National Unit Specification: general information

UNIT   Behaviour, Populations and the Environment (Higher)

NUMBER   D045 12

COURSE   Human Biology (Higher)

SUMMARY

The unit seeks to develop knowledge and understanding, problem solving and practical abilities in the context of the nervous system and memory, behaviour and population growth and the environment. This is a component unit of Higher Human Biology.

OUTCOMES

1   Demonstrate knowledge and understanding related to behaviour, populations and the environment.
2   Solve problems related to behaviour, populations and the environment.
3   Collect and analyse information related to Higher Human Biology obtained by experiment.

Administrative Information

Superclass: RH

Publication date: June 2002

Source: Scottish Qualifications Authority

Version: 05

National Unit Specification: general information (cont)

UNIT Behaviour, Populations and the Environment (Higher)

RECOMMENDED ENTRY

Entry to this unit is at the discretion of the centre. However, it would be an advantage if the candidate had attained one of the following:

- Standard Grade Biology with Knowledge and Understanding and Problem Solving at Credit level
- Intermediate 2 Biology.

In particular, candidates should have a clear understanding of the Standard Grade Biology topics of behavioural responses of animals to their environment, structure and function of the central nervous system and its sensory receptors, population regulation, nutrient cycles, pollution, ecosystems, and genetic engineering. Alternatively, candidates should have achieved the units: *Environmental Biology and Genetics (Int 2)* and *Animal Physiology (Int 2).*

CREDIT VALUE

1 credit at Higher.

CORE SKILLS

Core skills for this qualification remain subject to confirmation and details will be available at a later date.

Additional information about core skills is published in the *Catalogue of Core Skills in National Qualifications* (SQA, 2001).

National Unit Specification: statement of standards

UNIT   Behaviour, Populations and the Environment (Higher)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding related to behaviour, populations and the environment.

Performance criteria
(a) The nervous system is described correctly in relation to its structure and function and its role in memory.
(b) Behaviour is explained correctly in terms of the factors influencing the development of behaviour, and communication.
(c) Population growth and the environment is described correctly in terms of population change, population limiting factors and population effects on the environment.

Evidence requirements
Evidence of an appropriate level of achievement must be generated from a closed-book test with items covering all the above performance criteria.

OUTCOME 2

Solve problems related to behaviour, populations and the environment.

Performance criteria
(a) Relevant information is selected and presented in an appropriate format.
(b) Information is accurately processed, using calculations where appropriate.
(c) Conclusions drawn are valid and explanations given are supported by evidence.
(d) Experimental procedures are planned, designed and evaluated appropriately.
(e) Predictions and generalisations made are based on available evidence.

Evidence requirements
Evidence of an appropriate level of attainment must be generated from a closed-book test with items covering all the above performance criteria and with problems in the context of the nervous system and memory, behaviour and population growth and the environment.

National Unit Specification: statement of standards (cont)

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OUTCOME 3

Collect and analyse information related to Higher Human Biology obtained by experiment.

Performance criteria

(a) The information is collected by active participation in the experiment.
(b) The experimental procedures are described accurately.
(c) Relevant measurements and observations are recorded in an appropriate format.
(d) Recorded experimental information is analysed and presented in an appropriate format.
(e) Conclusions drawn are valid.
(f) The experimental procedures are evaluated with supporting argument.

Evidence requirements

A report of one experimental activity is required, covering the above performance criteria in relation to the contents and notes specified for Higher Human Biology.

The teacher/lecturer responsible must attest that the report is the individual work of the candidate derived from active participation in an experiment involving the candidate in planning the experiment; deciding how it is managed; identifying and obtaining the necessary resources, some of which must be unfamiliar; and carrying out the experiment. Depending on the activity, the collection of the information may be group work.

Evidence submitted in support of attainment of PC(d) must be in the format of a table or graph(s) as appropriate. Conclusions drawn should be justified by reference to supporting evidence.

The evaluation should cover all stages of the experiment, including the initial analysis of the situation and planning and organising the experimental procedure.

National Unit Specification: support notes

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This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

Outcome 1
a) **Nervous system and memory**
   Structure and function of the nervous system and its role in memory
   i   The brain.
       Large size of the human brain.
       The cerebrum and its convoluted surface.
       Localisation of function in discrete areas and the function carried out.
       The relationship between the size of a discrete area and the function carried out.
       The importance of the corpus callosum in transferring information between the two hemispheres.
   ii   Organisation of the nervous system.
       Division into central and peripheral nervous systems. Division into somatic and autonomic nervous systems (sympathetic and parasympathetic).
       Functions of dendrites, cell body, axons and myelin sheath. The continuing post-natal development of myelination.
       Chemical transmission at the synapse by neurotransmitters. The need for removal of neurotransmitters. Excitatory and inhibitory signals.
       Converging and diverging neural pathways. Plasticity of response of the nervous system.
   iii   Memory.
       Localisation of memory in the brain.
       The processes of encoding, storage and retrieval.
       Short-term memory.
       Transfer of information between short and long-term memory.
       The evidence for a molecular basis for memory.

b) **Behaviour**
   1   Factors influencing the development of behaviour
       i   Maturation.
               Constancy of sequencing in maturation. The sequence of development leading to walking in infants.
       ii   Inheritance.
               Inherited conditions that affect the development of the nervous system.
       iii   Environment.
               The value of twin studies in investigating the influence of the environment on behaviour.
       iv   The inter-relationship between maturation, inheritance and the environment.
               Influences on the development of intelligence.

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2   Communication and social behaviour
   i   The effect of infant attachment.
        The long period of dependency providing opportunities for learning.
        The importance of infant attachment in the development of later social development and competence.
   ii   The effect of communication.
        The importance of non-verbal communication in parent-infant bonding and in adult communication.
        The use of language (both written and spoken) to convey information.
   iii The effect of experience.
        The effect of practice on motor skills.
        Imitation.
        Reinforcement, shaping and extinction of behaviour as seen in trial and error learning.
        Generalisation and discrimination.
   iv   The effect of group behaviour and social influence.
        Social facilitation: increased performance in competitive situations.
        Deindividuation: loss of personal identity in a group leading to diminished restraints on behaviour.
        Influences that change beliefs: internalisation - changing beliefs as a result of persuasion; identification - changing beliefs to be like an admired influencing source.

c) **Population growth and the environment**
    1   Population change
       i   Human population growth.
            Pre-history of modern man.
            Growth of world population to the end of the twentieth century demonstrating the change from a period of stability to exponential growth.
            Demographic trends in developed and developing countries.
            Factors which may explain exponential growth of populations:
            - overpredation
            - increasing food availability
            - reduction in child mortality
            - increase of life expectancy and the consequences of female fecundity.
       ii   Population control through birth rate reduction and the effect on population increase.

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2   Population limiting factors
  i   Food supply.
        Consequences of increasing demand for agricultural land especially in developing countries.
        Purpose and impact of fertiliser, herbicide, fungicide and pesticide use.
        Increasing food production by selective plant breeding and genetic manipulation.
        Effects of food shortage: malnutrition and starvation.
  ii   Water supply.
        Meeting long increased demand worldwide.
        Unpredictability of supply due to climatic changes and erosion.
        Consequences of deforestation and marginal-land farming practices for water supply cycle.
  iii   Disease.
        Regulatory effects of disease on populations.
        Use of vaccines to control major childhood diseases, eg measles, whooping cough.
        Effects of improved hygiene and sanitation.

3   Population effects on the environment
  i   Disruption of food webs.
        Effects of chemicals (agricultural and other) on wildlife.
        Loss of complexity leading to instability.
  ii   Disruption of nitrogen cycle
        Algal blooms in marine and freshwater environments.
        Inadequate sewage treatment.
        Contamination of drinking-water supplies by nitrates and nitrites.
  iii   Disruption of carbon cycle
        Reasons for global increase in carbon dioxide and methane levels.
        Rise in sea level.

Further detail is given in the supplementary notes in the course content section of the course specification.

Outcome 2
Examples of learning activities which provide suitable contexts for the development of problem solving skills include:

• design and carry out an investigation to determine the memory span for letters or numbers
• design and carry out an investigation on learning using a finger maze
• design and carry out an investigation on the speed of performance of a task by following instructions and by imitation
• obtain and present information on human population density in various undeveloped societies
• obtain and present information on population growth
• interpret population pyramids, comparing potential for population growth in a developed and a developing country
• analyse data on the effect of pesticides or fertilisers
• analyse data on the eradication of smallpox
• obtain and present information on the use of vaccines.

National Unit Specification: support notes (cont)

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Outcome 3

Suitable experiments in the context of this unit include:

- short-term memory span
- the serial position effect
- learning using a finger maze
- the ability of the brain to suppress impulses
- factors which improve retrieval from long-term memory
- the speed of performance of a task by following instructions and by imitation
- the effect of specific chemicals on plant populations.

Candidates or centres could devise other appropriate experiments in the context of the nervous system and memory, behaviour and population growth and the environment.

The experiments chosen should allow all the performance criteria for this outcome to be achieved within any single report.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Details of suitable approaches are detailed in the course specification.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

It is recommended that a holistic approach is taken to assessment, eg Outcomes 1 and 2 could be assessed by an integrated end of unit test with questions covering all the performance criteria for knowledge and understanding and problem solving.

Outcome 2

Test items should be constructed to allow candidates to generate evidence relating to the performance criteria as follows:

a) Selecting and presenting information:
b) Sources of information to include: texts, tables, charts, graphs and diagrams
c) Formats of presentation to include: written summaries, extended writing, tables and graphs.
d) Calculations to include: percentages, averages, ratios. Significant figures and units should be used appropriately.
e) Conclusions drawn should include some justification.
f) Candidates could plan and design procedures to test given hypotheses or to illustrate particular effects. This could include identification of variables, controls and measurements or observations required. The evaluation of given experimental procedures may include situations which are unfamiliar to candidates and could test the candidate's ability to comment on the purpose of approach or the suitability of given experimental procedures. Candidates could comment on the limitations of the set-up, apparatus, suggested measurements or observations, limitations of equipment, appropriateness of controls, sources of error and possible improvements.

g) Candidates could make predictions and generalisations from given experimental results or, given situations, predict what the results might be.

Outcome 3

Type of experimental activity

The teacher/lecturer should ensure that the experimental activity to be undertaken in connection with Outcome 3 affords opportunity for the candidate to demonstrate the ability to undertake the planning and organising of an experimental activity at an appropriate level of demand. The activity must relate to the course content and candidates should be made aware of the range of skills which must be demonstrated to ensure attainment of Outcome 3.

Assessment of Outcome 3

Candidates are only required to produce one report for Outcome 3 in relation to the contents and notes specified for Higher Human Biology. This report can then be used as evidence for Outcome 3 for the other units of the course.

In relation to PC(a), the teacher/lecturer checks by observation that the candidate participates in the collection of the experimental information by playing an active part in planning the experiment, deciding how it will be managed, identifying and obtaining resources (some of which must be unfamiliar to the candidate), and carrying out the experiment.

National Unit Specification: support notes (cont)

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Candidates should provide a report with an appropriate title. The report should relate to the performance criteria as follows:

(b) The experimental procedures are described accurately.	A clear statement of the aim of the experiment. A few brief concise sentences including as appropriate: • a labelled diagram or brief description of apparatus or instruments used • how the independent variable was altered • control measure used • how measurements were taken or observations made. There is no need for a detailed description. The use of the impersonal passive voice is to be encouraged as an example of good practice but this is not mandatory for meeting the performance criteria.
(c) Relevant measurements and observations are recorded in an appropriate format.	Readings or observations (raw data) must be recorded in a clear table with correct headings, appropriate units and results/ readings entered correctly.
(d) Recorded information is analysed and presented in an appropriate format.	Data should be analysed and presented in tabular, graphical format or as a scatter diagram or equivalent as appropriate: • for a tabular presentation this may be an extension of the table used for PC (c) above, and must include: suitable headings and units showing averages or other appropriate computations • for a graphical presentation this must include: data presented as a histogram, bar chart, connected points or line of best fit as appropriate, with suitable scales and axes labelled with quantity and units and with variable correctly plotted.
(e) Conclusions drawn are valid.	Conclusions should use evidence from the experiment and relate back to the aim of the experiment. At least **one** of the following should be included: • overall pattern to readings or observations (raw data) • trends in analysed information or results • connection between variables and controls.
(f) The experimental procedures are evaluated with supporting argument.	The evaluation could cover all stages of the activity including preparing for the activity, analysis of the activity and the results of the activity. The evaluation must include supporting argument in at least **one** of the following: • effectiveness of procedures • control of variables • limitations of equipment • possible sources of error • possible improvements.

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The bullet points under each performance criterion give an indication of what should be addressed to achieve a pass. The relevance of the bullet points will vary according to the experiment. These bullet points are intended as helpful guidance. The decision of pass or fail is to be made by the professional judgement of the presenting centre (subject to moderation) against the performance criteria. It is appropriate to support candidates in producing a report to meet the performance criteria. Re-drafting of a report after necessary supportive criticism is to be encouraged, both as part of the learning and teaching process and to produce evidence for assessment. Redrafting and resubmission is only required for the specific performance criterion identified in need of further attention ie the entire report does not need to be rewritten.

Conditions required to complete the report

Candidates may complete their reports outwith class time provided reasonable measures are taken to ensure that the report is one individual work of the candidate.

Teachers/lecturers may wish candidates to write up reports under their direct supervision so that they can provide appropriate advice and support. However, they may feel confident that any redrafting required need not be undertaken under such close supervision as it will be evident in the candidate's response that it is his or her unaided work. Under such circumstances it would be acceptable for such redrafting to take place outwith class time.

Use of IT

Candidates may, if they wish, present their reports in a word-processed format. Candidates may use Excel (or any other suitable data analysis software) when tackling Outcome 3. However, candidates must not be given a spreadsheet with pre-prepared column headings nor formulae, as they are being assessed on their ability to enter quantities and units into a table and to make decisions about appropriate scales and labels on graph axes. The use of clip art or images captured by digital camera may also be used in recording details of experimental methods.

Transfer of evidence

Candidates may transfer evidence for Outcome 3 from one level to the one below provided the experiments are in the context of the units concerned.

Candidates who are repeating a course, may carry forward evidence, of an appropriate standard, generated in a previous year.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, 2001).