General Certificate of Education
Advanced Subsidiary Examination
June 2013

Biology BIO3T/Q13/TN

Unit 3T AS Investigative Skills Assignment

Teachers' Notes Confidential

A copy should be given immediately to the teacher responsible for GCE Biology

Open on receipt

Teachers' Notes

Confidential

These notes must be read in conjunction with *Instructions for the Administration of the ISA: GCE Biology* published on the AQA Website.

Estimating the density of stomata in the lower epidermis of leaves

Introduction

The epidermis is made up of a single layer of epidermal cells with stomata. Each stoma has two guard cells.

The density of stomata is the number of stomata in a given area of leaf epidermis. In this investigation, candidates will count the number of stomata in different fields of view of a microscope.

Materials

In addition to access to general laboratory equipment, each candidate needs:

- access to an optical microscope
- 3 microscope slides
- 3 cover slips
- forceps
- mounted needle
- a small beaker
- dropping pipette
- scalpel (if required)
- 3 mature leaves from the same plant.

Managing the investigation

If you have queries about the practical work for the ISA, please contact your Assessment Adviser. Contact details can be obtained by emailing your centre name and number to biology-gce@aqa.org.uk. Please do not contact suppliers for advice.

This investigation has been trialled successfully using leaves of *Pelargonium*, *Tradescantia*, *Philodendron* and *Ligustrum* (privet). Other plants may be used but plants with hairy leaves should be avoided. The leaves to be used in the investigation should be tested by the centre, so that candidates can easily produce peels in which stomata can be seen.

The Task Sheet states that the leaves are from the same plant. In terms of managing the investigation, it is not essential that the leaves are from the same plant but they should be of the same species.

To obtain a small piece of lower epidermal tissue, candidates should fold the leaf with the upper epidermis to the outside of the fold. The fold should be made at least 5 mm from a major vein. They should then tear the leaf, at an angle, where the fold has broken all the tissues other than the lower epidermis. A small piece of the lower epidermis can be removed with forceps. **Teachers should demonstrate this part of the procedure**.

Stomata are most easily counted at a magnification of about ×400, (i.e. ×10 eyepiece and ×40 objective) which is high power magnification for microscopes in most centres. If these lenses are not available on microscopes at your centre, please instruct candidates to use the objective lens on their microscope with the highest magnification.

Where centres do not have sufficient microscopes, candidates may share microscopes but they should make their own slides for viewing.

Trialling

The task must be trialled before use.

Calculating standard deviation

Candidates are expected to calculate standard deviation when processing their results (Candidate Results Sheet: Stage 2). The specification only requires that candidates are able to calculate this with a standard scientific calculator (3.3.3 and 3.9). We are aware, however, that some candidates may have been taught to calculate standard deviation using the formula:

$$SD = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

where

SD = the standard deviation
x = each value in the sample
$\bar{x}$ = the mean of the values
n = the number of values (the sample size).

If candidates calculate standard deviation using the following formula:

$$SD = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

they should receive credit for their answer, providing it has been calculated correctly.

Notes from CLEAPSS

Certain plants might be poisonous (e.g. laurel) or cause an allergic response. There should be no hand to mouth transfer during the activity, and candidates should wash their hands after handling plants.

We had difficulty obtaining peels from young leaves. Better results were obtained using mature, stiff leaves.

Additional Information

AQA might publish Additional Information about an ISA/EMPA practical. This will be placed on e-AQA in Secure Key Materials. We will email Exams Officers who have down-loaded the particular Teachers' Notes so they can print a copy for the Head of Biology. Additional Information will cover issues such as suitable suppliers or tips on getting a practical to work.

Information to be given to candidates

Candidates must **not** be given information about an ISA assessment until one week before Stage 1. One week before sitting Stage 1 of the ISA, teachers should give their candidates the following information.

You will investigate the number of stomata in a leaf. In addition, you will need to understand the following topics:

- leaf structure
- transpiration.

There **must** be no further discussion and candidates **must not** be given any further resources to prepare for the assessment.

Candidates must decide for themselves:

- how many fields of view to examine.

Copyright © 2013 AQA and its licensors. All rights reserved.