Human Biology 7042

This subject may be taken at both the May/June and January examinations.

Aims

The syllabus aims to give candidates an understanding of the scientific principles of modern biology through the study of human beings. This is gained firstly by a study of enough structure and function to enable candidates to appreciate how the human organism maintains itself and, secondly, by studying human relationships with other animals and the dependence on plants, to learn how humans can best modify their environment and habits to produce healthy conditions for present and future populations.

Objectives

The examination will test the following:

1. The knowledge, comprehension and application of the facts and principles contained in the syllabus
2. The planning, assessment and interpretation of simple biological experiments and the evaluation and interpretation of scientific data relevant to the syllabus
3. The ability to use simple mathematical skills to interpret data
4. The ability to select and relate information and present it in a logical way

The Examination

The examination will consist of two papers of 1 hour 15 minutes and 2 hours duration respectively. Paper 1 will carry 40% of the total subject marks and Paper 2 will carry 60%. The approximate total weighting in the examination of syllabus sections 1 and 2 is 70% and 30% respectively.

Questions will be set in SI units.

Paper 1 may cover all sections of the syllabus and the questions may examine all the objectives stated above. It will contain a variety of questions requiring short answers to be written or drawn on the question paper.

The specification for Paper 1 is given below. The figures show the appropriate percentage of marks allocated to each ability or syllabus section.

Ability	SYLLABUS SECTION		Weighting
	Section 1	**Section 2**	
Knowledge			40 - 50%
Comprehension			25 - 35%
Application Analysis Evaluation			20 - 30%
Weighting	85 - 95%	5 - 15%	

Paper 2 will require longer answers and may cover all the sections of the syllabus. The paper will be in two sections with Section A covering mainly Section 1 of the syllabus and Section B covering mainly Section 2. The candidate will be required to answer three out of five questions in Section A and two out of four questions in Section B.

Mathematical skills

The following mathematical skills may be required to answer the question papers.

1. A working knowledge of such simple arithmetical processes as are necessary to perform simple calculations involving biological data, eg fractions, decimals, proportions, percentages

2. Ability to construct simple graphs, histograms and pie charts

1. Ability to make simple deductions from arithmetical and graphical data

Practical work

Practical work is a necessary part of the study of this syllabus and candidates are strongly advised to carry out practical laboratory-based work in order to understand the syllabus at the required level.

Syllabus Content

The syllabus is designed on the assumption that candidates with some background of science will spend a minimum of two hours class time per week studying Human Biology throughout a two-year course. The presentation of the syllabus is intended to facilitate easy reference (and cross reference) but the order of the various sections is not intended to indicate any order of presentation in teaching. Suggestions for practical work are included. Those preparing candidates for the examination may find a useful approach to many of the topics is through project work.

Section 1 – Structure and function in humans

Parts of this section, eg body movement, position of heart, should be demonstrated on the students' bodies. Dissections of a small mammal may be used to illustrate the position and appearance of all the principal internal organs.

Films, video recordings, photographs and coloured transparencies of histology slides are helpful methods of illustrating many parts of this section.

Further suggestions for practical work are included in the relevant sections.

(a) Cells and tissues

Much of this section may be taught, if desired, when the appropriate organ or system is being considered.

Electron micrographs as well as light microscope preparations or slides or transparencies should be used to study the general structure of the cell and its organelles.

Cells: a general outline of their internal structure and function including nucleus, cytoplasm, mitochondria, endoplasmic reticulum, ribosomes and cell membranes.

Enzymes: their nature and the general principles of their actions in controlling the activities of cells.

Multiplication of cells with a simple explanation of mitosis.

Groupings of cells into tissues: bone, muscle, (voluntary, involuntary and cardiac), blood, nervous tissue and epithelium (squamous and ciliated, with reference to cells lining the cheek and trachea).

(b) Form and movement: bones, muscles and joints

The main parts of the skeleton: axial skeleton (vertebral column, rib cage and skull), appendicular skeleton (scapula, clavicle, pelvis and limbs).

Functions of the skeleton using examples from the list above.

Joints, using the elbow, shoulder and a cartilaginous intervertebral joint as examples.

The relationship between voluntary muscles and bones to bring about movement, illustrated by the biceps and triceps muscles and associated bones in the arm and shoulder.

Muscle and bone: the factors controlling their healthy development (Section 1(a), (c) and (d)).

Much of this section can best be appreciated by reference to the action of candidates' own limbs.

(c) Coordination

Neurones and their structure: sensory, motor and relay. (Section 1(a)).

The nervous system: central nervous system, peripheral nerves. (Autonomic nervous system is not required.)

The nerve impulse: its initiation in receptors, movement along a neurone, transfer across a synapse, transfer from neurone to muscle (Section 1(b)). (Biochemical details are not required.)

The spinal cord: its anatomy and functions of its main parts in outline.

The spinal reflex: knee jerk and withdrawal reflex.

The brain: its main areas, their functions in outline.

Receptors: responding to heat, chemical, mechanical and light energy.

The eye: structure and function, stereoscopic vision.

The ear: structure in sufficient detail to give an elementary understanding of its functions in balance and hearing.

Chemical coordination: the integrated action of hormones from the pituitary, adrenal and thyroid glands, the islets of Langerhans and the gonads; the role of hormones in growth and development.

Simple comparison of the nervous and hormonal systems.

The concept of feedback as an essential characteristic of living systems with particular reference to temperature control and endocrine secretion.

Candidates should have observed reflex actions and sensory mechanisms in themselves and others. Good models of the brain, eye and ear are valuable. Dissection of a mammalian eye may be helpful.

(d) Nutrition and energy

Food as a source of energy and of materials for growth.

The parts played in the body by proteins, carbohydrates, lipids (fats) ,water, vitamins (A, B_1, C, D) and minerals (iron, calcium, iodine).

The occurrence of these nutrients in common foods related to the understanding of a balanced diet; the variations in diet related to age, pregnancy, climate and occupation.

Dangers to health: protein deficiency, excessive body mass.

The importance of dietary fibre.

The structure and functions of teeth and the factors which affect their growth. The care of teeth and gums.

The main regions of the gut and the way in which food is moved along it.

The digestive glands in enough detail only to understand the digestion and absorption of food and water.

The principles of the digestion of proteins, carbohydrates and fats and the main enzymes involved.

The absorption of the products of digestion and the use of these products in the body. Egestion.

Respiration as a cellular process, represented by a simple chemical equation. Aerobic and anaerobic stages.

Energy transfer and the breakdown and regeneration of ATP, in outline only.

Simple experiments with digestive enzymes may be performed.

Candidates may be required to interpret numerical data in questions relating to the nutrient content and energy value of different foods.

The structure of the gut may be demonstrated by dissection of a small mammal and/or the use of models.

(e) Internal transport

The heart: its structure (Section 1(a)).

Arteries, veins, capillaries, lymph vessels: their structure and functions in circulation of body fluids to and from the cells (Section 1(f)).

Blood: the composition and functions of plasma; the structure, functions and sites of formation of erythrocytes, granulocytes and lymphocytes.

A model or dissection of the heart of a sheep or other large mammal would be helpful.

(f) Homeostatic mechanisms

The skin: its structure and functions (Section 2(b)).

Temperature regulation: heat production and loss, including study of the variation of body temperature and the effects of different types of clothing on skin temperature (Section 1(c) (d)).

The respiratory system: its structure and the mechanism of breathing.

Lung capacity.

The effects of exercise on the rate and depth of breathing and the action of the heart. The regulation of oxygen and carbon dioxide content of blood.

Gas transport in blood and body fluids and across cellular membranes (Section 1(e)).

The renal system: its structure and functions; the formation of urine, the normal constitution of urine and how and why this may vary.

Importance of rehydration following loss of body fluids by vomiting and diarrhoea. Oral rehydration method.

The liver: its structure and its functions in bile production, regulation of blood sugar, urea formation and detoxification (Section 1(d), 2(b)).

(g) Reproduction and heredity

Male and female reproductive organs; the menstrual cycle.

Copulation, fertilisation and implantation.

The placenta and fetal membranes.

Birth. Breast feeding.

An outline of growth and development to maturity.

Birth control: contraception by hormonal, barrier and natural methods, intra-uterine devices and sterilisation. Advantages and disadvantages of each method.

The importance of meiosis before gamete formation.

Sex determination in humans.

The mechanism of inheritance, illustrated by tongue rolling as an example of single gene inheritance.

Examples of genetically inherited conditions: sickle cell anaemia (autosomal inheritance) and haemophilia (sex linked inheritance).

Multiple alleles and codominance illustrated by the inheritance of the ABO blood groups.

The differences between gene and allele, genotype and phenotype, homozygous and heterozygous, dominant, recessive and codominant

Chromosomes and DNA: simple understanding of their roles in heredity.

Mutations and how these can lead to changes within a species (Section 2(d)).

Genetic and environmental variation in humans.

Section 2 - Relations with other Organisms

(a) Disease

Candidates should know the main effects of the diseases mentioned in this section but a detailed knowledge of their symptoms is not required.

(i) Diseases caused by pathogenic microorganisms

Viruses: a brief description of their structure and reproduction.

Methods of transmission, treatment and prevention of spread of the common cold, poliomyelitis and AIDS (Human Immuno Deficiency Virus - HIV).

Bacteria: a brief description of their structure, nutrition and reproduction.

Bacteria as pathogens. Methods of transmission, treatment and prevention of spread of typhoid, tuberculosis, diphtheria and gonorrhoea.

Fungi: a brief description of their structure and nutrition.

Methods of transmission, treatment and prevention of spread of thrush and athlete's foot.

(ii) Diseases caused by other parasites

The parasites *Ascaris* and *Schistosoma:* their nutrition and life cycles. The worldwide effects of the diseases Ascariasis and Schistosomiasis (Bilharzia.) Methods of preventing their spread.

Relationships between: lice and typhus rickettsia; mosquito and malarial parasite; housefly and typhoid bacillus.

Life-cycle and role of these vectors in transmitting causative agents of disease, treatment and prevention of spread of disease and its vector. (Reference should be made to the diseases listed in this paragraph.)

(iii) The general course of a disease

Methods of infection, incubation, signs and symptoms.

Endemic and epidemic diseases.

(iv) Defence

The skin and mucous membranes as barriers against mechanical and chemical damage and infection by pathogens. The effect of tobacco smoke on the respiratory mucous membranes.

Blood clotting, phagocytosis, production of antibodies by the lymphatic system and the functions of antibodies.

Immunity: natural and artificial, both active and passive, with reference to diseases listed in Section 2(a).

(b) Non-pathogenic organisms and their importance

Non-pathogenic bacteria useful to humans: in decomposition of organic matter; in vitamin formation.

Role of fungi. in decomposition of organic matter; as foods; as a source of antibiotics.

Sewage treatment: in a modern sewage works, in a septic tank and a pit latrine. The role of aerobic and anaerobic microorganisms in sewage breakdown.

(c) Environment

The relationship between humans and their environment.

Dependence on green plants (Section 1(d)).

Importance of photosynthesis and a simple word equation to summarise the process. Green leaves as organs of photosynthesis.

Food chains.

Food: an understanding of hygienic methods of food preparation, storage and preservation (Section 1(d)).

Water: the scientific principles used in its purification, distribution and storage. Water pollution by sewage and by excess nitrogen fertilisers. Eutrophication.

Air: pollution, its dangers and methods of prevention, to include pollution by carbon monoxide, sulphur dioxide and oxides of nitrogen. Hazards of ultra-violet light, X-rays and other ionising radiation (Section 1(g)).

Edexcel Publications

Coursework guidance notes, specimen examination papers and copies of past examination papers can be obtained from:

Edexcel International Publications
Adamsway
Mansfield
Notts
NG18 4FN
UK

Telephone: +44 1623 450 781

Fax: +44 1623 450 481

E-mail: intpublications@linneydirect.com

Coursework guidance notes, specimen examination papers and coursework exemplar materials are also available from our web site at www.edexcel-international.org and will be updated as appropriate.

How to contact Edexcel International

For further information and for all general enquiries, please contact:

Edexcel International
190 High Holborn
London
WC1V 7BH
UK

Telephone: +44 (0) 190 884 7750

Fax: +44 (0) 207 190 6700

E-mail: www.edexcel.org.uk/ask

Teachers are encouraged to check the Edexcel International website on a regular basis for any updates in information and advice, or to contact the International Customer Services with any queries.