1 **(a)** State the maximum magnification that can be achieved by a light microscope and a transmission electron microscope.

Select your answers from the list below.

10x **40x** 100x

light microscope x

transmission electron microscope ..... x **[2]**

(b) Describe what is meant by the term *resolution*.

.....

.....

.....

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

(c) Fig. 1.1 is an electron micrograph of xylem tissue in the stem of a plant.

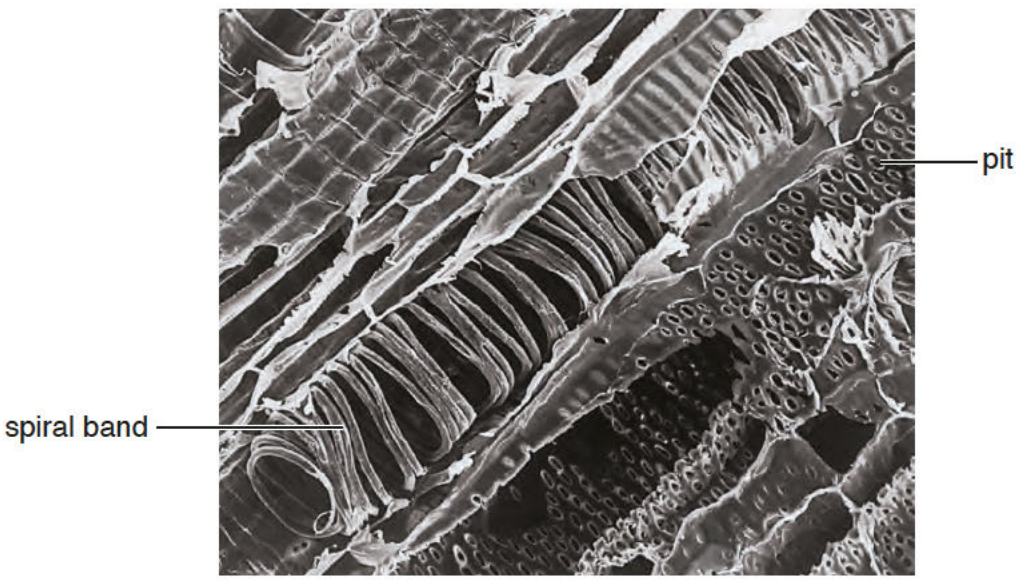


Fig. 1.1

(i) State **one** function of xylem tissue.

.....

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

(ii) The spiral band in the xylem vessel shown in Fig. 1.1 contains a substance called lignin.

State the function of this spiral band of lignin **and** explain why it is important that the xylem vessel becomes lignified in this way.

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

(iii) Explain the function of the pits seen in Fig. 1.1.

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

[Total: 10]

2 **(a)** Table 4.1 compares the structures of prokaryotic and eukaryotic cells.

Complete the table.

Table 4.1

prokaryotic	eukaryotic
no true nucleus	genetic material held in a nucleus
genetic material consists of 'naked' DNA	
average diameter of cell 0.5 – 5 µm	
	ribosomes about 22 nm in diameter
	cell wall sometimes present

[4]

(b) The cytoskeleton is an important component in the cytoplasm of all eukaryotic cells.

(i) Name **one** structure, **associated with the cytoskeleton**, which can bring about cell movement.

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

(ii) Suggest **two** processes **inside cells** that rely on the cytoskeleton for movement.

.....

.....

.....

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

[Total: 7]

3 Fig. 1.1 is a diagram of an animal cell as seen using a transmission electron microscope.

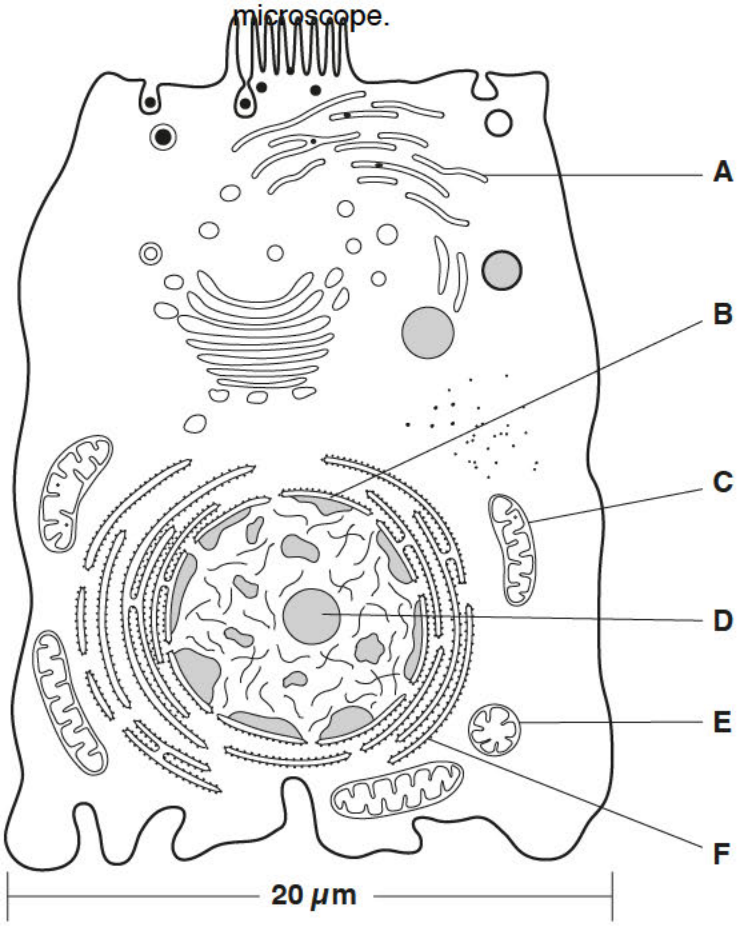


Fig. 1.1

(a) (i) Name the structures of the cell labelled **A**, **B**, **C** and **D**.

A .....

B .....

C .....

D ..... **[4]**

(ii) Structures **C** and **E** are examples of the same organelle.

Suggest why **E** looks so different to **C**.

.....

.....

.....

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

(iii) Calculate the actual length of structure **C**.

Show your working and give your answer in micrometres (μm).

Answer = ... μm **[2]**

(b) Proteins are produced by the structure labelled **F**. Some of these proteins may be **extracellular** proteins that are released from the cell.

Outline the sequence of events following the production of extracellular proteins that leads to their release from the cell.

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

[Total: 11]

4 Membranes are a fundamental part of the cell. They are found both at the surface of a cell and inside a cell.

(a) State **three** roles of membranes **inside** cells.

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.....

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

(b) Cells contain a large number of membrane-bound vesicles. Many of these vesicles transport substances between organelles.

(i) Outline how the vesicles are moved from one organelle to another.

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

(ii) The proteins embedded in the membranes of vesicles have different functions.

- COPI and COPII proteins are known as 'address proteins'.
- Vesicles that transport materials from the Golgi to the rough endoplasmic reticulum (RER) are coated in COPI proteins.
- Vesicles that transport materials to the Golgi from the RER are coated in COPII proteins.

Suggest how these proteins ensure that a vesicle is transported to the correct target organelle.

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

(c) Cells in the pancreas secrete proteins such as the enzymes pancreatic amylase and protease.

Describe how these extracellular enzymes are secreted from the cells.

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

[Total: 9]

5 (a) Fig. 1.1, **on the insert**, shows an electron micrograph of cells from the liver.

(i) Some cells, such as liver cells, contain a lot of Golgi apparatus.

State **one** function of the Golgi apparatus.

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

(ii) Suggest why the nuclear envelope contains pores.

.....

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.....

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

(iii) State the function of the lysosomes.

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

(b) The liver is an organ.

Explain what is meant by the term *organ*.

.....

.....

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.....

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

(c) Using the mammalian **gaseous exchange system** as an example, explain how the different cells and tissues enable the effective exchange of gases.



In your answer, you should use appropriate technical terms, spelt correctly.

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..... **[5]**

[Total: 11]

6 Fig. 2.1, **on the insert**, is a photomicrograph of a blood smear. The smear has been stained.

(a) State **two** reasons why the blood smear has been stained.

.....

.....

.....

.....

.....

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

(b) Suggest **one** detail that would be made visible if the micrograph were taken using:

(i) a scanning electron microscope

.....

(ii) a transmission electron microscope.

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

(c) The red colouration of the red blood cells is caused by the pigment haemoglobin. The main function of haemoglobin is to transport oxygen in the form of oxyhaemoglobin.

Fig. 2.2 shows the dissociation curves of adult oxyhaemoglobin (curve **A**) and fetal oxyhaemoglobin (curve **F**).

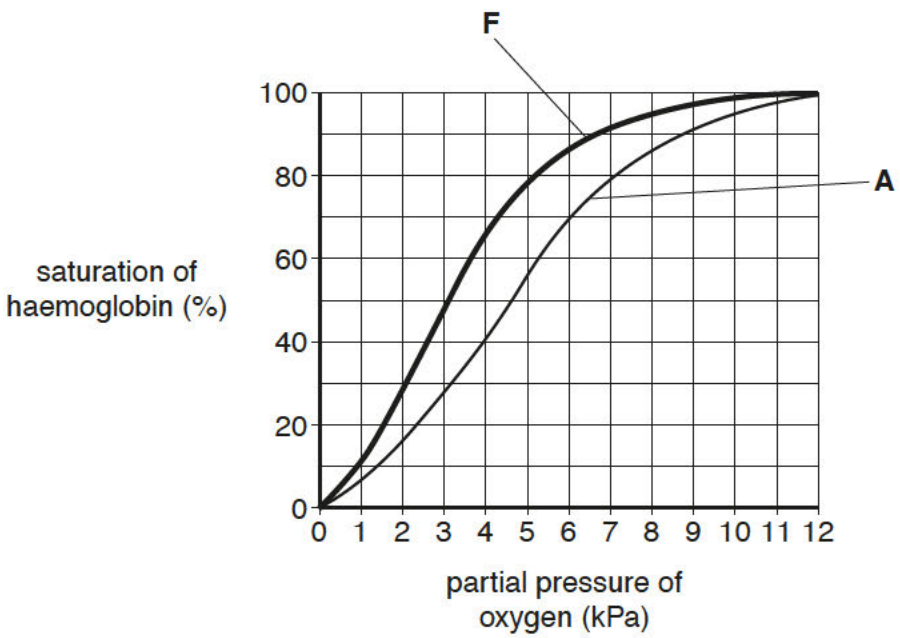


Fig. 2.2

Explain why the curve for fetal oxyhaemoglobin is to the left of the curve for adult oxyhaemoglobin.



In your answer you should use appropriate technical terms, spelt correctly.

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..... **[4]**

(d) In high partial pressures of carbon dioxide, the oxyhaemoglobin dissociation curve undergoes a change known as the Bohr shift.

(i) **Draw a curve on Fig. 2.2** to show the effect of the Bohr shift. **[2]**

(ii) Outline the benefits of the Bohr shift to actively respiring tissue.

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

[Total: 12]

7 **(a)** **(i)** Explain what is meant by the term *tissue*.

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.....

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

(ii) Name **one** type of epithelial tissue found in the lungs.

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

(b) Explain why the lungs can be considered to be an organ.

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

(c) In the lungs, goblet cells secrete mucus. The mucus is then moved by cilia.

Name **one** cellular structure from the list below that is associated with each of the following functions. You must select a structure once only.

mitochondria **ribosome** **Golgi vesicle** **centriole** **nucleus** **cytoskeleton**

(i) release of energy .....

(ii) movement of cilia .....

(iii) secrete mucus ..... **[3]**

[Total: 8]