NATIONAL SENIOR CERTIFICATE (NSC) EXAMINATION – 2009

MPUMALANGA DEPARTMENT OF EDUCATION

GRADE 12

LIFE SCIENCES PAPER 2

PREPARATORY EXAMINATION

Marks: 150

Duration : 2½ Hour

This question paper consist of 13 pages

INSTRUCTIONS AND INFORMATION TO CANDIDATES

Read the following carefully before answering the questions:

1. Answer ALL the questions.
2. Write ALL your answers in the answering book.
3. Start each question on a new page.
4. Number the answers according to the numeration system used in this question paper.
5. You will be penalised if you fail to adhere to the instructions on each question.
6. ALL drawings should be done in pencil and labels in blue or black ink.
7. Draw diagrams and flow charts ONLY when requested to do so.
8. The diagrams in this question paper may NOT necessarily be drawn to scale.
9. Graph paper may NOT be used.
10. Non-programmable calculators, protractors and compasses may be used.
11. Write neatly and legibly.

SECTION A
QUESTION 1

1.1 Various possible options are provided as answers to the following questions. Choose the correct answer and write only the letter (A – D) next to the questions number (1.1.1 – 1.1.5) in the ANSWER BOOK, for example 1.6 D.

1.1.1. Most scientists agree that the number of mass extinctions that have occurred in the history of life on Earth is …

3.
7.
6.
5.

1.1.2. According to the theory of continental drift, all the land masses were joined together to form one super-continent called …

A Gondwanaland.
B Pangaea.
C Eurasia.
D Laurasia.

1.1.3. The following conditions are proposed as being most favourable for fossil formation:
(i) Organisms should have a hard skeleton or shell
(ii) Micro-organisms must be present
(iii) The dead body must be covered by sediment fairly quickly
(iv) Little or no oxygen must be present

Which of the following combinations is correct?
A (i), (ii) and (iii)
B (ii), (iii) and (iv)
C (i), (iii) and (iv)
D (ii) and (iv)

1.1.4. Adding harmful substances to the atmosphere is called…..
A exploitation.
B pollution.
C deforestation.
D Fossilization.

1.1.5. Which of the following is a degradable byproduct? …
A rubber, glass, cow, manure
B plastic, metal, glass, grass
C grass cutting, cardboard, egg shells
D glass, wooden chair, old batteries

1.1.6. Which of the following may be reasons for the exploitation of the natural resources?

1. poverty and shortage of food
2. use of indigenous plants for medicinal purposes
3. use of heat to generate heat energy

A 1 and 3
B 1 and 2
C 2 and 3
D 1, 2 and 3

1.1.7 Pollutant gases have an adverse effect on the environment and our health. The amounts of these gases have been steadily increasing over the years. The table below shows the source and amount of some pollutant gases produced by human activities

POLLUTANT GAS	SOURCE	AMOUNT PRODUCED PER YEAR (MIILION OF TONNES)
Carbon monoxide	Vehicle exhausts	350
Sulphur dioxide	Burning coal and oil industry	200
Nitrogen oxide	Vehicle exhaust	55
Hydrocarbon	Vehicle exhausts industry	90

Which ONE of the following statements is correct?

A 150 million tonnes of nitrogen oxide is produced
B Carbon monoxide is produced by industry
C Sulphur dioxide is produced by vehicle exhaust
D Carbon monoxide is the gas produced in the largest amount

(7 x 2) **(14)**

1.2 Give the correct biological term for each of the following descriptions Write only the term next to the question number (1.2.1 – 1.2.7) in the answer book

1.2.1 Chemicals used to kill insects
1.2.2 The method used to determine the age of fossils
1.2.3 The simultaneous elimination of large numbers of species on a world wide scale
1.2.4 The term used to indicate the variety of living organisms on earth
1.2.5 The release of harmful substances into the environment
1.2.6 Development that meets the needs of the present without comprising the ability of future generations to meet their own needs
1.2.7 Carbon-based minerals such as oil and coal which release heat energy during combustion

(7 x 1) **(7)**

1.3 Choose an item from COLUMN II that matches a description in column I. Write only the letter (A-H) next to the question number (1.3.1-1.3.6) in the answer book for example 1.3.7 J

COLUMN I	COLUMN II
1.3.1 A study of the distribution of flora and fauna in different parts of the world	A palaeontology
1.3.2 Results from an increased carbon dioxide concentration in the atmosphere	B natural resources
1.3.3 Lung disease caused by a type of air pollution	C biotic factors
1.3.4 The study of fossils	D biogeography
1.3.5 A change in the structure of a gene	E dysentery
1.3.6 Food water and living space	F mutation
	G global warming
	H asbestosis
	I TB

(6 x 1) **(6)**

1.4 Study the passage below and answer the questions that follow ...

Charles Darwin

In 1831 Charles Darwin set out on a trip around the world in the HMS beagle. At the cape Verde Islands he saw the fossil remains of the sea creatures in the cliffs many meters above sea level. The unique forms of life he found on the Galapagos islands such as the giant tortoises convinced him that living organisms had evolved over many millions of years. He noticed that these tortoises were quite different from those found elsewhere in the world. Each island also had a distinct type of tortoise differing in the shape of the shell and mating behaviour.

1.4.1 Explain how Darwin would have used the example of the tortoises to explain speciation. (4)

1.4.2 How do fossils provide evidence for evolution? (2)

1.4.3 Give one reason why there are gaps in the fossil records (2)

(8)

1.5 Study the table below showing the amount of medical waste produced by three provinces over a number of years.

	Amount of medical waste (tonnes)				
Year	1995	1997	1999	2001	2003
Province A	357	398	410	426	450
Province B	283	290	300	312	330
Province C	230	240	245	270	290

1.5.1 Which province has shown the most rapid increase in the amount of medical wastes produced? (1)

1.5.2 What was the percentage increase of the medical waste produced by the Province named in Question 151 over the period 1995 to 2003? Show ALL workings. (3)

1.5.3 Give two negative effects of dumping medical waste. (2)
(6)

1.6 The dying of trees due to acid rain is brought about by changes in the pH of the soil. Tshepo observed that trees in his town were gradually dying. He decided to investigate the effect of acid rain on germinating beans seeds. He did the following:

- Placed cotton wool on 6 saucers
- Poured a solution with a different pH (varying from pH 2 to pH 7) onto the cotton wool in each saucer.
- Placed 50 bean seeds onto the cotton wool in each saucer
- Covered the seeds and left them on the shelf for a week

The following results were obtained:

pH	Number of germinating seeds
2	0
3	4
4	10
5	15
6	28
7	35

1.6.1 Name the independent variable in this investigation (1)
1.6.2 Name TWO ways in which the investigation could be improved to obtain accurate and valid results. (2)
1.6.3 Describe the relationship between pH and the number of germinating seeds (2)
1.6.4 Suggest three strategies that the government can use to help reduce the formation of acid rain. (3)
(8)

TOTAL SECTION A: [50]

SECTION B
QUESTION 2

2.1 Read the following passage and answer the questions that follow:

RESISTANCE OF MOSQUITO LARVAE TO AN INSECTICIDE

In a small city in the warm tropical lowlands, attempts were made to kill malaria-carrying mosquitoes by spraying all fresh water areas in the city with an insecticide called DDT. After a few years the situation became worse and they sprayed DDT on all freshwater areas within five kilometers of the city boundary.

A scientist became interested and collected 150 mosquito larvae from water within the city boundary (Sample A), 150 larvae less than 5 km from the city boundary (Sample B) and 150 larvae from the countryside 20 km away where no DDT had been sprayed (Sample C). He put all the larvae in clean water for 3 hours. He then prepared six solutions of DDT of various concentrations (see table) and put 25 larvae into each of the beakers of insecticide and left them for 24 hours. He then counted the number of living and dead mosquito larvae in each beaker and calculated the percentage of dead larvae.

His results are recorded in the table:

Concentration DDT (%)	Sample A Mortality %	Sample B Mortality %	Sample C Mortality %
0,00	0	0	0
0,25	4	17	24
0,50	7	34	47
0,75	12	68	82
1,00	24	84	100
1,25	36	85	100

2.1.1 According to the table, which of the three samples of larvae will be most affected by DDT? (1)

2.1.2 Which sample could be describes as most resistant to DDT? (1)

2.1.3 DDT is very expensive. What concentration would provide the best kill of larvae for the least cost in up to five kilometers from the city boundary? (1)

2.1.4 Give a reason for your answer in question 2.1.3. (2)

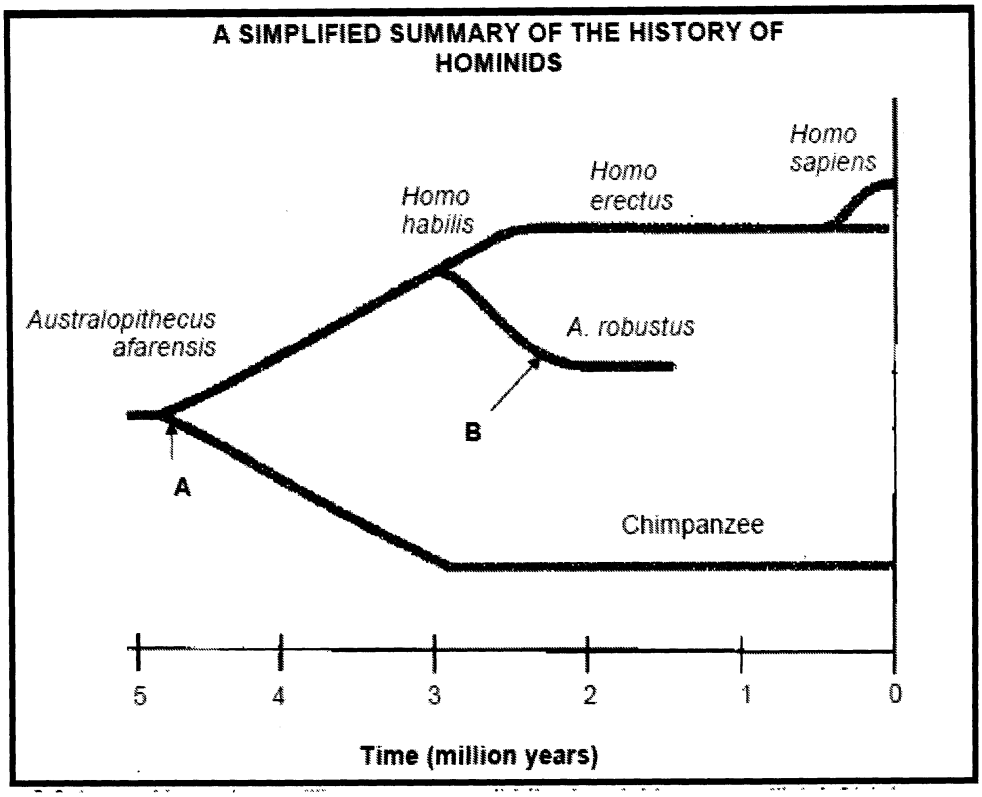
2.1.5 Draw 2 line graphs showing sample A and C on the same set of axes to illustrate the results. (11)

2.1.6 Suggest a reason for the presence of three apparently different populations of mosquitoes in such a small area. (2)

2.1.7 The city needs to kill mosquito larvae to control malaria. If you were the Environmental Officer, what would you suggest in view of these results? (2)

[20]

2.2 During the study of the fossil records the following timeline of hominids were constructed. Study it and answer the questions that follow.



2.2.1 How many years ago did the hominins split into two groups (label A) (2)

2.2.2 What does the branch labeled B signify in this family tree? (1)

2.2.3 What is the one single important characteristic that split the hominins into two groups at A? (2)

2.2.4 According to fossil records, which Homo species was the first to use simple tools? (1)

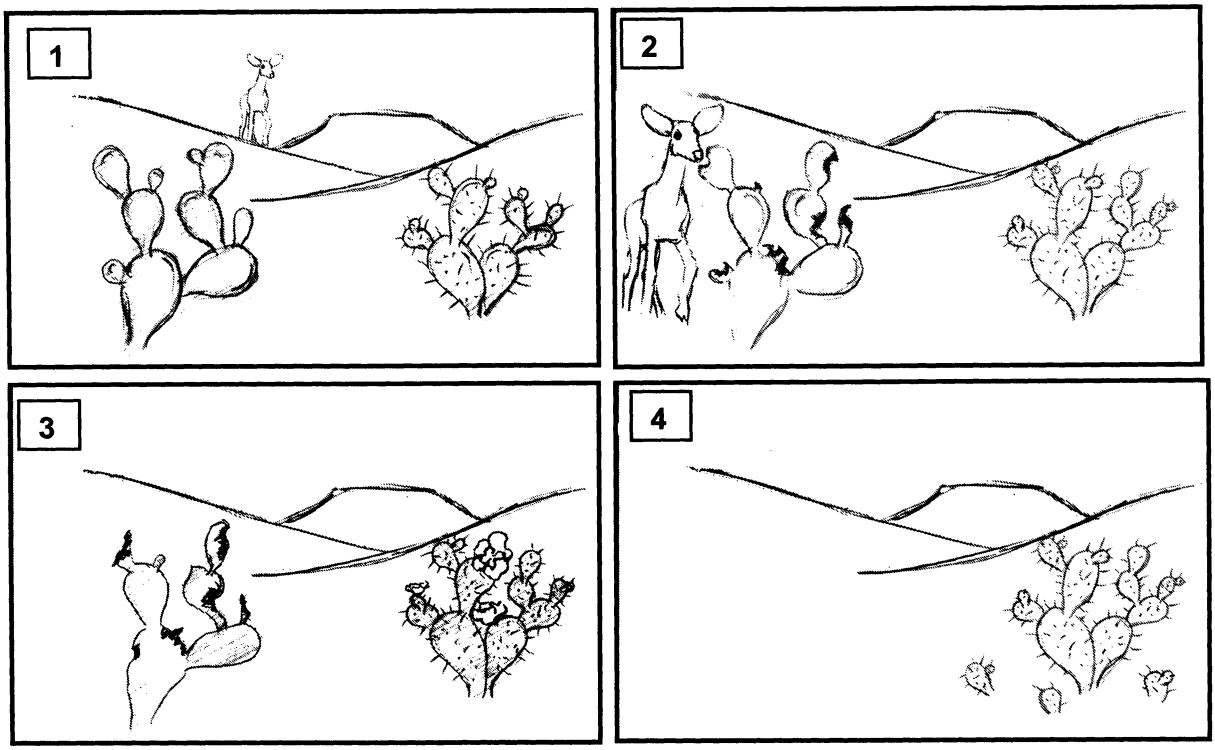
2.2.5 List two characteristics that primates and humans have in common (4)

(10)

TOTAL QUESTION TWO: [30]

QUESTION 3

3.1 Below is a series of pictures representing changes in a population of cacti over many generations. Study the pictures and answer the questions that follow



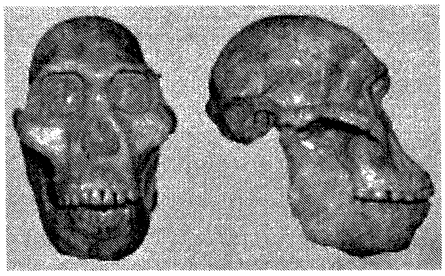
3.1.1 Name the mechanism put forward by Darwin to explain his theory of evolution that is illustrated in these diagrams. (2)

3.1.2 Use the diagrams above to explain the mechanism mentioned in QUESTION 3.1.1 (5)

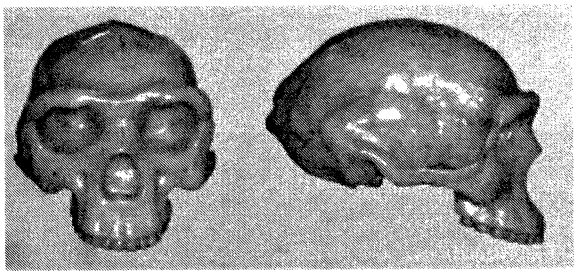
3.1.3 Define the term ***species*** (3)
(10)

3.2 Study the hominid skulls and answer the questions that follow:

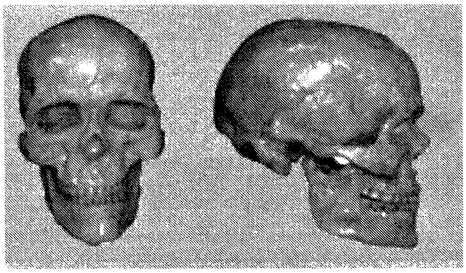
A. *Australopithecus africanus*:



B. *Homo erectus*:



C. *Homo sapiens*:



3.2.1 Contrast the three skulls with regard to the following features (copy the table onto your answer sheet):

KEY FEATURE	SKULL A	SKULL B	SKULL C
Size of the brain with regard to the rest of the skull.			
The brow ridges above the eyes.			
Sloped or flat facial angle.			

(9)

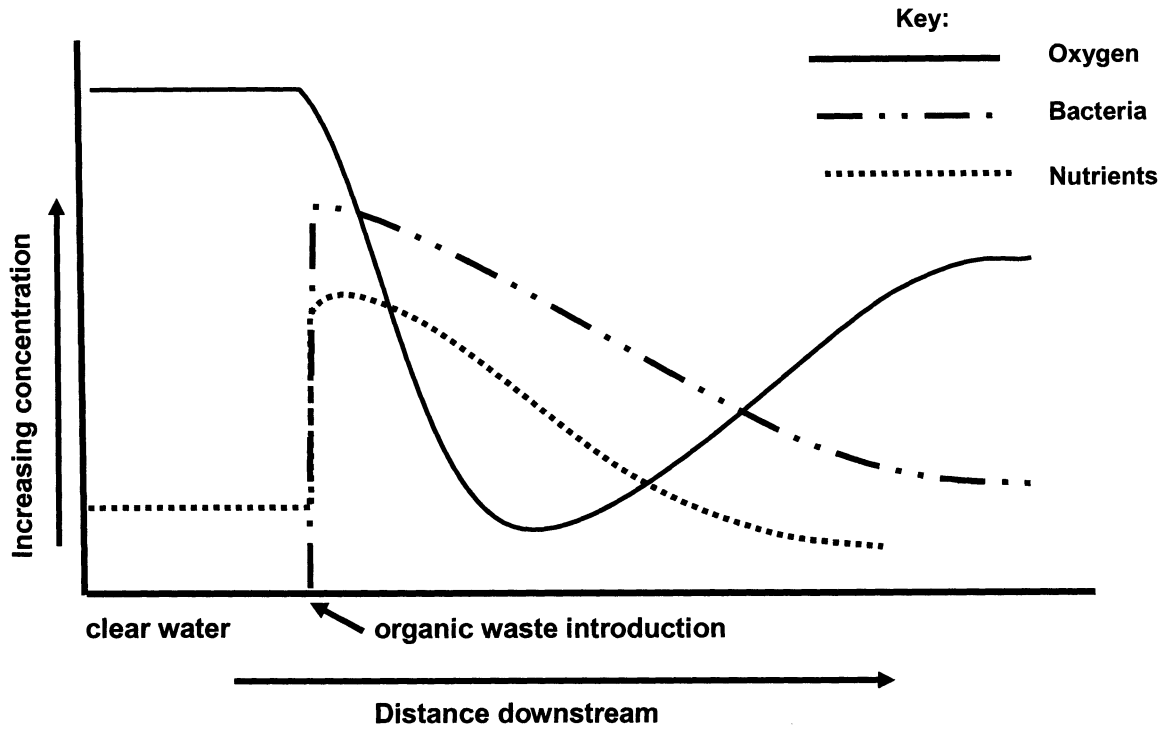
3.2.2 Do you think *Homo erectus* was a direct ancestor of *Homo sapiens*? (1)

3.2.3 Give a reason for your answer to question 3.2.2 (2)

(12)

3.3 Study the following graph and answer the questions about it:

Graph showing some changes in a river after the introduction of untreated sewage and detergents



GRAPH SHOWING CHANGES IN A RIVER AFTER INTRODUCTION OF UNTREATED SEWAGE

3.3.1 Explain the changes in the concentration of each of the substances, after the introduction of the organic waste. (6)

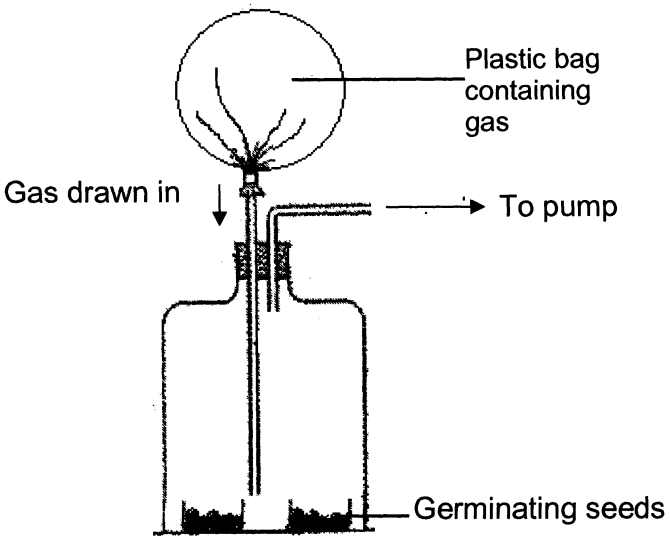
3.3.2 What could be done to prevent the spilling organic waste from happening again? (2)

(8)

TOTAL QUESTION TWO: [30]
TOTAL SECTION B: 60

SECTION C
QUESTION 4

4.1 Thandiwe does an investigation to test the effects of car exhaust fumes on germinating seeds. She set up the following apparatus:



Apparatus used to test the effect of car exhaust fumes on germinating seeds

She performed the investigation three times under each of the following air compositions:

A – Exposed to normal atmospheric air
B – Exposed to exhaust fumes

The percentage of seeds that germinated under each of these conditions over a seven-day period was recorded in the table below:

	% GERMINATION	
	A: Normal atmospheric air	**B: Exhaust fumes**
1	80	27
2	74	31
3	91	45
Average	81	34

4.1.1 Formulate a possible hypothesis for Thandiwe's investigation. (2)
4.1.2 Describe ONE way in which Thandiwe ensured reliable results in her investigation. (2)
4.1.3 Explain why the percentage of germinating seeds differs under the two air compositions. (2)
4.1.4 Explain ONE practical use of the results of this investigation. (1)
(7)

4.2 Study the table below showing fishing limits for two types of fish (1 and 2) in two different countries.

TYPES OF FISH	COUNTRY A	COUNTRY B
Fish 1	56 700	205 720
Fish 2	106 360	833 200

4.2.1 State what information is needed to set the fishing limit for each of the two countries. (2)
4.2.2 Why is the quota for fish 2 higher than that of fish 1? (2)
4.2.3 The limits for both types of fish could be different in a few years' time. Give a reason for this. (2)
4.2.4 Explain THREE management strategies by which each country could try to keep within its fishing limits. (6)
(12)

4.3 Explain how scientists have used each of the following as evidence for evolution:

4.3.1 An appendix is present in the alimentary canal of humans (3)
4.3.2 Gills slits are present at one stage in the development of the human embryo (3)
(6)

4.4 Since 2002, water polluted with heavy metals has entered a river passing through an industrialised area. The polluted water comes mostly from mining activities and is a threat to human health. The polluted water is rich in heavy metals as well as radioactive toxins that can poison the environment.

Write an essay that includes arguments against and in support of mining, the negative impact of mining on human health and strategies that could be used to prevent water pollution caused by various factors.

NOTE: NO marks will be awarded for answers in the form of flow charts or diagrams.

Content = 12
Synthesis = 3
TOTAL = 15

TOTAL SECTION C: 40
GRAND TOTAL:150