

## **Unit 2 Physiology and health**

### **1. Reproduction**

#### **The structure and function of reproductive organs and gametes and their role in fertilisation.**

- State that gametes are produced from germline cells.
- Give the location of gamete production in males.
- Describe the roles of seminiferous tubules, interstitial cells, testosterone, prostate gland and seminal vesicles.
- Give the location of gamete production in females.
- Describe the maturation of ova and the development of a follicle.
- Give the site of fertilisation.
- Give the site of zygote development.

#### **Hormonal control of reproduction**

- State that hormones control the onset of puberty, sperm production and the menstrual cycle.
- Describe the role of the pituitary gland in the onset of puberty.
- Describe the role of the hypothalamus in the onset of puberty.
- Describe the role of the hormones FSH, LH and ICSH in the onset of puberty.
- Describe the hormonal control of sperm production.
- Describe the role of the hormones FSH and ICSH in the production of sperm.
- Describe the role of testosterone in sperm production.
- Describe the negative feedback control of testosterone by FSH and ICSH.
- Describe the hormonal control of the menstrual cycle.
- State the duration of the menstrual cycle.
- State that FSH stimulates the development of a follicle and the production of oestrogen by the follicle in the follicular phase.
- Explain what the endometrium is.
- Describe the role of oestrogen in preparing the endometrium and affecting the consistency of the cervical mucus.
- State that peak levels of oestrogen stimulate a surge in the secretion of LH which triggers ovulation.
- Describe what happens during the luteal phase of follicle development.
- Describe the role of progesterone.

### **Hormonal control of reproduction continued**

- Describe the negative feedback effect of the ovarian hormones on the pituitary gland and the secretion of FSH and LH preventing further follicles from developing.
- Describe the roles of LH and progesterone in triggering menstruation.

### **The biology of controlling fertility**

- State that infertility treatments and contraception are based on the biology of fertility.
- Describe some of the risks and ethical issues regarding the use of fertility treatments.
- Explain what is meant by the term fertile period.
- Explain how fertility in males differs from fertility in females.
- Explain how fertile periods can be calculated and used to increase the chance of conception.
- Explain how ovulation can be stimulated.
- State that ovulatory drugs can cause super ovulation that can result in multiple births or be used to collect ova for in vitro fertilisation (IVF) programmes.
- Describe the process of artificial insemination.
- State that artificial insemination is useful if the male has a low sperm count.
- Describe the process of intra-cytoplasmic sperm injection (ICSI).
- Describe a situation where ICSI would be appropriate fertility treatment.
- Describe the process of IVF.
- State that pre-implantation genetic screening can be used to identify genetic disorders and chromosome abnormalities.
- Describe physical methods of contraception and explain why they are successful.
- Explain how chemical contraceptives work.

### **Ante- and postnatal screening**

- Explain what is meant by the terms ante- and postnatal screening.
- Describe the process of ultrasound imaging.
- Describe the information which can be obtained from an ultrasound.
- State that biochemical tests can be used to detect the normal physiological changes of pregnancy.
- Describe other checks which are carried out during pregnancy such as blood pressure, blood type and urine tests.
- Describe the amniocentesis process and the information which can be obtained from it.
- Give details of the advantages and disadvantages of this process.
- Describe the chorionic villus sampling process and the information which can be obtained from it.
- Give details of the advantages and disadvantages of CVS.

### **Ante- and postnatal screening continued**

- State that CVS carries a higher risk of miscarriage than amniocentesis.
- Explain why rhesus antibody testing is performed.
- Explain why anti-rhesus antibodies are given to rhesus negative mothers.
- Give examples of post-natal screening and explain why it is carried out.
- Describe the use of pedigree charts to analyse patterns of inheritance in genetic screening and counselling.
- Recognise the following patterns of inheritance autosomal recessive, autosomal dominant, incomplete dominance and sex-linked recessive single gene disorders.
- Describe the use of pre-implantation genetic diagnosis (PGD).

## **2. The cardiovascular system**

### **The structure and function of arteries, capillaries and veins**

- Describe the pathway of blood through the blood vessels.
- Describe the detailed structure and function of arteries, capillaries and veins.
- Describe the role of the endothelium, central lumen, connective tissue, elastic fibres, smooth muscle and valves in blood vessels.
- Describe the role of vasoconstriction and vasodilation in controlling blood flow.
- Explain what is meant by the term pressure filtration.
- Describe the role of lymph vessels.
- Describe the role of tissue fluid.

### **The structure and function of the heart**

- Explain what cardiac output is and how it is calculated.
- State that the left and right ventricles pump the same volume of blood through the aorta and pulmonary artery.
- Describe the cardiac cycle including atrial systole, ventricular systole, diastole.
- Name and give the locations of the valves in the heart.
- Describe the effect of pressure changes on AV and SL valves.
- Explain how the contractions of the heart are carefully timed.
- Carry out interpretation of electrocardiograms (ECG).
- Explain how the medulla regulates heart rate.
- Describe the role of sympathetic and parasympathetic nerves in controlling heart rate.
- Explain how blood pressure changes in response to the cardiac cycle.

## **The structure and function of the heart continued**

- Explain how blood pressure is measured using a sphygmomanometer and give typical values of blood pressure for a young adult.
- Explain what hypertension is and the dangers it presents.

## **Pathology of cardio vascular disease (CVD)**

- Describe the process of atherosclerosis and its effects on arteries and blood pressure.
- Explain the relationship between atherosclerosis and CVD.
- Explain what a thrombosis is and describe the events leading to an MI or stroke.
- Describe the roles of prothrombin, thrombin, fibrinogen and fibrin.
- Explain what an embolus is.
- State that during an MI/stroke, cells are deprived of oxygen leading to death of tissues.
- Explain what peripheral vascular disorders are and their symptoms.
- Describe the causes of peripheral vascular disorders including narrowing of arteries due to atherosclerosis, deep vein thrombosis (DVT) and pulmonary embolism due to blood clots.
- Explain how cholesterol is produced and its functions in the cell membrane and as steroid synthesis.
- Describe the roles of HDLs and LDLs.
- Describe the role of LDL receptors and the negative feedback system which prevents accumulation of too much cholesterol.
- Describe the ratios of HDL to LDL which should be maintained to promote health.
- Explain how cholesterol in the blood can be lowered by lifestyle changes and drugs.
- Describe the condition familial hypercholesterolaemia (FH) and its treatments.
- Describe the damaging effects of chronic high blood glucose levels in the blood vessels.
- Explain how high blood glucose levels can cause retinal damage, renal failure or peripheral nerve dysfunction.
- Describe the cell receptors and the role of hormones in negative feedback control of blood glucose through insulin, glucagon and adrenaline (epinephrine).
- Describe the role of glycogen in controlling blood glucose levels.
- State that vascular disease can be a chronic complication of diabetes.
- Describe the diagnosis, treatments and role of insulin in type 1 and type 2 diabetes.
- Describe the glucose tolerance test.
- Define obesity and explain how it is characterised.
- Explain how body fat, body density measurements and BMI calculations are performed.
- Explain how obesity is linked to CVD and diabetes and how exercise can reduce the risk of CVD.