education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES P2

EXEMPLAR 2008

MARKS: 150

TIME: 2½ hours

This question paper consists of 14 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1.　　　　Answer ALL the questions.

2.　　　　Write ALL the answers in the ANSWER BOOK.

3.　　　　Start EACH question on a NEW page.

4.　　　　Number the answers correctly according to the numbering system used in this question paper.

5.　　　　If answers are NOT presented according to the instructions of each question, candidates will lose marks.

6.　　　　ALL drawings should be done in pencil and labelled in blue or black ink.

7.　　　　Draw diagrams or flow charts ONLY when requested to do so.

8.　　　　The diagrams in this question paper may NOT necessarily be drawn to scale.

9.　　　　The use of graph paper is NOT permitted.

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 answer and write only the letter (A – D) next to the question number (1.1.1 – 1.1.4) in the ANSWER BOOK, for example 1.1.5   D.

       1.1.1   A living organism found only in a particular region is referred to as being …

            A   extinct.
            B   endangered.
            C   endemic.
            D   alien.

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

            1   Poverty and shortage of food
            2   Use of indigenous plants for medicinal purposes
            3   Use of wood to generate heat energy

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

       1.1.3   Extinction of species CANNOT occur as a result of …

            A   disease.
            B   competition.
            C   fossilisation.
            D   volcanic eruptions.

       1.1.4   Study the food chain shown below.

            algae → snail → fish → human

          Which of the following is MOST UNLIKELY to happen if humans would exploit the fish population?

            A   An increase in algae and snail populations
            B   A decrease in fish as food for humans
            C   An increase in the snail population
            D   A decrease in the algae population   (4 x 2)   (8)

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 – 1.2.6) in the ANSWER BOOK.

    1.2.1   Range of different species found in an environment

    1.2.2   The removal of vegetation in large quantities to create space for human use

    1.2.3   Remains of organisms which are preserved in sedimentary rocks

    1.2.4   The movement of continents relative to one another across the surface of the earth

    1.2.5   The ability of a substance to be broken down into simpler substances by decomposition

    1.2.6   A method of using resources in such a way that they are available for future generations   (6)

1.3   Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A – G) next to the question number (1.3.1 – 1.3.5) in the ANSWER BOOK, for example 1.3.6 H.

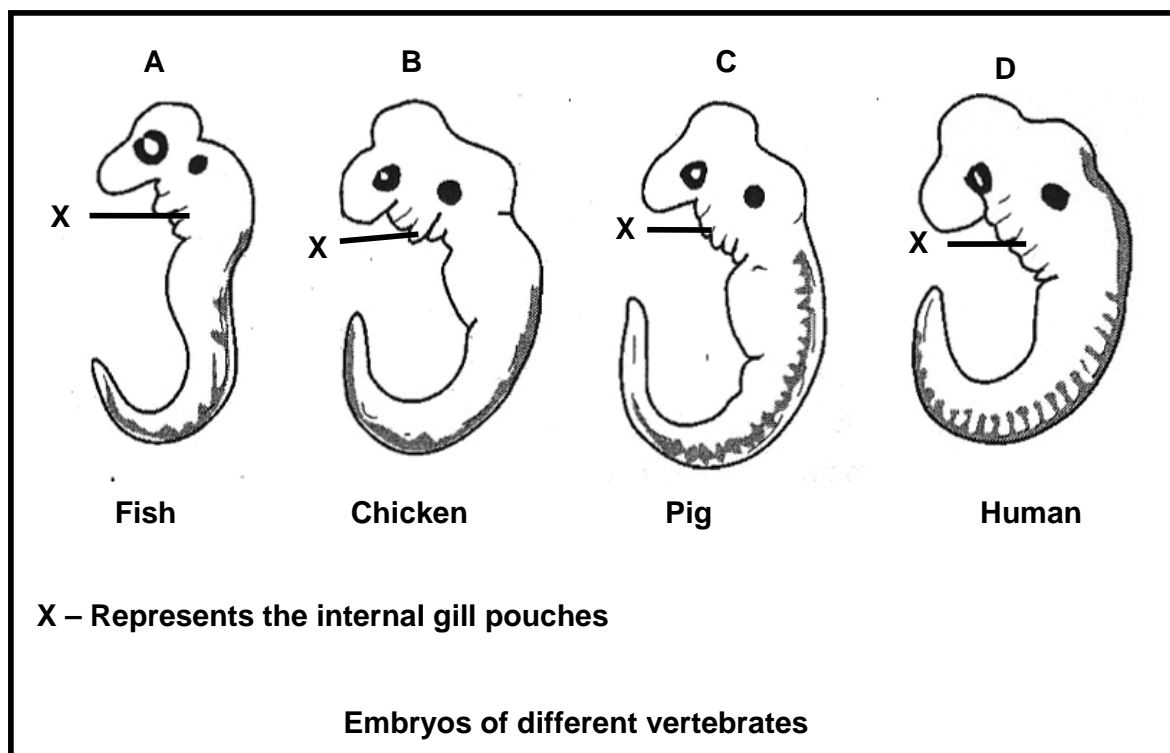| COLUMN A		COLUMN B
1.3.1	The small scale changes resulting from genetic adaptations within a species	A homologous
		B fossil fuels
1.3.2	Factors in the environment such as soil, air and water	C analogous
		D abiotic
1.3.3	Structures that evolve separately to perform a similar function	E micro-evolution
1.3.4	Structures that appear different but have a similar evolutionary origin	F macro-evolution
		G biotic
1.3.5	Chemical energy stored in organisms that lived in the past	

                          (5 x 1)   (5)

1.4   Study the table below, that shows the relationship between the average level of pollution and the number of respiratory diseases reported in a town per week.

| Year	Average sulphur dioxide concentration per week ($\mu g/m^3$)	Average smoke concentration per week ($\mu g/m^3$)	Average number of respiratory diseases reported per week
1980	5	10	10
1985	10	12	20
1990	17	20	30
1995	40	50	70
2000	10	10	20
2005	15	20	20

1.4.1   List THREE main sources of smoke pollution.   (3)

1.4.2   According to the table, in which year was the smoke concentration the highest?   (1)

1.4.3   Describe the relationship between the number of respiratory diseases reported and the sulphur dioxide concentration in the air.   (2)

1.4.4   Name THREE respiratory diseases caused by pollution.   (3)

1.4.5   State THREE possible ways of decreasing air pollution.   (3)

1.5 Study the diagrams below that show embryos of different vertebrates and answer the questions that follow.

A   **B**   **C**   **D**

Fish   **Chicken**   **Pig**   **Human**

X – Represents the internal gill pouches

Embryos of different vertebrates

1.5.1 Explain what biologists concluded about the similarities in the structures of the embryos of the four vertebrates shown in the above diagram. (2)

1.5.2 Most scientists believe that all vertebrates share a common ancestor. Which of the embryos (A, B, C or D) would scientists identify as being closely related to this ancestor? (1)

1.5.3 Explain your answer to QUESTION 1.5.2. (2)

1.6 The different species of finches (A, B, C and D) below are found on different Galapagos Islands and are thought to have originated from a seed-eating ancestral species from the mainland of South America. They resemble each other with respect to their internal body structure but differ with respect to the shapes and sizes of their beaks and hence their feeding habits.

Some of the finch species from the different Galapagos Islands
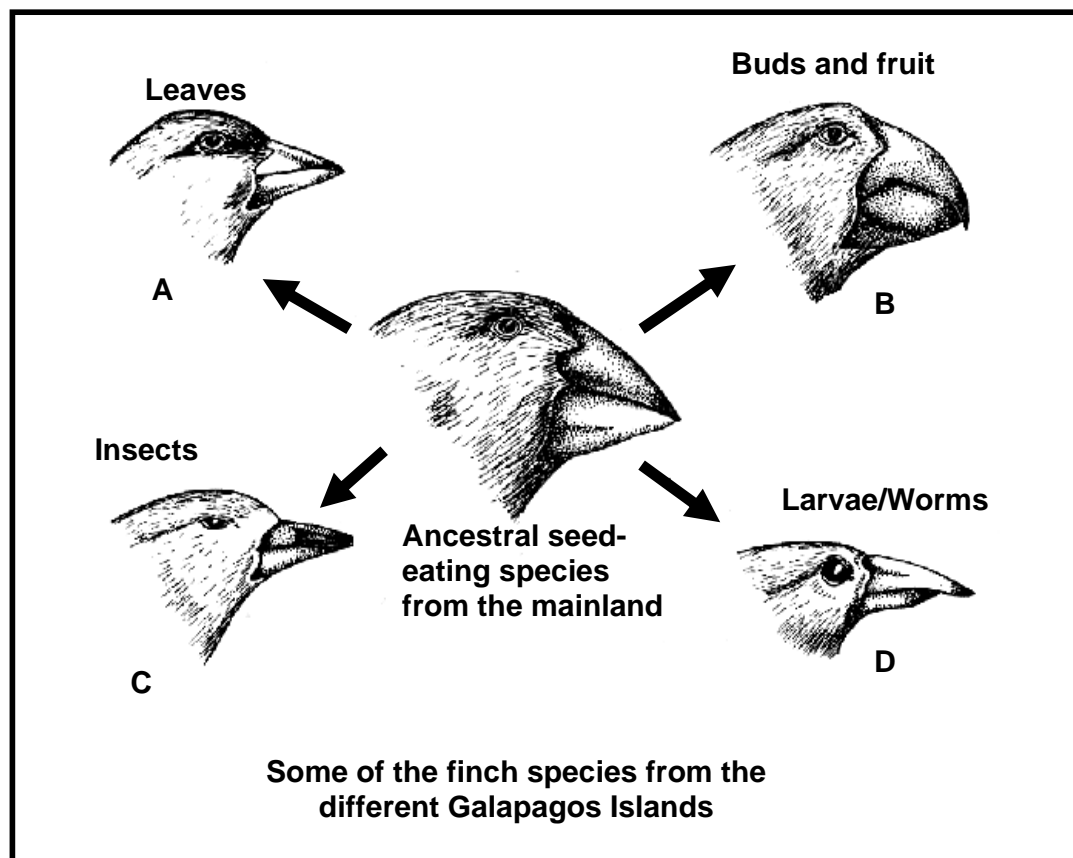
1.6.1 Explain what is meant by *geographical isolation of a population*. (2)

1.6.2 Why do you think the different finch species became adapted to eat different food types? (1)

1.6.3 Explain the process by which the different species adapted and evolved to eat different types of food. (5)

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

The cheetah (*Acinonyx jubatus jubatus*) found in Southern Africa is classified as a critically endangered species. Very small populations are also found in West, East and Central Africa and in Asia.

Research has shown that the gene pool of this kind of cheetah is extremely small. This means that the species has lost most of its variety of alleles. Two major events appear to be the cause of limiting this cheetah's gene pool. The first one is an ice age when most members of the species died out. The second one was about 120 years ago when cheetahs became popular targets for hunters and farmers.

Reduction of the gene pool led to inbreeding, passing on unfavourable characteristics such as the inability to adapt to new environments, difficulty of breeding in captivity and an increased ability to contract diseases easily.

1.7.1   Suggest TWO reasons why the cheetahs were almost wiped out during one of the ice ages.   (2)

1.7.2   Explain why farmers and hunters would want to kill cheetahs.   (2)

1.7.3   What suggestion would you make to conservationists to decrease the problems of inbreeding as described in the passage above?   (2)

[50]

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1   A group of Grade 12 learners wanted to investigate the oxygen level in a nearby river. A low oxygen level indicates that the water is polluted. They carried out the following steps:

- Using a rope, bucket and protective gloves they collected some water from the river before and after a sewerage outflow pipe (which pumps out human waste including faeces into the river).
- They labelled the samples of the water A and B.
- The learners then added a few drops of methylene blue to each sample (A and B).

NOTE: Methylene blue is an indicator which changes colour as follows:

- A low level of oxygen is indicated by a loss of the blue colour.
- A high level of oxygen is indicated by a darker blue colour.

Their results are shown in the table below.

Sample	Colour change of methylene blue
A	Darker blue
B	Loss of blue colour

2.1.1   Suggest a caption for the table above.   (2)

2.1.2   Write down a hypothesis for the above investigation.   (2)

2.1.3   Suggest why the learners used a rope for the bucket and why they wore protective gloves when collecting the samples of water.   (2)

2.1.4   Why did the learners take two samples of water, A and B?   (1)

2.1.5   Which one of the samples (A or B) was taken after the sewerage outflow pipe?   (1)

2.1.6   Explain your answer to QUESTION 2.1.5.   (3)

2.1.7   How will the oxygen levels affect the fish in the river at point B?   (2)

2.1.8   Suggest TWO ways in which the learners could improve the investigation.   (2)

2.2   Read the following passage on natural pesticides and answer the questions
        that follow.

The use of neem leaves to control insect pests in vegetables

Insects are a hindrance to farmers. For the battle against insects
chemical pesticides are too expensive and have negative side effects. In
Tanzania farmers are now making use of a natural pesticide that is locally
available at nearly no cost. The leaves of the neem tree (*Azadiracta indica*)
are crushed and the liquid is brushed onto plants three times a week.
The remains of the crushed neem leaves can be spread on the soil to
increase fertility.

2.2.1   State THREE advantages of using neem leaves instead of
        chemical pesticides.   (3)

2.2.2   State TWO possible disadvantages of using neem leaves.   (2)

2.2.3   Describe TWO strategies that the South African government can
        use to encourage the use of local plants and animals in the control
        of pests.   (4)

2.3   Read the following paragraph and answer the questions that follow.

Abalone

Abalone, a type of shellfish commonly known as perlemoen, is found on
rocks near the sea. Since it is thought to improve sexual ability, especially
by people in countries where abalone does not naturally occur, it is sold at
very high prices. Because of this it is being collected by poachers in large
numbers.

2.3.1   Describe TWO consequences of perlemoen exploitation.   (4)

2.3.2   Suggest TWO ways in which the population of perlemoen can be
        managed.   (2)
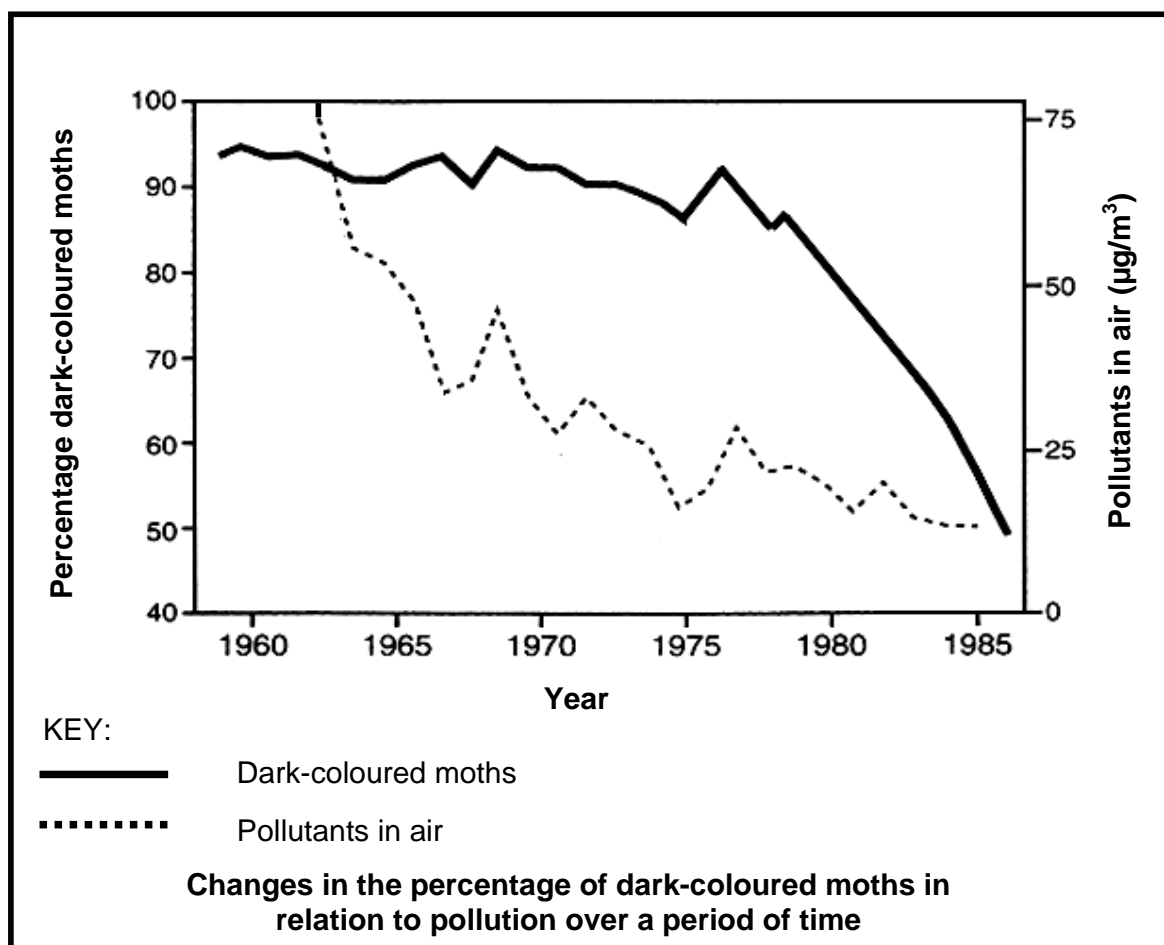
[30]

QUESTION 3

3.1   Before the Industrial Revolution took place in Britain in the 19th century, light-coloured moths that blended with the lichen-covered bark of trees were far more common than dark-coloured moths.

However, pollution from factories killed the lichens on the trees leaving their dark bark exposed. The light-coloured moths were easily identified against the black background.   The dark-coloured moths that were easily camouflaged on the dark bark, soon became far more common than the lighter varieties.

Now that pollution is decreasing the light-coloured moths are increasing in numbers again.

Study the graph below, that shows the changes in the percentage of dark-coloured moths.

KEY:

———————— Dark-coloured moths

• • • • • • • • Pollutants in air

Changes in the percentage of dark-coloured moths in relation to pollution over a period of time

3.1.1   What was the percentage of the dark-coloured moths in 1970?   (1)

3.1.2   What is the general relationship between the dark-coloured moth population and pollution from 1965 to 1985?   (2)

3.1.3   Explain the relationship mentioned in QUESTION 3.1.2.   (2)

3.2   Briefly outline Lamarck's theory of evolution.   (5)

3.3   The following questions are based on mutation.

    3.3.1   Define a *gene mutation*.   (2)

    3.3.2   Name TWO factors that can cause mutations.   (2)

    3.3.3   Differentiate between *neutral* and *lethal mutations*.   (4)

3.4   The diagrams below represent the skull, the upper jaw and lower jaw of three organisms, the Taung child (*Australopithecus africanus*), a modern human (*Homo sapiens*) and a gorilla (*Gorilla gorilla*). The arrow indicates the position of the foramen magnum (the opening that allows the spinal cord to connect with the brain). Study the diagrams and answer the questions that follow.

Skulls, upper jaws and lower jaws of the three organisms
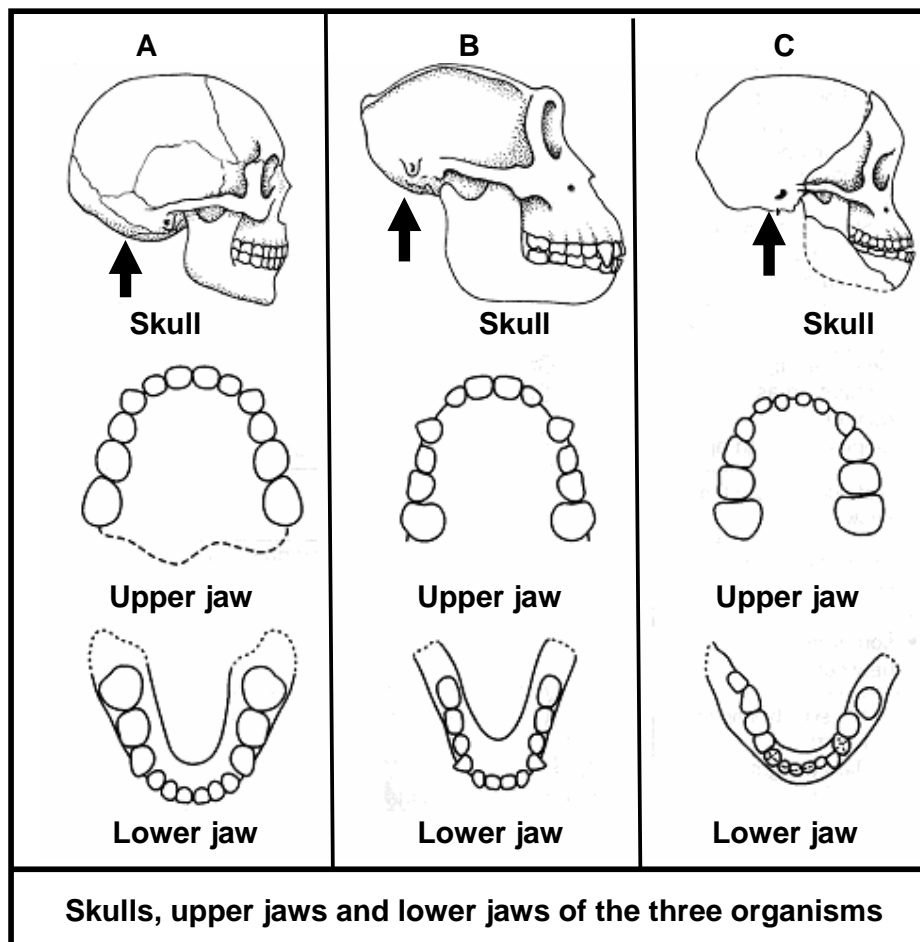
    3.4.1   Identify the organisms that are represented by each of A, B and C.   (3)

    3.4.2   Assuming that the diagrams were drawn to scale, name TWO observable differences between the skulls of organisms A and B.   (4)

    3.4.3   Which organism (A, B or C) represents a carnivore?   (1)

3.4.4   Explain your answer to QUESTION 3.4.3 using features visible in the diagram. (2)

3.4.5   Name TWO organisms that are best adapted for walking on two legs rather than four legs, by looking at the position of the foramen magnum (indicated by the arrows). (2)

[30]

TOTAL SECTION B: 60

SECTION C

QUESTION 4

4.1   The table below gives information about an investigation carried out on four types of female mice (A, B, C and D), each with a different fur colour. These mice live on a beach with a yellow-gold sand colour. The average results for 10 mice of each fur colour are represented in the table below.

Type of mouse	A	B	C	D
Fur colour	Dark brown	Yellow gold	Black	White
Average age at death (months)	4	10	2	3
Average number of offspring produced by female	4	14	0	0
Average running speed (metres per minute)	8	6	8	7

4.1.1   Which type of mouse (A, B, C or D) is best adapted to its environment? (1)

4.1.2   Explain your answer to QUESTION 4.1.1. (2)

4.1.3   Give a reason why mice C and D did not reproduce. (1)

4.1.4   Explain why the average running speed of mouse B might be lower than the others. (2)

4.1.5   Using the same system of axes, draw a bar graph to illustrate both the average age at death and the average number of offspring of the mice of different fur colours. (11)

4.2   Scientists believe that large-scale variation can lead to the formation of new species.

4.2.1   Explain how speciation occurs if a population becomes separated into two by a geographical barrier. (6)

4.2.2   Describe the creationist viewpoint of speciation. (2)

4.3   Read the following passage and follow the instructions.

Waste management in South Africa

Many towns and cities of South Africa spend a large amount of money in cleaning up litter and general household waste. Approximately 6 000 tons of waste is generated daily in Cape Town. The clean up of litter and dumping exceeds R100 million a year in this city. This money could be put to better use.

[Source: Adapted from the *City of Cape Town State of the Environment Report 2005*]

Write an essay explaining FOUR strategies you would use to manage the waste if you were appointed as the head of the waste disposal division of your town/city.

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

The following rubric will be used to assess the essay.

CRITERIA	Marks			
	1	**2**	**3**	**4**
State his/her waste managing strategy	One appropriate strategy given	Two appropriate strategies given	Three appropriate strategies given	Four or more appropriate strategies given
Description of strategy	One appropriate strategy described	Two appropriate strategies described	Three appropriate strategies described	Four or more appropriate strategies described
Motivation of strategy	One appropriate strategy motivated	Two appropriate strategies motivated	Three appropriate strategies motivated	Four or more appropriate strategies motivated
Synthesis	Significant gaps in the logic and flow of the answer	Minor gaps in the logic and flow of the answer	Well structured – demonstrates insight and understanding of the question	

(15)

TOTAL SECTION C: 40

GRAND TOTAL: 150