



GRADE 11 EXAMINATION
NOVEMBER 2007

**LIFE SCIENCES: PAPER I
SECTIONS B & C**

Time: 2½ hours

Total marks: Section A = 50, Section B & C = 100

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

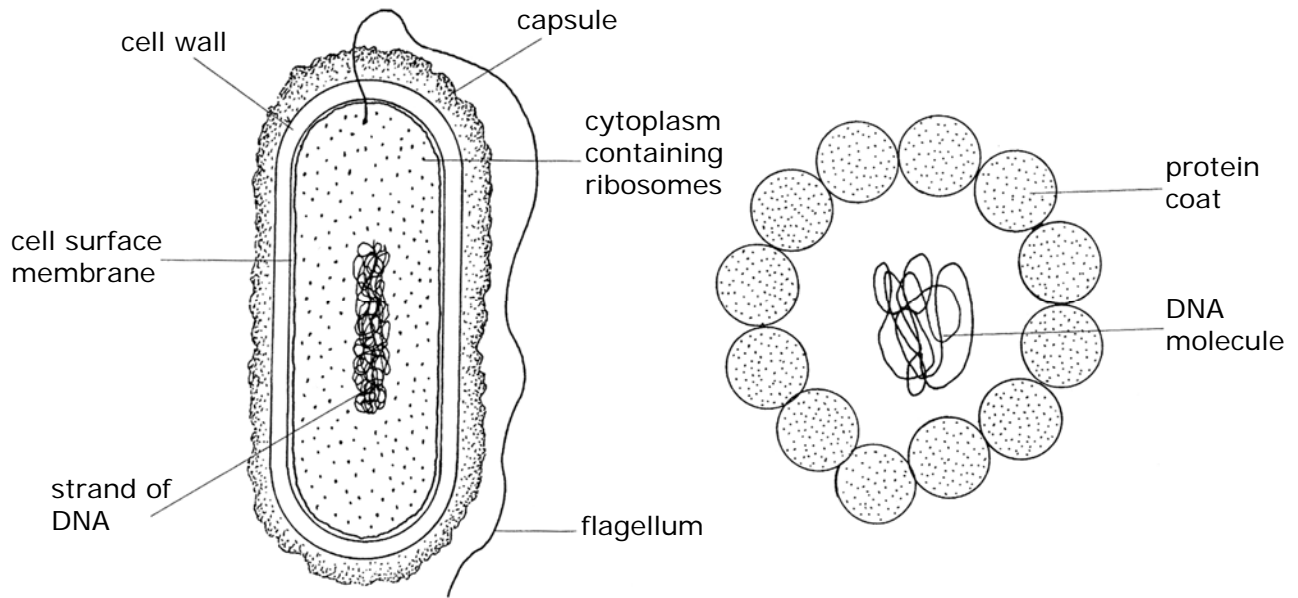
1. This question paper consists of SECTION A (7 pages) and SECTION B and C (10 pages). Please check that your question paper is complete.
 2. Section A must be answered in the Answer Booklet provide. Sections B & C must be answered on the lined paper provided.
 3. Read the questions carefully.
 4. Number your answers exactly as the questions are numbered.
 5. Use the total marks which can be awarded for each question in Sections A and B as an indication of the amount of detail required.
 6. It is in your own interest to write legibly and to present your work neatly.
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SECTION B

Answer ALL questions in this section in your Answer Book.

QUESTION 2

2.1 Observe the two diagrams of micro-organisms found below and use them to answer the following questions.



The structure of a bacterium

The structure of a virus

[Adapted from *Biology 1, IGCSE series; Cambridge International Examinations*
NOT DRAWN TO SCALE

- 2.1.1 These micro-organisms look very different. Give three structural differences you can observe. (3)
- 2.1.2 DNA is found in both. Why is this substance present? (2)
- 2.1.3 Viruses do not have a typical cell structure. Observe the diagram and give two reasons for this statement being true. (2)
- 2.1.4 Give an example of a virus that is affecting many people in South Africa at present. (1)
- 2.1.5 How can your knowledge of viruses help you avoid contracting the disease caused by the virus, you mentioned in 2.1.4? (3)

2.2 Use the information provided from the reference book *Data and Data handling for AS Level-Biology* by Bill Indge to answer the questions that follow.

Plague

You have probably never heard of *Yersinia pestis*. It is the bacterium which was responsible for the great outbreaks of plague which swept through Europe in the Middle Ages. The Black Death was the worst of these and killed almost a quarter of the entire population of Europe, while the Great Plague of 1665 had a terrible effect on London and other British cities.

Burying the dead with a bell before them. Searchers.

Carts full of dead to bury.

Burying the dead during the Great Plague in 1665. Detailed records made at the time have allowed us to follow the course of the disease in detail as it swept through London.

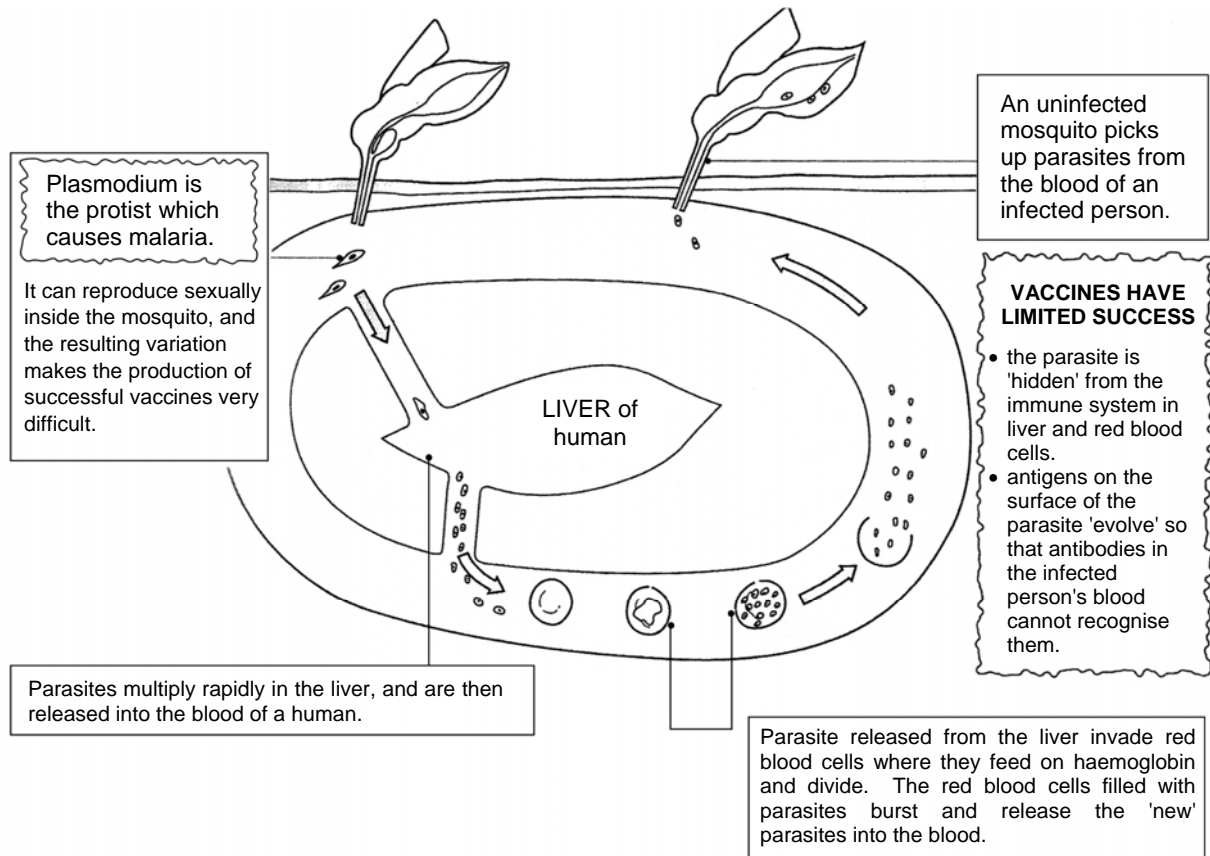
The data given below come from *A Journal of the Plague Year*, a book written by the novelist Daniel Defoe and published in 1722. He took the facts and figures about the number of people dying and wrote a novel round them. Although the book is fiction, the figures that it contains are fairly accurate.

	Dead from all diseases	Dead from diseases other than plague
From 15 to 22 August		1331
From 22 to 29 August	7496	1394
From 29 August to 5 September	8252	1264
From 5 to 12 September	7690	1056
From 12 to 19 September	8297	1132
From 19 to 26 September	6460	927

2.2.1 Use the information in the table and pictures to give two facts about the bacterium *Yersinia pestis*. (2)

- 2.2.2 The figures indicating the causes of death are not very accurate by today's standards. Give a reason to support this statement. (2)
- 2.2.3 Explain how you would calculate the percentage of deaths due to plague in a particular week from Defoe's data. (2)
- 2.2.4 Explain why the figures given for the week 19th to 26th September are different to those in the preceding weeks. (5)

2.3 Analyse the following information about Malaria. This disease has killed more humans than any other disease.



[Adapted from *AS and A level Human Biology through diagrams*; W R Pickering]

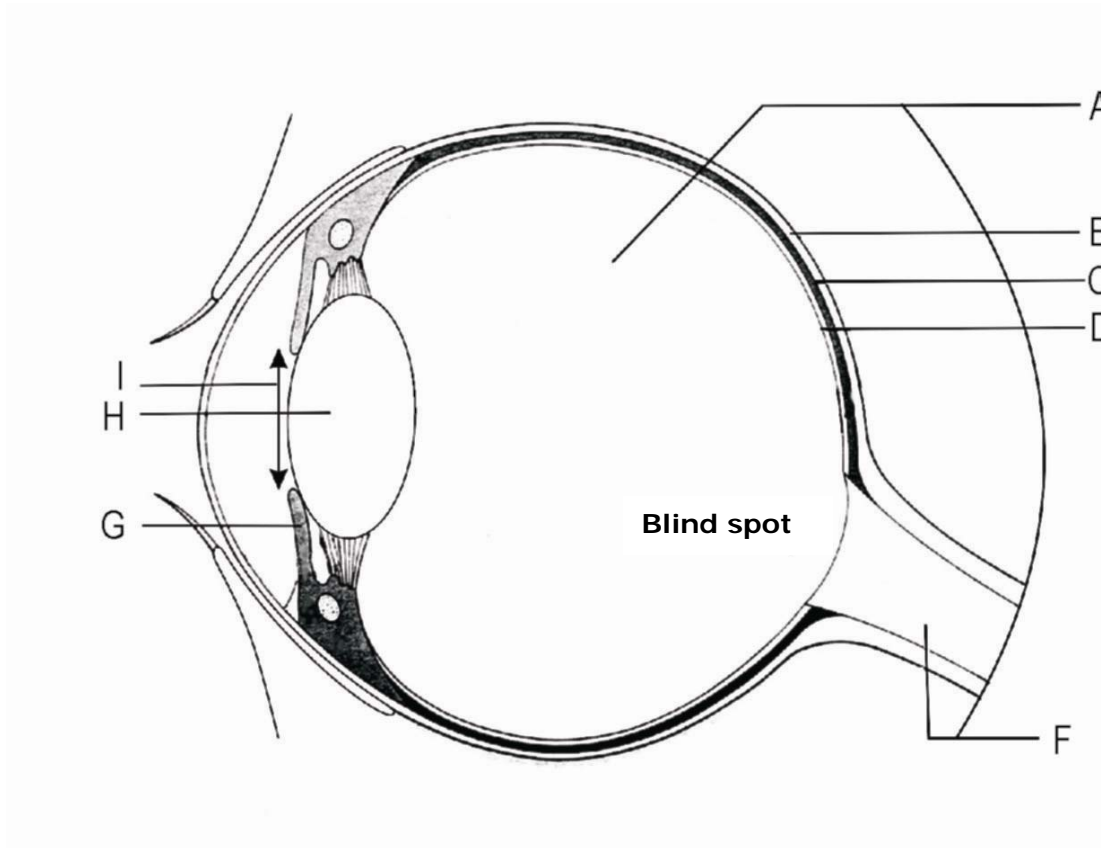
- 2.3.1 Malaria is an organism which relies on humans for its survival. What do we call such an organism? (1)
- 2.3.2 Explain the following terms: (3)
- protist
 - vaccine
 - antibodies
- 2.3.3 Plasmodium destroys red blood cells. What effect could this have on the body? (2)
- 2.3.4 Use the information provided to carefully explain why sexual reproduction in Plasmodium makes the production of vaccines difficult. (3)

- 2.3.5 The drug Larium is used to treat malaria. It limits entry of the malaria cells to the liver. Explain why it is a successful treatment for the disease. (3)
- 2.3.6 It is claimed that malaria has killed more humans than any other disease. One way to get rid of malaria is to spray DDT, an insecticide that kills mosquitoes, onto the resting places of these insects. However, this has a negative effect on many food chains. If you were a health official in malaria infested area, how would you make a choice as to whether to spray DDT or not? (6)

40 marks

QUESTION 3

3.1 The diagram below shows a section through a human eye. Use the information provided to assist you in answering the questions that follow.



Write down the letter of the structure which:

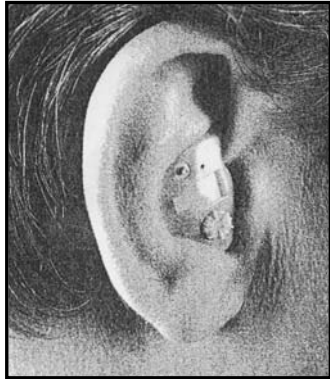
3.1.1 Converts light rays into nerve impulses.

3.1.2 Carries nerve impulses to the brain. (2)

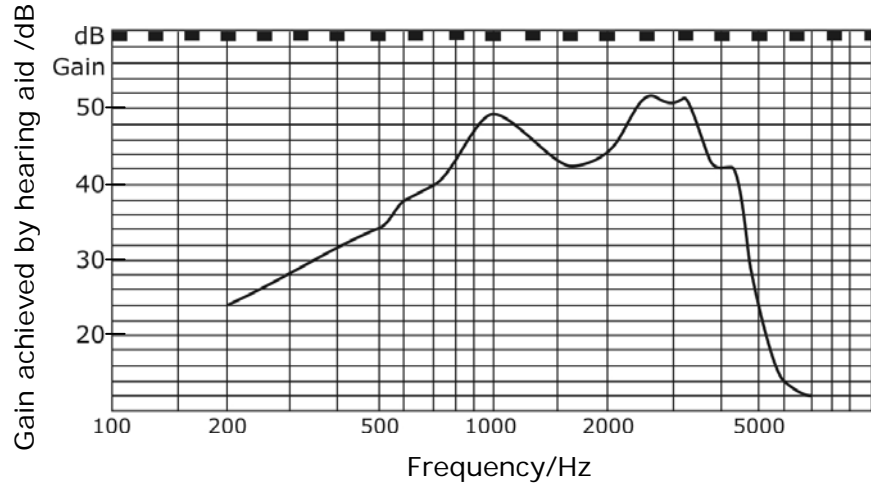
3.2 There are two responses of the eye to light rays entering it. Describe the changes that structures I and H make to these light rays and explain why these changes are necessary. (6)

3.3 Design an experiment you could conduct in the school laboratory to investigate the pupillary reflex. Use the headings; hypothesis, aim, method. Do not include results or a conclusion as you have not done the experiment. (8)

3.4 Use the information below about two types of hearing aid to answer question 3.4.1 and then answer questions 3.4.2 to 3.4.4 about the ear using your own knowledge.



An intra-aural hearing aid in position inside the ear.



Graph showing the gain in hearing achieved at different frequencies by a high performance post-aural hearing aid in its normal position behind the ear with the volume control turned right up.

The normal range of speech varies from 1000 to 3000 Hz.

dB = unit in which sound is measured.

[Adapted from *Biology: Principles and Processes*; Roberts, Reiss and Monger]

- 3.4.1 Where will the post-aural hearing aid be attached?
 Now analyse this graph. How useful do you think this post-aural hearing aid will be to a school pupil during his lessons? (5)
- 3.4.2 Name the exact part of the inner ear that converts sound waves into nerve impulses. (1)
- 3.4.3 Name the part of the ear that separates the outer ear from the middle ear. (1)
- 3.4.4 Name the part of the brain that interprets the impulses received from the sound receptors. (1)

24 marks

QUESTION 4

Read the following extract which is adapted from *The people's guide to useful plants in South Africa* by B E van Wyk and N Gericke.

Cannabis sativa (Cannabinaceae) – *Dagga* (Afrikaans); *marijuana* (English); *umya* (Xhosa); *matokwane* (Sotho); *nsangu* (Zulu).

Dagga is an erect herb of up to four metres in height. The leaves are very characteristic. They are divided into several leaflets with toothed margins. Subsp. *indica* has large quantities of chemicals called cannabinoids and is used as a medicine and mood-altering drug. The sticky female flowering tops and leaves are the parts usually used, as these have the highest concentration of substances which affect the nervous system.



Dagga plant (*Cannabis sativa*)

The earliest record of the use of *Cannabis* as a medicine is in a Chinese pharmaceutical book dated 2737 BC. It is believed to have been introduced to Africa by Arab traders. In spite of strict laws to suppress its use, *dagga* is widely smoked in southern Africa to induce a feeling of relaxation and well-being. Sometimes smoking *dagga* can, however, produce a severe mental disturbance.

Smoking *dagga* can cause bronchitis, bronchial tumours, and have negative effects on learning and short-term memory. Scientists are uncertain whether using *dagga* leads to the use of more dangerous drugs. The plant is used in indigenous medicine as a remedy for asthma, bronchitis, headache, migraine, eye problems and nausea from chemotherapy, for improving appetite in patients with cancer, AIDS and anorexia nervosa and for reducing muscular spasms in multiple sclerosis. The chemicals called tetrahydrocannabinols are the main ingredients in *dagga*. These chemicals have been found to act on specific receptors in the brain.

South Africa's illegal *dagga* crop is an important part of the rural economy, estimated to be worth at least R10 million a year.

- 4.1 Which part of the human body is mostly affected for a drug to have a mood altering effect? (1)
- 4.2 Which part of the plant should be harvested to ensure the highest concentration of the active ingredients? (1)
- 4.3 Imagine that you are a medical researcher. Use the information in this extract to get money to carry out trials on the benefits of the chemicals found in *Cannabis sativa*. Write your motivation in the form of four well supported reasons. (8)
- 4.4 Cannabinols slow down the transmission of nerve impulses at the synapses.
- 4.4.1 What is a synapse? (2)
- 4.4.2 Carefully explain the negative effect of cannabinoids on a reflex action. (4)

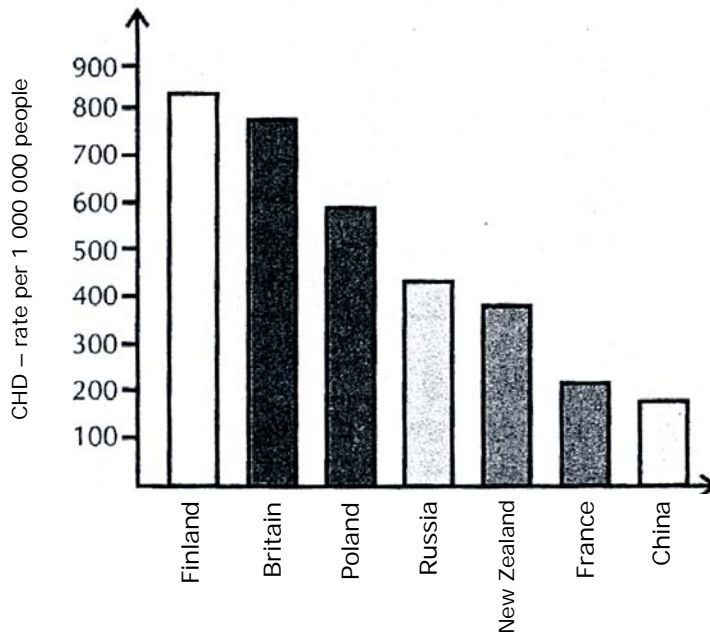
16 marks

Total for Section B: 80 marks

SECTION C

In humans, Coronary Heart Disease (CHD) occurs when not enough oxygen gets to the heart so it cannot function effectively. If the blood supply to an area of the heart is cut off then the heart muscle cannot respire and stops working. This causes a heart attack and can result in death.

This graph illustrates the difference in death rate from CHD in seven different countries.



Use the information provided and your knowledge of Life Sciences to answer the following question.

Imagine you are a Chinese Health official. Write a report for the Finland government authorities, who are not all medically trained people, which will help them develop a programme to reduce the high death rate due to CHD in their country.

In your report it will be useful to include the following:

- The important functions of a healthy heart
- Why people die from heart attacks
- Reasons relating to lifestyle, diet, genetics and others that could possibly account for the low occurrence of CHD in the Chinese people.

20 marks

Total for Section C: 20 marks

GRAND TOTAL FOR SECTIONS B AND C: 100 MARKS