1 Malaria is a disease that is estimated to kill around 80 people every hour worldwide.

(a) The symptoms of malaria are caused by a single-celled organism belonging to the genus *Plasmodium*.

(i) *Plasmodium* is described as a parasite.

Define the term *parasite*.

.....

.....

.....

.....

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

(ii) Explain why the human body's primary defences do **not** prevent the entry of *Plasmodium* into the body.

.....

.....

.....

.....

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

(iii) Suggest why malaria is much more common in tropical areas than in other parts of the world.

.....

.....

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

(iv) Suggest **two** reasons why governments in parts of the world other than tropical areas, are also becoming increasingly concerned about malaria.

.....

.....

.....

.....

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

(b) People with the disease known as iron-deficient anaemia (IDA) are resistant to malaria. This resistance is not well understood but is thought to involve phagocytosis.

Fig. 2.1 shows the process of phagocytosis of a pathogen by a phagocyte.

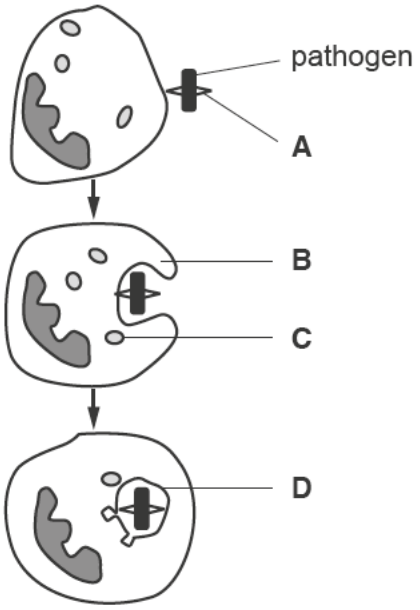


Fig. 2.1

(i) Identify the structures represented by the letters **A**, **B**, **C** and **D**.

A .....

B .....

C .....

D .....

[4]

(ii) In patients with IDA, anaemia is caused by the destruction of erythrocytes (red blood cells) by phagocytosis.

Suggest why erythrocytes that contain *Plasmodium* are more likely to be destroyed by phagocytosis than healthy erythrocytes.

.....

.....

.....

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

(c) Erythrocytes contain haemoglobin, which is a globular protein.

Blood vessel walls contain collagen, which is a fibrous protein.

Describe the differences between globular and fibrous proteins using haemoglobin and collagen as examples.



In your answer you should refer to collagen and haemoglobin.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[8]**

[Total: 21]

2 Antibodies are important biological molecules.

(a) Describe how the structure of antibodies allows them to perform their function.



In your answer you should clearly link structure to function.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[7]**

(b) Antibodies can defend the body against pathogens in a number of ways.

Outline the mode of action of antibodies in defending the body against pathogens by describing the processes of neutralisation and agglutination.

neutralisation .....

.....

.....

.....

agglutination .....

.....

.....

.....

[4]

[Total: 11]

3 Vaccination can provide immunity to disease.

(a) Complete the following passage by using the most appropriate term from the list.

active **en(s)** **double-helix** **membra** **memory**
mutation **passive** **gocytic** **receptor(s)**
species **specific** **strain** **blood**

Some vaccines contain a dead or weakened form of a pathogen. The ..... on the cell surface of the pathogen are still able to trigger the production of ..... antibodies in the person being vaccinated. Cells called ..... cells are also produced, which retain the ability to divide and produce the antibodies quickly, should the pathogen return.

A new ..... of pathogen can arise if there is a ..... in the DNA of the pathogen. If this happens, the original vaccine is not likely to be effective.

[5]

(b) The term *immunity* is often used when describing how vaccines work.

In a piece of school homework a student wrote:

"Bacteria can evolve quickly and many are now immune to antibiotics."

Explain why the student's use of the word 'immune' was incorrect.

.....

.....

.....

.....

.....

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

[Total: 8]

4 **(a)** Phagocytes form part of the body's non-specific response to disease.

Fig. 3.1, **on the insert**, shows a photograph of some blood cells.

(i) Identify which of the cell(s) labelled **A, B** and **C**, are phagocytes.

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

(ii) Why are phagocytes described as a secondary defence against pathogens?

.....

.....

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

(iii) Why is the response involving phagocytes regarded as **non-specific**?

.....

.....

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

(iv) Explain how phagocytes, such as those shown in Fig. 3.1, are able to pass from the blood into the tissue fluid.

.....

.....

.....

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

(v) Bacterial pathogens initially attach to receptors on the surface of phagocytes.

Describe the process by which a pathogen is destroyed after it has become attached to the surface of a phagocyte.

In your answer you should describe clearly the sequence of events that takes place.

[7]

(b) The infective agent that causes TB is not easily destroyed by phagocytes.

(i) Name the infective agent that causes TB.

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

(ii) Describe how the infective agent that causes TB is transmitted from one individual to another.

.....

.....

.....

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

(c) The World Health Organisation (WHO) collects data about diseases worldwide.

Table 3.1 shows data published by the WHO about the incidence of TB in the years 2000 and 2008 for four different income groups.

Income group	Incidence of TB per 100 000 population	
	In 2000	In 2008
Low	280	280
Lower middle	150	150
Upper middle	100	110
High	17	14

Table 3.1

(i) Using the information in Table 3.1, compare the data for 2000 and 2008 in the four income groups.

.....

.....

.....

.....

.....

.....

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

(ii) The highest incidence of TB is associated with the low income group.

Suggest **three** reasons why the incidence of TB is higher in the low income group.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

[Total: 21]