GRADE 11 EXEMPLAR PAPERS

LIFE SCIENCES: PAPER I

Time: 2½ hours 150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This paper consists of 14 pages. Please check that your question paper is complete.
2. This paper consists of three sections.
3. Section A consists of short questions. Answer these on the question paper in the spaces provided.
4. Answer the questions to Sections B and C on the foolscap paper provided.
5. It is in your interests to write legibly.

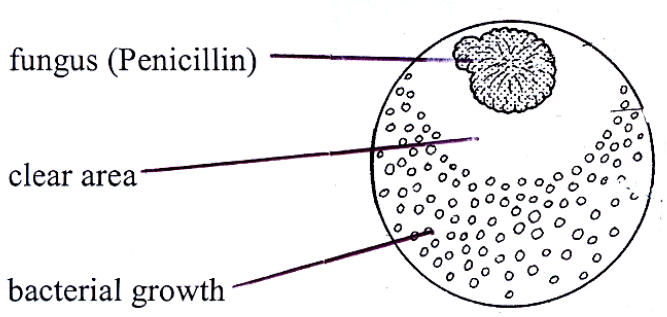
SECTION A

Answer the questions in this section in the spaces provided on this paper.

QUESTION 1

1.1 Penicillin was discovered by a scientist called Alexander Fleming in 1928 while he was working with bacteria growing on a nutrient medium (agar). He noticed that on one of the plates there was a fungal growth. Around this fungal growth, was a clear area where no bacteria were growing. (See the diagram below). The bacteria had been affected by 'something' that had been released by the fungus. The fungus was identified as *Penicillium* . Tests showed that *Penicillium* was not toxic to humans and could be used to treat bacterial infections.

Fleming's famous plate



1.1.1 Give the generalised term used for medicines such as penicillin that kill off bacterial infections.

_____ (1)

1.1.2 Name TWO diseases that can be treated by using penicillin.

_____ (2)

1.1.3 Some bacteria have become resistant to penicillin. Explain this statement.

_____

_____ (2)

1.1.4 In some areas of South Africa today, TB medications are not curing some patients of this crippling disease. The TB bacteria are resistant to TB drugs. One way that encourages TB bacteria to become drug resistant is because the patient does not complete the full course of medicines that the doctor prescribes.

(a) Why do you think this is the case?

_____

_____ (2)

(b) What recommendations would you give a TB patient about taking their medication?

_____

_____

_____ (3)

1.1.5 Explain one way in which our blood system can protect us against being infected by the TB bacteria.

_____

_____

_____

_____

_____

_____ (6)

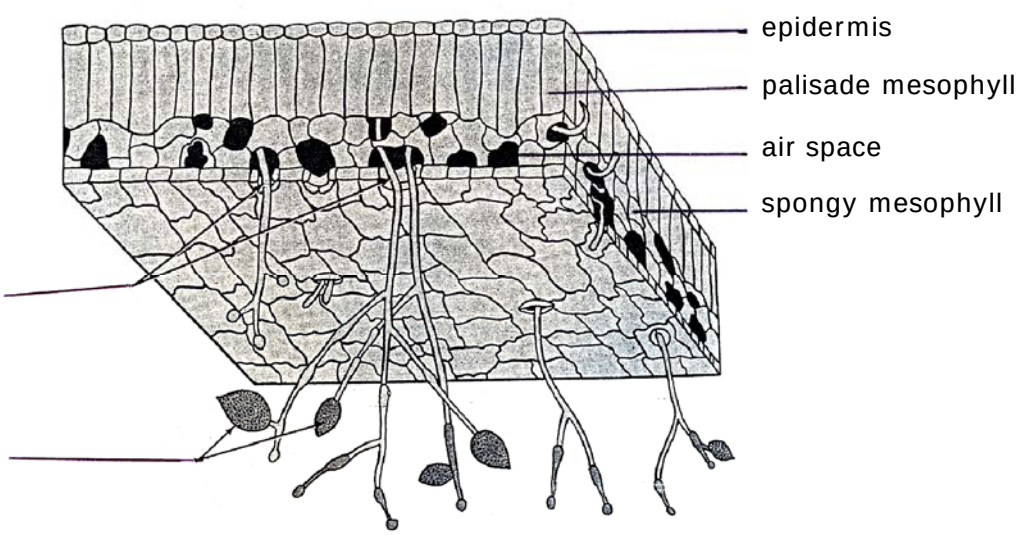
[16]

1.2 A fungus *Phtophthora infestans,* causes a severe disease called late blight in potato plants. It not only kills the leaves of the plant but it also attacks the tubers causing them to rot in the soil. This fungal disease changed the course of history in Ireland between 1843 and 1847 when the weather conditions were just right for the growth of this fungus. This resulted in a large scale food famine. Potatoes were the staple diet of the poor people and a quarter of a million people died.

During this time over a million Irishmen immigrated to New York City.

Study the diagram below of a section through a leaf and the fungal threads (*Phtophthora infestans*) growing in the leaf.

Diagram to show the growth of potato blight on a potato leaf



1.2.1 Write in the two missing labels above. (2)

1.2.2 Explain why this fungus is a parasite.

_____

_____ (2)

1.2.3

(a) In which plant tissue do you think the rhizoids are embedded?

_____ (1)

(b) Give a reason for your answer in 1.2.3 (a) above.

_____

_____ (2)

1.2.4 What weather conditions would have encouraged the growth of this fungus?

_____

_____ (2)

[9]

1.3 The data in the table below are results of an investigation into the efficiency of a male athlete's heart rate during exercise and the amount of blood pumped from his heart per minute as his heart rate changed.

Heart rate (beats per min)	55	80	120	150	170
Cardiac output (cm^3 per min)	4000	5200	600	5800	4600

1.3.1 Circle the letter of the statement below which is the correct interpretation of the data:

A His heart rate and cardiac output doubled during exercise
B His heart rate had little or no effect on the output of his blood
C As his heart rate increased, the volume of blood output with each beat decreased as time went on
D The faster his heart beat, the more blood it pumped out each minute (2)

1.3.2 How is the efficiency of the male athlete being measured?

_____ (2)

1.3.3 Name the independent variable in the investigation above.

_____ (1)

1.3.4 Name TWO variables that would have to be kept constant during this investigation.

_____

_____ (2)

1.3.5 Give another term for 'beats per minute'.

_____ (1)

1.3.6 Explain how the beats per minute are measured in this investigation.

_____

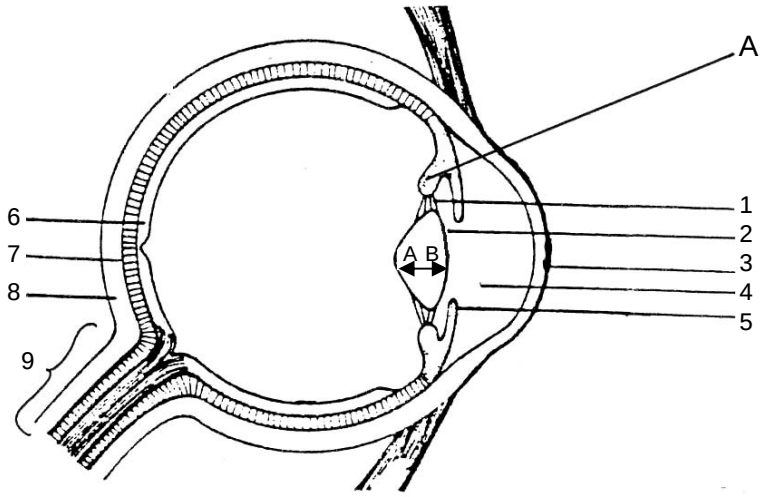
_____

_____

_____ (4)

[12]

1.4 Study the diagram below.



1.4.1 Provide labels for the following parts:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ (5)

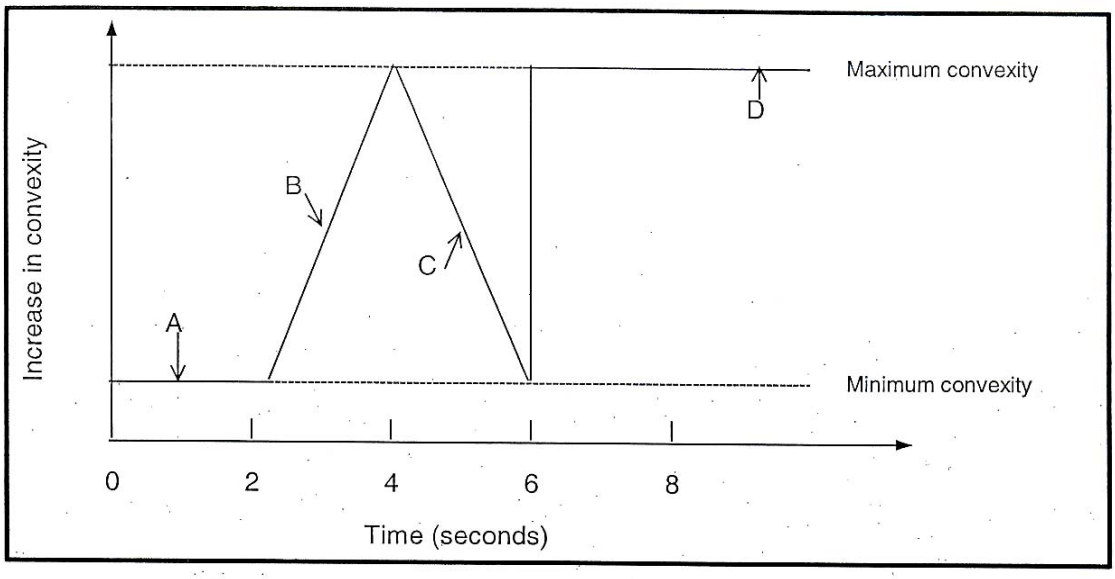
1.4.2 Give the numbers of the parts that contain pigment _____ (2)

1.4.3 Explain what would happen to the person's vision if the muscles in the part labeled A were paralysed?

_____

_____ (3)

1.4.4 The graph below shows changes in the convexity of the lens as different objects are viewed.



Write down the letter of the part of the graph that shows the lens under the following conditions:

(a) Looking at an object 30 cm from the eye _____

(b) Watching an object as it moves away from the eye _____

(c) Looking at an object 12 m from the eye _____ (3)

[12]

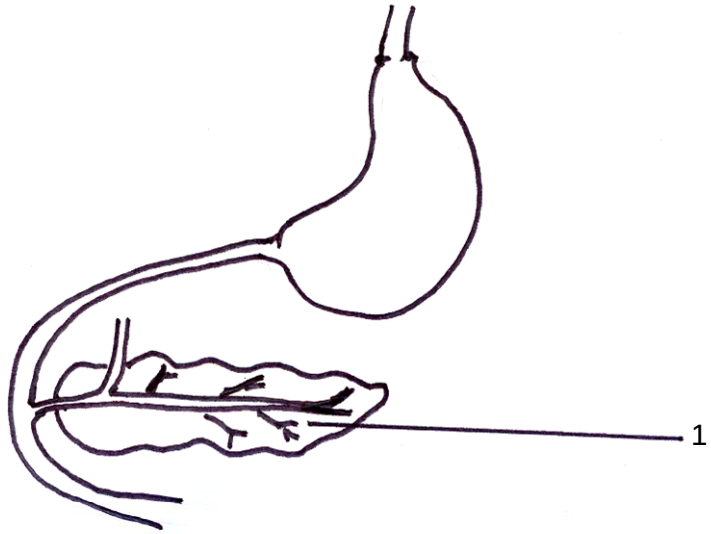
Total for Section A: 50 marks

SECTION B

Write the answers to this section on the paper provided

QUESTION 2

The diagram below shows part of the human digestive system.



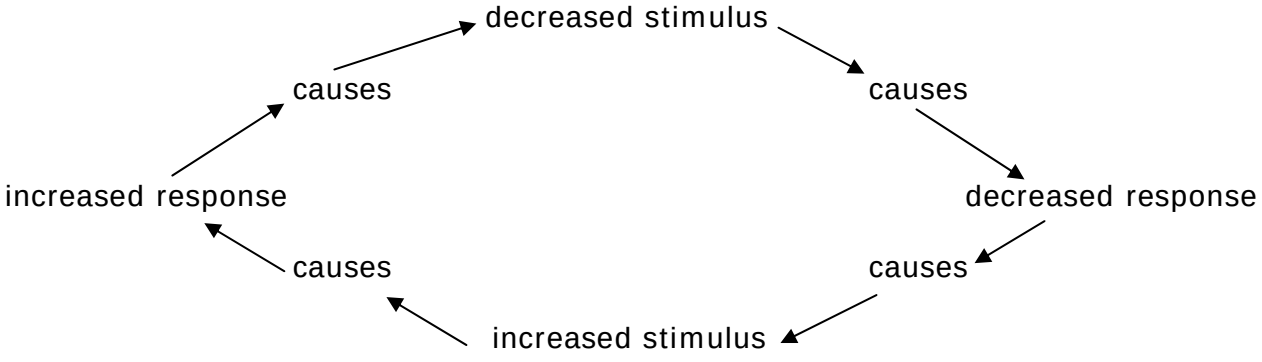
2.1 Name the organ labeled 1. (1)

2.2. Name two hormones that are made and released by this organ. (2)

2.3. Explain the difference in meaning between the following two terms:

2.3.1 secretion
2.3.2 excretion (4)

2.4. The flow diagram below shows the principle of 'negative feedback' which keeps the balance of materials in the body constant.



2.4.1 In your own words, explain what is meant by 'negative feedback'. (4)

2.4.2 Using the flow diagram above as a guide, draw and label your own flow diagram to explain the negative feedback of the two hormones that are released by the organ labeled 1. (5)

2.5 Some people suffer from a condition called diabetes melitus. Describe this condition. (3)

2.6 Read the following:

> Diabetes often develops in older people because their insulin producing cells do not make and release enough insulin. These people need to be given insulin. As the expected life span of people increases the demand for artificial insulin is likely to increase in the future. Thanks to biotechnology this demand can be met.
>
> Man's advancement in genetic engineering has meant that large amounts of insulin can be produced using bacteria or yeast. The gene that codes for the protein, insulin, is found in insulin producing cells. Various enzymes are used to cut this gene out of the human chromosome and insert it into the chromosome of a bacterial or yeast cell. When the bacteria or yeast reproduce they also produce insulin. The bacteria or yeast is placed into a fermenter and the organisms are allowed to grow into large populations thus producing large amounts of insulin. The insulin is drained from the fermenter and bottled for human use.

2.6.1 Why do you think yeast or bacteria are used to produce insulin? (2)

2.6.2 Using the information in the text given above draw a flow diagram to summarise the information given about the making of insulin. (5)

2.6.3 Do you think that the life of elderly people suffering from diabetes mellitus should be extended by giving them artificially produced insulin? Give reasons for your answer. (6)

[32]

QUESTION 3

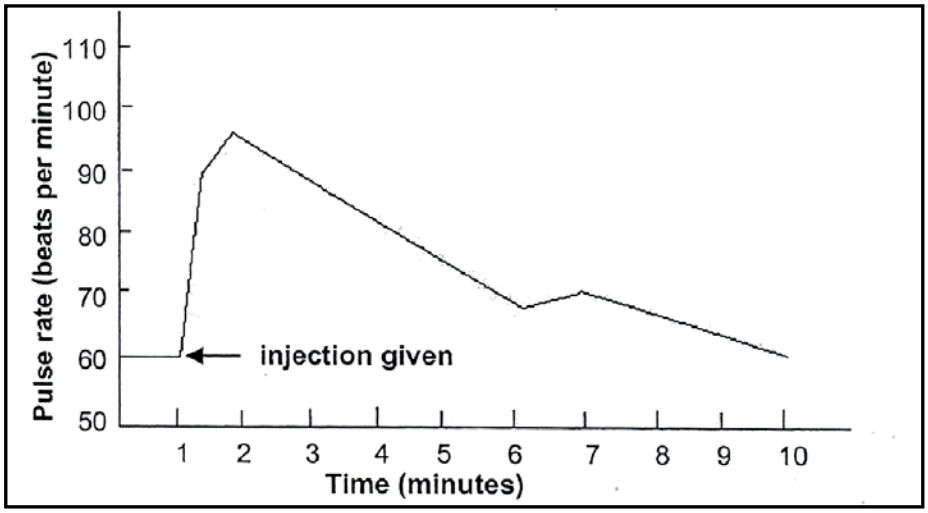
3.1 A virus is known as an 'obligate parasite'. What does this mean? (2)

3.2 To date man has not yet found a cure for any diseases that are caused by viruses. Immunisation however, does help prevent us getting some of the viral diseases. Explain how the immunisation polio drops given to babies prevent polio developing in that person. (6)

[8]

QUESTION 4

An injured person was injected with adrenalin intravenously (into the vein). The graph below shows the changes that occurred in the pulse rate of this person after the injection was given.



4.1 Why did the adrenalin cause an increase in pulse rate? (1)

4.2 Give 1 reason why it is necessary to ensure that the pulse rate of a person does not become too low. (2)

4.3 By how much had the pulse rate increased one minute after the injection? (Show how you calculated this) (3)

4.4 Explain why the pulse rate increased and then decreased again. (4)

4.5 Explain why the adrenalin was injected into the venous system and not into the muscles. (3)

4.6 When people are injured and suffer from shock, their blood pressure often drops. By referring to the structure of blood vessels, explain what could cause this. (3)

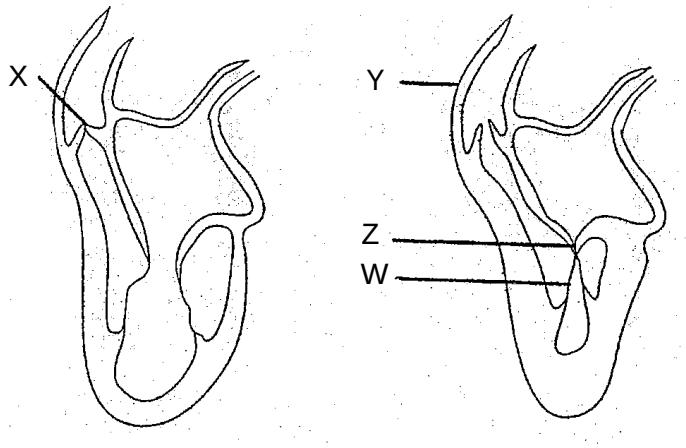
4.7 Describe two other effects the adrenalin injection would have had on this patient (2)

[18]

QUESTION 5

The diagram shows only the **left** side of the heart at two stages in a cardiac cycle.

Diagram A **Diagram B**



5.1 Name the structures labeled W, X and Z. (3)

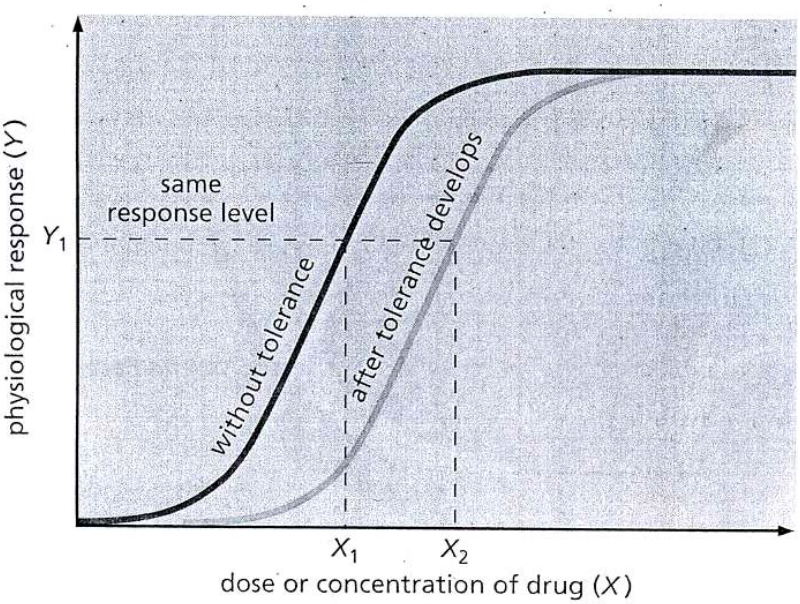
5.2 Describe 2 visible pieces of evidence which indicate that the ventricle in Diagram B is in systole. (4)
[7]

QUESTION 6

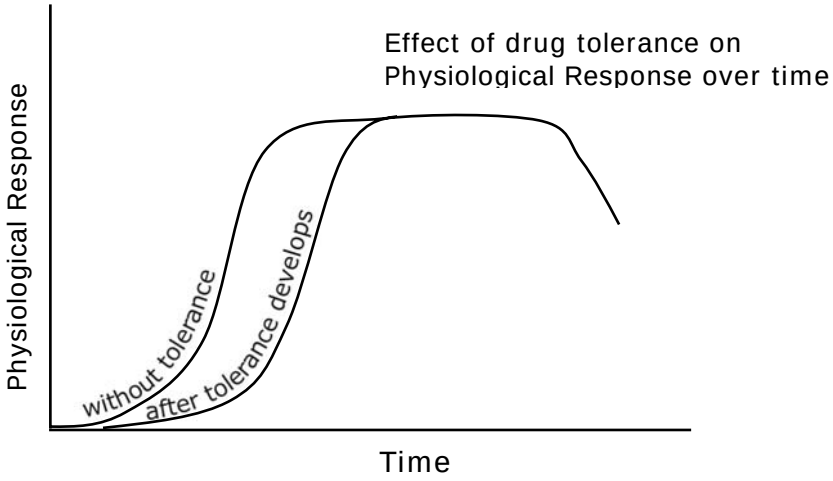
Drugs that affect the Central Nervous System compete with the body's own neuro-transmitters in the "pleasure centres" in the brain. Long term use of these addictive drugs decreases the number of receptors on the nerve cells so that the "pleasure centres" of the brain are only stimulated when the drug abuser is taking drugs and no longer by the experiences that used to be pleasurable. Addictive drugs produce tolerance in the body. This means that the drug addict must keep taking larger amounts of the drug to experience the same effect. The increasing doses needed to produce the sensations of pleasure may become toxic (poisonous) or lethal (i.e. they may kill the person).

Study the graphs below which show the effect of drug tolerance on the dose-response curve.

Effect of drug tolerance on the dose-response curve. A higher dose (X_2) is required to produce the same response after drug tolerance develops.



Graph showing the effect of drug tolerance on the physiological response in a person over time



Tolerance to drugs develops partly because the drug causes the liver to increase its production of certain enzymes. These enzymes break down the drugs so that the rate at which they are removed from the body increases with use. Drug tolerance is also caused because the drug decreases the number of receptors on nerve cells. Drug tolerance also means that there is an increase in the amount of the drug needed to produce a response. Heroin produces these changes in the brain within a week of daily use. More frequent use causes a higher level of tolerance to develop. Some drugs can cause permanent damage to receptors and therefore tolerance to these drugs becomes permanent.

6.1 What is the function of neurotransmitters? (2)

6.2 Some well-meaning people suggest that drug addicts should be given "all the drugs they want" to keep them off the street. Which two biological reasons are given in the text that suggest that such an approach would not work? (2)

6.3 The graphs show another effect of tolerance which would cause an addict to take drugs more often. What is this effect? (1)

6.4 By referring to information given in the text explain why drug-addicts seldom get pleasure from things that used to stimulate the pleasure centres in the brain. (1)

6.5 For what 2 purposes other than "giving pleasure" are drugs used? (2)

6.6 List two negative effects that illegal drugs and drug addiction have on society. (2)

6.7 "Many American people believe that there should be a "*quick fix*" for any of "*life's pains*" that they might experience. This belief may contribute to the enormous number of drugs both *legal and illegal* that they take". Using the words in *italics* as a focus, explain what is meant by these two sentences. (5)

[15]

Total for Section B: 80 marks

SECTION C

The following information has been adapted from a report in the Sunday Tribune newspaper: October 2006

If an animal virus contains RNA it is called a retrovirus. The HI virus (HIV) is a retrovirus. Along with its RNA the virus injects an enzyme called reverse transcriptase into the host cell. This enzyme produces viral DNA from viral RNA. By inserting this DNA into the host cell's DNA, the virus is able to make copies of itself many times. The new viral particles escape from the host cell and infect other cells.

Antiretrovirals (ARVs) are drugs that prevent reverse transcriptase from working to convert viral RNA to viral DNA.

Ann Smith (30) and Zolani Mente (28) have been living with HIV for years, yet each is dealing with the illness differently.

Mente, who discovered his status in 2002 has been taking antiretroviral drugs since 2005 and they are working for him. His CD 4 cell count (CD 4 cells are the cells in the immune system that help to fight the virus) has increased by 263 in a year and his viral "load" has decreased.

Smith also has a success story, except hers does not involve drugs. She takes a tonic made up of lemon, olive oil and water and eats garlic and ginger every day. She also follows a healthy diet. She was put onto ARVs when she was first diagnosed as being HIV+ but her condition deteriorated. Her liver became inflamed and she was really not doing very well as she suffered from a condition known as lactic acidosis. Smith then started using the tonic, developed by Dutch nurse Tina van der Maas, and improved her nutritional programme. She hasn't looked back since. Her CD 4 cell count showed an improvement of 80 in a year. Her viral "load" has also decreased. I asked Smith whether she would take ARVs again. She replied that the drugs would be her last option. She believes good nutrition will keep her from having to make that choice.

Smith and Mente seem to be living proof that there is no single solution to HIV/AIDS.

Imagine that you are counselling a person who has recently been diagnosed as being HIV+. This person knows nothing about the disease. He has heard about ARVs and that there are nutritional alternatives which can be used to treat his condition but knows nothing about either form of treatment.

With reference to information given in the text (but without using the same words) and your own knowledge about the immune system and viruses, provide the person you are counselling with as much information as you can about

- what HIV is
- how it is contracted
- the effects of HIV infection on the body and the patient's life

Advise the person on what method you believe is best to treat the disease, giving reasons why you prefer this method of treatment above any other.

Total for Section C: 20 marks

Total: 150 marks