

Centre Number						Candidate Number				
Surname										
Other Names										
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For Examiner's Use Total Task 1



General Certificate of Education
Advanced Subsidiary Examination
June 2010

Human Biology

HBI3X/PM1

Unit 3X AS Externally Marked Practical Assignment

Task Sheet 1

To be completed before Task Sheet 2.

For submission by 15 May 2010

For this paper you must have:

- a ruler with millimetre measurements
- a calculator.

Investigating the cell cycle and the time spent in different stages of mitosis

Introduction

In this investigation, you will estimate the number of cells undergoing mitosis in the root tip of an onion.

Task 1

The root tip of a plant is a region where many cells are dividing by mitosis. You are going to stain cells from an onion root tip with toluidine blue. If a cell is dividing by mitosis, you will see chromosomes. If a cell is not dividing, you will see a nucleus but you will not see chromosomes. You only need to obtain one set of results from one slide that you prepare.

Materials

You are provided with

- test tube containing pre-heated hydrochloric acid
- toluidine blue stain
- thermometer
- dropping pipette
- 2 root tips in water
- test tube
- test-tube rack
- distilled water
- scalpel
- white tile
- forceps
- access to water bath at 60 °C
- microscope slides
- cover slips
- microscope
- timer

You may ask your teacher for any other apparatus you require.

Outline method

Read these instructions carefully before you start your investigation.

It is important that the root tips are not allowed to dry out by being exposed to air between steps in the method.

1. You are provided with a test tube containing hydrochloric acid that has been heated in a water bath at 60 °C. Remove the first 3 mm from the tip of each root.
2. Add the root tips to the pre-heated acid and leave at 60 °C for 4 minutes.
3. Use the forceps to hold one root tip by its cut end and rinse the root tip in a tube of water.
4. Transfer the root tip by its cut end onto a microscope slide.
5. Place a second microscope slide on top of the root tip, at right angles to the first slide, and squash the root tip between the two slides.
6. Separate the two slides and add 1 drop of toluidine blue to the squashed root tip on one of the slides. Immediately cover the squashed tissue with a cover slip.
7. Use the microscope at its highest magnification (such as x400) to examine the slide for signs of mitosis.
8. Select an appropriate field of view and count:
 - the total number of cells visible
 - the number of cells showing mitosis (where chromosomes can be seen).
9. Record your results in the table below.

You will need to decide for yourself

- whether or not a cell shows signs of mitosis.

Recording your results

Record your results in the table.

Total number of cells visible	Total number of cells showing mitosis

Questions on Task 1

Answer **all** questions in the spaces provided.

1 Suggest **one** reason why you

1 (a) held the root tip by its cut end (step 3).

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1 (b) added toluidine blue stain to the squashed root tip (step 6).

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1 (c) placed the root tips in hydrochloric acid (step 2).

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1 (d) heated the root tips at 60 °C (step 2).

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(4 marks)

2 You squashed the root tip between two microscope slides.

2 (a) Explain why you squashed the root tip.

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(1 mark)

- 2 (b)** Squashing between two microscope slides can provide more than one set of results. Explain how.

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(2 marks)

- 3** Another student carried out the same investigation as you did. She counted the cells in one field of view and recorded the number of cells showing mitosis. She calculated the mitotic index from these figures. The mitotic index is the percentage of cells undergoing mitosis. The table shows her results.

Total number of cells visible	Total number of cells showing mitosis	Mitotic index
368	59	

- 3 (a)** Use the student's results to calculate the mitotic index for the root tip. Enter this value in the table. (1 mark)

- 3 (b)** A different student used the same procedure with a pea plant he had grown himself. He counted 227 cells in one field of view and recorded that 2 of the cells were undergoing mitosis. He calculated the mitotic index but did not think that the figure he calculated was reliable.

Give **two** reasons why his calculation was unreliable.

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(2 marks)

END OF TASK 1

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