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|---------------|------------------|------|
| Centre Number | Candidate Number | Name |
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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**BIOLOGY**

**0610/03**

Paper 3 Extended

May/June 2005

**1 hour 15 minutes**

Candidates answer on the Question Paper.  
There are no Additional Materials.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.  
Write in dark blue or black pen in the spaces provided on the Question Paper.  
You may use a soft pencil for any diagrams, graphs or rough working.  
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.  
At the end of the examination, fasten all your work securely together.  
The number of marks is given in brackets [ ] at the end of each question or part questions.

| FOR EXAMINER'S USE |  |
|--------------------|--|
| 1                  |  |
| 2                  |  |
| 3                  |  |
| 4                  |  |
| 5                  |  |
| 6                  |  |
| <b>TOTAL</b>       |  |

This document consists of **15** printed pages and **1** blank page.

- 1 Three plants were grown to study the effects of nitrate and magnesium ion deficiency on their development. They were kept in the same conditions, except for the types of minerals supplied.

Plant **A** was provided with all essential minerals.

Plant **B** was given all minerals except nitrate ions.

Plant **C** was given all minerals except magnesium ions.

Fig. 1.1 shows the plants a few weeks later.

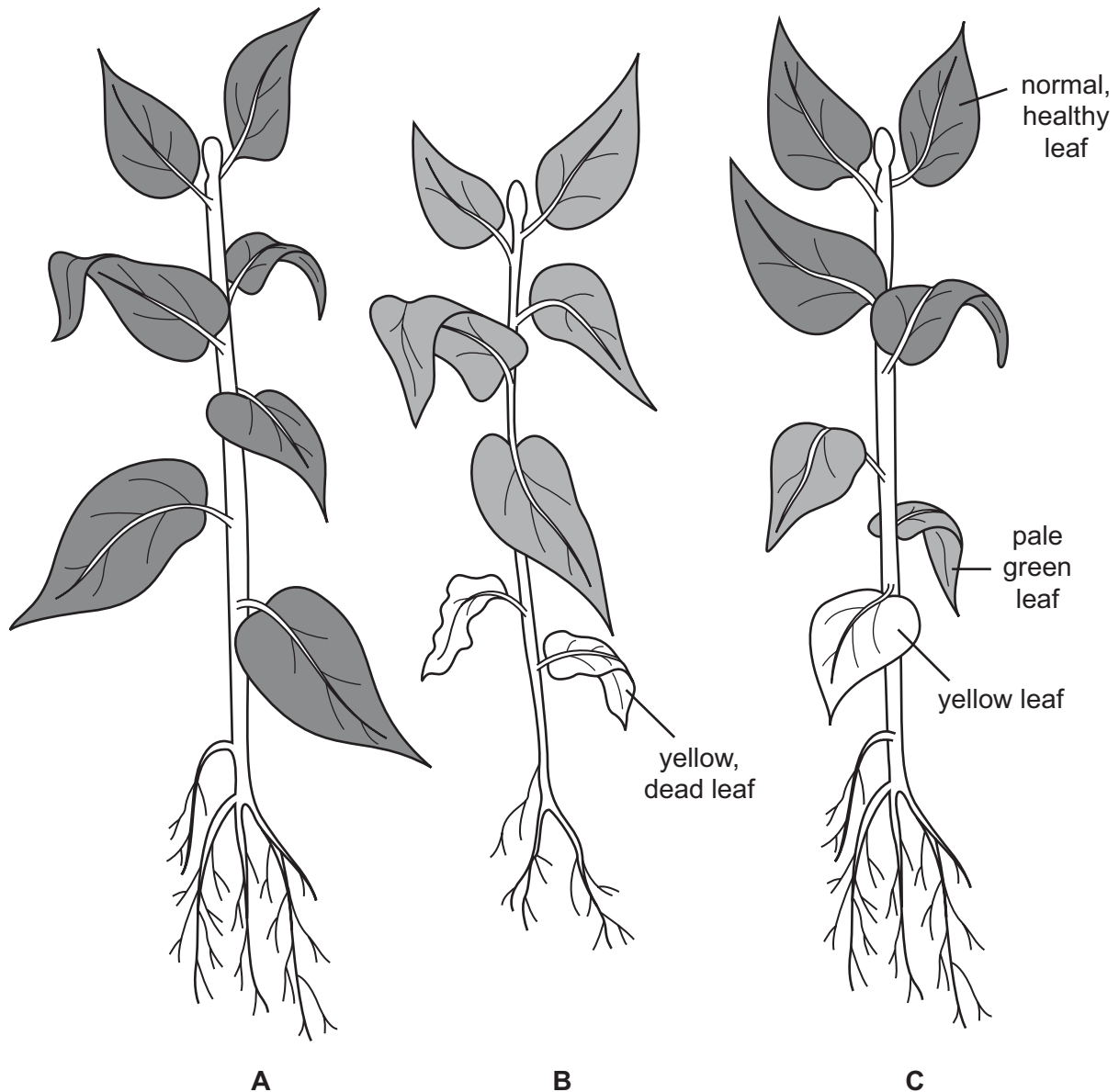


Fig. 1.1

(a) State three conditions, **other than** water and the concentration of mineral ions, that would need to be kept the same for all the plants, in order to make the investigation a fair test.

- 1. ....
- 2. ....
- 3. .... [3]

(b) Describe and explain the effect on plant growth of

(i) a deficiency of nitrate ions on plant **B**;

description .....

.....

.....

explanation .....

.....

..... [4]

(ii) a deficiency of magnesium ions on plant **C**.

description .....

.....

explanation .....

..... [2]

(c) A farmer tested the soil in a field and found that there was a high nitrate ion concentration.

The farmer then grew a crop in this field.

After the crop was removed, the soil was tested again. The nitrate ion concentration had decreased.

(i) Suggest two reasons why the nitrate ion concentration had decreased.

- 1. ....
- 2. .... [2]

(ii) Describe two methods the farmer could use to improve the nitrate ion concentration in the soil.

- 1. ....  
.....
- 2. ....  
..... [2]

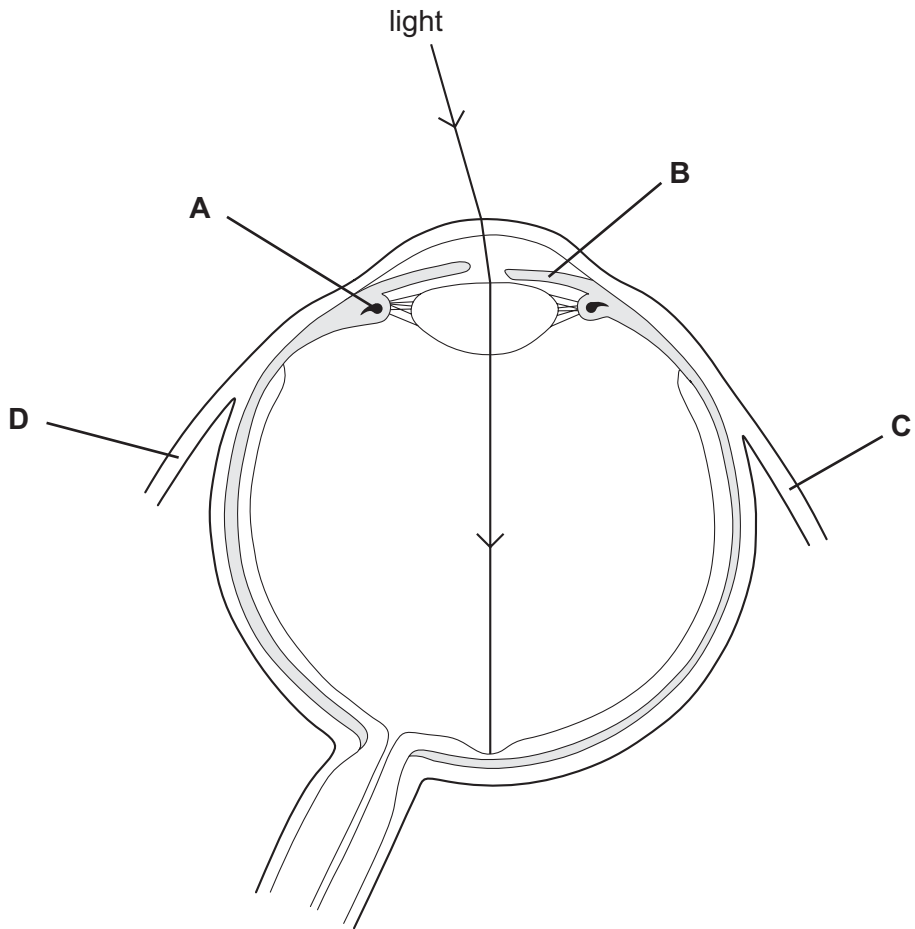
(d) Some species of plant grow well in soil that is always low in nitrate ions.

Explain how they can obtain a source of nitrogen compounds.

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

[Total: 16]

- 2 Fig. 2.1 shows a section through the eye with a ray of light passing through it and four muscles labelled **A**, **B**, **C** and **D**.



**Fig. 2.1**

**(a)** Complete the table.

| part     | name of muscle       | effect of contraction   |
|----------|----------------------|---|
| <b>A</b> | .....                | allows the lens to become fatter for<br>focusing on close objects |
| <b>B</b> | iris circular muscle | .....<br>.....  |

[2]

Muscles **C** and **D** are voluntary muscles that are antagonistic. They are attached to the eye socket of the skull.

**(b) (i)** Explain the terms *voluntary* and *antagonistic*.

voluntary .....

.....

antagonistic .....

..... [2]

**(ii)** Suggest the effect on the eye when muscle **C** contracts.

.....

..... [1]

**(iii)** Explain how the eye would return to its original position after this contraction.

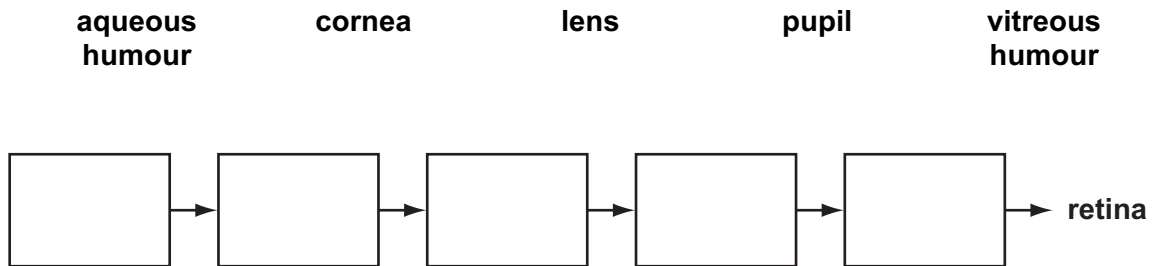
.....

.....

..... [2]

(c) Light passes through parts of the eye to reach the retina.

Complete the flow chart by putting the following terms in the boxes to show the correct order that the light passes through them.



[2]

(d) The retina contains rods and cones.

Complete the table to distinguish between rods and cones.

|       | type of light detected | distribution in the retina |
|-------|------------------------|----------------------------|
| rods  | .....                  | .....<br>.....             |
| cones | .....                  | .....<br>.....             |

[4]

[Total: 13]

3 Fig. 3.1 shows structures in the human thorax.

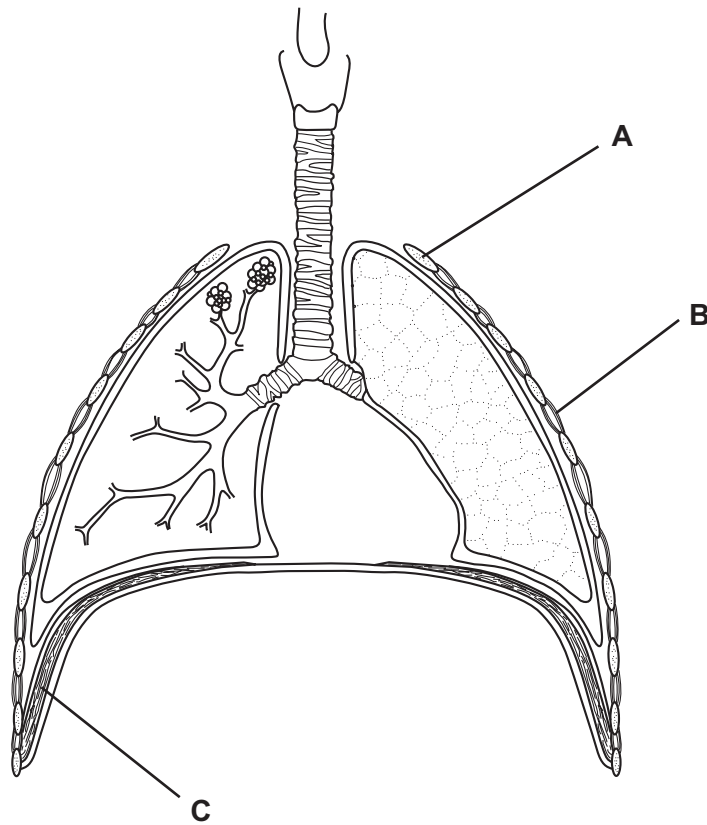


Fig. 3.1

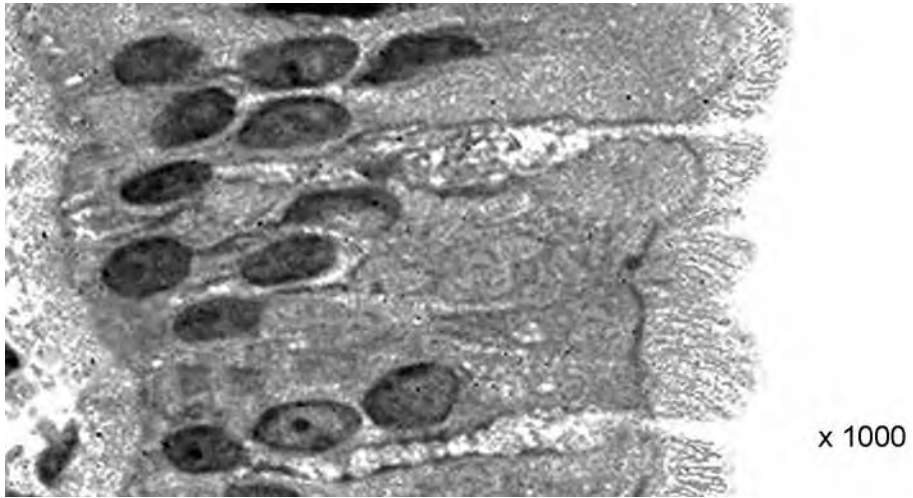
(a) Complete the table by identifying parts **A**, **B** and **C** and describing their roles in breathing in.

| part     | name  | role in breathing in    |
|----------|-------|-------------------------|
| <b>A</b> | ..... | .....<br>.....<br>..... |
| <b>B</b> | ..... | .....<br>.....<br>..... |
| <b>C</b> | ..... | .....<br>.....<br>..... |

[6]



Fig. 3.2 shows some cells from the lining of the bronchus.



**Fig. 3.2**

**(b) (i)** Explain how these cells help to keep the bronchus free from dust and bacteria.

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

**(ii)** Describe how the actions of these cells would be affected by **one named** compound of tobacco smoke.

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

[Total: 12]

- 4 Fig. 4.1 shows a transverse section through an *Ammophila* leaf. This plant has very long roots.  
Fig. 4.2 shows a cactus plant.  
Both plants live in very dry conditions.

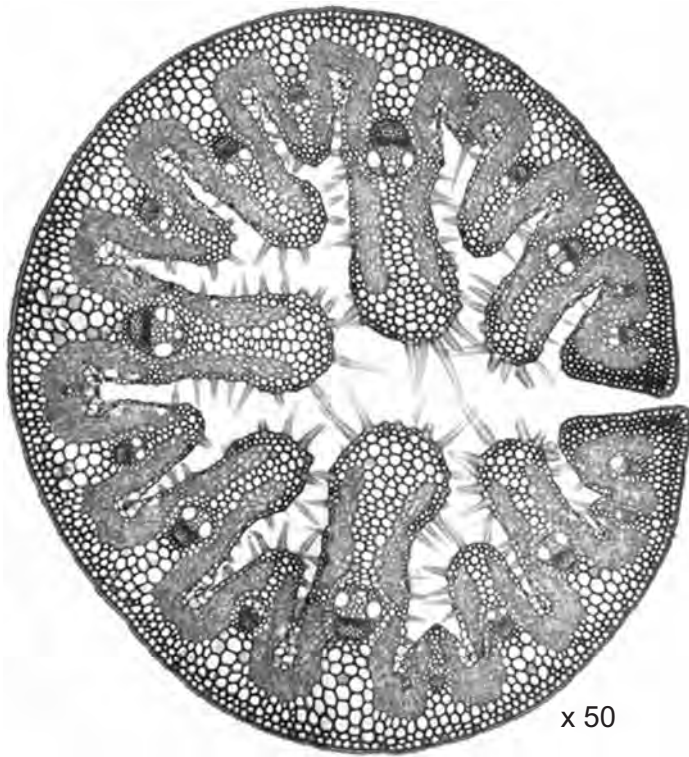


Fig. 4.1

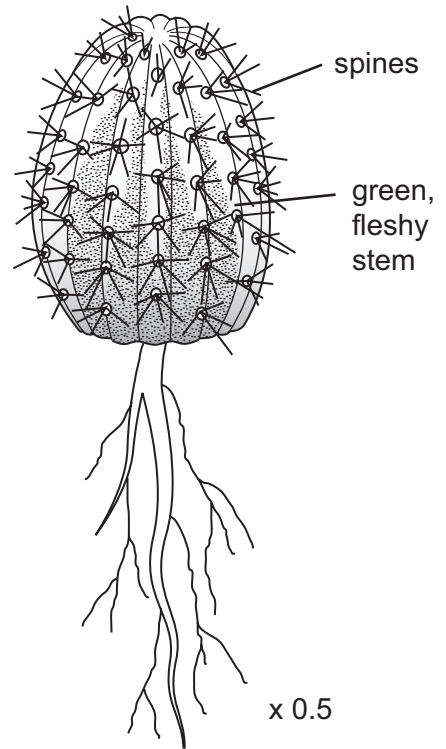


Fig. 4.2

(a) Suggest how each of the following adaptations would enable the named plant to survive in very dry conditions.

(i) *Ammophila*

1. rolled leaves with stomata on the inside of the leaf

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

2. thick waxy cuticle on the outside of the leaf

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

(ii) Cactus

1. very long roots

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

2. fleshy green stem

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

(b) Suggest why having only a few, very small leaves could be a disadvantage to a plant.

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

(c) Water is involved in a number of processes in plants.

Complete the table by

(i) naming the processes described;

(ii) stating one variable that, if increased, would speed up the process.

| description of process                 | name of process | variable that, if increased, would speed up the process |
|--|-----------------|---|
| absorption of water from the soil      | .....<br>.....  | .....<br>.....  |
| using water to form glucose            | .....<br>.....  | .....<br>.....  |
| movement of water vapour out of leaves | .....<br>.....  | .....<br>.....  |

[6]

[Total: 14]

5 Fig. 5.1 shows stages in the formation of a human fetus.

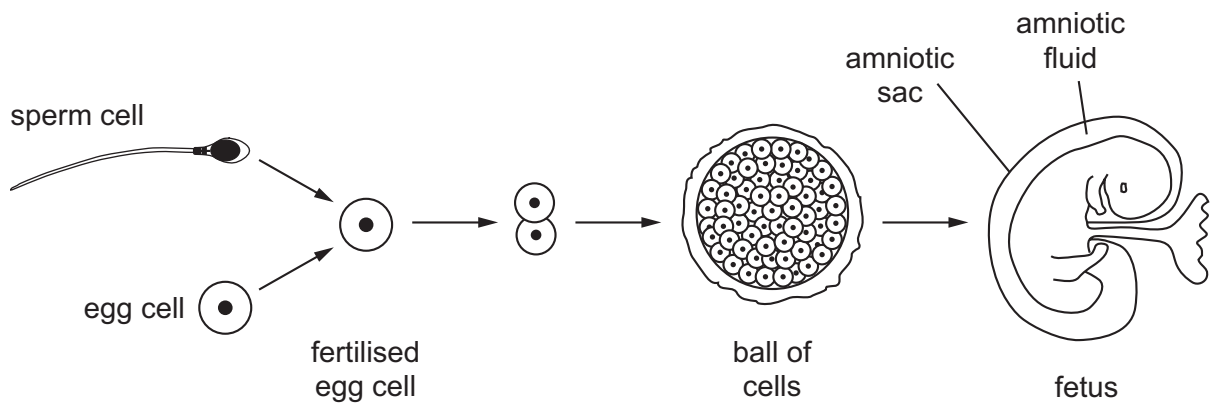


Fig. 5.1

(a) (i) Name the process of cell division that results in the formation of sperm cells.

..... [1]

(ii) State **one** way in which the sperm cell is different from cells in the developing fetus.

..... [1]

(iii) State the term used to describe the fertilised egg cell.

..... [1]

(iv) Explain what determines that a fertilised egg cell develops into a girl rather than a boy.

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

(b) State where each of the following is produced.

(i) the egg cell .....

(ii) the fertilised egg .....

(iii) the fetus ..... [3]

(c) The fetus is surrounded by amniotic fluid and an amniotic sac.

State their functions.

amniotic fluid .....

.....

amniotic sac .....

..... [2]

(d) (i) Outline the role of the placenta in the development of the fetus.

.....

.....

.....

.....

..... [4]

(ii) Describe the role of the placenta in maintaining pregnancy.

.....

.....

..... [2]

[Total: 15]

- 6 The Ruddy duck, *Oxyura jamaicensis*, is a native of America. A flock of 20 birds was introduced into Britain from America before 1950. The original flock settled quickly in their new habitat and started breeding. Numbers now exceed 6000.
- The White-headed duck, *Oxyura leucocephala*, (a native of Spain) is a closely related species to the Ruddy duck.
- Female White-headed ducks are more attracted to male Ruddy ducks than to males of their own species.
- Cross-breeding between the two species produces a new variety of fertile duck.
- The White-headed duck is now threatened with extinction.
- Some conservationists are considering a plan to kill the British population of Ruddy ducks to prevent the White-headed duck becoming extinct.

Fig. 6.1 shows a male Ruddy duck.



Fig. 6.1

- (a) State two features, visible in Fig. 6.1, that distinguish birds, such as the Ruddy duck, from other vertebrate groups.

1 .....

2 ..... [2]

- (b) (i) With reference to an example from the passage, describe what is meant by the term *binomial system*.

.....

..... [2]

- (ii) State two reasons, based on information in the passage, why the Ruddy duck and White-headed duck are considered to be closely related.

1 .....

.....

2 .....

..... [2]

(c) (i) Explain why Ruddy ducks would **not** become extinct, even if British conservationists carried out their plan.

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

(ii) Suggest **one** factor, other than the breeding habits of the Ruddy duck, that could result in the extinction of a bird such as the White-headed duck.

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

(d) The Ruddy duck feeds on seeds and insect larvae. The ducks are eaten by foxes and humans.

Explain why these feeding relationships can be displayed in a food web, but not in a food chain.

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

[Total: 10]

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