



NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2009

LIFE SCIENCES: PAPER II

Time: 2 ½ hours

150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 11 pages and a yellow booklet attached to the middle of your question paper. Please check that your question paper is complete. Detach the yellow booklet from the middle of your question paper.
 2. Question 1 must be answered in the yellow booklet. Questions 2, 3, 4 and 5 must be answered in your Answer Book.
 3. Read the questions carefully.
 4. Number the answers exactly as the question is numbered.
 5. Use the total marks that can be awarded for Questions 1, 2, 3 and 4 as an indication of the detail required.
 6. It is in your own interest to write legibly and to present your work neatly.
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QUESTION 2

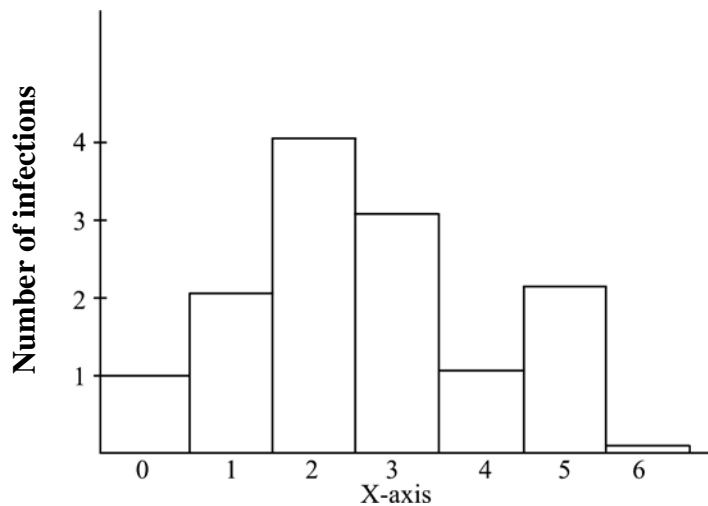
2.1

A group of students read the information on a packet of honeybush tea that they had bought from a supermarket. It claimed that for many centuries people had drunk the sweet fragrant tea made from the honeybush plant growing wild in the Cape mountain regions of South Africa. The packet said that the tea helps the immune system to fight infection. The students researched the honeybush plant and read that chemists had found flavonoids in the tea. Indigenous knowledge of the local traditional healers maintained that the tea stimulates milk flow in lactating mothers.

2.1.1 In a brief sentence, state how the:

- (a) chemists' knowledge; and
- (b) indigenous knowledge was probably obtained. (2)

2.1.2 The following graph shows the results of a survey in which the number of infections a group of people had over a period of six months was plotted against the number of cups of honeybush tea drunk in a day by 10 people.



Graph showing number of infections vs number of cups of honeybush tea drunk

- (a) Provide a label for the X-axis. (1)
- (b) How many cups of honeybush tea were drunk per day where the person has only ONE infection? (2)
- (c) What conclusion can be drawn from this survey? (1)
- (d) Apart from repeating the experiment, suggest TWO improvements to this investigation that would make the results more reliable. Use information given above to help you answer this question. (4)

- 2.1.3 (a) Describe how the honeybush species could be over-used as a resource. (2)
- (b) Suggest THREE ways in which the honeybush species can be protected from extinction. (3)

2.1.4 The students wished to scientifically investigate the relationship between drinking honeybush tea and lactation in humans.

- (a) What hypothesis would the students test? (3)
- (b) Mention TWO variables that need to be kept constant in this investigation. (2)

2.2

West Rand escapes the worst of cholera spread

The West Rand has not been affected too badly by the cholera epidemic, which has spread to South Africa over the last two months. The Director for Public Health, Baski Desai, explained that the cholera cases experienced so far are people who had travelled. He said the people were not catching cholera from the water in the Roodepoort area. Water sampling was taking place on an ongoing basis and so far the water in Gauteng had tested negative for cholera. Between 9 and 13 January there were 30 confirmed cases and of these three had died in the province. There were several areas of environmental concern such as stagnant water and unsanitary conditions (water polluted with human faeces) in informal settlements on the West Rand. Water would be tested regularly.

[Adapted: *Roodepoort Record*, 23 January 2009]

- 2.2.1 What is the environmental source of the cholera infection? (1)
- 2.2.2 How did Baski Desai know that Roodepoort residents were safe from cholera? (1)
- 2.2.3 The World Health Organisation (WHO) monitors the Zimbabwe cholera deaths on a daily basis. This particular epidemic began in August 2008. Some of the data is summarised in the table below.

| Day of monitoring | Cumulative number of infections | Increase in number of infections | Cumulative number of deaths | Increase in number of deaths |
|-------------------|---------------------------------|----------------------------------|-----------------------------|------------------------------|
| 0 | 13 960 | | 589 | |
| 4 | 16 141 | 2 181 | 775 | 186 |
| 21 | 29 097 | 12 956 | 1 565 | 790 |
| 22 | 30 365 | 1 268 | 1 608 | 43 |
| 52 | 60 401 | 30 036 | 3 161 | 1 553 |
| 60 | 67 945 | 7 544 | 3 371 | 210 |

[Information from: <www.news24.com>]

- (a) Draw a line graph to represent the WHO information in the last column of the table above. Graph paper is not required. Do not spend time plotting the data points accurately; only the trend is required. (6)
- (b) Suggest TWO basic hygiene measures to prevent cholera infection. (2)

30 marks

QUESTION 3

3.1 Read the extract below and answer the following questions.

Half of mammals 'in decline', says extinction Red Data List

Half the world's mammals are declining in population size and of these more than a third probably face extinction according to the latest update of the Red Data List (6 October 2008).

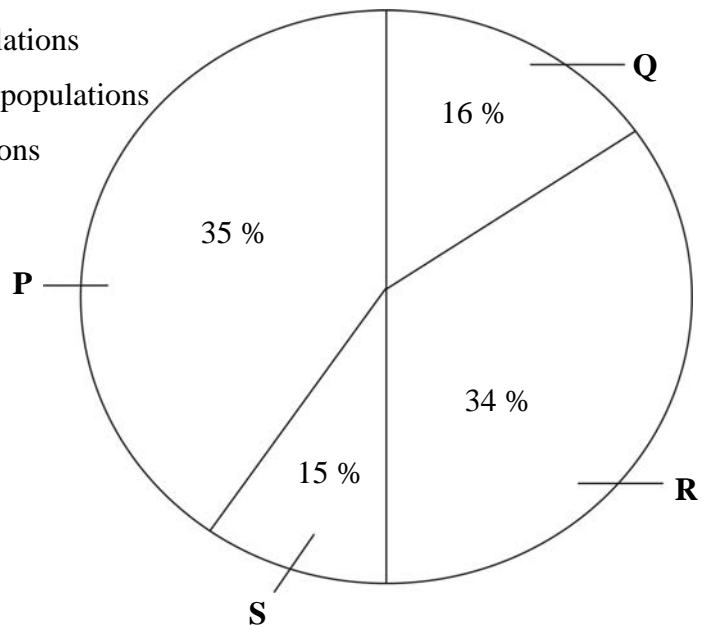
A comprehensive survey of mammals included in the annual report of the International Union of Conservation of Nature (IUCN), shows that a large number of the planet's 5 487 known mammal species are clearly at risk of disappearing forever.

Jan Schipper, IUCN scientist and author of the mammal survey, has said that the number of critically endangered animals could be higher since a further 836 mammal species (15%) have unknown threat status due to lack of data.

[Adapted from: <<http://afp.google.com/article>, January 2009>]

- 3.1.1 What is meant by a 'critically endangered species'? (2)
- 3.1.2 What is the purpose of the Red Data listings? (2)
- 3.1.3 The pie chart shows information from the extract above. Match the following categories of mammals to the letters (or combination of letters) on the pie chart. (4)

- (a) Declining mammal populations
- (b) Known healthy mammal populations
- (c) Unknown status populations
- (d) Critically endangered populations



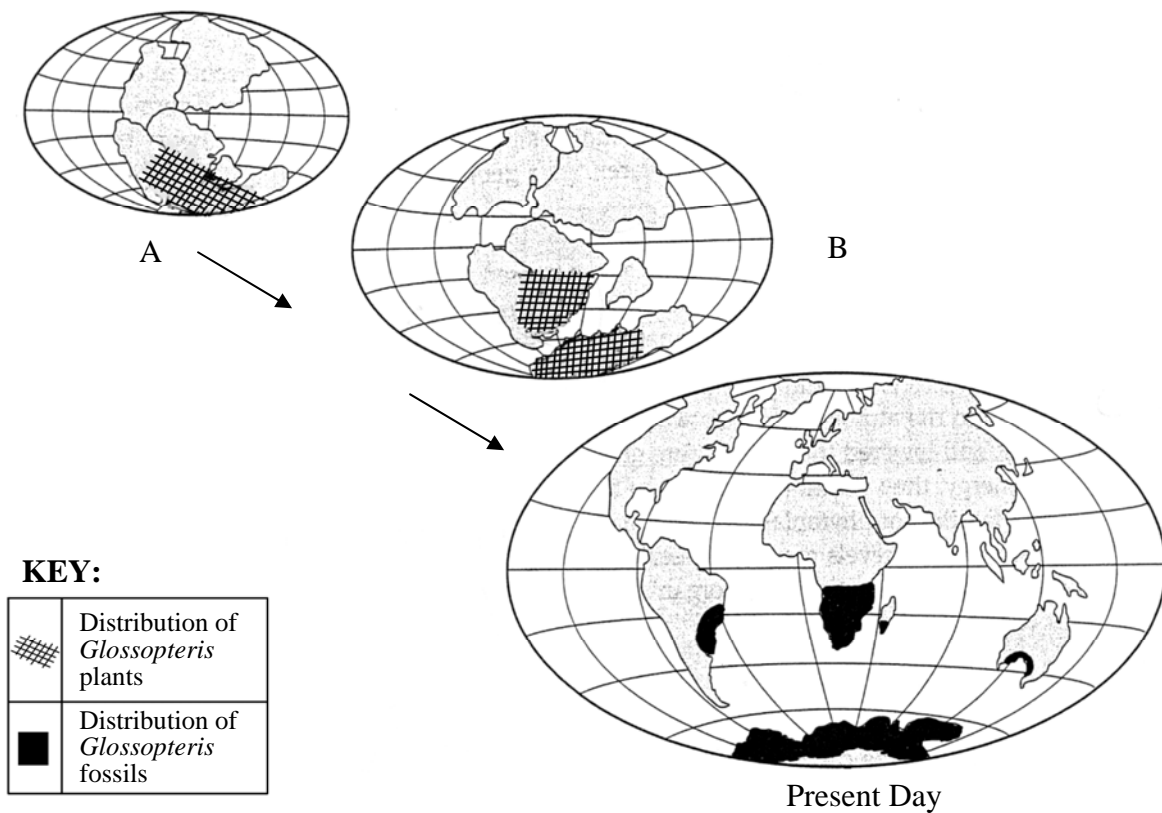
Pie Chart illustrating the survival status of mammals

- 3.1.4 Describe in what way the extract has changed your **attitude** towards mammals. Be sure to give your attitude before and after your reading. (4)
- 3.1.5 Compile a short plan of action that South Africans can support to stop the loss of mammal species in our country. (3)

3.2 Tay-Sachs is a fatal genetic disease in which the brain and nerve cells begin to degenerate about six months after birth. A sufferer usually dies before the age of five. Many South African Jewish people are descended from emigrants from Eastern Europe where the recessive gene for this disease (Tay-Sachs) originated. About 1 in 25 South African Jews now carry this gene.

- 3.2.1 Define 'inbreeding'. (2)
- 3.2.2 Give THREE effects of inbreeding on a population. (3)
- 3.2.3 Using the example above, explain how this gene increased in frequency in the South African Jewish population. (5)

3.3 Refer to the maps below and answer the questions that follow.



The Earth's Continents over the past 300 million years






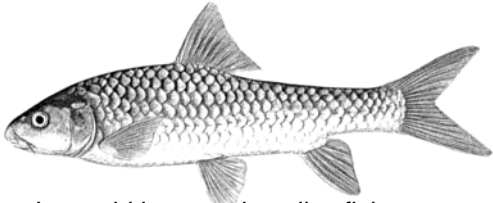

- 3.3.1 Between 500 and 300 million years ago continental material of the Earth united into a supercontinent shown in A. What is the name of this supercontinent? (1)
- 3.3.2 Name ONE of the large land masses in B. (1)
- 3.3.3 How do scientists explain the present day distribution of the fossils of *Glossopteris* plants? (3)

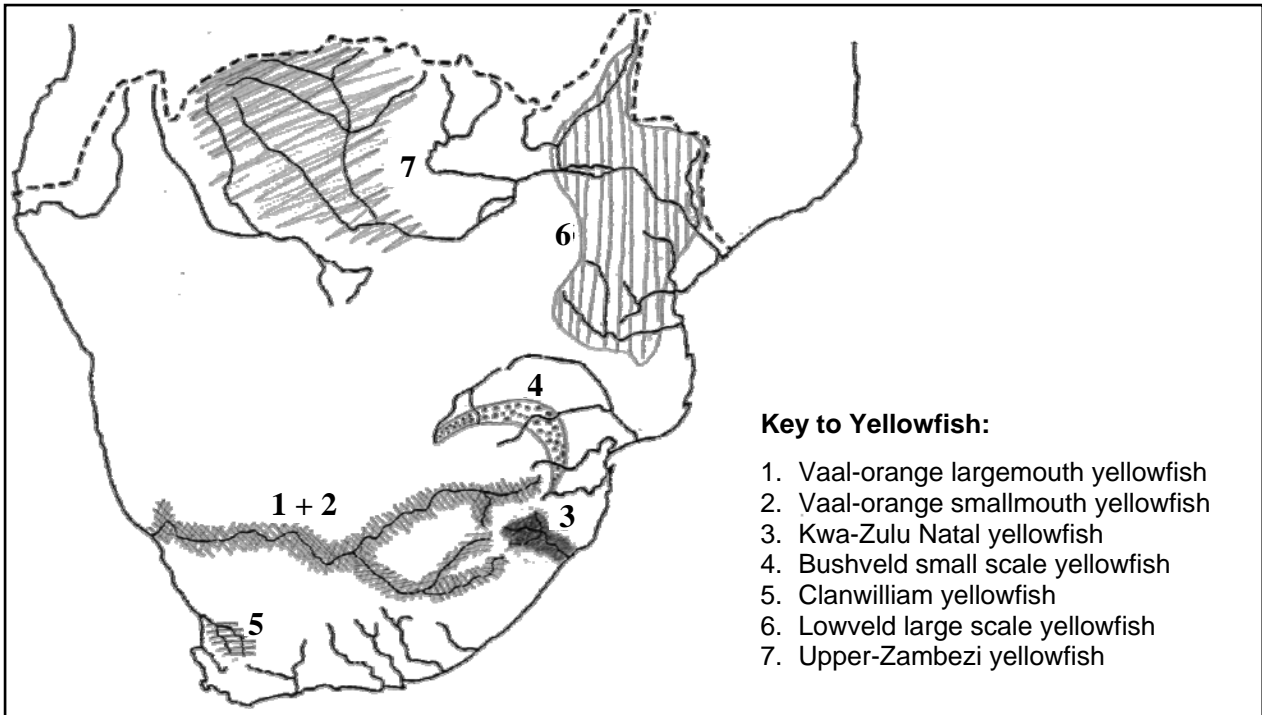
30 marks

QUESTION 4

The table provides information about seven different edible yellowfish species. The map shows the distribution of these fish species in Southern Africa.

Use the information provided to answer the questions that follow. (Pictures not to scale)

| Yellowfish Species – Common Name | Description |
|--|--|
| <p>1.</p>  <p>Vaal-orange largemouth yellowfish</p> | <p>Largest, scale-bearing, indigenous, freshwater fish. Vulnerable status. Carnivorous fish feeding on insects, crabs and other fish. Adults prefer flowing water in deep channels or below rapids. Live in dams. Breed in mid to late summer over gravel beds in running water.</p> |
| <p>2.</p>  <p>Vaal-orange smallmouth yellowfish</p> | <p>Omnivorous fish feeding on insects, clams, vegetation and algae. Adults prefer clear-flowing water of large rivers with sandy bottoms. Live in dams. Migrate upstream to breed in spring to mid-summer over gravel beds.</p> |
| <p>3.</p>  <p>KwaZulu-Natal yellowfish</p> | <p>Omnivorous fish. Found in a wide range of habitats including pools and rapids of clear streams. Breeds in summer.</p> |
| <p>4.</p>  <p>Bushveld smallscale yellowfish</p> | <p>Feeds on algae in winter and insects in summer. Found in cool water only above an altitude of 600 m. Breeds in spring and summer.</p> |
| <p>5.</p>  <p>Clanwilliam yellowfish</p> | <p>Vulnerable status. Omnivorous includes frogs and small fish in the diet. Breeds in summer migrating upstream.</p> |
| <p>6.</p>  <p>Lowveld largescale yellowfish</p> | <p>Omnivorous fish. Breeds in spring and summer.</p> |
| <p>7.</p>  <p>Upper Zambezi yellowfish</p> | <p>Lips often thickened.</p> |



Map showing distribution of the Southern African yellowfish species in Southern African rivers.

- 4.1 Explain what is meant by the term 'species'. (3)
- 4.2 The pictures show the structural features of yellowfish. Give **THREE** structural features the scientists could use when comparing their appearance. (6)
- 4.3 Find the distribution of the KwaZulu-Natal yellowfish and the Clanwilliam yellowfish on the map. Use this information to explain the probable way in which these species formed. (5)
- 4.4
- 4.4.1 Name the two fish species that live in the same river. (2)
- 4.4.2 What is the diet of these two fish? (2)
- 4.4.3 These two fish species live in the same area. Use the information from the table to suggest why they have not become one species over time. (4)
- 4.5 How could the preservation and resulting population growth of the yellowfish affect humans? (2)
- 4.6 Briefly describe an **example** of Darwin's theory of natural selection that you have studied. (3)
- 4.7 In what way is the evolution of the yellowfish similar to your example in 4.6? (3)

30 marks

QUESTION 5

Do you think local South African communities are aware of global warming and are doing enough about it?

Read the source material (A – F) on page 9 to 11 in order to help you add to your knowledge and respond to the question.

Select **only** the facts from the information given that will assist your answer, do not attempt to use all the material.

Provide a written response of not more than two pages explaining your decision and the reasons/motivation for it.

| |
|-----------------|
| 20 marks |
|-----------------|

QUESTION 5 RESOURCE MATERIAL

SOURCE A PUBLIC AWARENESS OF CLIMATE CHANGE

A world interest in climate change is growing. Public opinion is known to influence policies. The annual South African Social Attitudes Survey 2007 included the following question on climate change:

Have you heard of climate change or global warming?

The following responses were obtained:

People who had never heard of it: 27%

People who had heard about it but knew nothing about it: 27%

People who had heard about it but knew little about it: 28%

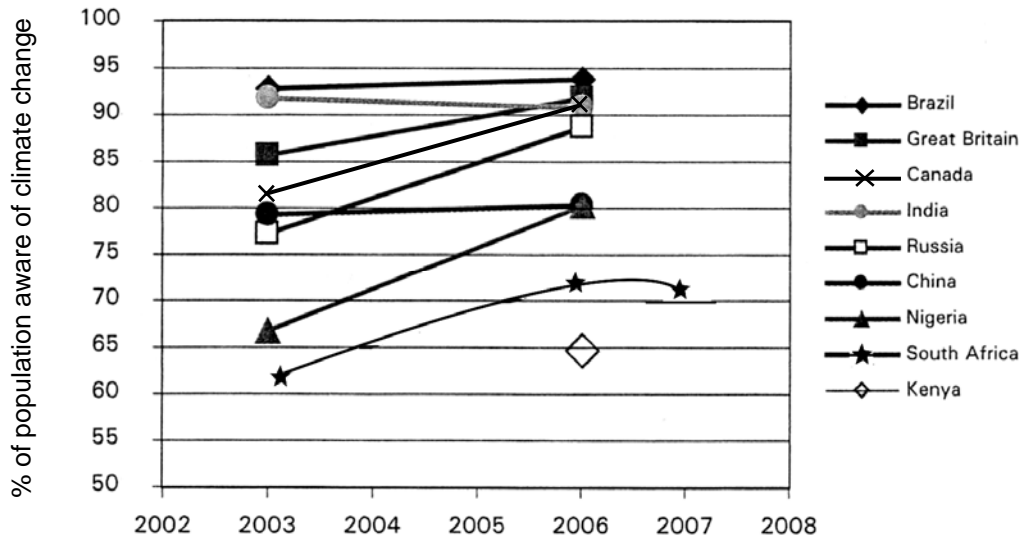
People who knew a fair amount about it: 12%

People who knew a lot about it: 6%

[Adapted from: *HRS Review*, September 2008]

SOURCE B INTERNATIONAL TRENDS

When compared with other countries, including developing countries, South Africans have a low awareness of the seriousness of climate change/global warming.



International trends in concern that climate change is a 'very serious' or 'somewhat serious' problem

[Adapted: Source: 2003, 2006: *GlobeScan Poll 1*; 2007: SASAS]

SOURCE C SOUTH AFRICAN GOVERNMENT RESPONSE

Carbon capture and storage

During the week of 30 July 2008, the Minister of Environmental Affairs and Tourism, Martinus van Schalkwyk, said a process know as carbon capture and storage would probably become compulsory for all new coal-fired power stations in the country. The technology was still being developed but these power stations would be expected to use it.

He also said that the government was considering a carbon tax on all businesses in an effort to reduce carbon emissions and so limit the effects of global warming.

[Adapted: <www.Southafrica.info>, January 2009]

Table: The satisfaction with SA government's responses to climate change

| Do you think enough is being done by SA government to take action on climate change? | Percent |
|--|---------|
| Cannot choose | 40 |
| Very satisfied with how much they are doing | 15 |
| Fairly satisfied | 16 |
| Fairly dissatisfied | 25 |
| Very dissatisfied | 4 |
| Total | 100 |

[HRS Review, September 2008]

SOURCE D PHOTOGRAPHS

Rubbish dump

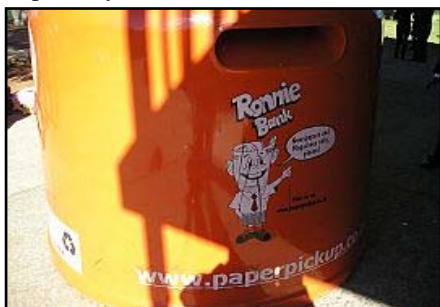


[<www.greencotton.worldpress.com>]

Wind generator



Paper recycle bin



[<www.johnmitchell.co.za>]

SOURCE E DIFFERENT BELIEFS

Only after the last tree has been cut down,
 Only after the last river has been poisoned, only after the last fish has been caught,
 Only then will we find that money cannot be eaten.

[Cree Indian Prophecy]

Live for today for tomorrow we die!

[English saying]

'So God created man ... male and female. He created them. Then God blessed them, and God said to them, "Have many children, so that your descendants will live all over the earth and bring it under their control. I am putting you in charge of the fish, the birds, and all wild animals".'

[Genesis 1: v 27 – 28, *Good News Bible*]

SOURCE F TWO UNIVERSITY STUDENT RESPONSES

It is a known fact that Milankovitch cycles, which refer to the changes in shape of the earth's orbit around the sun and the changes in the tilt and wobble of the earth as it rotates on its axis, combine to control the amount of sunshine that the earth receives and affects global climate. Ice ages and periods of global warming are part of earth's history. We are moving naturally into a warming time period. So humans really have little control over this whole climate change story.

[Personal communication]

Chemical cycles occurring in the earth's crust and oceans regulate temperature. If carbon dioxide is added faster to the atmosphere then it will be removed by the calcite deposition in the ocean sediments. This has happened before in the history of the earth – so what is all the media fuss over increased carbon?

[Personal communication]