EXAMINATIONS COUNCIL OF ZAMBIA

Joint Examination for the School Certificate
and General Certificate of Education Ordinary Level

BIOLOGY
PAPER 2 Theory

Wednesday 17 NOVEMBER 2004

1 hour 45 minutes

Additional materials:
Answer paper
Graph paper

TIME: 1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page and on all separate answer paper used.

There are ten questions in this paper.

Section A
Answer all questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any three questions.
Write your answers on the separate answer paper provided.

At the end of the examination:
1. fasten all separate answer paper used securely to the question paper;
2. enter the numbers of the Section B questions you have answered in the grid below.

INFORMATION FOR CANDIDATES

The intended number of marks is given in brackets [ ] at the end of each question or part question.

You are advised to spend no longer than one hour on Section A and no longer than 45 minutes on Section B.
Section A

Answer all questions.

1. Fig 1.1 shows the chromosomes of three cells from one organism.

![Diagram of three cells](image)

**Fig. 1.1**

(a) Which of the cells, B or C could be developed from cell A by:

(i) Mitosis

(ii) Meiosis

[1]

(b) (i) Name two places in the human body where mitosis occurs.

1

2

[1]

(ii) Name two places, one in the animal body and the other in a plant body where meiosis occurs.

1 Animal body

2 Plant body

[1]

(c) Describe the importance of meiosis in living organisms.

[2]

[Total: 8]
Fig. 2.1 shows an experimental set up using a potometer.

![Diagram of an experiment setup](image)

Scale in mm

Fig 2.1

In the above experiment, the distance moved by the meniscus along the capillary tube in 30 minutes was measured and recorded. The meniscus was brought back to zero. Two leaves were removed and the distance moved by the meniscus in 30 minutes was again measured and recorded. The process of removing two leaves at a time was repeated until all the leaves were removed.

The readings were as given in the table below:

**NOTE:** Other factors remained unchanged

**Table 2.1**

<table>
<thead>
<tr>
<th>Twig</th>
<th>Distance (in mm) moved by meniscus in 30 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All leaves present</td>
<td>15.0</td>
</tr>
<tr>
<td>Two leaves removed</td>
<td>12.2</td>
</tr>
<tr>
<td>Four leaves removed</td>
<td>7.1</td>
</tr>
<tr>
<td>Six leaves removed</td>
<td>3.9</td>
</tr>
<tr>
<td>Eight leaves removed</td>
<td>1.0</td>
</tr>
</tbody>
</table>

(a) (i) What does the movement of the meniscus measure?

...........................................................................................................................................

........................................................................................................................................... [1]

(ii) How would you return the meniscus to zero?

...........................................................................................................................................

........................................................................................................................................... [1]
(b) (i) Why is a capillary tube used instead of an ordinary glass tube?
............................................................................................................ [1]

(ii) What was the effect of decreasing the number of leaves present on the twig?
............................................................................................................. [1]

(iii) Explain why removing leaves has the effect you have given in (b) (ii) above.
............................................................................................................. [1]

(iv) Explain why the meniscus still moves when there are no leaves on the shoot.
............................................................................................................. [1]

[Total: 6]

3 Fig. 3.1 shows the circulation of carbon in nature.

![Diagram of carbon cycle]

Fig. 3.1

(a) Name the processes represented by the arrows A and B.

Process A: ........................................................................................................... [1]
Process B ........................................................................................................... [1]

(b) (i) Name the gas produced as a result of process A.
.......................................................................................................................... [1]
(ii) Describe a simple chemical test which you could use to identify the gas you have named.

.........................................................................................................................................[2]

(c) In addition to carbon dioxide another acidic gas is released as a result of process C.

(i) Name the other gas produced by process C. .................................................................................................................................[1]

..............................................................................................................................................................................................[1]

(ii) What is the effect of the gas you have named in (c) (i) above on human health?

.....................................................................................................................................................................................................................................[1]

[Total: 7]

4 Fig 4.1 shows the circulation through a kidney machine of the blood of a person suffering from kidney failure.

![Kidney machine diagram]

Fig. 4.1

(a) (i) Place an X on the diagram where the blood enters the kidney machine. [1]

(ii) What structures in a normal kidney is represented by the thin-walled plastic tubes? ...................................................................................[1]
(b) Explain why glucose must be present in the fluid surrounding the thin walled plastic tubes in the kidney machine.

.............................................................................................................................................. [1]

(c) Name another substance other than water which is removed from the blood as it flows through the kidney machine.

.............................................................................................................................................. [1]

(d) (i) Suggest a suitable temperature for the fluid entering the kidney machine.

.............................................................................................................................................. [1]

(ii) Give reasons for your answer.

.............................................................................................................................................. [1]

(e) Explain why people using kidney machines are told to limit the amount of protein in their diet, whereas they can have a normal intake of carbohydrates.

.............................................................................................................................................. [4]

[Total: 10]

5 Fig 5.1 shows the inheritance of the eye colour within a family.

![Genetic Family Tree]

Fig. 5.1

Key
Brown eyed female
Brown eyed male
Blue eyed female
Blue eyed male
(a) (i) Suggest which eye colour is dominant in fig. 5.1

.................................................................................................................. [1]
.................................................................................................................. [1]

(ii) Give reasons for your answer.

.................................................................................................................. [1]
.................................................................................................................. [1]

(b) What are the eye colours of the following persons?

Person 1........................................................................................................ [3]
Person 11 .................................................................................................... [3]
Person 16 .................................................................................................... [3]

(c) (i) Which three persons in fig. 5.1 are homozygous for eye colour?

Person ........................................................................................................ [3]
Person ........................................................................................................ [3]
Person ........................................................................................................ [3]

(ii) Which three persons in fig. 5.1, F_2 generation, are heterozygous for eye colour?

Person ........................................................................................................ [3]
Person ........................................................................................................ [3]

(d) (i) If person 17 is homozygous for eye colour, what would be the chance of a child born to 16 and 17 being brown eyed?

.................................................................................................................. [1]
.................................................................................................................. [1]

(ii) If person 14 is heterozygous for eye colour, what would the chance of a child born to 13 and 14 being brown eyed?

.................................................................................................................. [1]

[Total: 13]
Section B

Answer any three questions.

6 (a) Describe ways in which a farmer would increase the rate of photosynthesis in a greenhouse.  [8]

(b) Explain why a bean plant will not produce seeds unless its rate of photosynthesis is greater than the rate of respiration.  [4]

[Total 12]

7 (a) Discuss the causative agent, signs and symptoms of cholera.  [9]

(b) Explain why incidences of cholera are more common during the rainy season than in the dry season.  [3]

[Total: 12]

8 (a) Describe the role played by fungi in the balance of nature.  [8]

(b) Describe two industrial processes in which fungi is used.  [4]

[Total: 12]

9 (a) Describe the process of water uptake by a plant.  [5]

(b) A backyard garden is suddenly flooded by untreated sewer water. Explain what effect this flooding would have on the:
   (i) soil  [7]
   (ii) crops

[Total: 12]

10 (a) Touching a hot object brings about a reflex response.
   (i) Why is such a response important to the body?  [3]
   (ii) Explain how a nerve impulse passes from one neurone to another.  [3]

(b) A possible risk of danger to the body can bring about the release of the hormone adrenaline.
   How does this hormone prepare the body to deal with danger?  [6]

[Total: 12]
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