HHB Unit 2.1 **Gamete production and fertilisation** LOs

Lesson(s)	..by the end of the lesson(s) I should know…
testes	☐sperm are produced in seminiferous tubules in the testes ☐the interstitial cells of the testes produce the hormone testosterone ☐the prostate gland and the seminal vesicles secrete fluids that maintain the motility and viability of the sperm
ovaries	☐ovaries contain the immature ova (eggs) in various stages of development ☐each ovum is surrounded by a follicle that protects the maturing egg and secretes hormones
fertilisation	☐mature ova are released into the oviduct where they may be fertilised by sperm ☐a fertilised egg forms a zygote ☐a zygote undergoes mitosis

HHB Unit 2.2 **Hormonal Control of Reproduction** LOs

Lesson(s)	..by the end of the lesson(s) I should know…
puberty	☐ the hypothalamus (in the brain) secretes a releaser hormone that targets the pituitary gland (below the brain), this triggers the onset of puberty
males	☐ the pituitary gland in males, releases follicle stimulating hormone (FSH) and interstitial cell stimulating hormone (ICSH) ☐ in males, follicle stimulating hormone (FSH) promotes sperm production in the seminiferous tubules of the testes ☐ interstitial cell stimulating hormone (ICSH) stimulates the interstitial cells in the testes to produce the male sex hormone testosterone ☐ testosterone stimulates sperm production in the seminiferous tubules & activates the secretion of fluids by the prostate gland and seminal vesicles ☐ high testosterone levels inhibit the secretion of FSH and ICSH, resulting in decrease production of testosterone by interstitial cells = negative feedback control
females	☐ the pituitary gland in females releases follicle stimulating hormone (FSH) and luteinising hormone (LH) ☐ the menstrual cycle is a series of hormone controlled events from one menstruation to the next ☐ the menstrual cycle takes about 28days (day 1 = first day of menstruation) ☐ the menstrual cycle has two phases – 1st = follicular phase, 2nd = luteal phase ☐ in the follicular phase FSH stimulates the development and maturation of a follicle surrounding the ovum and the production of the ovarian hormone oestrogen by the follicle ☐ oestrogen stimulates the proliferation of the endometrium, and thins the cervical mucus (making it easier for sperm to swim through) ☐ when oestrogen levels are high, LH is released by the pituitary gland ☐ in the luteal phase, a surge of LH triggers ovulation and the subsequent development of the corpus luteum from the follicle ☐ LH also stimulates the corpus luteum to secrete the ovarian hormone progesterone ☐ progesterone promotes further development and vascularisation of the endometrium (ready for implantation if pregnancy occurs) ☐ high levels of oestrogen and progesterone inhibit the secretion of FSH and LH by the pituitary gland which prevent further follicles developing ☐ inhibition of FSH and LH is an example of negative feedback control ☐ if there is no fertilisation LH levels drop, causing the corpus luteum to break down, causing a drop in progesterone levels ☐ decrease in oestrogen and progesterone levels cause the endometrium to break down resulting in menstruation ☐ if fertilisation does occur the corpus luteum does not degenerate and progesterone levels remain high

Higher Human Biology Unit 2.3 **Biology of Controlling Fertility** LOs

Lesson(s)	..by the end of the lesson(s) I should know…
fertility	☐males are continuously fertile with a constant, continuous level of sperm production ☐female's fertility is cyclical leading to a fertile period of a few days during each menstrual cycle ☐the time of ovulation can be estimated by the number of days after menstruation, a slight increase in body temperature on the day of ovulation and the thinning of the cervical mucus ☐infertility treatments and contraception are based on the biology of fertility.
infertility treatment	☐ovulatory drugs can be used to stimulation of ovulation by preventing the negative feedback effect of oestrogen on FSH secretion OR 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 IVF ☐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 partner is sterile a donor may be used ☐IVF – *in vitro* fertilisation = Surgical removal of eggs from ovaries after hormone stimulation, mix with sperm, incubate zygotes until they have formed at least 8 cells, then implant into uterus. ☐Pre-implantation genetic diagnosis (PGD) is used in conjunction with IVF to identify single gene disorders and chromosome abnormalities ☐ICSI - Intracytoplasmic sperm injection – used if mature sperm are defective or very low in number— the head of the sperm is drawn into a needle and injected directly into the egg to achieve fertilisation
contraception	☐contraception is the intentional prevention of pregnancy by natural or artificial methods ☐contraception includes both physical and chemical methods ☐physical methods = barrier methods (condom / diaphragm), intra-uterine devices and sterilisation procedures, prevent fertilisation or implantation ☐chemical methods = oral contraceptive pill, mini pill, morning after pill ☐oral contraceptive pill contains a combination of synthetic progesterone and oestrogen that mimic negative feedback control, preventing release of FSH & LH and prevent ovulation ☐progesterone only (mini) pill contains synthetic progesterone which causes thickening of the cervical mucus ☐morning after pill prevents ovulation or implantation

HHB Unit 2.4 **Antenatal and postnatal screening** LOs

Lesson(s)	..by the end of the lesson(s) I should know…
	☐ A variety of techniques can be used to monitor the health of the mother, developing foetus and baby
antenatal screening	
	☐antenatal screening identifies risk of a disorder so that further tests and prenatal diagnosis can be offered
ultrasound scan	☐an ultrasound scan is used to produce an ultrasound image ☐pregnant women are given two ultrasound scans ☐dating scans take place between 8-14 weeks and determine the stage of pregnancy and predict the due date ☐ dating scans are used with tests for marker chemicals which vary normally during pregnancy ☐anomaly scans take place between 18-20 weeks are used to detect serious physical problems in the foetus
blood & urine tests	☐routine blood and urine tests are carried out throughout pregnancy to monitor the concentrations of marker chemicals ☐measuring a chemical at the wrong time could give a false positive ☐an atypical result can lead to diagnostic testing to determine of the foetus has a medical condition
amniocentesis	☐this is a diagnostic test in which a sample of the amniotic fluid is taken ☐ amniotic fluid contains foetal cells which are cultured and karyotyped ☐Karyotype shows an individual's chromosomes arranged as homologous pairs and used to identify anomalies in the number or structure of chromosomes ☐Amniocentesis is carried out later in pregnancy and carries a risk of miscarriage (lower than CVS)
chorionic villus sampling (CVS)	☐This is a diagnostic test in which a sample of cells from the placenta is taken ☐ sample contains foetal cells which are cultured and karyotyped and used to identify anomalies in the number or structure of chromosomes ☐can be done earlier than amniocentesis but has higher risk of miscarriage ☐risks and potential decisions after a positive test will be assessed prior to carrying out amniocentesis and CVS

analysis of patterns of inheritance in genetic screening and counselling	
genetic terms	☐ from N5 Biology you should be familiar with the standard genetic terms - alleles, dominant, recessive, homozygous, heterozygous, carriers, genotype, phenotype, autosomes, sex chromosomes
patterns of inheritance	☐ pedigree charts are family trees compiled to analyse patterns of inheritance ☐ autosomal recessive e.g. cystic fibrosis – rare, males and females equally affected, can skip generations ☐ autosomal dominant e.g. Huntingdon's disease - males and females equally, shows up in all generations of affected families ☐ incomplete dominance e.g. sickle cell disease, males and females equally affected, fully affected form is rare, partially affected form is more common ☐ sex-linked recessive e.g. haemophilia- gene is on the part of the X chromosome where there is no corresponding y chromosome
postnatal screening	
	☐ postnatal screening involves health checks carried out after the birth of the baby ☐ postnatal screening focusses on specific conditions or abnormalities e.g. PKU
PKU	☐ phenylketonuria (PKU) is an inborn error of metabolism caused by an autosomal recessive genetic disorder ☐ PKU is a substitution mutation resulting in the enzyme which converts phenylalanine to tyrosine being non-functional ☐ undetected PKU causes problems with mental development ☐ an individual with PKU is put on a restricted diet lacking phenylalanine

HHB Unit 2.5 **Arteries, capillaries and veins** LOs

	..by the end of the lesson(s) I should know…
blood vessels	☐ blood circulates from the heart through blood vessels called **arteries**, **arterioles**, **capillaries**, **venules** and **veins** and back to the heart ☐ there is a **decrease** in blood pressure as blood moves away from the heart ☐ the central space or cavity of blood vessels is called the **lumen** ☐ the lining of blood vessels is a thin layer of cells called the **endothelium**
arteries	☐ arteries carry blood away from the heart ☐ blood in the arteries is at **high pressure** ☐ the **thick elastic walls** of arteries allow them to stretch and recoil to accommodate the surge of blood after each heart contraction ☐ the **smooth muscle** in the walls of arterioles can contract or relax causing **vasoconstriction** or **vasodilation** to control blood flow to tissues ☐ arteries have **narrow** lumens ☐ during exercise blood flow to the skeletal muscles increases by the vasodilation of the arterioles supplying them & blood flow to abdominal organs reduces by vasoconstriction of the arterioles supplying them
capillaries	☐ the role of capillaries is to allow **exchange of substances** with the tissue cells ☐ capillary walls are **only one cell thick**, allowing quick and efficient exchange of materials ☐ arterioles deliver blood to a dense network or **bed of capillaries** in each tissue ☐ the higher pressure in arterioles compared to capillaries results in **pressure filtration** ☐ pressure filtration forces plasma (the liquid part of the blood) out of the capillaries into the tissues forming **tissue fluid** ☐ tissue fluid is similar to blood plasma they contain small molecules, but tissue fluid contains **no plasma proteins** as they are too large to be filtered through the capillary walls ☐ glucose and oxygen diffuse from tissue fluid into the cells and carbon dioxide and waste substances diffuse into the tissue fluid form the cells ☐ tissue fluid re-enters the capillaries at the venule end of the capillary bed by **osmosis** ☐ pressure filtration removes more water out of the capillaries than osmosis returns, causing and **excess of tissue fluid** ☐ the excess tissue fluid is absorbed by the **lymph vessels** and passes into **the lymphatic system** ☐ the lymphatic system returns the **lymph fluid** to the circulatory system
veins	☐ capillaries merge into one another, producing wider blood vessels called **venules** ☐ venules merge to form **veins** which carry blood **back to the heart** ☐ the blood in veins is at **low pressure** ☐ the walls of veins are **elastic** but have a much **thinner muscular wall** than arteries ☐ the lumen in a vein is much **wider** than that of an artery ☐ **valves** are present in veins to **prevent the backflow** of blood (which may happen due to the blood being at low pressure and flowing against the force of gravity)

HHB Unit 2.6 **Structure and Function of the heart** Los

	..by the end of the lesson(s) I should know…
heart structure	☐ the heart has **four chambers** (left and right atria at the top, left and right ventricles at the bottom) ☐ the right and left side of the heart are separate ☐ the right side of the heart collects the **deoxygenated** blood from the body and pumps it to the lungs ☐ the left side of the heart collects the **oxygenated** blood from the lungs and pumps it to the body ☐ the walls of the heart are made of **cardiac muscle**, which can contract continuously **without fatigue** ☐ there are four **valves** in the heart which prevent blood flowing back into the heart chamber it just came from ☐ between the right atrium and right ventricle and between the left atrium and left ventricle is an **atrio-ventriclar valve** (AV) ☐ at the start of the pulmonary artery and aorta is a **semilunar valve** (SL)
circulation	☐ body -> **vena cava** (main vein) ☐ vena cava -> right atrium -> right ventricle -> **pulmonary artery** ☐ pulmonary artery -> lungs -> pulmonary vein ☐ **pulmonary vein** -> left atrium -> left ventricle -> aorta (main artery) ☐ **aorta** -> body
cardiac cycle	☐ the cardiac cycle is the pattern of diastole and systole in one complete heart beat ☐ **diastole** is when heart muscle is relaxed ☐ **systole** is when heart muscle is contracting ☐ during **diastole,** blood returning to the atria flows into the ventricles ☐ **atrial systole** transfers the remainder of the blood through the AV valves into the ventricles ☐ **ventricular systole** closes the AV valves and pumps the blood through the SL valves to the aorta / pulmonary artery ☐ in **diastole** the higher pressure in the arteries closes the SL valves ☐ the opening and closing of the heart valves causes the **sounds** of the heart beat heard with a stethoscope

cardiac conducting system	☐the cardiac conducting system is the **nervous control** of the heart beat ☐the heart beat originates in the heart itself ☐the auto-rhythmic cells of the **sino-atrial node** (SAN) or pacemaker, in the wall of the right atrium set the rate at which the heart contracts ☐impulses from the SAN spread though the atria causing atrial systole ☐the electrical impulses then spread 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 ☐the electrical impulses in the heart can be detected by an **electrocardiogram** (ECG), showing three phases (P, QRS & T) ☐**P wave** = atrial systole ☐**QRS complex** = ventricular systole ☐**T wave** = diastole ☐the **medulla** of the brain regulates the SAN through the antagonistic action of the **autonomic nervous system (ANS)** ☐**sympathetic** accelerator nerves release **nor-adrenaline,** which increase heart rate ☐**parasympathetic** nerves to the heart release **acetylcholine** which decrease the heart rate
circulatory system measurements	☐blood pressure is measured using a **sphygmomanometer**-an inflatable cuff stops blood flow, in the artery, and deflates gradually. The blood then 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 reading for a young adult is **120/80 mmHG** ☐the higher value represents **systolic** pressure and the lower value is **diastolic** pressure ☐**hypertension** (high blood pressure) is a major risk factor for many diseases including coronary heart disease ☐**stroke volume** is the volume of blood pumped out by either ventricle during one systole (the same volume is pumped out by left and right ventricles) ☐**cardiac output** is the volume of blood pumped out by either ventricle per minute, it is determined by **Heart Rate X Stroke Volume**

Higher Human Biology Unit 2.7 **Cardiovascular Disease** LOs

	..by the end of the lesson(s) I should know…
atherosclerosis	☐atherosclerosis is the accumulation of fatty material (mainly cholesterol, fibrous material and calcium), forming an **atheroma** or plaque ☐an atheroma forms **beneath the endothelium** of the artery wall ☐as an atheroma grows, the **artery thickens and loses its elasticity** ☐an **atheroma reduces the diameter of the lumen** of an artery which **restricts blood flow** and **increases blood pressure** ☐atherosclerosis is the root cause of various cardiovascular diseases (CVD) including **angina**, **heart attack**, **stroke** and **peripheral vascular disorders** ☐
thrombosis	☐if an atheroma ruptures, the damage to the endothelium causes the release of **clotting factors** ☐clotting factors cause the **enzyme prothrombin** to be converted into its **active** form **thrombin** ☐thrombin causes molecules of the soluble plasma protein fibrinogen to form threads of insoluble fibrin protein ☐ fibrin threads form a **mesh** that platelets adhere to, forming a **blood clot**, which seals a wound and forms a scaffold for the formation of scar tissue ☐ thrombosis is the **formation of a blood clot** (thrombus) in a vessel ☐ if a thrombus breaks loose, it forms an **embolus** that travels through the blood stream until it blocks a blood vessel ☐ thrombosis in a coronary artery can lead to **myocardial infarction (MI)** commonly known as a heart attack ☐ Thrombosis in an artery in the brain can lead to a **stroke** ☐ thrombosis normally results in the **death of some of the tissue** served by the blocked artery as the cells are deprived oxygen

peripheral vascular disorders	☐peripheral vascular disorders include narrowing of arteries due to atherosclerosis of arteries **other than those of the heart or brain** ☐blood clots can result in **deep vein thrombosis (DVT)** and **pulmonary embolism** ☐DVT is the formation of a blood clot in a deep vein, most commonly the **lower leg** ☐in DVT pain is experienced in the leg muscles due to limited oxygen supply ☐a pulmonary embolism is caused by part of a thrombus breaking free and travelling through the blood stream to the **pulmonary artery**, where is can cause a blockage resulting in chest pain and breathing difficulties
cholesterol	☐cholesterol is a type of lipid found in **cell membranes** and is used to make the sex hormones: testosterone, oestrogen and progesterone ☐cholesterol is synthesised by all cells, 25% of total production takes place in ☐a diet high in **saturated fats** or cholesterol causes and increase in cholesterol levels in the blood ☐lipoproteins contain lipid and protein ☐**High-density lipoprotein (HDL)** transports the excess cholesterol from body cells to the liver for elimination (so prevents the build-up of cholesterol in the blood) ☐**Low-density lipoprotein (LDL)** transports cholesterol to body cells ☐most cells have **LDL receptors** that take LDL into the cell where the cholesterol is released ☐once a cell has sufficient cholesterol, a **negative feedback** system inhibits the synthesis of new LDL receptors and so LDL circulates in the blood ☐LDL circulating in the blood may deposit the cholesterol in the arteries causing **atheromas** ☐ **higher ratio of HDL to LDL** results in lower blood cholesterol and a reduced chance of atherosclerosis ☐ regular **physical activity tends to raise HDL levels** ☐ dietary changes aim to **reduce the levels of total fat in the diet** and to replace saturated fats with **unsaturated** fats ☐ drugs such as statins reduce the blood cholesterol by **inhibiting the synthesis of cholesterol** by liver cells

Higher Human Biology Unit 2.8 **Blood Glucose Levels and obesity** LOs

	..by the end of the lesson(s) I should know…
importance of blood glucose control	☐ 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 high glucose levels may result in haemorrhage of blood vessels in the retina (light detecting surface at back of the eye), renal (kidney) failure or peripheral nerve dysfunction
blood glucose regulation	☐ blood glucose concentration is maintained within fine limits by **hormones** ☐ blood glucose concentration is monitored by receptors in the **pancreas** ☐ the pancreas controls blood glucose levels with the **antagonistic** hormones **insulin** and **glucagon** ☐ the hormones are transported in the blood to the **liver** ☐ insulin makes the liver cells **more permeable to glucose** and activates the conversion of **glucose to glycogen**, decreasing the blood glucose concentration ☐ glucagon activates the conversion of **glycogen to glucose**, increasing the blood glucose concentration ☐ during exercise, and the flight or fight responses, glucose levels are raised by **adrenaline** released from the adrenal glands, stimulating glucagon secretion and inhibiting insulin secretion

type 1 & type 2 diabetes	☐type-1 diabetes usually occurs in childhood, is caused by **lack of insulin production** & is treated with regular doses of **insulin** ☐type-2 diabetes is also called **adult onset** diabetes as develops later in life ☐likelihood of developing type 2-diabetes is increased by being **overweight** ☐in type 2-diabetes, insulin is still produced but the **cells are less sensitive** to it, it 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** blood glucose concentration will rise rapidly after a meal, the kidneys will remove some of this glucose via the urine ☐the presence of glucose in the **urine** is an indicator of diabetes ☐the **glucose tolerance test** is used to diagnose diabetes, it involves measurement of blood glucose concentrations after fasting, drinking a glucose solution then monitoring blood glucose concentrations over the next two hours ☐in the glucose tolerance test blood glucose concentrations of a diabetic usually start higher, reach higher levels and take longer to return to starting levels than non-diabetic
obesity	☐**obesity** is a major risk factor for Cardiovascular disease and type 2 diabetes, and may impair health ☐obesity is characterised by **excess body fat in relation to lean body tissue** (muscle) and is a major risk factor in CVD and type 2 diabetes ☐**Body Mass Index (BMI)** is a measurement of body fat based on height and weight (BMI = weight (kg) divided by height (m) squared) ☐**B**MI over 30kgm^{-2} is obese ☐BMI can wrongly classify obesity in muscular individuals ☐obesity is linked to **high fat diet** and a **low physical activity** ☐fats have a high calorific value and so should be limited in the diet ☐sugar require no metabolic energy to digest them and so should be limited in the diet ☐**exercise** increases energy expenditure and preserves lean tissue ☐exercise can **reduce risk factors** for CVD by keeping weight under control, reducing stress and hypertension and can improve HDL to LDL ratios