

Gastrointestinal System

1. Oesophagus and stomach:

- Describe the gross anatomy and microstructure of the GIT (including the stomach and duodenum)
- Outline the mechanism of swallowing and oesophageal motility
- discuss the function of the gastro oesophageal sphincter
- describe gastric movements, stomach emptying and their regulation
- list and define the functions of the various gastric secretions and gastric enzymes in the digestion of dietary products

2. Peptic ulcers:

- Outline the mechanism of acid production by the stomach
- Describe the regulation of gastric secretions
- Discuss the pathophysiology of peptic ulcer disease
- Outline the causes of peptic ulcer disease
- Discuss the pharmacological basis of the treatment of peptic ulcer
- Discuss the epidemiology of peptic ulcer disease

3. Liver

- Describe the macro and microscopic structure of the liver
- Describe the blood supply to the liver and its relationship to the systemic circulation
- Outline hepatic processing of blood returning from the gut, including metabolism of Dietary products
- Outline the processes by which the liver detoxifies waste products
- Explain the pathophysiology of portal hypertension and hepatic encephalopathy.
- Diagnosis and management
- Role of the liver in carbohydrate, protein and lipid metabolism
- How does the liver detoxify waste products
- Describe the macro and microstructure of the liver
- Describe the blood supply to the liver and its relationship to the systemic circulation
- LFTs in liver disease
- Pathogenesis of cirrhosis and complications of liver cirrhosis
- Causes, diagnosis and management

4. Hepatitis

- Appreciate differing epidemiology and clinical manifestations of Hepatitis viruses
- To review basic serology of Hepatitis viruses
- To review treatment options for Hepatitis viruses

5. Bilirubin metabolism

- To understand the biochemical and anatomical pathways associated with the generation of bile pigments and their biological significance.

- To appreciate the importance of bile salts in facilitating digestion of lipids and lipid-soluble vitamins
- To understand the basis for classification of the three types of jaundice, and the conditions in which each is commonly observed
- To appreciate how quantitation of serum bile pigments can be used as a diagnostic tool to aid classification of jaundice in patients

6. Biliary Tree

- Draw a diagram of biliary tract
- Describe the composition and formation of bile including the enterohepatic circulation
- Outline the regulation of gallbladder contraction
- Describe the metabolism of bilirubin
- Discuss the emulsification of lipids by bile
- Outline the causes of obstructive jaundice including gall stones and their effects on liver function tests.

7. Coeliac disease

- Describe the gross anatomy and histology of the small intestine
- Discuss the digestive processes which occur in the small intestine including motility.
- Describe the mucosal absorption of products of digestion
- Discuss the iron homeostasis and how this is changed in a patient with coeliac disease.
- Consider the importance of the small intestine in the absorption of vitamins and minerals
- Outline the pathophysiology of coeliac disease and the sequelae of malabsorption due to this condition

8. Iron metabolism

- Absorption
- Transport
- Utilisation
- Storage and recycling
- Regulation of iron metabolism
- Hereditary Haemochromatosis

9. Diarrhoea

- Describe the gross anatomy and histology of the large bowel including the anal canal
- Discuss the motility of the large intestine and factors affecting it
- Describe fluid and electrolyte absorption in the gastrointestinal system
- Describe the normal flora of the gastrointestinal system
- Discuss the pathogenic mechanisms involved in diarrhoeal disease including the role of bacterial toxins
- Discuss the spread and control of enteric infection

10. Enteric Infection

- Pathogenic mechanisms
- Clinical features of gastroenteritis

- Aetiologies
- Approach to the patient
- Management of infectious diarrhoea
- Specific causes

11. Chronic Pancreatitis

- Describe the gross anatomy and histology of the pancreas and the spleen
- List the pancreatic secretions
- Discuss the role of pancreatic enzymes in the digestion of foodstuffs
- Describe the regulation of pancreatic secretion
- Discuss the dietary advice you would give to a patient with pancreatic insufficiency
- Outline the causes and treatment of chronic pancreatitis
- Discuss possible strategies for improving patient compliance

12. Liver function tests

- —To review the anatomy of the liver
- —To understand the normal function of the liver
- —To identify the most commonly used liver markers in the work up to diagnosis of liver diseases
- —Use of liver function tests in clinical contexts – case review

Reproduction, Nephrology, Urology

13. Conception

- Describe the anatomy and histology of the male and female reproductive tracts and accessory glands
- Describe the blood supply, venous and lymphatic drainage of the reproductive system
- Understand the peritoneal relationships of the reproductive organs in the female
- Discuss the biology of male and female fertility, including gametogenesis and the menstrual cycle
- Describe the endocrinology of fertility and the mechanism of action of the oral contraceptive pill
- Review the physiology of sexual intercourse

14. Cryptorchidism

- Summarise the development of the testis
- Describe the path and control of testis descent
- Describe the inguinal canal
- Describe the coverings of the testis within the scrotum
- Explain the contents and coverings of the spermatic cord
- Describe the common disorders and management of sex development including cryptorchidism and hypospadias

15. Infertility

- Revise the biology of fertilisation, including the barriers that must be penetrated by successful sperm and the blocks to polyspermy
- Revise the role of the hypothalamus and pituitary in controlling follicle development

- Explain the development of the male and female reproductive tracts
- Outline factors which may impair fertility in both sexes
- Outline assisted reproduction technology

16. Introduction to embryology

- Describe the key events that occur during weeks 1 and 2 of early human development
- Understand the key events happening during gastrulation including the formation of the 3 germ layers and their derivatives
- Describe the formation and importance of the extra embryonic membranes

17. Development of the urogenital system

- Understand the development and regression of the duct system in the formation of the urogenital system
- Describe the cellular movements involved in the formation of the indifferent gonad
- Describe the development of the testis from the indifferent gonad
- Describe the development of the ovary from the indifferent gonad
- Describe some common clinical conditions associated with development of the urogenital system including hypospadias and intersex disorders.

18. Female reproductive endocrinology

- Understand the biosynthesis and mechanism of action of steroid hormones
- Describe the roles of pituitary hormones in regulation of ovarian function including ovulation, formation and decline of the corpus luteum
- Describe the endometrial changes (proliferative and secretory phases) that occur throughout the menstrual cycle and correlate them with the changes in pituitary and ovarian hormones
- Understand some common clinical issues associated with problems in endocrine function

19. Male reproductive endocrinology and endocrine disruptors

- Normal male endocrine system
- What are endocrine disruptors?
- How do endocrine disruptors affect male reproduction?

20. Pelvic floor anatomy:

- Anatomy of pelvic Floor
- Describe the skeleton of the pelvis
- How does the anatomy work?
- What does it do?
- Understand the clinical relevance of pelvic imaging.
- What happens when anatomy is disrupted?
- What can go wrong?
- How does anatomy influence surgery?

21. Assisted reproductive technology:

- Understand the “holy triad” of reproductive physiology in the female

- Understand how semen quality is defined and how this relates to fertility
- Describe the common investigative techniques in fertility assessment
- Explain the steps in the in vitro fertilisation process

22. Gross anatomy of human reproduction:

- Identify key features on the ligamentous pelvis and give the attachments of the inguinal ligament.
- Explain the development of the male and female reproductive tracts.

23. Renal Physiology

- Give an account of the role of the kidneys in controlling the volume of extracellular fluid, metabolic waste removal and electrolyte homeostasis
- Describe the composition of the nephron and explain the function of each component
- Understand the other main functions of the kidneys, including activation of vitamin D, toxin metabolism and regulation of erythropoietin

24. Measuring Kidney Function

- Understand how substances such as creatinine are “cleared “by the kidneys
- Understand how kidney function can be assessed by measurement of glomerular filtration rate
- Explain how estimated GFR measurements are made, and the limitations of this measurement
- List typical values for renal blood flow, glomerular filtration rate and urine production

25. Examining the Urine and Kidney Disease

- Describe the common causes and classification of kidney disease
- List what is measured by semi-quantitative urinalysis
- Explain how proteinuria and haematuria are quantified
- Be able to identify patients with kidney injury/ disease by eGFR and urine quantification
- Understand how patients with chronic kidney disease are managed

26. Fluid and Electrolyte Balance

- Describe how the nephron controls excretion of sodium and potassium
- Explain how the kidney controls water reabsorption and secretion
- Describe how the countercurrent multiplier system concentrates filtrate in the loop of Henle
- Understand how the countercurrent exchange mechanism functions in the Vasa Recta
- Understand the channels involved in electrolyte transport
- List the main hormones involved in regulating renal function and understand how they act

27. Imaging and Renal Stone Disease

- Describe the various methods available to image the kidneys and bladder, and understand the risks associated with some of these methods
- Understand how kidney stones/crystals form, and the different types that exist
- Understand the role of serum/urine biochemistry and imaging in diagnosing kidney stones
- Discuss the common treatments for kidney stones

28. Determining normal kidney function and the absence of kidney disease

- Describe the anatomy of the kidney and urinary tract, especially the structure of the nephron and its blood supply
- To know about different ways of measuring glomerular filtration rate (GFR) to determine kidney function and their limitations: – direct measures (timed inulin clearance, isotopic GFR, creatinine clearance) and estimates – serum creatinine and eGFR equations.
- To know that kidney disease can be detected by reduced GFR, detection of proteinuria, detection of non visible or visible haematuria), detection of structural abnormalities on imaging, or a combination of these. Non-visible or visible haematuria indicates bleeding from anywhere in the urinary tract from glomerular filtration barrier to urethra.
- To know that the severity of kidney disease is determined by a combination of the measurement of GFR and the quantification of proteinuria.
- To know what is detected by dipstick testing of urine
- To understand that dipstick testing of urine is a sensitive but imprecise method of quantifying urine protein excretion
- To understand how to quantify protein excretion by measurement of the protein: creatinine ratio and the advantages of this over 24 hour urine collection for measurement of total protein excretion.
- To understand the difference between proteinuria and albuminuria
- To know why kidney stones form and how they can be detected by imaging.
- To consider the ethical arguments of making non-directed living kidney donation legal despite the desire to 'first do no harm'

29. Response to haemorrhage

- Revise the cardiovascular responses to blood loss, including redistribution of blood flow at an organ and tissue level
- Describe the mechanisms by which the kidney excretes or conserves specific ions and molecules, with reference to sodium, water, potassium, urea and creatinine
- Describe the mechanism by which the kidney concentrates urine, explaining the counter current mechanisms
- Describe the mechanism by which the kidney is involved in the maintenance of intravascular volume, focussing on the response to blood loss
- Be aware of the limitation of eGFR in the non-steady state scenario

30. Chronic renal failure

- Describe the mechanism by which bladder volume is sensed and bladder emptying achieved
- Be aware of the mechanism by which chronic obstruction of bladder outflow can lead to back pressure, dysfunction and damage to the kidneys.
- Describe how reduced glomerular function (as estimated by eGFR) causes biochemical changes in the blood, in particular to urea, creatinine and potassium
- Describe the mechanisms by which the kidney regulates acid-base balance
- Describe the hormonal functions of the kidney with specific reference to erythropoietin and vitamin D metabolism
- Be aware of causes (pre-renal, renal and post-renal) of chronic kidney disease with reduced renal function (chronic renal failure) and the approach to identifying the cause

- Describe the role of the kidney in excretion of medicines and the importance of considering kidney function when prescribing medicines and assessing potential medicine toxicity

31. Bladder Function

- Describe the anatomy of the bladder
- Understand the physiology of bladder voiding
- Describe the neurological conditions affecting bladder functions
- Understand the principle causes and management of bladder outflow obstruction

32. Acid-Base Balance

- Understand simple acid-base physiology
- Understand the process of compensation
- Be able to recognise the presence of acid-base disorders

33. Drugs and the Kidney

- Understand the mechanisms involved in renal excretion of drugs
- Describe how impaired kidney function has an effect on drug metabolism and clearance
- Explain the dose adjustment options necessary in patients with compromised kidneys
- Understand the mechanisms and clinical presentation of nephrotoxicity
- Understand the use and misuse of diuretics

34. Solid Organ Allo-Transplantation

- Explain how compatibility between donor organs and recipients is determined
- Understand how major histocompatibility complex matching is critical in transplantation
- Understand the factors contributing to and the various types of transplant rejection
- Understand how donor organs are allocated to recipients in the UK

Endocrine

35. Endocrinology and diabetes

- Explain the difference between exocrine and endocrine glands
- Understand the importance of the pituitary gland in overall regulation of the endocrine system
- Outline the basic principles of hormone production and action
- Demonstrate a broad understanding of the normal physiological roles of the thyroid, parathyroid and adrenal glands
- Understand the difference between the endocrine and exocrine pancreas
- Explain the key differences between type 1 and type 2 diabetes

36. Insulin production and action

- Describe the site and mechanism of insulin and glucagon secretion
- Outline the processes through which glucose is converted to glycogen and vice versa and explain how these processes are controlled and respond to signals generated by insulin, glucagon and (nor)adrenaline in

- Muscle and liver
- Outline the processes through which glucose is synthesised de novo by the liver and how this process is regulated by signals generated by insulin and glucagon
- Describe the different routes through which glucose can be metabolised.
- Describe how insulin and glucagon regulate blood glucose concentration in a healthy individual immediately after a meal, between meals and after a prolonged period without food.
- Describe the mechanism of action of the biguanide and sulphonylurea classes of drugs

37. Pathogenesis of Type 1 Diabetes

- Outline diagnostic criteria for diabetes, impaired fasting glucose and impaired glucose tolerance
- Understand that diabetes may be caused by a number of aetiologies and is divided into type 1, type 2, monogenic and secondary causes
- Describe the autoimmune basis of type 1 diabetes and how type 1 diabetes relates to other autoimmune diseases
- Explain the aetiology of monogenic forms of diabetes, how these are transmitted in families
- Outline how autoantibodies can be used to differentiate different forms of diabetes
- List the classic presenting clinical features of type 1 Diabetes and explain how it is diagnosed.
- Understand the underlying pathophysiology of Type 1DM, especially the role of autoimmunity
- Describe the structure of the pancreas and the functions of different cell types.
- Describe the synthesis and processing of insulin in cells of Islets of Langerhans
- Describe the changes in blood insulin produced by a healthy pancreas in response to normal eating and fasting patterns and compare these with the changes when a diabetic patient injects insulin.
- Be aware of different types of available insulin and different regimes using insulin to control blood sugar
- Describe the effects of insulin on relevant tissues (short and long term) and how these effects are achieved
- Understand the risk factors for hypoglycaemia and how this could be treated.
- Explain the different responsibilities of a patient for self-management and of the General practice staff and Diabetes Clinic staff for supervision of diabetic care.
- Examine the ethical and legal responsibilities of having type 1 diabetes and the impact of these on patient lifestyle.

38. Pancreas and adrenal glands

- Recognise and describe the anatomical structure of the exocrine and endocrine pancreas and its relations to other abdominal organs
- Describe the histology of the pancreas - recognise and distinguish different cell types
- Explain the basis of immunocytochemical techniques and how they can be used to identify molecular functions of cells
- Distinguish, using immunocytochemical observations, between normal and failing function of specific cell types
- Identify the usual anatomical position of the adrenal glands
- Describe the histological structure and physiological function of the adrenal cortex
- Describe potential adrenal pathologies (e.g. Benign adenoma, adrenocortical carcinoma, atrophy in Addison's disease)

- Describe the structure and function of the adrenal medulla

39. Carbohydrate metabolism

- List the types of carbohydrate in the diet
- Describe the processes involved in the digestion and absorption of different types of dietary carbohydrates including disaccharides.
- Describe the mechanism(s) through which glucose enters cells and explain the significance of tissue-specific differences in this process.
- Describe the different routes through which glucose can be metabolised.
- Explain the different reasons why some tissues are more dependent on glucose than others.
- Describe how blood glucose concentration is controlled in a healthy individual immediately after a meal, between meals and after a prolonged period without food.
- Outline the processes through which glucose is converted to glycogen and vice versa and explain how these processes are controlled and how they respond to signals generated by relevant hormones in different tissue types.

40. Microvascular complications

- Outline key points relating to the epidemiology of microvascular disease in diabetes
- Describe the pathogenesis, screening system and management of diabetic retinopathy
- Explain the underlying mechanisms, screening and treatment of diabetic nephropathy
- Explain the pathogenesis, screening, differential diagnosis and treatment of diabetic neuropathy
- Summarise the key clinical trials emphasising the importance of glycaemic control in reducing incidence of microvascular complications
- Understand the concept of glycaemic targets and their role in minimising microvascular disease.
- Understand how glycaemic control is assessed in diabetes and the importance of good control.
- Describe the capillary damage that occurs in diabetes
- Understand the consequences of poor diabetic control on the capillaries and small arteries of the eye/kidney/peripheral nerves
- Describe the retinal screening process undergone by patients with diabetes
- Describe the classification of diabetic eye disease
- Explain the consequences of renal capillary damage in diabetes and how this can be prevented or how to reduce its rate of progression

41. Metabolic complications of diabetes

- Describe the main acute metabolic complications of diabetes
- Outline the pathophysiology and biochemical changes observed in diabetic ketoacidosis
- Understand the consequences of relative insulin deficiency and the acute metabolic complications that can develop (HONK)
- Outline the aims of treatment of diabetic ketoacidosis and HONK with reference to the biochemical and physiological changes that occur
- Describe the symptoms of hypoglycaemia and be aware of the short and long term dangers of this metabolic complication

42. Pathophysiology of type 2 diabetes

- Normal endocrine pancreatic function and role in glycaemic control
- Genetic factors predisposing to the development of Type 2 Diabetes
- Lifestyle and developmental factors predisposing to the development of Type 2 Diabetes
- Development of pancreatic dysfunction and peripheral insulin resistance
- Pathogenesis of complications of T2DM

43. Macrovascular complications and type 2 diabetes

- Describe the typical clinical features of a patient with type II diabetes and understand its impact on NHS resources
- Understand pathophysiological mechanisms underlying type II diabetes (especially the close link between obesity and insulin resistance) and explain how these differ from type I diabetes
- Outline the molecular and cellular changes leading to the deposition of atheromatous plaque and the role of diabetes in accelerating this process
- Outline the macrovascular (cardiovascular) consequences of type 2 diabetes its importance as a cardiovascular risk factor
- Describe how to minimise cardiovascular risk in diabetes and appreciate the importance of addressing other risk factors as well as glycaemic control
- Describe the main classes of drugs used to treat type II diabetes.
- Appreciate the role of doctors, nurses, podiatrists, ophthalmologists as well as the patient in contributing to diabetes care and, in particular, the responsibility of the patient in self management.
- Understand the potential usefulness of a diabetes database to optimise individual patient management as well as overall public health benefit

44. Obesity and the role of adipose tissue in disease

- Describe the epidemiology of the global obesity epidemic
- Outline possible causative factors for the global obesity epidemic
- Describe the role of adipose tissue in health
- Outline the mechanisms by which adipose tissue contributes to diabetes and cardiovascular disease in obesity
- Describe broad treatment strategies for an individual with obesity
- Outline preventative strategies for obesity at a population level

45. Lipid metabolism

- Describe the types of lipid in the diet
- Describe the processes involved in the digestion and absorption of dietary lipids.
- Describe the key intermediates and regulated enzymes of fatty acid synthesis and oxidation
- Describe the key intermediates and regulated enzymes of triglyceride synthesis and lipolysis in adipose tissue
- describe the different routes through which lipids can be metabolised.
- Outline the mechanisms by which insulin regulates fatty acid and triglyceride metabolism in liver and adipose tissue.
- Explain the requirement for essential fatty acids

46. Calcium production, regulation and disorders

- Explain importance of calcium & what it does

- Understand anatomy & physiology of the parathyroid glands
- Explain how serum calcium is regulated
- Outline sources & synthesis of vitamin D & its role in calcium regulation
- Describe causes & clinical features of hypercalcaemia
- Describe causes & clinical features of hypocalcaemia

47. Pituitary and regulation of the endocrine system

- Understand the anatomical relationship between the hypothalamus and anterior pituitary
- Explain the role of the hypothalamus in regulating hormone production from the anterior pituitary
- Describe the hormones produced by the anterior pituitary and their normal physiological actions on target organs
- Describe the function of the posterior pituitary gland and the normal physiological role of posterior pituitary hormones
- Describe the clinical consequences of disorders of the pituitary glands

48. Thyroid gland - anatomy, physiology and disorders

- Describe the synthesis of thyroid hormone within thyroid follicles and how this is regulated
- Outline how thyroid hormone is secreted and how it circulates in the plasma
- Understand how thyroid hormone exerts its action at a tissue level and its major physiological role
- Explain the causes of hyperthyroidism and the clinical effects of thyroid hormone excess
- Describe the causes and clinical effects of hypothyroidism
- Describe the anatomical relationships and the cell structure of the thyroid gland.
- Describe how thyroxine (T₄) and tri-iodothyronine (T₃) are synthesised and transported and how their secretion is regulated
- Explain how thyroid hormones identify their target tissues and outline how T₄ and T₃ affect cellular functions in target tissues
- Describe the consequences of both increased and decreased thyroid hormone production
- Outline the autoimmune basis of hyper- and hypothyroidism
- Describe the causes of and treatment options for thyrotoxicosis
- Understand the role of radioactive iodine in the treatment of hyperthyroidism and possible short-term and long-term consequences
- Outline the causes and treatment of hypothyroidism

49. Corticosteroid production and regulation

- Understand the anatomical /functional zonation of the adrenal cortex
- Outline the steps in the biosynthesis of cortisol and how this is regulated
- Describe the biosynthesis of aldosterone and its regulation by the RAS
- Describe how both cortisol and aldosterone exert their effects via receptors located in the cell nucleus
- Explain the multiple physiological effects of cortisol
- Understand the main physiological role of aldosterone
- Describe adrenal androgen production and how this is regulated

50. Adrenal glands

- Outline the anatomy and histology of the adrenal glands
- Describe the synthesis, function and importance of cortisol and aldosterone, identifying their target tissues and mechanisms of action within those tissues
- Outline the functional relationships between the hypothalamus, the anterior pituitary and the adrenal cortex
- List the tests used to investigate adrenal insufficiency
- Outline investigations used to investigate possible cortisol excess and how iatrogenic and endogenous cortisol excess can be distinguished biochemically
- Distinguish primary and secondary adrenocortical insufficiency
- Explain how corticosteroid hormones can be replaced and the importance of patient education in ensuring this is done safely
- Understand the metabolic and biochemical consequences of long-term exposure to excess corticosteroid

51. Clinical disorders of the adrenal glands

- Explain the pathophysiology and consequences of glucocorticoid over and underproduction
- Outline principles of glucocorticoid replacement therapy and the role of patient education in this process
- Understand the difference of primary and secondary adrenal insufficiency
- Outline the causes and consequences of mineralocorticoid excess
- Describe the anatomy of the adrenal medulla and its physiological role
- Outline the clinical features of catecholamine excess

Head, Neck and Neurology

52. Horner's syndrome

- Appreciate the anatomical/pathological significance of weakness of one hand and the distinction between a peripheral nerve lesion and a brachial plexus lesion.
- Recognise Horner's syndrome and understand its features and its anatomical basis.
- Work out the anatomical/pathological significance of upper limb swelling and discoloration in this patient.
- Understand how the above three sets of symptoms and signs might indicate a single disease process.
- Appreciate the location and nature of a Pancoast tumour and its possible effects on structures at the thoracic outlet.
- Give an overview of the likely diagnosis and management of a Pancoast tumour.

53. Neural tube development

- Describe the development of the neural tube from the neural plate
- Explain what is meant by 'neural crest' and list neural crest derivatives

- Describe further differentiation of the neural tube to the spinal cord and relate this to development of the spinal nerve.
- Explain the primary brain vesicles and list their derivatives
- Explain the defects 'spina bifida' and 'anencephaly'

54. Peripheral nervous system

- Structural Division: CNS and PNS
- Peripheral nerve structure
- Functional Division: SNS and ANS
- Spinal nerve structure
- Structure of ANS
- Cutaneous innervation

55. Signalling in the nervous system

- Explain the ionic basis for the resting membrane potential of excitable cells
- Summarize how the nerve action potential is generated
- Contrast action potential propagation in myelinated versus unmyelinated nerve fibres
- Explain the concept of chemical neurotransmission
- Describe how chemical neurotransmitters influence the polarity of the post synaptic membrane
- Compare and contrast temporal and spatial summation of synaptic inputs
- Explain how convergence of neural inputs can result in integrative abstraction
- Summarize methods of localising cerebral function

56. Spinal cord

- Gross features, development and segmental variation
- Meninges and blood supply
- Features in situ
- Sensory and motor pathways

57. Back pain and incapacity

- Describe the differential diagnosis between serious spinal diseases ('red flags'), disc prolapse and non-specific low back pain ('ordinary backache')
- Describe the normal anatomy of the spinal cord, segmental innervation, dermatomes and myotomes in relation to the clinical features and diagnosis of disc prolapse
- Describe the physiological basis of non-specific low back pain and the neurophysiology of pain.
- Describe the management of acute back pain
- Describe the role of the GP, physiotherapist, osteopath and chiropractor and of hospital specialists in the management of back pain
- Consider the factors that contribute to the development and maintenance of chronic pain and disability, and how that might be prevented.

58. Chronic pain

- Outline the mechanisms

- Outline the assessment
- Outline the management

59. Facial laceration

- Understand the anatomy of the face to a depth sufficient to allow the student to appreciate structures at risk in wounds at defined sites on the face.
- Have knowledge of the blood supply of the face and the arrangement of arterial anastomoses in this region.
- Appreciate the location of the salivary glands and their ducts.
- Be aware of the concept and possibility of fistula formation from severed ducts.
- Understand the anatomy of the facial nerve in the face and be able to carry out clinical tests for facial nerve function.
- Be aware of agencies and local projects working to reduce violence in Scotland.

60. Cranial nerves and brain stem

- Define the term "brain stem"
- Explain that all the motor cranial nerve nuclei lie in the brain stem
- Describe how to elicit vestibulo-ocular reflexes and explain their mechanism

61. Reflexes

- Describe a "spinal reflex" and describe the components of a reflex pathway
- Describe how to elicit a tendon jerk reflex
- Know the segmental root levels of common reflexes (jaw-jerk, biceps, supinator, knee jerk and ankle jerk)
- Describe how a subject can reinforce a reflex and the physiological basis of this
- Describe how to elicit the "plantar reflex" and describe the reflex response in a normal adult
- Describe a "Babinski-positive" response and explain its significance
- Describe the effects on reflexes of an injury to the spinal cord

62. Brain

- Early development from the Three Vesicle Brain
- Meninges or Connective Tissue Support
- Ventricular system and Cerebrospinal Fluid
- Cerebral Lobes and Outline of Functional Areas
- Overview of Clinically Important Motor and Sensory Pathways
- Blood supply of Brain
- Overview of Traumatic Brain Injury

63. Spinal cord injury and shock

- Describe the pathogenesis of spinal shock
- Relate clinical findings to the functional anatomy of the spinal cord - motor, sensory and autonomic pathways

- Predict the likely outcome of spinal cord injuries at different segmental levels, including effects on respiration and bladder control
- Describe the return of somatic and autonomic reflexes following spinal cord injury
- Discuss the importance of personality, family and other support and rehabilitation in assisting patients in coming to terms with and adapting to long term disability
- Explain what is meant by an upper and a lower motor neurone lesion

64. Schwannoma of the vestibulocochlear nerve

- Understand the terms tinnitus and vertigo and appreciate that they may be symptoms of inner ear dysfunction.
- Appreciate the medical conditions “Meniere’s disease” and “schwannoma of the vestibulocochlear nerve”, their nature, presentation and differential diagnosis.
- Describe the course, function and distribution of the facial and vestibulocochlear nerves.
- Understand the terms “benign” and “malignant” in relation to tumours and appreciate the sequelae of enlarging space occupying lesions.
- Appreciate what is meant anatomically by the “sub-occipital retrosigmoid approach”.
- Understand why surgery on the vestibulocochlear nerve might result in damage to the facial nerve
- Understand the clinical features of a facial palsy. To be able to explain the problems a patient with a facial palsy will have in speaking and eating. To appreciate why the patient required a tarsorrhaphy.

65. Peripheral nerves

- Describe the composition of peripheral nerves
- Have an awareness of the developmental aspects of myelination
- Understand how the effectiveness of local anaesthetics is related to fibre type
- Understand how nerves can be damaged by pressure and give examples of this occurring
- Briefly describe the process of axon regeneration

66. Head injury

- Revise the basic functional anatomy of the brain
- List the cranial nerves and briefly outline clinical tests for their function
- Identify the effects of primary and secondary brain injury in pathological and biochemical terms
- Discuss the clinical assessment and significance of consciousness level and lateralising neurological signs and understand the concepts of intracranial pressure and cerebral perfusion pressure
- Explain the effects of local ischaemia and hypoxia on the injured brain
- Describe the acute management of head injury
- Discuss recovery of function in the context of CNS plasticity and the limited capacity of the CNS for regeneration
- Discuss the outcome and long-term sequelae of head injury

67. Serous otitis media

- Understand the distribution of lymphoid tissue (tonsils and lymph nodes) in the head and neck and to describe the lymphatic drainage of the pharynx.
- Understand the aetiology and anatomico-pathology of serous otitis media or glue ear.
- Understand the difference between conductive and sensorineural deafness and how they might be distinguished in clinic.
- Understand the rationale of treating serous otitis media by insertion of grommets.
- Appreciate the difficulties that arise as a result of deafness in children and measures that are taken to detect it.

68. Parkinson's disease

- Identify the CNS pathways involved in the control of movement (distinguish the roles of basal ganglia, cerebellum and brainstem).
- Describe dopamine synthesis and function in the CNS with reference to distribution of receptors and dopaminergic neurons.
- Briefly outline the other monoaminergic systems in the CNS and their roles.
- Describe the clinical and pathological features of Parkinson's disease.
- Explain the rationale for using L-dopa as a treatment for Parkinson's disease and its mechanism of action, indicating the therapeutic strategies used to maximise its efficacy and minimise its side-effects.

69. Oral cancer and the tongue

- Discuss the aetiology and presentation of oral cancer and appreciate its pathology.
- Understand the importance of vigilance, particularly by dentists, for detecting oral cancer and other conditions at an early stage.
- Give an account of the lymphatic drainage of the tongue and to appreciate the way in which lymph node involvement affects management and prognosis.
- Name the intrinsic and extrinsic muscles of the tongue and their innervations.
- Give a general overview of the structure of the larynx and appreciate the position of the vocal folds.
- Appreciate the importance of a multidisciplinary team approach to management of the patient with oral malignancy.
- Outline the role of speech therapists in the management of patients following surgery on the mouth and tongue.

70. Macular degeneration

- Illustrate the anatomy of the eye including the macula
- Discuss the steps in vision that take place in the eye
- Identify the muscles controlling the full range of eye movements
- Explain how fluid or blood under the macula leads to loss of vision and how this is detected
- Discuss recent advances in understanding the aetiology and pathogenesis of age-related macular degeneration
- Describe the mechanism of action of drugs used to control the growth of new blood vessels in the eye, and consider the financial and logistical implications for health services.
- Discuss the psychological and social implications of blindness

Pharmacology

71. Pharmacokinetics

- To describe the different routes of drug administration.
- To understand the importance of bioavailability of drugs.
- To describe volume of distribution and its determinants.
- To describe basic principles of drug clearance / maintenance dosing.
- To describe drug half life / steady state and its determinants

Immunity and Infection

72. The Immune System

- Describe the white blood cells, responsible for both innate and adaptive immune responses
- Outline the innate immune response to an extracellular pathogen.
- Describe the primary and secondary lymphoid organs, and outline their functions.
- Summarise antibody structure and function.
- Explain how T lymphocytes develop.
- Discuss the adaptive response to a viral infection
- Summarise the role of T helper lymphocytes, in particular how they interact with B lymphocytes.

73. Abnormal Development

- Define the terms 'teratogenesis' and 'teratogen'
- Understand the effects of teratogens at the pre-embryonic, embryonic and fetal stages of life
- Describe the general mechanisms by which defects can be caused and give examples
- Give examples of environmental teratogens

74. Bacteria and viruses

- Describe the general structure of bacteria and describe how they cause infection in humans.
- Revise the general structure of viruses and describe how they infect and replicate in human cells.
- Describe the immune response to bacterial infections.
- Describe the immune response to viral infections.
- Describe the main causes and symptoms of gastroenteritis.
- Explain the importance of infection control measures in clinical practice.

75. Bacteria

- Classify microorganisms in very broad terms
- Describe the general structure of bacteria
- Describe sites of the body that are sterile and that are colonised with bacteria
- Understand the difference between colonisation and infection
- State common colonisers and pathogens of different body systems

- Understand host, pathogen and environmental factors that lead to infection
- Describe common ways in which bacterial infection is diagnosed in the laboratory setting
- Understand the meaning of sepsis and broad principles of management of infection
- Describe the chain of infection and understand the rationale behind basic infection prevention and control measures in the hospital and community settings

76. Melanoma

- Revise the normal structure of skin and describe the function of melanocytes.
- Outline the causes, incidence and clinical features of metastatic melanoma and describe the histology and grading of the disease.
- Describe the normal function of BRAF, its role as an oncogene in Melanoma and the use of Vemurafenib for some melanomas.
- Describe the surveillance by the immune system to detect and destroy abnormal (cancer) cells.
- Review current immunotherapeutic approaches to treat disease, including treatment for cancer such as Ipilimumab (anti-CTLA4).

77. Viruses and Cancer in Humans

- Understand that cancer has multifactorial causes, many of which target growth related genes.
- Describe the estimated proportion of human cancers that are associated with viruses and what the other known causes of cancer are in man.
- Describe which seven well-characterised viruses are associated with the development of cancer (carcinogenesis) in humans.
- In outline : describe what is known about the mechanisms by which each of these is associated with a particular malignancy.
- For which two of these viruses effective vaccines are now available: the first two anticancer vaccines.

78. Cancer and Metastasis: The Immune System in Control, Progression and Therapy

- Recognise the incidence, prevalence and source of different cancers
- Identify the role of the immune response in cancer development and control
- Outline the process of cancer escape to metastatic disease
- Summarise the range of immunotherapies that are being developed for control and therapy of cancer.

79. Tendons, Cartilage and Fracture Healing

- Describe the structure and function of tendon
- Understand the sequelae of tendon healing
- Appreciate the differences between acute and chronic tendon injuries
- Appreciate management options available for treating acute and chronic tendon injuries
- Describe the different types of cartilage in the human body
- Define the components of articular cartilage, including collagen, extracellular matrix and cells

- Discuss the biomechanics of articular cartilage
- Understand the sequelae of cartilage repair
- Appreciate medical and surgical treatments for injury to articular cartilage
- Explain the cellular, histological and chemical structure of bone
- Explain the importance of blood supply to the healing of bone
- Explain the process of fracture healing via callus formation / secondary intention
- List the factors that can have an adverse effect upon bone healing

80. Immunodeficiency and antibodies

- Briefly revise the structure & function of each of the antibody isotypes.
- Describe the normal production (primary and secondary responses) of antibody isotypes during infection, including the essential roles of T cells.
- Describe immunodeficiency and, giving examples, distinguish between primary and secondary immunodeficiency states.
- What is the immunological basis for Jason's recurrent infections where IgM levels are high, and discuss treatment options for an individual with immunodeficiency
- Describe the commonest types of infections in immune-compromised individuals.
- Explain primary and secondary immunodeficiency and give examples of both
- Understand some of the causes and consequences of above

81. Vaccines and Immunological memory

- Describe the important features of memory T and B cells
- Describe when and, where memory T and B cells are generated
- Explain how, when and where memory T and B cells are maintained
- Explain how vaccines induce memory
- Describe the obstacles to continued vaccine development
- Describe potential solutions including the use or development of
 - Recombinant Vaccines (e.g. MVA),
 - New Adjuvants
 - DNA vaccines

82. Autoimmunity

- Understand the underlying principal of autoimmunity – loss of selftolerance
- Explain the overlap in effector mechanisms but appreciate that each is also unique
- Appreciate that there is often significant intra-patient heterogeneity
- Discuss the interactions between gene – environment in autoimmunity and how these pave the way towards prevention (public health measures)

83. Polio virus

- Describe the causes and distribution of Poliomyelitis
- Define vaccines, distinguish between the various types of vaccines and different methods of delivery, and discuss the advantages and disadvantages of each

- Describe the vaccination strategies employed to immunise against Polio, and the protective host response that results
- Explain why some diseases can be eradicated by vaccines and others cannot
- Discuss the difficulties associated with carrying out successful vaccination programmes.

84. Immunotherapeutics

- Describe current anti-inflammatory/immune therapies
- Describe the use of biological therapies

85. Asthma Immunology

- Describe the features of asthma and its impact
- Describe the diagnosis of asthma
- Describe the natural history of asthma
- Recognise factors that may contribute to asthma phenotypes
- Explain the Immunological mechanisms involved in asthma
- Describe measures to improve understanding of asthma and new therapies

86. Osteoporosis

- Review bone re-modelling
- Define osteoporosis
- Explain fracture risk assessment
- Describe non-pharmacological and pharmacological management of
- Osteoporosis/fracture prevention