NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2008

**LIFE SCIENCES: PAPER II**

| **EXAMINATION NUMBER** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|

**There are (vii) pages in this booklet**

## QUESTION 1

Answer these questions in the spaces provided. Place this yellow booklet inside the Answer Book in which you answer the rest of the examination paper.

1.1 Six multiple-choice questions are given below. Choose the most correct alternative in each question and write its letter in the space provided in the table below.

| **Question** | 1.1.1 | 1.1.2 | 1.1.3 | 1.1.4 | 1.1.5 | 1.1.6 |
|---|---|---|---|---|---|---|
| **Answer** | | | | | | |

1.1.1 With which of the following scientists is the concept 'survival of the fittest' associated?

A Hans Krebs
B Jean Baptiste Lamarck
C Charles Darwin
D James Watson

Use the following information to answer questions 1.1.2 and 1.1.3.

*Mesosaurus* was a giant reptile that lived about 270 million years ago. The average *Mesosaurus* measured about one metre in length, had webbed feet, a long tail and many sharp teeth. Fossils of *Mesosaurus* have been found in only two places: the eastern side of South America and the western side of South Africa.

1.1.2 The distribution of the fossil remains is evidence of …

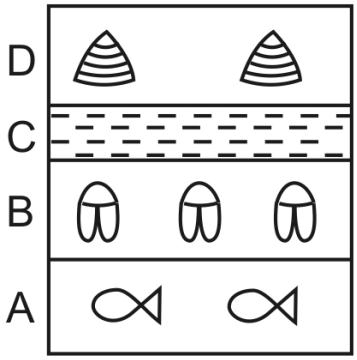
A speciation.
B continental drift.
C natural selection.
D divergent evolution.

1.1.3 *Mesosaurus* was most likely to be …

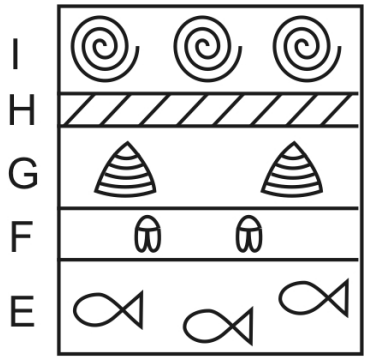
A a land animal that ate plants.
B an aquatic animal that ate plants.
C an aquatic animal that ate small fish.
D a land animal that ate small animals.

1.1.4 The diagrams below represent rock strata (layers) containing fossils from two different locations.

**Rock strata from location 1**




**Rock strata from location 2**




Based on these diagrams it would be reasonable to conclude that **fossils** in …

A stratum B are the same age as fossils in stratum E.
B stratum A are younger than fossils in stratum E.
C stratum D are younger than fossils in stratum F.
D stratum I are younger than fossils in stratum G.

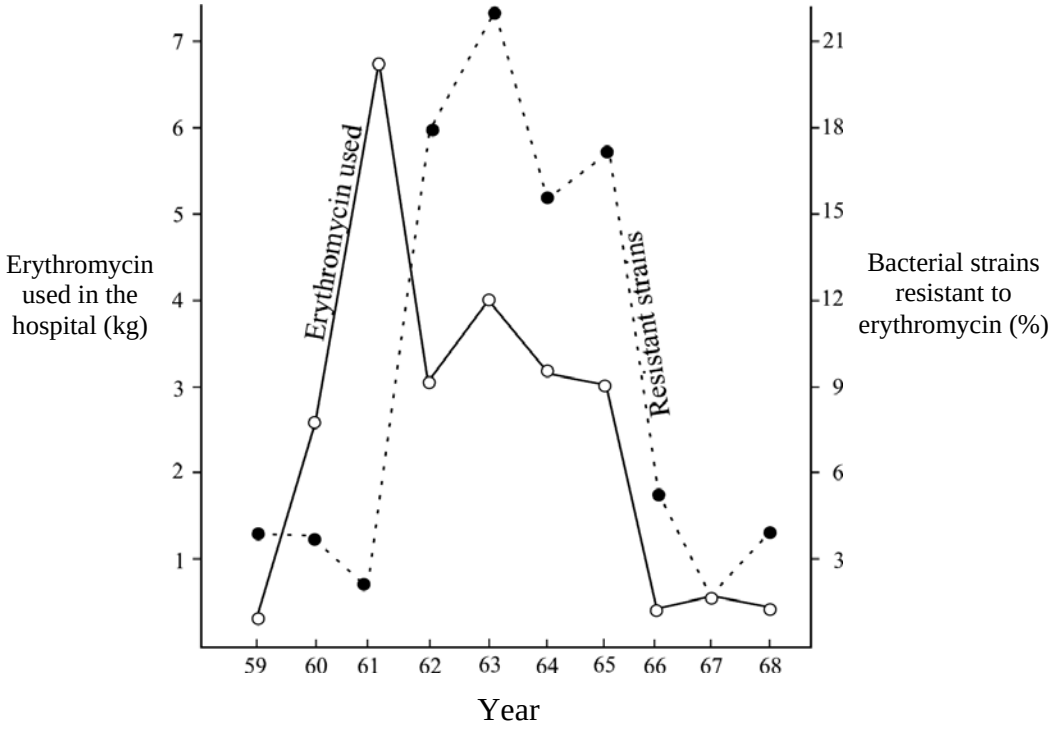
1.1.5 Which of the following statements is true?

Adaptive radiation enables each of the different species that evolves to …

A fully exploit a particular set of environmental resources.
B compete effectively with all the others for the same resources.
C be a versatile feeder and make use of any available resource.
D make optimum use of the same ecological niche as the others.

[Adapted from Torrance *New Higher Biology Multiple Choice and Matching*]

1.1.6 The following graph shows the development of a bacterial strain resistant to the antibiotic erythromycin, in a hospital.




[Adapted from Glen and Susan Toole, *A level Biology*]

The graph may be used to demonstrate evolution in action. What is the selection pressure and what is the result of the effect of the selection pressure?

| | **Selection pressure** | **Result of the effect of the selection pressure** |
|---|---|---|
| A | Erythromycin | As the selection pressure increases, the more rapid the development of resistance |
| B | Number of bacteria present | As the selection pressure increases, the more rapid the development of resistance |
| C | Erythromycin | As the selection pressure increases, the less rapid the development of resistance |
| D | Number of bacteria present | As the selection pressure increases, the less rapid the development of resistance |

(6)

1.2 For the following three questions, 1.2.1 to 1.2.3, write the letter …

A if both statements are true and are related to each other.
B if both statements are true but are unrelated.
C if the first statement is true and the second statement is false.
D if the first statement is false and the second statement is true.

Write the letter you have chosen in the table below.

| **Question** | 1.2.1 | 1.2.2 | 1.2.3 |
|---|---|---|---|
| **Answer** | | | |

1.2.1 Studies have shown that children exposed to high concentrations of car exhaust fumes become sick …
BECAUSE
car exhaust fumes contain pollutants such as nitrogen dioxide ($NO_2$).

1.2.2 It is unwise to drink water straight from a river …
BECAUSE
it could be polluted with sewage containing harmful organisms.

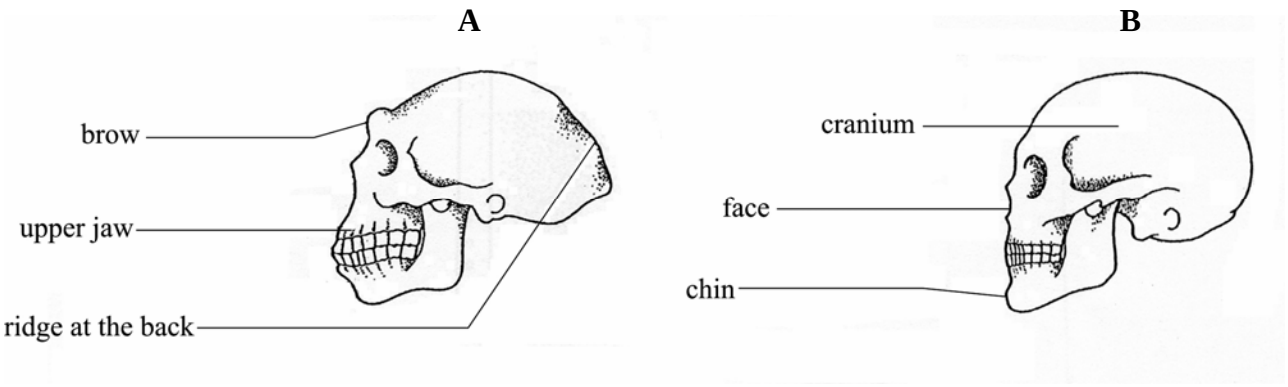
1.2.3 The table shows the results of investigations of several dams in South Africa.

| **Dam** | **pH of dam water** | **Number of plant species** | **Number of animal species** |
|---|---|---|---|
| V | 4.4 | 8 | 4 |
| W | 4.8 | 11 | 5 |
| X | 5.7 | 16 | 9 |
| Y | 6.6 | 23 | 19 |
| Z | 8.1 | 21 | 14 |

The lower the pH, the lower the diversity of species in dams …
BECAUSE
acidic conditions in water support a large variety of animal life.

(3)

1.3 Study the diagram of two hominid fossils shown below.




1.3.1 Use the information in the diagram to complete the table.

| Differences between | |
|---|---|
| **Skull A** | **Skull B** |
| 1. | 1. |
| 2. | 2. |
| 3. | 3. |
| 4. | 4. |

(8)

1.3.2 Which skull, A or B, do you think was more highly evolved? Give evidence from the diagrams to support your answer and suggest how this evidence could have contributed to the evolution of the organism.

_____

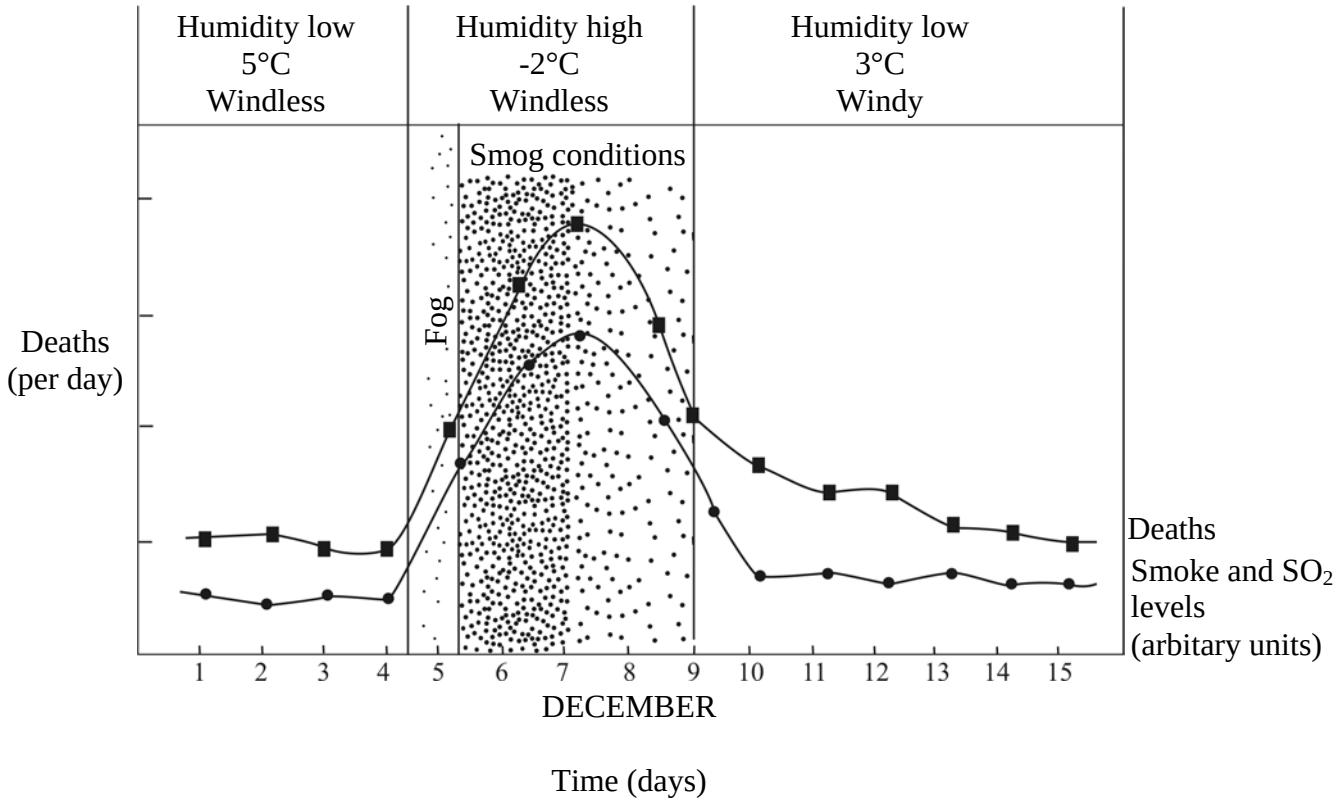
_____

_____

(3)

1.4 The graph below shows details of the great London smog of 1952.




[Adapted from Brocklehurst and Fielden, *Biology Now*]

1.4.1 In the period shown, approximately how many extra deaths occurred during the period of the smog compared to deaths in periods of no smog?

_____ (1)

1.4.2 From the information provided above, list FOUR environmental conditions that caused smog to form.

_____

_____

_____

_____ (4)

1.4.3 Suggest why the levels of smoke and sulphur dioxide ($SO_2$) started to rise before the smog formed.

_____

_____ (2)

1.4.4 Although the levels of smoke and sulphur dioxide were back to pre-smog levels by 10th December, the death rate was still high. How can this be explained?

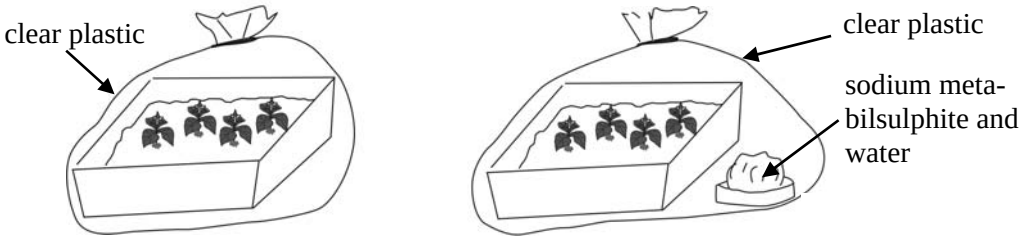
_____

_____

_____ (3)

1.4.5 A pupil thinks that sulphur dioxide will have a toxic effect on plants. She set up an investigation, over a two-week period, as shown in the diagram below to test her hypothesis. Sodium meta-bisulphite, when mixed with water, releases sulphur dioxide.

**radish plants and damp air** **radish plants and $SO_2$**




(a) In what THREE ways is the experiment a fair test of the hypothesis? Explain your answer.

_____

_____

_____

_____

_____

_____ (6)

(b) Suggest ways in which the experimental **design** could be more effective.

_____

_____

_____

_____ (4)

**40 marks**