



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P2**

**FEBRUARY/MARCH 2009**

**MEMORANDUM**

**MARKS: 150**

**This memorandum consists of 10 pages.**

**SECTION A****QUESTION 1**

1.1

1.1.1 D✓✓

1.1.2 B✓✓

1.1.3 C✓✓

1.1.4 B✓✓

1.1.5 D✓✓

(5 x 2) = (10)

1.2

1.2.1 Phylogenetic tree✓/cladogram

1.2.2 Abiotic✓

1.2.3 Biological control✓

1.2.4 Food web✓

1.2.5 Archaeology✓

(5)

1.3

1.3.1 J✓

1.3.2 H✓

1.3.3 F✓

1.3.4 A✓

1.3.5 C✓

1.3.6 B✓

(6)

1.4

1.4.1 (a) Mayfly nymph ✓

(1)

(b) Sludge worms ✓

(1)

(c) Leeches ✓

(1)

1.4.2 - The size/volume of the water samples must be the same✓

- The samples must be taken at the same depth✓

- Samples must be taken at the same time in all three areas✓

- Use sterile containers✓

**(Mark first TWO only)**

any (2)

1.4.3 - Wear rubber gloves when taking the samples✓ so as not to get contaminated with germs✓

- Samples should be taken by using a container/bottle attached to a string ✓ to avoid stepping too close to the river bank✓/prevent drowning/falling into water

**(Mark first TWO only)**

(4)

1.4.4 Oxygen✓/waste/amount of substances

(1)

**(Mark first ONE only)**

- 1.4.5 The oxygen decreases ✓ proportionally to the decrease in the waste ✓ until the amount of waste reaches 'normal' level ✓ when the amount of oxygen begins to increase ✓ and stabilise/become constant ✓  
any (4)
- 1.4.6 Unpolluted water ✓/less waste at X  
therefore more plants will be present ✓  
producing more oxygen through photosynthesis ✓ (any 2)
- OR**
- Unpolluted water ✓/less waste at X  
therefore fewer aerobic bacteria will be present ✓  
hence using less oxygen ✓ (any 2) (2)
- 1.4.7 Local government must provide proper sanitation ✓  
Water must be purified before it enters the river ✓  
Education ✓ to make people aware of proper waste disposal measures  
(**Mark first TWO only**) any (2)

1.5

1.5.1

<b>Homo</b>	<b>Chimpanzee</b>
1. Canines not well developed ✓	1. Canines well developed ✓/form fangs
2. Less protruding jaws ✓/not prognathus	2. Protruding jaws/prognathus ✓
3. Brow-ridge less pronounced ✓	3. Heavily pronounced brow-ridge ✓
4. Proportionally large cranium ✓	4. Proportionally smaller cranium ✓
5. Proportionally shorter cheek bone ✓	5. Proportionally larger cheek bone ✓
6. No ridge at base/back of skull ✓	6. Ridge at base/back of skull ✓

**(Mark first THREE only)**

(any 3 x 2)

1 mark for table (7)

- 1.5.2 Chimpanzee ✓ (1)
- 1.5.3 The foramen magnum is towards the posterior/back of the skull ✓ (1)
- 1.5.4 Taung child ✓  
Mrs Ples ✓  
Little-foot ✓ any (2)  
**(Mark first TWO only)**

**TOTAL SECTION A: 50**

**SECTION B****QUESTION 2**

2.1

2.1.1 Long roots✓ (1)

2.1.2 Natural selection✓/survival of the fittest (1)

- 2.1.3 - There is variation✓ in the length of roots among the cacti plants  
- The cacti with the long roots have the desirable characteristic✓/are better adapted/ long roots absorb water from deep underground  
- for surviving under dry/unfavourable conditions✓  
- more of the cacti with long roots survive✓  
- most of the cacti with the short roots die✓  
- most of the offspring produced have long roots ✓

any (5)

2.2

- 2.2.1 - During prophase 1✓  
- crossing over✓ takes place  
- and genetic material is exchanged✓/recombination occurs between chromatids of homologous chromosomes  
- which ensures that the gametes formed are different✓ from each other  
- During metaphase 1✓  
- Homologous chromosomes arrange themselves randomly✓/ independent assortment along the equator  
- which ensures that the gametes formed are different✓ from each other

any (6)

- 2.2.2 - Sudden random changes✓  
- occur in the genetic code/gene/DNA✓ (2)

- 2.2.3 - Large number of gametes produced✓  
- Gametes are different because they are produced by meiosis✓  
- random fusion of gametes✓  
- therefore the offspring✓ produced  
- will be genetically different✓

any (4)

- 2.3 - The population will split up into two groups✓  
- and each group adapts to the new environmental factors✓/  
develops separately/each group undergoes natural selection  
independently  
- each group may become genotypically✓  
- and phenotypically different✓  
- which might prevent them from interbreeding✓/become  
reproductively isolated leading to the formation of a new  
species (5)
- 2.4
- 2.4.1 Fossil✓evidence/Paleontological studies (1)
- 2.4.2 Radiometric dating✓ of the fossils or the rocks in which the fossils  
were found (1)
- 2.4.3 - A comet, an asteroid or part of a star✓ from outer space struck  
the Earth/Gulf of Mexico which resulted in  
- large clouds of dust blocking out the sun✓  
- stopped photosynthesis✓  
- global cooling✓/dinosaurs might have been ectotherms and not  
able to live in the cold  
- world-wide fire✓  
- monstrous tsunamis✓  
These factors caused the dinosaurs to become extinct any (4)  
**[30]**

**QUESTION 3**

3.1

3.1.1 Both✓ the total amount of waste produced and the amount of recyclable material increased✓ from 2003 to 2006 (2)

- 3.1.2 - People collect and sell waste at buy-back centres✓ and benefits therefore economically✓/creates own jobs  
 - People who collect waste and take it to recycling depots✓ contributes to sustainable use of materials✓  
 - Recycling saves energy✓ and therefore reduces the amount of energy used to make new products✓

**(Mark first TWO only)** (any 2 x 2) (4)

3.2 Calculations of sectors for pie chart.

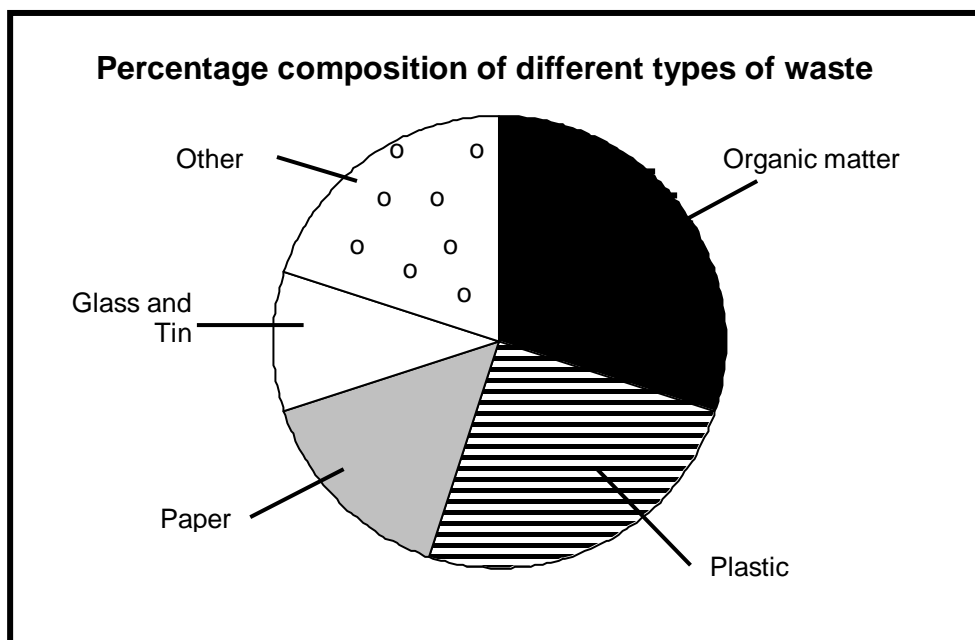
$$\text{Organic matter: } \frac{30}{100} \times \frac{360}{1} = 108^\circ$$

$$\text{Plastic: } \frac{25}{100} \times \frac{360}{1} = 90^\circ$$

$$\text{Paper: } \frac{15}{100} \times \frac{360}{1} = 54^\circ$$

$$\text{Glass and tin: } \frac{10}{100} \times \frac{360}{1} = 36^\circ$$

$$\text{Other: } \frac{20}{100} \times \frac{360}{1} = 72^\circ$$



**Rubric for the mark allocation of the graph**

Calculation/working to determine the correct proportions	1 mark for each calculation including the correct answer (5)	
Correct type of graph	1	
Title of graph	1	
Correct proportions for each labelled sector/slice	1 mark for each sector/slice (5)	(12)

**Note:**

If the wrong type of graph is drawn: marks will be lost for 'correct type of graph' as well as for drawing of sectors in correct proportion.

**3.3**

3.3.1 Nitrogen✓ (1)

3.3.2 - Run-off of nitrates and phosphates✓ from excess use of fertilizers has greatly increased the nitrate and phosphate in rivers✓ and lakes  
 - Leads to eutrophication✓  
 - overgrowth of microscopic algae✓/algal bloom  
 - Many algae and other organisms die✓ as the oxygen is used up  
 - their bodies are broken down by bacteria✓  
 - bacteria need oxygen therefore oxygen levels in water gets further depleted✓  
 - Lack of oxygen causes animals to die✓ any (3)

**3.4****3.4.1**

- a) 300✓million years ago (1)  
 b) Bacteria✓ (1)  
 c) Amphibians✓ (1)  
 d) Birds✓ (1)

3.4.2 Studying fossils✓/paleontology  
 Anatomy✓  
 Taxonomy✓  
 Biogeography✓ any (2)

3.4.3 We cannot observe these changes✓ because they took place millions of years ago✓  
 Gaps✓ in the fossil records✓/comparative anatomy, biochemistry  
 embryology (any 1 x 2) (2)

**TOTAL SECTION B: 60**

**SECTION C****QUESTION 4**

4.1

- 4.1.1 - Increase✓ in numbers of the prey✓ that they feed on e.g. herring and squid
- Decrease✓ in numbers of predators✓ that feed on them
  - Cause an imbalance✓ in the food chain/web✓
  - Lack of cod✓ for human consumption✓

**(Mark first TWO only)**

(any 2 x 2) (4)

4.1.2

- Declare a fishing season✓ so that no fishing occurs during the breeding season✓
- Have a bag limit✓ so that the breeding stock is not depleted✓
- Limit size of fish caught✓ to allow fish to complete breeding✓
- Ban catching of cod completely✓ to allow cod population to recover✓
- Impose fines✓ to encourage adherence to fishing regulations✓

**(Mark first THREE only)**

(any 3 x 2) (6)

- 4.1.3 - Fishing methods are such that before the smaller cods (less than 50 cm in length) are thrown back✓ they would have already died✓
- Policing the ban on the fishing of cod or a quota system✓ is expensive✓ to maintain
  - Illegal fishing will still take place✓ by unscrupulous people✓
  - Could have a negative impact on people✓ who rely on cod-fishing as an income✓

**(Mark first ONE only)**

(any 1 x 2) (2)

4.2

- 4.2.1 Grasping things to obtain a power grip✓/ precision grip/using tools

**(Mark first ONE only)**

(1)

- 4.2.2 - Allows total awareness✓ of the environment in sensing danger✓/looking for food
- Enables hands to be free✓ to use implements✓/carry objects or offspring/throw/protect
  - Exposes a large surface area✓ for thermo-regulation✓/lose body heat to surroundings in hot conditions/reduce overheating therefore reduce need for water
  - Display of male sex organs✓ as part of courtship behaviour✓

**(Mark first TWO only)**

(any 2 x 2) (4)

- 4.3.1 - Identical DNA structure in different species✓  
 - Similar protein synthesis✓ among different species  
 - amino acid sequence of haemoglobin✓/similar /similar proteins✓  
 - Similar metabolic pathways✓/ cellular respiration in many species  
 - Similar sequence of genes✓ in different species also show close genetic relationship  
**(Mark first THREE only)** any (3)

- 4.3.2 - Similar structure✓  
 - All vertebrate embryos have gill slits✓  
 - All vertebrate embryos have a tail✓  
**(Mark first TWO only)** any (2)

## 4.4

- 4.4.1 - Outbreeding increases variability✓ of alleles in the gene pool  
 - making the population more resistant to disease✓  
 - and breeding disorders✓ any (2)

- 4.4.2 Desirable alleles can be selected and passed on to successive generations✓ (1)

## 4.5 Possible answers for the mini essay

**Disadvantages in disposal of solid waste in landfill sites**

- The wastes in a landfill attract vermin✓ (rats, cockroaches etc) and these often harbour disease vectors✓
- Landfills give off bad odours✓ /are ugly/presence leads to urban decay because only poor people are prepared to live near them✓
- Wind blown litter✓ causes a pollution problem✓
- Sites attract informal “pickers” ✓/poor people seeking food/ building materials often exposing themselves to health hazards✓/ risk/injury
- Highly flammable methane gas✓ sometimes escapes from the decomposing wastes can cause health hazards✓
- Streams near the landfill sites often become contaminated✓ with hazardous leachate/chemicals✓
- Borehole water gets contaminated✓ by leachate/chemicals that percolates into the groundwater✓

**(Mark first TWO only)** (any 2 x 2) (4)

**Advantages of incineration**

- Incineration plant is quite small✓ so valuable land is not used✓
- No attraction to pests✓ so less risk of disease✓
- Heat generated can be used/incinerators built as part of housing projects✓ can save energy✓

**(Mark first TWO only)**

(any 2 x 2) (4)

**Disadvantages of incineration**

- May generate toxic fumes✓ (especially from burning plastics) cause health hazards ✓
- Can be expensive to build✓ money can be used for other social interventions✓
- Seepage of wastes✓ may pollute groundwater✓
- Fuel is consumed✓ to begin the combustion process✓

**(Mark first TWO only)**

(any 2 x 2) (4)

<b>Description</b>	<b>Marks</b>
Not attempted	0
Significant gaps in the logic and flow of the answer (only described landfill or incineration)	1
Minor gaps in the logic and flow of the answer (answered both landfill and incineration but left out some points)	2
Well structured – demonstrates insight and understanding (answered both landfill and incineration fully)	3

**Content: (12)****Synthesis: (3)****TOTAL SECTION C: 40****GRAND TOTAL: 150**