Cambridge Assessment International Education

THIRD PREDICTED PAPER MAY/JUNE 2025

Cambridge IGCSE™

CANDIDATE NAME Solved by Anubha Roberts

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

BIOLOGY **0610**

Paper 4 Theory (Extended)

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

For any further queries please contact on email below-

Email ID- anubharoberts@gmail.com
Contact no. - +97455012107.

1(a) A student used an apparatus to investigate the effect of temperature on the rate of photosynthesis of the leaves of Chinese plantain, *Plantago asiatica*, at two different concentrations of carbon dioxide, **A** and **B**.

Fig. 2.2 shows the results of the investigation.

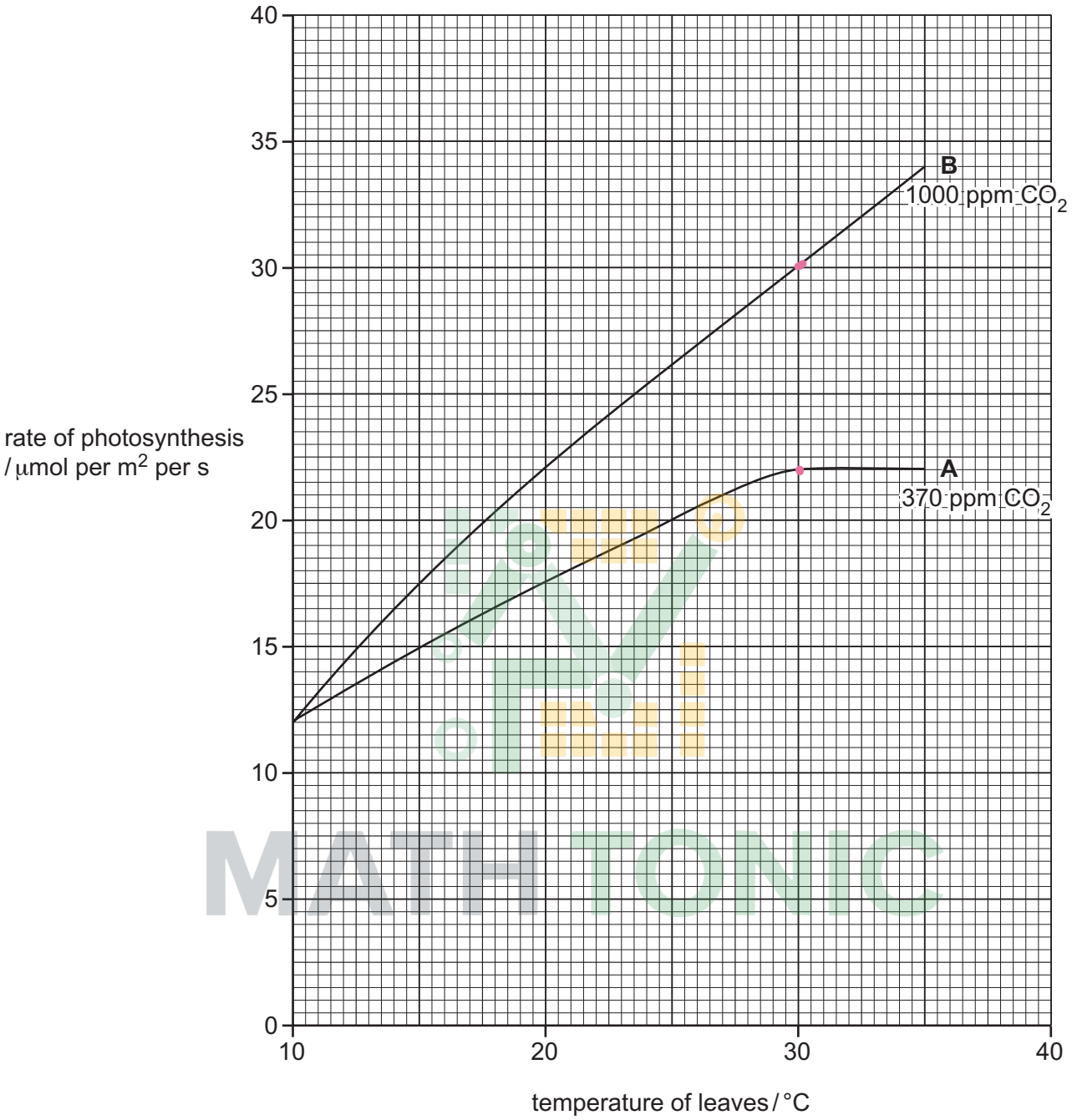


Fig. 2.2

(i) State **one** environmental factor that should have been kept constant in this investigation.

Light intensity ..... [1]

(ii) Describe the effect of temperature on the rate of photosynthesis when carbon dioxide concentration **A** was supplied.

Use the data from Fig. 2.2 in your answer.

Rate of photosynthesis increases from 10° to 30°c and stays constant above 30°c
At 30°c the rate is 22 u mol per m^2 per sec

[3]

(iii) Calculate the percentage increase in the rate of photosynthesis at 30 °C when the carbon dioxide concentration was increased from **A** to **B** as shown in Fig. 2.2.

Show your working and give your answer to the nearest whole number.

$$\frac{\text{Final} - \text{Initial}}{\text{Initial}} \quad \frac{30 - 22}{30} \times 100 = 36.36$$

36 %

[2]

(iv) Explain the effect of increasing temperature on the rate of photosynthesis for carbon dioxide concentration **B**.

Use the term *limiting factor* in your answer.

- Temperature is limiting factor in B.
- Temperature increases kinetic energy between enzyme and substrate molecules. There are more successful collisions.
- More enzyme-substrate complexes.
- Photosynthesis is enzyme catalysed reactions.

[3]

(v) The student concluded that carbon dioxide concentration is the factor limiting the rate of photosynthesis between 30 °C and 35 °C for the results shown for **A** in Fig. 2.2.

State the evidence for this conclusion.

The graph of B has higher rate with more CO_2 concentration than A. [1]

[Total: 10]

2 (a) Tissue plasminogen activators (TPAs) are human proteins that are used as drugs to break down blood clots.

TPAs break down blood clots by activating plasminogen. Plasminogen is a protein that is always present in the blood.

When activated, plasminogen forms a protease that breaks down fibrin molecules.

(i) Plasminogen is found in the plasma.

State what is meant by the term *plasma*.

liquid part of blood ..... [1]

(ii) State the products of the action of protease on the protein fibrin.

Amino acids ..... [1]

TPAs can be produced by genetically-engineered bacteria.

Fig. 5.1 shows some of the stages involved in genetically engineering a bacterium to make a TPA.

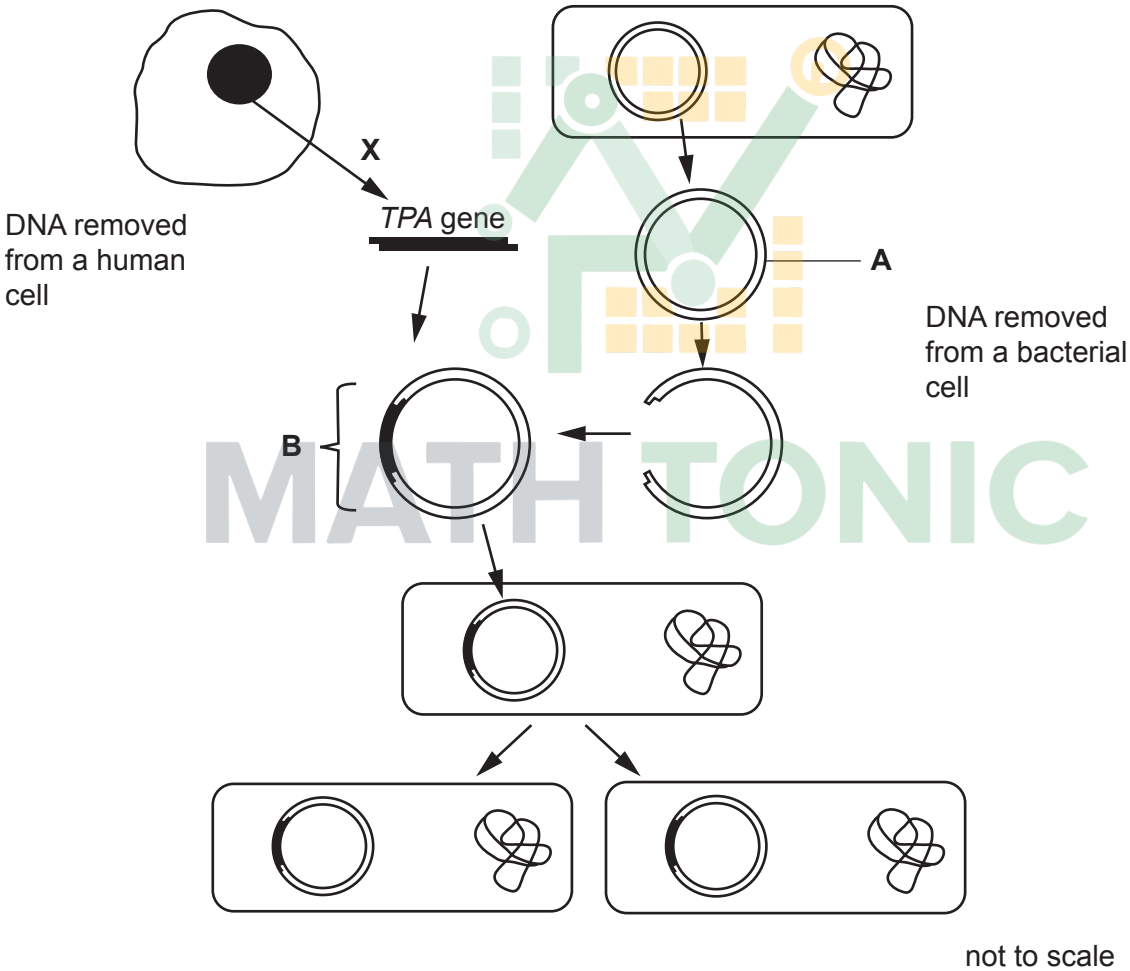


Fig. 5.1

(b) (i) State the name of structure **A** in Fig. 5.1.

plasmid ..... [1]

(ii) In the flow chart, **X** represents the action of an enzyme on a molecule of DNA.

State the name of this enzyme.

restriction enzyme ..... [1]

(iii) The *TPA* gene is inserted into structure **A**.

Explain how the gene is inserted into structure **A** to form structure **B** as shown in Fig. 5.1.

→ Cutting human gene and plasmid from same restriction enzyme
→ to produce complementary sticky ends.
→ Use DNA ligase to join the sticky ends of plasmid and human gene. ..... [3]

(iv) Before TPA was made by genetically-engineered bacteria it was only available from blood donated by people.

Suggest **one** advantage of producing TPA by genetically-engineered bacteria.

No allergic reactions. .....

..... [1]

(v) Discuss the disadvantages of producing genetically modified crops.

→ Seeds are very expensive. .....
→ Reduced genetic variation to adapt to changing environment. .....
→ Resistant genes to insects or herbs might cause super weeds. .....

.....

→ Ethical concerns for changing genes of organisms.

.....[4]

[Total: 12]

3(a) A plant, *Arabidopsis thaliana*, was placed on its side in the dark. Fig. 2.2 is a series of drawings made of the plant, over seven days, as it responded to a change in its surroundings.

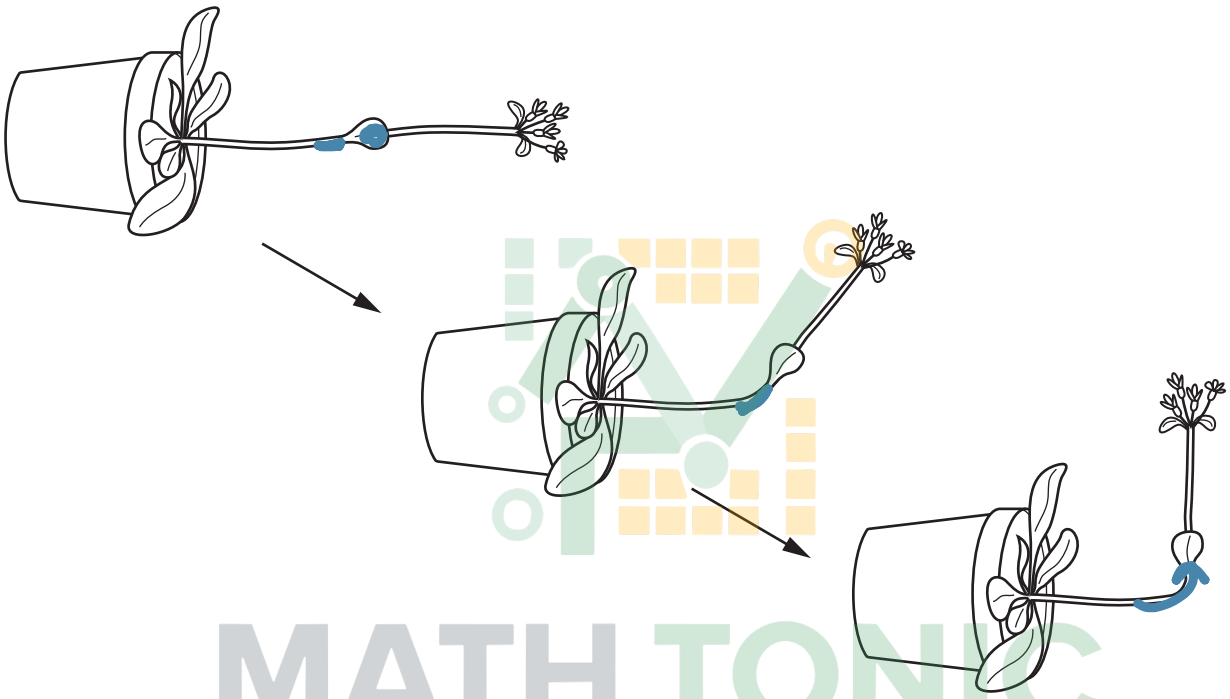


Fig. 2.2

(i) State the stimulus to which the plant responded.

Gravity ..... [1]

(ii) Name the growth response shown by the plant.

Negative gravitropism. ..... [2]

(iii) Explain the advantage to plants of the growth response shown in Fig. 2.2.

Growth of plant towards light and more diffusion of CO_2 for more photosynthesis. Promotes growth of plant. [2]

(b) Auxins control the growth responses of seedlings.

Explain how auxins control the growth response of *A. thaliana*, shown in Fig. 2.2.

→ Auxin is produced at shoot tip.
→ It diffuses below under effect of gravity and
→ causing elongation of cells on the lower surface and
→ the tip bends and grows upwards.

[4]

[Total: 9]

4 Tasmania is an island off the south coast of Australia. Sheep were introduced to Tasmania in the nineteenth century.

Fig. 3.1 shows the population of sheep in Tasmania from 1820 to 1940. The dashed line shows the trend in the population growth.

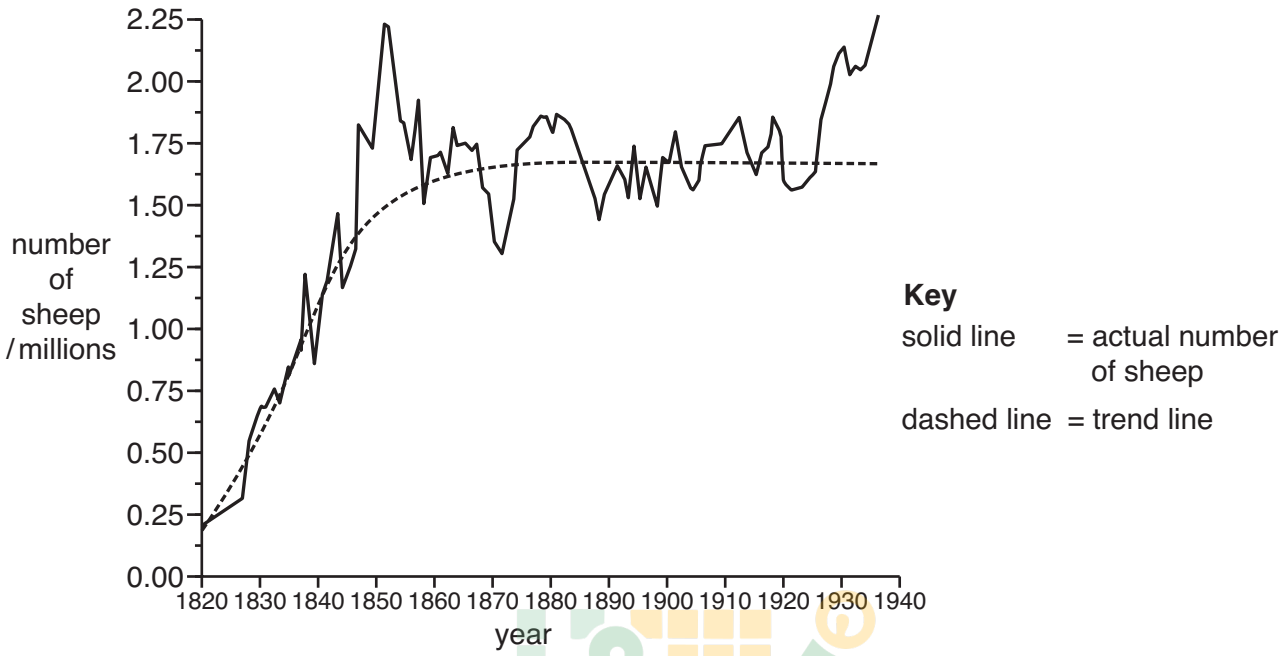


Fig. 3.1

(a) Describe the **trend** in the population of sheep in Tasmania between 1820 and 1940, using the information in Fig. 3.1.

→ Number of sheep increases exponential till 1860.

→ It remains constant from 1860 to 1930 with fluctuations. that is stationary phase.

→ In between 1850-1860 it peaks 2.25 millions.

.....[3]

(b) Explain the change in the **trend** of the population that you described in **3(a)**.

→ From 1820 to 1850 there are more birth than deaths. as
→ more food is available and less predators.
→ From 1850 to 1930 population is constant as births and deaths are equal. [3]

(c) The sheep that were first introduced to Tasmania were not well adapted to the environment.

Describe how farmers can use selective breeding to improve their sheep so that they are better adapted to the environment.

→ Farmer chooses animals with desired feature.
→ Crossbreeding them to obtain offspring
→ Select the offspring with desired feature.
→ Repeat it for many generations.

[3]

(d) Maintaining very large populations of farm animals is unsustainable.

Define the term sustainable resource..

→ A resource which is produced rapidly as it is removed.
→ from environment and doesn't run out.

[2]

(e) The introduction of sheep on the island reduced the number of tortoise drastically. Discuss the ways in which the number of tortoise can be restored.

→ Keeping them in protected areas
→ Using captive breeding programme.
→ Implemting law for hunting
→ Educating people for protection.
→ Monitoring their number regularly.

[4]

(f) Give two similarities and two differences between Artificial insemination (AI) and In- vitro fertilisation (IVF).

Common points -
Both include collection of sperm
Both include implantation in uterus.

Difference - In IVF Both egg and sperm are collected outside. Fertilization is external and zygote is produced outside body. [3]

[Total: 18]

5 The kidney is one of the main excretory organs of the body.

(a) Explain role of liver in excretion.

Liver breaks down excess amino acids as there Nitrogen part is removed and used to form urea.
Breakdown of lactic acid. [3]

(b) One of the roles of the kidney is to filter the blood.

Fig. 1.1 shows a section of a kidney.

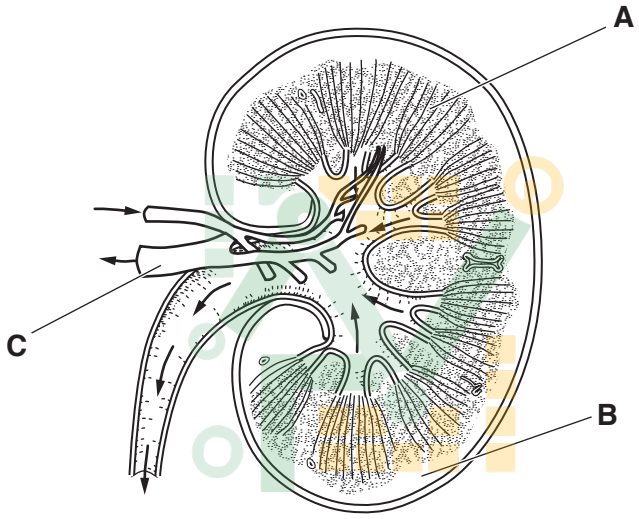


Fig. 1.1

(b) Table 1.1 shows the concentrations of four solutes:

- in the blood in the renal artery
- in the fluid in the kidney tubule
- in the urine.

Table 1.1

solute	solute concentration / g dm^{-3}		
	blood in the renal artery	fluid in the kidney tubule	urine
glucose	0.9	0.9	0.0
protein	83.0	0.0	0.0
salts	8.0	8.0	16.5
urea	0.2	0.2	20.0

Explain the difference in the concentration of constituents between the blood, fluid in the kidney tubule and urine.

→ All of the glucose, urea, salts and water get filtered.
→ None of the protein gets
→ filtered as they are too big to diffuse
→ Glucose is reabsorbed by
→ active transport using energy from carrier proteins.
Some salts are reabsorbed.
→ Excess salts, water and all

of urea are excreted in urine.

Urea concentration increases in urine as most water is reabsorbed in loop of Henle by osmosis.

[6]

[Total: 9]

6 Pollution is the harm done to the environment by the release of substances from human activities.

Table 4.1 shows the names of some pollutants, their sources and their effects on the environment.

Table 4.1

pollutant	source	effect on environment
carbon dioxide	Fossil fuel combustion	enhanced greenhouse effect
Methane	cattle and rice farming	enhanced greenhouse effect
fertilisers	crop farming	eutrophication

[2]

(a) Complete Table 4.1.

(b) When fertiliser is applied to fields, it can lead to eutrophication in lakes and rivers.

Describe **and** explain what happens in lakes when eutrophication occurs.

Fertilizers are rich in nitrates and organic matter. They increase growth of algae in water bodies. Algae cover the water body Other plants are not able to obtain light. They die due to increased competition. Decomposers breakdown dead producers and use all of O_2 by aerobic respiration. This reduces O_2 in lake and cause fish mortality.

[6]

[Total: 8]

7 Meningitis is a transmissible disease. One form of the disease is caused by the bacterium *Neisseria meningitidis*.

(a) Define the term *transmissible disease*.

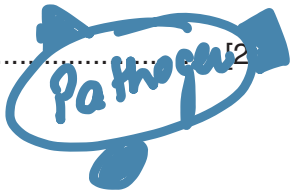
A disease caused by pathogen which spreads from one host to another.

[2]

(b) Explain why the shape of antibody is important.

→ Antibody structure is complementary to shape of antigen.
→ So antibody can bind with specific antigen.

[2]



(c) The spread of meningitis can be controlled by using vaccines.

(i) Explain how vaccination provides active immunity.

→ Weakened pathogen is injected
→ Pathogen has antigen over its surface
→ Lymphocytes recognise antigen and produce antibody complementary to antigen.
→ Memory cells are produced which provide long-term immunity.

[4]

(ii) If meningitis disappears from a country, explain why the vaccine should continue to be used in that country.

→ To develop herd immunity and travellers bring more
→ cases from other countries
→ Some hosts have not shown symptoms.

[2]

(d) People who have meningitis are treated with injections of antibodies to give them passive immunity.

(i) Suggest why the antibodies must be injected rather than taking them by mouth.

→ Antibodies are proteins and can denature due to HCl in stomach.

→ Faster action when injected in blood. [2]

(ii) Explain why passive immunity does not give long-term protection against diseases, such as meningitis.

Passive immunity involves

→ Injecting antibodies and no action of lymphocytes.

→ No memory cells are produced.

→ Antibodies are broken down after few days. [2]

[Total: 14]