this occurs.

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

..... **[Total: 17]**