

National Unit Specification: general information

UNIT The Continuation of Life (Higher)

NUMBER D044 12

COURSE Human Biology (Higher)

SUMMARY

This unit seeks to develop knowledge and understanding, problem solving and practical abilities related to reproduction, development, transport mechanisms, delivery of materials to cells, removal of materials from the blood and regulating mechanisms. This unit is a component unit of Higher Human Biology.

OUTCOMES

- 1 Demonstrate knowledge and understanding related to the continuation of life.
- 2 Solve problems related to the continuation of life.
- 3 Collect and analyse information related to the Higher Human Biology obtained by experiment.

Administrative Information

Superclass: RH

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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 male and female reproductive systems, gametes, fertilisation and implantation, structure and function of placenta, digestion and absorption in the gut, structure and function of the kidney, gas exchange in the lungs and tissues, and the heart and blood circulatory systems. Alternatively, candidates should have achieved the unit: 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

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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 the continuation of life.

Performance criteria

- (a) Reproduction is described correctly in relation to fertility and its control.
- (b) Development is described correctly in relation to pre-natal and post-natal development of the individual.
- (c) Transport mechanisms are described correctly in relation to tissue fluid and lymph and the need to circulate fluid in vessels.
- (d) The delivery of materials to cells is described correctly in relation to oxygen and nutrients.
- (e) The removal of materials from the blood is described correctly in relation to the role of the liver, lungs and kidneys.
- (f) Regulating mechanisms are described correctly in relation to the principle of negative feedback.

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 the continuation of life.

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 achievement must be generated from a closed-book test with items covering all the above performance criteria and with problems in the context of reproduction, development, transport mechanisms, delivery of materials to cells, removal of materials from the blood or regulating mechanisms.

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) Reproduction

1 Fertility and its control

i Structure and function of reproductive organs.

Structure of testes and ovaries and their function.

The contribution to fertilisation of the secretions of the prostate gland and the seminal vesicles.

ii Hormonal control.

The influence of the pituitary hormones, follicle stimulating hormone (FSH) and luteinising hormone (LH), on the testes and the ovaries.

The influence of testosterone on the testes.

The influence of the ovarian hormones, oestrogen and progesterone, on the uterus and the pituitary.

Changes during the menstrual cycle and control of these changes through interaction of hormones.

Continuous fertility in the male compared with cyclical fertility in the female.

iii Intervention in fertility.

Causes of infertility to include failure to ovulate, blockage of uterine tubes, failure of implantation and low sperm counts.

Treatment of infertility to include fertility drugs, *in vitro* fertilisation and artificial insemination.

The biological basis of contraception by calculation of fertile period and by hormonal methods.

b) Development

1 Pre-natal and post-natal development of the individual

i Intra-uterine development.

Cleavage, implantation and differentiation.

Monozygotic and dizygotic twins.

Exchanges between maternal and fetal circulations, including transfer of harmful substances and pathogens.

Influence of the placental hormones progesterone and oestrogen, and of prolactin.

Effects of the fetus on the maternal immune system, as illustrated by Rhesus problems and their solution.

ii Birth.

The role of oxytocin at birth and the use of artificial hormones in induction of birth.

Nutrition of the new-born.

iii The pattern of growth after birth.

The major stages of the growth curve, including changes in body proportions.

The role of growth hormone.

The major body changes in males and females at puberty.

Hormonal changes and development in males and females at puberty.

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c) **Transport mechanisms**

1 Plasma tissue fluid and lymph and the need to circulate fluid in vessels

i The need for a transport system with vessels.

ii Tissue fluid and lymph.

The relationship of arterioles, capillaries, venules and lymphatic capillaries to the body cells and tissue fluid.

The exchange of materials between arterioles, capillaries, venules and lymphatic capillaries, body cells and tissue fluid.

iii The need to circulate fluid in vessels.

The heart; cardiac cycle; conducting system of the heart.

Blood pressure in different parts of the circulation.

Lymph circulation, lymph nodes.

d) **Delivery of materials to cells**

Oxygen and nutrients

i Oxygen.

The affinity of haemoglobin for oxygen under different conditions.

The structure of red blood cells related to their function. The production and breakdown of red blood cells.

ii Nutrients.

The absorption of nutrients.

The dual blood supply of the liver.

The role of the liver in carbohydrate, lipid and protein metabolism.

The fate of absorbed materials.

e) **Removal of materials from the blood**

The role of the liver, lungs and kidneys

i The role of the liver.

Conservation of useful substances.

Detoxification of toxic materials.

Removal of bilirubin and its excretion into bile.

Production of urea.

ii The role of the lungs in the removal of carbon dioxide.

iii The role of the kidneys.

The mechanisms of kidney function, including ultrafiltration and reabsorption.

National Unit Specification: support notes (cont)

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f) **Regulating mechanisms**

The principle of negative feedback control as illustrated by the following physiological mechanisms:

- i The control of heart rate: the effects of exercise on the cardiovascular and respiratory systems.
- ii Blood sugar: the roles of insulin, glucagon and adrenaline.
- iii Temperature: the role of the hypothalamus as a temperature monitoring centre; nerve communication between the hypothalamus and effectors; involuntary and voluntary responses in temperature regulation and changes in the ability to control body temperature as age increases.

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:

- construct charts to illustrate the changes in the body during the menstrual cycle
- obtain and present information on causes of infertility and their treatment
- identify the fertile period from data on timing of menstruation, body temperature and cervical mucus
- obtain and present information on the effects on the embryo/fetus of harmful agents, eg rubella, thalidomide, alcohol and heroin
- analyse data on the effects of the Rhesus factor
- analyse data to compare the composition of colostrum, breast milk and powdered cow's milk
- obtain and present information on organochlorines in breast milk
- obtain and present information on the illicit use of testosterone in sport
- calculate surface area to volume ratios
- use nomograms to estimate surface area of the body
- obtain and present information on coronary heart disease
- interpret graphs of pressure changes in heart and blood vessels
- analyse data from Hb/ O₂ dissociation curves
- analyse data on composition of plasma of hepatic artery, hepatic vein and hepatic portal vein
- analyse data on glomerular filtrate, tubule fluid and urine composition and rates of production
- analyse graphs showing distribution of blood to tissues at rest and during exercise
- calculate cardiac output under different conditions
- analyse glucose tolerance curves of normal and diabetic subjects.

Outcome 3

Suitable experiments in the context of this unit include:

- bile salts and lipase activity
- testing 'artificial urine' samples
- body response to sudden heat loss.

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Candidates or centres could devise other appropriate experiments in the context of reproduction, development, transport mechanisms, delivery of materials to cells, removal of materials from the blood or regulating mechanisms.

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:
 - sources of information to include: texts, tables, charts, graphs and diagrams
 - formats of presentation to include: written summaries, extended writing, tables and graphs
- b) Calculations to include: percentages, averages, ratios. Significant figures and units should be used appropriately.
- c) Conclusions drawn should include some justification.
- d) 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.
- e) Candidates could make predictions and generalisations from given experimental results or, given situations, predict what the results might be.

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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 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.

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

<p>(b) The experimental procedures are described accurately.</p>	<p>A clear statement of the aim of the experiment.</p> <p>A few brief concise sentences including as appropriate:</p> <ul style="list-style-type: none"> • 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. <p>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.</p>
<p>(c) Relevant measurements and observations are recorded in an appropriate format.</p>	<p>Readings or observations (raw data) must be recorded in a clear table with correct headings, appropriate units and results/ readings entered correctly.</p>
<p>(d) Recorded information is analysed and presented in an appropriate format.</p>	<p>Data should be analysed and presented in tabular, graphical format or as a scatter diagram or equivalent, as appropriate:</p> <ul style="list-style-type: none"> • 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 variable and units and with data correctly plotted.
<p>(e) Conclusions drawn are valid.</p>	<p>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:</p> <ul style="list-style-type: none"> • overall pattern to readings or observations (raw data) • trends in analysed information or results • connection between variables and controls.
<p>(f) The experimental procedures are evaluated with supporting argument.</p>	<p>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:</p> <ul style="list-style-type: none"> • effectiveness of procedures • control of variables • limitations of equipment • possible sources of error • possible improvements.

National Unit Specification: support notes (cont)

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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 the 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 course 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).