SCQF level 6
Unit Specification

Human Biology: Physiology and Health

SCQF: level 6 (6 SCQF credit points)

Unit code: J4A5 76

Unit outline

The general aim of this Unit is to develop skills of scientific inquiry, investigation and analytical thinking, along with knowledge and understanding of physiology and health.

Learners will apply these skills when considering the applications of physiology and health on our lives. This can be done by using a variety of approaches, including investigation and problem solving.

The Unit covers the key areas of gamete production and fertilisation; hormonal control of reproduction; the biology of controlling fertility; antenatal and postnatal screening; the structure and function of arteries, capillaries and veins; the structure and function of the heart; pathology of cardiovascular disease (CVD); and blood glucose levels and obesity.

Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Learners who complete this Unit will be able to:

1 Apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment/practical investigation
2 Draw on knowledge and understanding of the key areas of this Unit and apply scientific skills

This Unit is a free-standing Unit. The *Unit Support Notes* in the Appendix provide advice and guidance on delivery, assessment approaches and development of skills for learning, skills for life and skills for work. Exemplification of the standards in this Unit is given in *Unit Assessment Support*.

Recommended entry

Entry to this Unit is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by one or more of the following or equivalent qualifications and/or experience:

- National 5 Biology Course
- free-standing SCQF level 5 Biology Units

Equality and inclusion

This Unit Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information, please refer to the *Unit Support Notes.*

Standards

Outcomes and Assessment Standards

Outcome 1

The learner will:

1 Apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment/practical investigation by:

1.1 Planning an experiment/practical investigation
1.2 Following procedures safely
1.3 Making and recording observations/measurements correctly
1.4 Presenting results in an appropriate format
1.5 Drawing valid conclusions
1.6 Evaluating experimental procedures

Outcome 2

The learner will:

2 Draw on knowledge and understanding of the key areas of this Unit and apply scientific skills by:

2.1 Making accurate statements
2.2 Solving problems

Evidence Requirements for the Unit

Assessors should use their professional judgement, subject knowledge and experience, and understanding of their learners, to determine the most appropriate ways to generate evidence and the conditions and contexts in which they are used.

The key areas covered in this Unit are gamete production and fertilisation; hormonal control of reproduction; the biology of controlling fertility; antenatal and postnatal screening; the structure and function of arteries, capillaries and veins; the structure and function of the heart; pathology of cardiovascular disease (CVD); and blood glucose levels and obesity.

The following table describes the evidence for the Assessment Standards. Exemplification of assessment is provided in *Unit Assessment Support*.

Assessment Standard	**Evidence required**
Planning an experiment	The plan must include: ♦ a clear statement of the aim ♦ a hypothesis ♦ a dependent and independent variable ♦ variables to be kept constant ♦ measurements/observations to be made ♦ the equipment/materials ♦ a clear and detailed description of how the experiment/practical investigation should be carried out, including safety considerations
Following procedures safely	The learner must be seen to follow procedures safely.
Making and recording observations/measurements correctly	The raw data must be collated in a relevant format, for example a table.
Presenting results in an appropriate format	One format from: bar graph or line graph.
Drawing a valid conclusion	Must include reference to the aim and be supported by the results.
Evaluating experimental procedures	Provide one evaluative statement about the procedures used **and** suggest one improvement for the experiment. **or** Provide two evaluative statements about the procedures used. **or** Suggest two improvements for the experiment. Appropriate justification must also be provided, whichever option is chosen.

Assessment Standard	Evidence required
Making accurate statements and solving problems	Achieve at least 50% of the total marks available in a holistic assessment. A holistic assessment must include: ♦ an appropriate number of opportunities to make accurate statements for each key area of the Unit ♦ at least one opportunity to demonstrate each of the following problem-solving skills: — make generalisations/predictions — select information — process information, including calculations, as appropriate — analyse information

Assessment Standard thresholds

Outcome 1

Learners are not required to show full mastery of the Assessment Standards to achieve Outcome 1. Instead, five out of the six Assessment Standards for Outcome 1 must be met to achieve a pass. Learners must be given the opportunity to meet all Assessment Standards.

Outcome 2

Learners are assessed using a holistic assessment that assesses Assessment Standards 2.1 and 2.2. To gain a pass for Outcome 2, learners must achieve 50% or more of the total marks available in the assessment.

Transfer of evidence

Evidence for the achievement of Outcome 1 for this Unit can be used as evidence for the achievement of Outcome 1 in the SCQF level 6 Units: Human Biology: Human Cells (J4A3 76) and Human Biology: Neurobiology and Immunology (J4A4 76).

Evidence for the achievement of Outcome 2 for this Unit is **not** transferable between the SCQF level 6 Units: Human Biology: Human Cells (J4A3 76) and Human Biology: Neurobiology and Immunology (J4A4 76).

Re-assessment

SQA's guidance on re-assessment is that there should only be one or, in exceptional circumstances, two re-assessment opportunities. Re-assessment must be carried out under the same conditions as the original assessment.

Outcome 1

Learners can re-draft their original Outcome 1 report or carry out a new experiment/practical investigation.

Outcome 2

Learners must have a full re-assessment opportunity, ie a holistic assessment. To achieve Outcome 2, learners must achieve 50% of the total marks available in the re-assessment.

Development of skills for learning, skills for life and skills for work

It is expected that learners will develop broad, generic skills through this Unit. The skills that learners will be expected to improve on and develop through the Unit are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and drawn from the main skills areas listed below. These must be built into the Unit where there are appropriate opportunities.

1 Literacy

1.2 Writing

2 Numeracy

2.1 Number processes
2.2 Money, time and measurement
2.3 Information handling

5 Thinking skills

5.3 Applying
5.4 Analysing and evaluating
5.5 Creating

Amplification of these is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work.* The level of these skills should be at the same SCQF level of the Unit and be consistent with the SCQF level descriptor. Further information on building in skills for learning, skills for life and skills for work is given in the Appendix: *Unit Support Notes.*

Appendix: Unit Support Notes

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing this Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- *Unit Assessment Support*

Developing skills, knowledge and understanding

Teachers and lecturers are free to select the skills, knowledge, understanding and contexts that are most appropriate for delivery in their centres.

Approaches to learning and teaching

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
1 Gamete production and fertilisation (a) Gamete production in the testes Testes produce sperm in the seminiferous tubules and testosterone in the interstitial cells. The prostate gland and seminal vesicles secrete fluids that maintain the mobility and viability of the sperm.		
(b) Gamete production in the ovaries The ovaries contain immature ova in various stages of development. Each ovum is surrounded by a follicle that protects the developing ovum and secretes hormones.		
(c) Fertilisation Mature ova are released into the oviduct, where they may be fertilised by sperm to form a zygote.		

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
2 Hormonal control of reproduction (a) Hormonal influence on puberty	The pituitary gland is stimulated to release follicle stimulating hormone (FSH), luteinising hormone (LH) or interstitial cell stimulating hormone (ICSH) by a releaser hormone produced in the hypothalamus. This triggers the onset of puberty.	
(b) Hormonal control of sperm production	FSH promotes sperm production and ICSH stimulates the production of testosterone. Testosterone also stimulates sperm production and activates the prostate gland and seminal vesicles. Negative feedback control of testosterone by FSH and ICSH.	
(c) Hormonal control of the menstrual cycle The menstrual cycle takes approximately 28 days, with the first day of menstruation regarded as day one of the cycle. FSH stimulates the development of a follicle and the production of oestrogen by the follicle in the follicular phase. Oestrogen stimulates proliferation of the endometrium preparing it for implantation, and affects the consistency of cervical mucus making it more easily penetrated by sperm. Peak levels of oestrogen stimulate a surge in	Interpretation of graphs showing changes in FSH, LH, oestrogen and progesterone concentrations throughout the menstrual cycle.	Construct charts to illustrate the changes in the female body during the menstrual cycle.

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
the secretion of LH. This surge in LH triggers ovulation. In the luteal phase the follicle develops into a corpus luteum, which secretes progesterone. Progesterone promotes further development and vascularisation of the endometrium preparing it for implantation if fertilisation occurs. The negative feedback effect of the ovarian hormones on the pituitary gland and the secretion of FSH and LH prevent further follicles from developing. The lack of LH leads to degeneration of the corpus luteum with a subsequent drop in progesterone levels leading to menstruation.	Ovulation is the release of an egg (ovum) from a follicle in the ovary. It usually occurs around the mid-point of the menstrual cycle. If fertilisation does occur, the corpus luteum does not degenerate and progesterone levels remain high.	
3 The biology of controlling fertility Infertility treatments and contraception are based on the biology of fertility. (a) Women show cyclical fertility leading to a fertile period. Men show continuous fertility. Identification of the fertile period	Women are only fertile for a few days during each menstrual cycle. Men continually produce sperm in their testes, so show continuous fertility. A woman's body temperature rises by around 0·5°C after ovulation and her cervical mucus becomes thin and watery.	Identify the fertile period from data on the timing of menstruation, body temperature, cervical mucus viscosity and the life span of sperm and eggs.

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
(b) Treatments for infertility Stimulating ovulation Ovulation is stimulated by drugs that prevent the negative feedback effect of oestrogen on FSH secretion. Other ovulatory drugs mimic the action of FSH and LH. These drugs can cause super ovulation that can result in multiple births or be used to collect ova for in vitro fertilisation (IVF) programmes. Artificial insemination Several samples of semen are collected over a period of time. Artificial insemination is particularly useful where the male has a low sperm count. If a male partner is sterile, a donor may be used to provide semen. Intra-cytoplasmic sperm injection (ICSI) If mature sperm are defective or very low in number, ICSI can be used. The head of the sperm is drawn into a needle and injected directly into the egg to achieve fertilisation.		

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
In vitro fertilisation (IVF) Surgical removal of eggs from ovaries after hormone stimulation. Incubation of zygotes and uterine implantation. The use of IVF in conjunction with pre-implantation genetic diagnosis (PGD) to identify single gene disorders and chromosomal abnormalities.	Eggs are mixed with sperm in a culture dish. The fertilised eggs are incubated until they have formed at least eight cells and are then transferred to the uterus for implantation.	Examine data on the success rate of IVF and its effect on long-term health. Debate the ethics surrounding the use of PGD.
(c) Physical and chemical methods of contraception Biological basis of physical methods used to prevent pregnancy The oral contraceptive pill is a chemical method of contraception. It contains a combination of synthetic oestrogen and progesterone that mimics negative feedback, preventing the release of FSH and LH from the pituitary gland. The progesterone-only (mini) pill causes thickening of the cervical mucus. The morning-after pill prevents ovulation or implantation.	Understanding of how the following physical methods prevent pregnancy — barriers, intra-uterine devices and sterilisation procedures.	Compare the success rates of different methods of contraception.

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
4 Antenatal and postnatal screening A variety of techniques can be used to monitor the health of the mother, developing fetus and baby. (a) Antenatal screening Antenatal screening identifies the risk of a disorder so that further tests and a prenatal diagnosis can be offered. Ultrasound imaging Pregnant women are given two ultrasound scans. Dating scans, which determine pregnancy stage and due date, are used with tests for marker chemicals, which vary normally during pregnancy. Anomaly scans may detect serious physical abnormalities in the fetus. Blood and urine tests Routine blood and urine tests are carried out throughout pregnancy to monitor the concentrations of marker chemicals.	A dating scan takes place between 8 and 14 weeks and an anomaly scan between 18 and 20 weeks. Measuring a chemical at the wrong time could lead to a false positive result. An atypical chemical concentration can lead to diagnostic testing to determine if the fetus has a medical condition.	View ultrasound images taken at different stages of pregnancy. Examine data on the altered blood and urine biochemistry that can occur during pre-eclampsia. Examine data on the blood test for alpha-fetoprotein (AFP) and its link to Down's syndrome.

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
Diagnostic testing Amniocentesis and chorionic villus sampling (CVS) and the advantages and disadvantages of their use. Cells from samples can be cultured to obtain sufficient cells to produce a karyotype to diagnose a range of conditions.	CVS can be carried out earlier in pregnancy than amniocentesis, although it has a higher risk of miscarriage. A karyotype shows an individual's chromosomes arranged as homologous pairs. In deciding to proceed with these tests, the element of risk will be assessed, as will the decisions the individuals concerned are likely to make if a test is positive.	Examine karyotypes of fetal chromosomes that indicate genetic disorders, such as Down's syndrome, Turner's syndrome and Klinefelter's syndrome.
(b) Analysis of patterns of inheritance in genetic screening and counselling Patterns of inheritance in autosomal recessive, autosomal dominant, incomplete dominance and sex-linked recessive single gene disorders	Draw, analyse and interpret family histories over three generations to follow patterns of inheritance in genetic disorders. Standard genetic terms and their related symbols should be used — alleles, dominant, recessive, homozygous, heterozygous, carriers, genotype, phenotype, autosomes and sex chromosomes.	Calculate the percentage chance of inheriting a single gene disorder. Suitable examples include albinism, Huntington's disease, sickle cell, thalassaemia, haemophilia and muscular dystrophy.
(c) Postnatal screening Diagnostic testing for phenylketonuria (PKU) In PKU a substitution mutation means that the enzyme that converts phenylalanine to tyrosine is non-functional.	Individuals with high levels of phenylalanine are placed on a restricted diet.	

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
5 The structure and function of arteries, capillaries and veins (a) Blood circulates from the heart through the arteries to the capillaries then to the veins and back to the heart. There is a decrease in blood pressure as blood moves away from the heart.		
(b) The structure and function of arteries, capillaries and veins: endothelium, central lumen, connective tissue, elastic fibres, smooth muscle and valves	The endothelium lining the central lumen of blood vessels is surrounded by layers of tissue. Arteries have an outer layer of connective tissue containing elastic fibres and a middle layer containing smooth muscle with more elastic fibres. The elastic walls of the arteries stretch and recoil to accommodate the surge of blood after each contraction of the heart.	Examine prepared slides showing cross sections of arteries and veins. Compare the degree of stretching possible in animal arteries and veins by adding weights to them.
The role of vasoconstriction and vasodilation in controlling blood flow	To control blood flow, the smooth muscle surrounding arteries can contract causing vasoconstriction or relax causing vasodilation. Capillaries allow exchange of substances with tissues through their thin walls. Veins have an outer layer of connective tissue containing elastic fibres, but a much thinner muscular wall than arteries. They contain valves to prevent the backflow of blood.	Demonstrate the presence of valves in veins.

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
(c) The exchange of materials between tissue fluid and cells through pressure filtration and the role of lymphatic vessels Tissue fluid and blood plasma are similar in composition, with the exception of plasma proteins, which are too large to be filtered through the capillary walls.	Pressure filtration causes plasma to pass through capillary walls into the tissue fluid surrounding the cells. Tissue fluid supplies cells with glucose, oxygen and other substances. Carbon dioxide and other metabolic wastes diffuse out of the cells and into the tissue fluid to be excreted. Much of the tissue fluid returns to the blood. Lymphatic vessels absorb excess tissue fluid and return it as lymph to the circulatory system.	Examine the causes of oedema in conditions such as kwashiorkor and elephantiasis.
6 The structure and function of the heart Blood flow through the heart and its associated blood vessels (a) Cardiac output and its calculation	The volume of blood pumped through each ventricle per minute is the cardiac output. Cardiac output is determined by heart rate and stroke volume (CO = HR x SV). The left and right ventricles pump the same volume of blood through the aorta and pulmonary artery.	Use a stethoscope or listen to a recording of heart sounds. Measure pulse rate in arteries using a pulsometer. Calculate cardiac output under different conditions.

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
(b) The cardiac cycle Functions of diastole, atrial systole and ventricular systole Effect of pressure changes on atrio-ventricular (AV) and semi lunar (SL) valves	During diastole, blood returning to the atria flows into the ventricles. Atrial systole transfers the remainder of the blood through the atrio-ventricular (AV) valves to the ventricles. Ventricular systole closes the AV valves and pumps the blood out through the semi lunar (SL) valves to the aorta and pulmonary artery. In diastole, the higher pressure in the arteries closes the SL valves. The opening and closing of the AV and SL valves are responsible for the heart sounds heard with a stethoscope.	Interpret graphs of pressure changes in the heart and blood vessels.
(c) The structure and function of the cardiac conducting system Control of contraction and timing by cells of the sino-atrial node (SAN) and transmission to the atrio-ventricular node (AVN)	The heartbeat originates in the heart itself. The auto-rhythmic cells of the sino-atrial node (SAN) or pacemaker, located in the wall of the right atrium, set the rate at which the heart contracts. The timing of cardiac muscle cell contraction is controlled by impulses from the SAN spreading through the atria causing atrial systole. They then travel to the atrio-ventricular node (AVN), located in the centre of the heart. Impulses from the AVN travel down fibres in the central wall of the heart and then up through the walls of the ventricles, causing ventricular systole.	

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
Impulses in the heart generate currents that can be detected by an electrocardiogram (ECG). The medulla regulates the rate of the sino-atrial node through the antagonistic action of the autonomic nervous system (ANS). A sympathetic nerve releases noradrenaline, which increases the heart rate, whereas a parasympathetic nerve releases acetylcholine, which decreases the heart rate.	Interpretation of electrocardiograms (ECG) should involve calculation of heart rate and linking of the waves to atrial systole, ventricular systole and diastole.	Examine normal and abnormal ECGs.
(d) Blood pressure changes in the aorta during the cardiac cycle Measurement of blood pressure using a sphygmomanometer Hypertension (high blood pressure) is a major risk factor for many diseases including coronary heart disease.	Blood pressure increases during ventricular systole and decreases during diastole. An inflatable cuff stops blood flow, in the artery, and deflates gradually. The blood starts to flow (detected by a pulse) at systolic pressure. The blood flows freely through the artery (and a pulse is not detected) at diastolic pressure. A typical blood pressure reading for a young adult is 120/80 mmHg.	Measure blood pressure using a digital sphygmomanometer.

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
7 Pathology of cardiovascular disease (CVD) (a) Process of atherosclerosis, its effect on arteries and blood pressure Atherosclerosis is the root cause of various cardiovascular diseases (CVD) — angina, heart attack, stroke and peripheral vascular disease.	Atherosclerosis is the accumulation of fatty material (consisting mainly of cholesterol, fibrous material and calcium) forming an atheroma or plaque beneath the endothelium. As the atheroma grows the artery thickens and loses its elasticity. The diameter of the lumen becomes reduced and blood flow becomes restricted resulting in increased blood pressure.	Examine league tables for cardiovascular disease worldwide. Examine trends in cardiovascular disease over the last 10 years.
(b) Thrombosis — endothelium damage, clotting factors and the role of prothrombin, thrombin, fibrinogen and fibrin Thrombus formation and the formation and effects of an embolus	Atheromas may rupture damaging the endothelium. The damage releases clotting factors that activate a cascade of reactions resulting in the conversion of the enzyme prothrombin to its active form thrombin. Thrombin causes molecules of the plasma protein fibrinogen to form threads of fibrin. The fibrin threads form a meshwork that clots the blood, seals the wound and provides a scaffold for the formation of scar tissue. The formation of a clot (thrombus) is referred to as thrombosis.	Study the use of thrombolytic medications, such as streptokinase, and tissue plasminogen activator. Study the use of antiplatelet and anticoagulant therapies.

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
A thrombosis in a coronary artery may lead to a myocardial infarction (MI), commonly known as a heart attack. A thrombosis in an artery in the brain may lead to a stroke. Cells are deprived of oxygen leading to death of the tissues.	In some cases, a thrombus may break loose forming an embolus that travels through the bloodstream until it blocks a blood vessel.	
(c) Causes and effects of peripheral vascular disorders Peripheral vascular disease is narrowing of the arteries due to atherosclerosis of arteries other than those of the heart or brain. The arteries to the legs are most commonly affected. Pain is experienced in the leg muscles due to a limited supply of oxygen. A deep vein thrombosis (DVT) is a blood clot that forms in a deep vein, most commonly in the leg. This can break off and result in a pulmonary embolism in the lungs.		
(d) Control of cholesterol levels in the body Cholesterol is a type of lipid found in the cell		

Physiology and health		
Key areas	**Depth of knowledge required**	**Suggested learning activities**
membrane. It is also used to make the sex hormones — testosterone, oestrogen and progesterone. Cholesterol is synthesised by all cells, although 25% of total production takes place in the liver. A diet high in saturated fats or cholesterol causes an increase in cholesterol levels in the blood.		
Roles of high-density lipoproteins (HDL) and low-density lipoproteins (LDL)	HDL transports excess cholesterol from the body cells to the liver for elimination. This prevents accumulation of cholesterol in the blood. LDL transports cholesterol to body cells.	
LDL receptors, negative feedback control and atheroma formation	Most cells have LDL receptors that take LDL into the cell, where it releases cholesterol. Once a cell has sufficient cholesterol a negative feedback system inhibits the synthesis of new LDL receptors and LDL circulates in the blood, where it may deposit cholesterol in the arteries forming atheromas.	
Ratios of HDL to LDL in maintaining health.	A higher ratio of HDL to LDL will result in lower blood cholesterol and a reduced chance of atherosclerosis.	
The benefits of physical activity and a low-fat diet.	Regular physical activity tends to raise HDL levels.	

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Key areas	**Depth of knowledge required**	**Suggested learning activities**
Reducing blood cholesterol through prescribed medications.	Dietary changes aim to reduce the levels of total fat in the diet and to replace saturated with unsaturated fats. Drugs, such as statins, reduce blood cholesterol by inhibiting the synthesis of cholesterol by liver cells.	Examine data on the impact of using statins to treat patients at risk of CVD.
8 Blood glucose levels and obesity (a) Chronic elevated blood glucose levels leads to atherosclerosis and blood vessel damage	Chronic elevation of blood glucose levels leads to the endothelium cells taking in more glucose than normal, damaging the blood vessels. Atherosclerosis may develop, leading to cardiovascular disease, stroke or peripheral vascular disease. Small blood vessels damaged by elevated glucose levels may result in haemorrhage of blood vessels in the retina, renal failure or peripheral nerve dysfunction.	Research the symptoms associated with microvascular and macrovascular disease.
(b) Pancreatic receptors and the role of hormones in negative feedback control of blood glucose through insulin, glucagon and adrenaline	Pancreatic receptors respond to raised blood glucose levels by increasing secretion of insulin from the pancreas. Insulin activates the conversion of glucose to glycogen in the liver, decreasing blood glucose concentration. Pancreatic receptors respond to lowered blood glucose levels by increasing secretion of glucagon from the pancreas. Glucagon	

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Key areas	**Depth of knowledge required**	**Suggested learning activities**
	activates the conversion of glycogen to glucose in the liver, increasing blood glucose concentration. During exercise and fight or flight responses, glucose concentrations in the blood are raised by adrenaline, released from the adrenal glands, stimulating glucagon secretion and inhibiting insulin secretion.	
(c) Type 1 and type 2 diabetes Type 1 diabetes usually occurs in childhood. A person with type 1 diabetes is unable to produce insulin and can be treated with regular doses of insulin. Type 2 diabetes typically develops later in life. The likelihood of developing type 2 diabetes is increased by being overweight. In type 2 diabetes, individuals produce insulin, but their cells are less sensitive to it. This insulin resistance is linked to a decrease in the number of insulin receptors in the liver, leading to a failure to convert glucose to glycogen. In both types of diabetes, individual blood glucose concentrations will rise rapidly after a meal. The kidneys will remove some of this	Testing urine for glucose is often used as an	

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Key areas	**Depth of knowledge required**	**Suggested learning activities**
glucose, resulting in glucose appearing in urine. The glucose tolerance test is used to diagnose diabetes.	indicator of diabetes. The blood glucose concentrations of the individual are initially measured after fasting. The individual then drinks a glucose solution and changes in their blood glucose concentration are measured for at least the next two hours. The blood glucose concentration of a diabetic usually starts at a higher level than that of a non-diabetic. During the test, a diabetic's blood glucose concentration increases to a much higher level than that of a non-diabetic and takes longer to return to its starting concentration.	 Analyse the glucose tolerance curves of individuals with and without diabetes.
(d) Obesity Obesity is a major risk factor for cardiovascular disease and type 2 diabetes. Obesity is characterised by excess body fat in relation to lean body tissue, such as muscle. Obesity may impair health. Body mass index (BMI) is commonly used to measure obesity but can wrongly classify muscular individuals as obese.	 BMI = body mass divided by height squared. A BMI greater than 30 is used to indicate obesity.	 Measure the BMI of individuals.

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Key areas	**Depth of knowledge required**	**Suggested learning activities**
Role of diet and exercise in reducing obesity and cardiovascular disease (CVD)	Obesity is linked to high-fat diets and a decrease in physical activity. The energy intake in the diet should limit fats and free sugars, as fats have a high calorific value per gram and free sugars require no metabolic energy to be expended in their digestion. Exercise increases energy expenditure and preserves lean tissue. Exercise can help to reduce risk factors for CVD by keeping weight under control, minimising stress, reducing hypertension and improving blood lipid profiles.	Examine the factors that increase an individual's risk of developing CVD.

Administrative information

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Superclass: RH

History of changes to National Unit Specification

Version	Description of change	Authorised by	Date