1)

Malaria is a disease caused by a eukaryotic parasite.

(a) State **two** features of the malarial parasite that indicate that it is **not** a prokaryote.

1 .....

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

(b) In a piece of word-processed homework, a student stated that one species of parasite that causes malaria is called:

Plasmodium Vivax

State **one** error made by the student.

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

(c) The malarial parasite is carried by an insect, the female *Anopheles* mosquito.

(i) Describe how the mosquito transmits the malarial parasite to a human.

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

(ii) In order to fight the spread of malaria, insecticides have been used in areas where the *Anopheles* mosquito breeds.

One problem that can occur when using insecticides in this way is the development of insecticide resistance.

Suggest **one other** reason why some people might be concerned about using insecticides.

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

(iii) Suggest how the effects of insecticide use on a population of *Anopheles* mosquitoes could be measured **and** state the steps that should be taken in order to produce valid and reliable results.

[5]

.....

2)

The system used by scientists for classifying living things has developed from the original classification system proposed by Carl Linnaeus around 250 years ago.

(a) Complete the following paragraph by using the most appropriate term(s).

The system of classifying organisms according to their observable features or genetic characteristics is called ..... . Organisms are classified into large groups which are then subdivided into increasingly smaller groups. A system such as this is called a ..... . The term that describes the evolutionary relationship between organisms is ..... .

[3]

(b) New Zealand is made up of two large and many smaller islands and is situated a long distance from any other land mass.

In New Zealand there is a large variety of birds not found elsewhere in the world.

Among its many species of the parrot family, Psittacidae, are:

- kaka (*Nestor meridionalis*)
- kea (*Nestor notabilis*)
- kakapo (*Strigops habroptila*)

These birds are shown in Fig. 4.1 **on the insert**.

(i) State **two** characteristics that birds, such as parrots, share with other members of the animal kingdom.

1 .....

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

(ii) Name the **domain** to which the parrot belongs.

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

(iii) Species that are more closely related in evolutionary terms have more genes in common than species that are less closely related.

Using the information provided, suggest the likely genetic relationship between the three parrot species.

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

(c) The kakapo is one of the world's largest and rarest parrot species. The variation in mass of adult birds in the kakapo population has been reported to be between 950 g and 4000 g.

(i) Define the term *variation*.

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

(ii) Suggest **two** reasons why the kakapo varies in size.

1 .....

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

(iii) Suggest **two** reasons why the reported mass range for the adult kakapo may not be accurate.

1 .....

.....

2 .....

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

(d) At some point in the past, distinct species of New Zealand parrot are likely to have arisen from an original ancestral population.

State the name of the process by which new species arise **and** suggest the mechanisms necessary for this process to occur.

name of process .....

mechanisms necessary for this process to occur ..... **[3]**

3)

(a) The black poplar was once a common tree throughout southern Britain. Its numbers have decreased by 94% since 1942 and it is in danger of becoming extinct in the wild.

There are thought to be approximately 2500 black poplars surviving in Britain today.

Use the information above to calculate the original number of black poplar trees in 1942.

Show your working

Answer = ... **[2]**

(b) Species such as the black poplar contribute to the biodiversity of the UK.

Suggest **three** reasons why the conservation of the black poplar is important. **[3]**

(c) Botanic gardens are important in the conservation of plant species.

(i) State why the conservation of a species in a botanic garden is described as *ex situ*.

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

(ii) Many botanic gardens use seed banks as a method of plant conservation.

Outline the **advantages** of using a seed bank, as opposed to adult plants, in order to conserve an endangered plant species.

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

(iii) Suggest why it is important to ensure that, for each species, the seeds in a seed bank have been collected from several different sites in the wild.

[3]

.....

4)

(a) In his book 'On the Origin of Species', Charles Darwin made the following four observations:

W Offspring generally appear similar to their parents.
X No two individuals are identical.
Y Organisms have the ability to produce large numbers of offspring.
Z Populations in nature tend to remain relatively stable.

From these observations he made a number of deductions, which are listed below in Table 6.1.

The deductions are supported by one **or more** of the observations (**W**, **X**, **Y** or **Z**).

In Table 6.1, indicate which of the above observations supported each deduction.

You may use each letter (**W**, **X**, **Y**, or **Z**) once, more than once or not at all.

Table 6.1

deduction	supporting observation(s)
characteristics are passed on to the next generation	
there is a struggle for existence	
individuals with beneficial characteristics are among the few who survive	

[3]

(b) Resistance to antibiotics has evolved in some pathogenic bacteria, such as MRSA.

Suggest why the resistance of MRSA to existing antibiotics is of major concern to humans.

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

(c) The evolution of antibiotic resistance in bacteria is evidence to support the theory of evolution.

How does **fossil** evidence support the idea that evolution has taken place?

[3]

.....

5)

(a) Lymphocytes are important components of the immune system and can be classified into B lymphocytes and T lymphocytes.

For each of the statements in the table below, identify whether the description applies to:

- only B lymphocytes
- only T lymphocytes
- both B and T lymphocytes
- neither.

You may use each response once, more than once, or not at all. The first one has been done for you.

statement	can be applied to ...
form part of immune response	*both*
matured in thymus	
secrete substances which kill infected cells	
manufacture antibodies	
undergo clonal expansion	
activate other lymphocytes	

[5]

(b) Fig. 7.1 shows the concentration of antibodies in a patient's blood following an initial infection with a pathogen. This is known as the primary response.

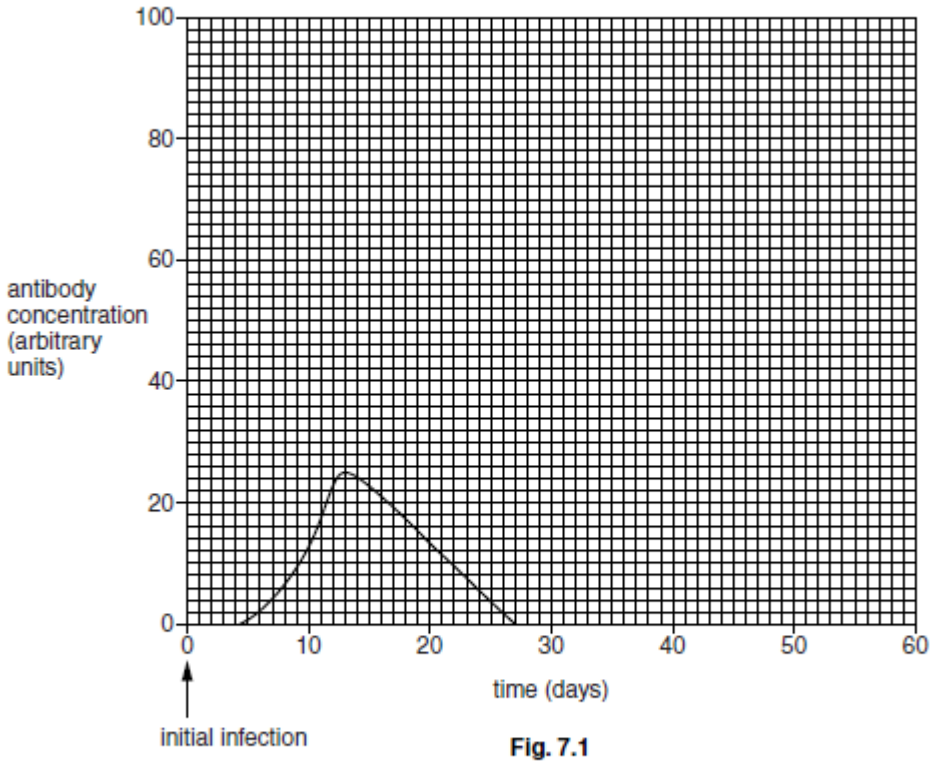

Fig. 7.1

(i) Describe the changes in antibody concentration that occur in the patient's blood during the primary response.

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

(ii) The patient was subsequently infected with the same pathogen 30 days after the initial infection.

Draw a line **on the graph** to show the likely concentration of antibodies in the patient's blood from 30 days onwards.

..... *The answer to this question must be drawn on Fig. 7.1* ..... **[2]**

(c) Fig. 7.2 shows the structure of an antibody.

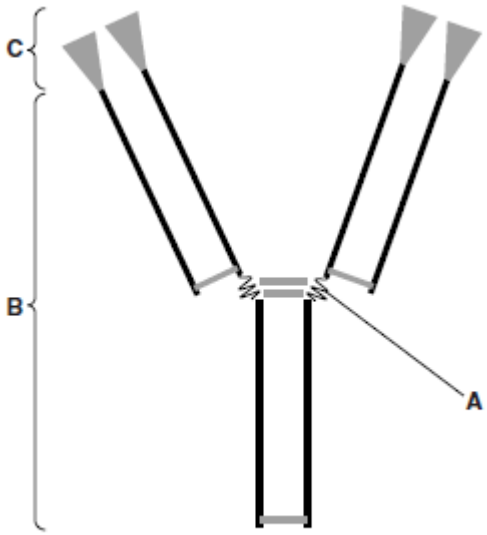

Fig. 7.2

Complete the table below by stating the name and function of each of the regions **A**, **B** and **C**.

region	name	function
A		
B		
C		

[6]

6)

Insect pests, such as aphids, can reduce yield in rye plants by piercing the phloem and removing materials.

Aphids can be killed using an insecticide. However, over a period of time, an increasing concentration of insecticide is required to control the aphid population.

Explain why this is the case.

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