

# Reproduction

## Question Paper 2

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|-------------------|--|
| <b>Level</b>      | International A Level                        |
| <b>Subject</b>    | Biology                                      |
| <b>Exam Board</b> | Edexcel                                      |
| <b>Topic</b>      | Cell Structure, Reproduction and Development |
| <b>Sub-Topic</b>  | Reproduction                                 |
| <b>Booklet</b>    | Question paper 2                             |

**Time Allowed:** 53 minutes

**Score:** /44

**Percentage:** /100

**Grade Boundaries:**

| A*   | A     | B   | C     | D     | E   | U    |
|------|-------|-----|-------|-------|-----|------|
| >85% | 77.5% | 70% | 62.5% | 57.5% | 45% | <45% |

- 1 Infertility reduces the chance of successful fertilisation of the egg by a sperm cell. There are many causes of infertility in humans.

One cause of infertility is cigarette smoking. Men who smoke cigarettes have a 30% higher risk of infertility.

Cigarette smoke contains nicotine. The effects of nicotine on the quality of sperm cells have been studied in rats.

Male rats were given nicotine at levels of either 0.5 mg per kg of body mass or 1.0 mg per kg of body mass.

The sperm cells produced by these rats were compared with sperm cells produced by a control group of rats. The rats in the control group were not exposed to nicotine. The defects in the sperm cells produced were recorded and the results are shown in the table below.

| Type of sperm cell                     | Percentage of each type of sperm cell (%) |                           |                           |
|--|---|---------------------------|---------------------------|
|  | Control                                   | 0.5 mg of nicotine per kg | 1.0 mg of nicotine per kg |
| normal sperm cells                     | 93.6                                      | 83.2                      | 75.2                      |
| sperm cells with flagella defects      | 3.9                                       |                           | 19.9                      |
| sperm cells with mid-piece defects     | 2.0                                       | 2.7                       | 3.7                       |
| other defects, including missing heads | 0.5                                       | 1.0                       | 1.2                       |

- (a) (i) Complete the table to give the percentage of sperm cells with flagella defects when the rats were given 0.5 mg of nicotine per kg of body mass.

(1)





(c) Suggest why a valid study on the effects of globozoospermia on fertility would have to be carried out on non-smokers.

(3)

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**(Total for Question 1 = 13 marks)**





(b) When the female lion was first brought to Longleat Safari Park, the zookeepers noted symptoms including tremors, uncoordinated movements and aggressive behaviour.

It was thought that these problems were due to a poor diet when she was younger.

Her cubs were given a better diet at Longleat but they had the same symptoms as their mother.

Suggest what could have been the main cause of the problems in these lions.  
Give a reason for your answer.

(2)

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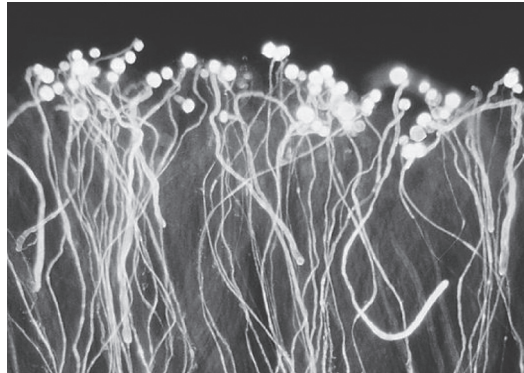
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**(Total for Question 2 = 8 marks)**



3 The photograph below shows pollen germinating on the stigma of a tomato flower.



Magnification  $\times 100$

(a) Explain how the pollen tubes grow through the style of the flower.

(2)

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(b) Place a cross  in the box next to the correct word or words to complete each of the following statements.

(i) The tip of the pollen tube breaks through the micropyle to enter the

(1)

- A** egg cell
- B** embryo sac
- C** ovary
- D** style

(ii) During fertilisation, nuclei from the pollen tube fuse with (1)

- A the antipodal cells
- B the egg cell and the antipodal cells
- C the egg cell and the polar nuclei
- D the polar nuclei and the antipodal cells

(iii) During fertilisation, the following structures are produced (1)

- A diploid zygote and diploid endosperm
- B diploid zygote and triploid endosperm
- C triploid zygote and diploid endosperm
- D triploid zygote and triploid endosperm

(c) Describe how the structure of a pollen grain differs from that of a sperm cell. (2)

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**(Total for Question 3 = 7 marks)**

4 The root tip squash procedure can be used to observe cells undergoing mitosis.

(a) Explain the role of mitosis in the development of roots.

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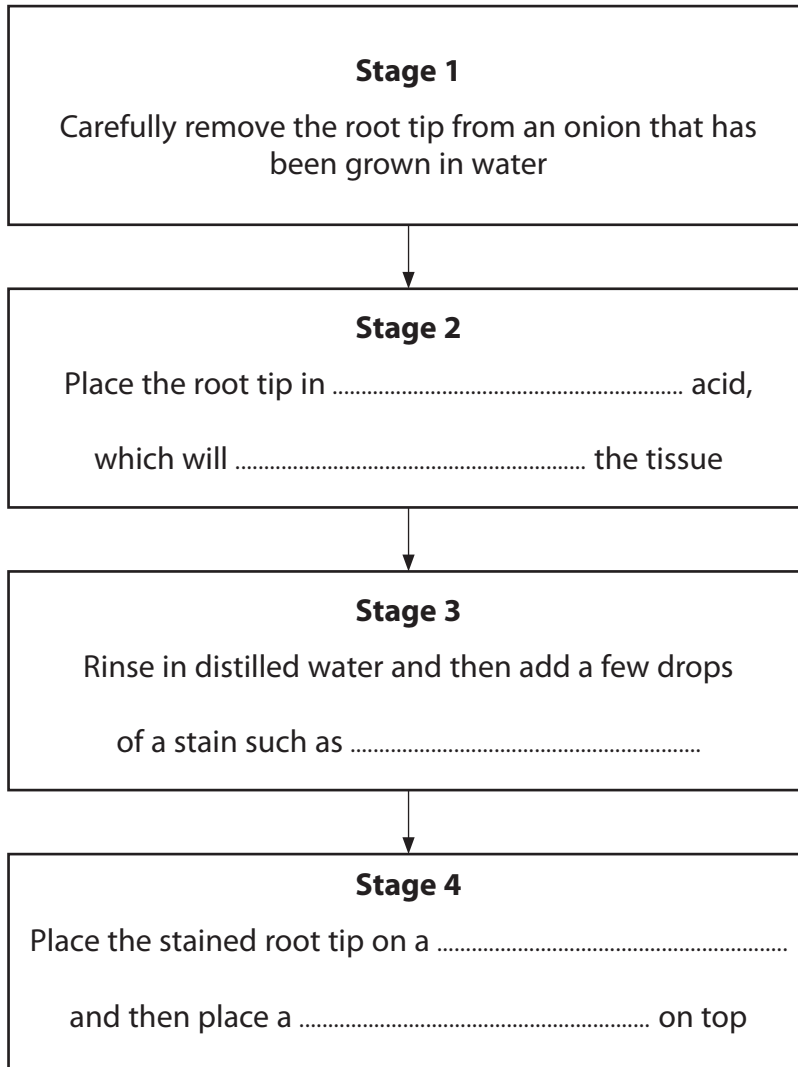
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(b) (i) The flow chart below describes the stages involved in staining a root tip squash to show mitosis.

Complete the flow chart by writing the most appropriate word or words on the dotted lines.

(3)



(ii) Describe **one** safety precaution that should be taken when carrying out this procedure.

(1)

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\*(c) Following mitosis, some cells undergo differentiation to become specialised tissues, such as xylem.

Explain how cells differentiate to become specialised tissues.

(4)

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(d) Similar staining techniques can be used to observe cells undergoing meiosis.

(i) Name a process that may be observed in cells undergoing meiosis but **not** mitosis.

(1)

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(ii) Explain how meiosis can give rise to genetic variation in the gametes produced.

(2)

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**(Total for Question 4 = 13 marks)**