-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

Hanover House
24 Douglas Street
GLASGOW G2 7NQ

NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- **7310102** **-Session-1992-93**
-Superclass- **RH**

-Title- **INTRODUCING BIOLOGICAL CELLS**

-DESCRIPTION-

Purpose

This module is designed to introduce candidates to the major processes occurring in cells.

The module would be suitable for inclusion in introductory programmes in biology, biochemistry, or genetics.

It could be offered in conjunction with other Stage 1 modules.

Preferred Entry Level

No formal entry requirements.

Outcomes

The candidate should:

1. use a compound microscope to identify cell types;
2. explain diffusion and osmosis in cells;
3. perform experiments related to diffusion and osmosis;
4. describe enzyme controlled synthesis and degradation in cells;
5. perform experiments related to enzyme controlled synthesis and degradation.

Assessment Procedures

Acceptable performance in this module will be satisfactory achievement of all the Performance Criteria specified for each Outcome.

The following abbreviations are used below:

PC Performance Criteria
IA Instrument of Assessment

Note: The Outcomes and PCs are mandatory and cannot be altered. The IA may be altered by arrangement with SQA. (Where a range of performance is indicated, this should be regarded as an extension of the PCs and is therefore mandatory.)

OUTCOME 1 USE A COMPOUND MICROSCOPE TO IDENTIFY CELL TYPES

PCs

(a) The setting up of the microscope is correct with respect to focusing and positioning of slide to locate cells.
(b) The identification of cells as either plant or animal is correct with reference to observed characteristics.

IA Assignment

A set exercise to assess the candidate's ability to use a compound microscope to identify cell types.

The exercise will involve identification of cell types from 5 slides. At least 2 of the slides must be cell types from plants and at least 2 must be from animals. The cells should be drawn from different tissues. The times magnification range of the microscope should be between 40 and 200.

The candidate will be required to set up the microscope, correctly position the slide to enable identification of cell type and record the reasons for their decision.

An observation checklist should be used to record the candidate's practical skills in the use of the microscope for Performance Criterion (a).

Satisfactory achievement of the Outcome will be demonstrated by the candidate achieving both Performance Criteria for 4 of the 5 slides.

OUTCOME 2 EXPLAIN DIFFUSION AND OSMOSIS IN CELLS

PCs

(a) The description of both diffusion and osmosis is correct in terms of:

    (i) membrane permeability;
    (ii) direction of molecular movements.

(b) The prediction of movement of water and solutes is correct for given situations involving cells.

(c) The explanation of the effect of placing animal and plant cells in different solute concentrations is correct with respect to appearance of cells.

IA Restricted Response/Objective Questions

2 restricted response questions and 8 objective questions under closed book conditions to assess the candidate's ability to apply the concepts of osmosis and diffusion in given situations.

The restricted response questions should be allocated to (a) and objective questions for (b) and (c) allocated as follows:

(a)	diffusion	1
	osmosis	1
(b)	cells	4
(c)	animals cells	2
	plant cells	2

Several types of objective questions would be suitable for the above assessments.

The range of questions should be such that the ability of the candidate to apply the concepts of osmosis and diffusion in both ANIMAL and PLANT cells is tested.

Satisfactory achievement of the Outcome will be demonstrated by the candidate achieving 2 correct responses for (a), and 3 correct responses for (b) and 3 correct responses for (c).

OUTCOME 3 PERFORM EXPERIMENTS RELATED TO DIFFUSION AND OSMOSIS

PCs

(a) The preparation for an experimental procedure is:

(i) in accordance with given specifications;
(ii) correct with respect to setting up equipment.

(b) The experimental procedures carried out are correct and safe.
(c) The recorded results are in an appropriate format.
(d) The interpretation of results is correct with respect to identification of factors affecting the experiment.
(e) The conclusions drawn are valid.

IA Assignments

2 assignments to assess the candidate's ability to perform experiments relating to diffusion and osmosis.

The candidate will be required to carry out two experiments, one related to osmosis and one to diffusion. A checklist should be devised to ensure a reliable interpretation of the candidate's practical performance for Performance Criteria (a) and (b).

The candidate will be required to present evidence for each experiment for Performance Criteria (c)-(e).

Satisfactory achievement of the Outcome will be based on the candidate achieving ALL the Performance Criteria in BOTH experiments.

OUTCOME 4 **DESCRIBE ENZYME CONTROLLED SYNTHESIS AND DEGRADATION IN CELLS**

PCs

(a) The description of enzyme activity is correct in terms of:

(i) enzyme specificity;
(ii) model for enzyme action;
(iii) factors that affect enzyme activity.

(b) The outline of photosynthesis is correct with respect to:

(i) raw materials;
(ii) required conditions;
(iii) product(s).

(c) The outline of aerobic and anaerobic respiration is correct with respect to:

(i) raw materials;
(ii) required conditions;
(iii) product(s).

IA Objective Questions

12 objective questions under closed book conditions to assess the candidate's ability to describe enzyme controlled synthesis and degradation in cells.

The questions should be allocated as follows:

(a) enzyme activity 4
(b) photosynthesis 4
(c) cell respiration 4

Several types of objective questions would be suitable for the above assessment.

Satisfactory achievement of the Outcome will be demonstrated by the candidate achieving 3 correct responses for (a), 3 correct for (b), and 3 correct responses for (c).

OUTCOME 5 **PERFORM EXPERIMENTS RELATED TO ENZYME CONTROLLED SYNTHESIS AND DEGRADATION**

PCs

(a) The preparation for an experimental procedure is:

(i) in accordance with given specifications;
(ii) correct with respect to setting up equipment.
(b) The experimental procedures carried out are correct and safe.
(c) The recorded results are in an appropriate format.
(d) The interpretation of results is correct with respect to identification of factors affecting the experiment.
(e) The conclusions drawn are valid.

IA Assignments

2 assignments to assess the candidate's ability to perform experiments relating to synthesis and degradation.

The candidate will be required to carry out two experiments, one related to synthesis and one related to degradation.

A checklist should be devised to ensure a reliable interpretation of the candidate's practical performance for Performance Criteria (a) and (b).

The candidate will be required to present evidence for each experiment for Performance Criteria (c)-(e).

Satisfactory achievement of the Outcome will be based on the candidate attaining ALL the Performance Criteria in BOTH experiments.

The following sections of the descriptor are offered as guidance.
They are not mandatory.

CONTENT/CONTEXT

Corresponding to Outcomes 1-5:

1. Range of plant cells could include prepared slides of: onion epidermis, tomato parenchyma, guard cells, Elodea mesophyll, rhubarb epidermis, xylem, phloem.

   Range of animal cells could include prepared slides of: red blood cells, white blood cells, cheek cells, muscle cells, nerve cells, bone cells, epidermal cells.

   Cell components: cellulose cell wall, chloroplast, permanent vacuole - identifies as plant cells; absence of above identifies as animal cell.

   Function of cell components: nucleus - controls cell's activity; chloroplast - site of photosynthesis; vacuole - water regulation; cell membrane - controls entry and exit of substances; cell wall - support.

2. Explanation of appearance of cells in haemolysis, crenation, plasmolysis and turgor in terms of movement of water.

3. Experiments could include for diffusion: movement of glucose across visking tube;

   Experiments for osmosis: potato cylinders, sugar/salt solutions, visking tubes, osmometers, plasmolysis under a microscope.

4. The influence of temperature and pH on enzyme activity.

   Word equations for photosynthesis, aerobic and anaerobic respiration.

   Required conditions for photosynthesis to include raw materials, light, suitable temperature and pH.

   Required conditions for respiration to include raw materials, suitable temperature and pH.

5. Synthesis experiments could include: synthesis of starch in potato tubers, Elodea bubbler experiment.

   Degradation experiments could include: breakdown of starch, lipids, proteins, hydrogen peroxide.

   Experiments on photosynthesis to demonstrate factors affecting enzyme activity.

SUGGESTED LEARNING AND TEACHING APPROACHES

During the work of the module candidates should have several opportunities to practise their skills. Each candidate should be assessed at appropriate points throughout the module. Where a candidate is unsuccessful in achieving an Outcome, provision should be made for remediation and reassessment.

Laboratory practical work is likely to play a significant part in this module. Safety considerations should be observed at all times.

A candidate-centred, resource-based approach is likely to be the most suitable for this module. The Outcomes can be integrated so that concepts can be developed.