JINNAH SINDH MEDICAL UNIVERSITY

STUDY GUIDE	
PROGRAM	**MBBS**
MODULE TITLE	**ENDOCRINOLOGY-I**
ACADEMIC YEAR	**2nd Year MBBS -2024**
INTRODUCTION	The Endocrine system is the collection of glands that produce hormones that regulate metabolism, growth and development, tissue function, sexual function, reproduction, sleep, and mood, among other things. Endocrinology is the study of specific secretions known as hormones and their related effects on the body. This module will build the concepts that will be taught in the latter module of Endocrine system -2. This module deals with endocrine glands' normal and abnormal structures and functions. At the same time, it provides an overview of diseased states and medications for those conditions. This module also helps students understand the basics of research.
RATIONALE	Endocrine disorders like Diabetes Mellitus and Thyroid related diseases are very common in all parts of Pakistan. This module is designed to help the learners develop an understanding of the pathophysiologic basis for these conditions. It also aims to provide basic information about medications that can be used to treat these conditions.
OUTCOMES	**By the end of the module, students should be able to:** • Describe the normal and abnormal developmental, macro, and micro-structures & functions of endocrine glands • Diagnose common endocrine disorders based on clinical presentations
DEPARTMENTS INVOLVED	1. Anatomy 2. Biochemistry

	3. Physiology
MODULE OBJECTIVES	**By the end of the module, students should be able to:**
LECTURES **Anatomy**	**1. Anatomical Overview of All Endocrine Glands in the Body** • Classify the glands • Define endocrine glands • Describe the location of all endocrine glands in the body • Briefly discuss the functions of all endocrine organs in the body **2. Gross and Development of Pituitary Gland** • Describe the location, relations, and external features of pituitary gland • Describe the division/components of pituitary gland • Describe the neurovascular supply of the pituitary gland • Describe the hypophyseal portal system • Explain the development of the pituitary gland • Describe the related clinical condition & congenital anomalies of the pituitary gland **3. Microscopic Anatomy of Pituitary Gland** • Enumerate different parts of adenohypophysis and neurohypophysis • Describe the histological features of adenohypophysis and neurohypophysis **4. Review of Gross and Microscopic Anatomy of Thyroid and Parathyroid Gland** • Describe the location, relations & neurovascular supply of thyroid gland. • Describe the cellular architecture found in the thyroid gland

	• Correlate microscopic structures with clinical conditions of the thyroid gland • Describe the gross and microscopic anatomy of the parathyroid gland. **5. Developmental and Microscopic Anatomy of Pancreas** • Describe the histological structure and components of exocrine and endocrine pancreas **6. Gross and Microscopic Anatomy of Adrenal Gland** • Describe the gross anatomical features of the adrenal gland along with its neurovascular supply • Describe the cells found in cortex and medulla • Correlate the gross and microscopic structure of the adrenal gland with common clinical conditions **7. Development and Anomalies of Adrenal Gland** • Explain the embryological origin and development of the cortex and medulla of adrenal gland • Describe the developmental anomalies of the adrenal gland
BIOCHEMISTRY	**1: Introduction to Hormones** • Classify hormone with examples, according to the mechanism of action • Classify hormone receptors with examples • Describe the role of second messenger system • List the hormones of the body with their functions **2: Hypothalamic Hormones** • List the hypothalamic hormones • List the stimulatory and inhibitory hypothalamic hormones • Explain the chemical structure of hypothalamic hormones • Describe the biochemical functions of Hypothalamic Hormone

	• Discuss the hypothalamic control of pituitary hormones. • Describe the feedback mechanism of hypothalamic hormones. • Describe the mechanism of circadian rhythm. **3 Growth Hormone** • List the anterior pituitary hormones • Explain the chemical nature of growth hormone • Explain the mechanism of action of growth hormone • Discuss the synthesis and metabolic effects of growth hormone • Discuss clinical complications and diseases of growth hormone **4 Anterior Pituitary Hormones (ACTH, LH, FSH, TSH and PRL)** • Explain the chemical structure of anterior pituitary hormones • Describe the mechanism of action of Anterior Pituitary Hormones • Describe the biochemical functions of anterior pituitary hormone • Discuss the hypothalamic control of pituitary hormones • Discuss the regulation of anterior pituitary hormone • Describe the clinical diseases and complication associated with anterior pituitary hormones. **5 Posterior Pituitary Hormones** • List the posterior pituitary hormones • Explain the synthesis of Posterior Pituitary Hormones • Explain the chemical structure of posterior pituitary hormones • Describe the mechanism of action of Posterior Pituitary Hormones • Describe the biochemical functions of posterior pituitary hormone

	• Discuss the hypothalamic pituitary axis of posterior pituitary hormones • Discuss the regulation of posterior pituitary hormone • Describe the clinical diseases and complication associated with posterior pituitary hormones **6 Thyroid Hormones** • List the Thyroid hormones • Discuss the cells types and production of thyroid hormones • Explain the synthesis and chemical structure of Thyroid hormones • Describe the mechanism of action and metabolic functions of Thyroid hormones • Discuss the hypothalamic pituitary axis of Thyroid hormone • Discuss the regulation of Thyroid hormones and feedback mechanism • Describe the clinical diseases and complication associated with Thyroid hormones **7 Serum Calcium Regulation & Parathormone** • List the hormones regulating serum calcium (Para hormone, Calcitriol and calcitonin) • Explain the synthesis of Para hormone • Explain the chemical structure of Parathormone • Describe the mechanism of action of Parathormone • Describe the metabolic functions of Parathormone (on GIT, Skeleton & Kidneys) • Discuss the regulation of Parathormone • Describe the role of 1,25-dihydroxy vitamin D in calcium homeostasis • Describe the role of Calcitonin in calcium regulation

	• Describe the clinical diseases and complication associated with Parathormone **8 Pancreatic Hormones** • List the pancreatic hormones (Insulin, glucagon and somatostatin) • Explain the synthesis & chemical structure of pancreatic hormones • Describe the mechanism of action & metabolic functions of pancreatic hormones • Discuss the regulation of pancreatic hormones • Describe the clinical diseases and complication associated with pancreatic hormones **9 Blood Glucose Regulation** • Explain the regulation of blood glucose • Discuss the tissues which regulate fuel metabolism in blood glucose level • Describe the mechanism of metabolic regulation of blood glucose • Discuss the biochemical complications of hypoglycemia and hyperglycemia 10 **Diabetes Mellitus and its complications**: • Classify diabetes mellitus • Differentiate between Type I diabetes mellitus and Type II diabetes mellitus • Describe the biochemical causes of development of diabetes mellitus • Discuss the factors responsible for metabolic changes in DM • Discuss the clinical significance of diabetes mellitus and its complications

	• Discuss the diagnostic investigations for diabetes mellitus **11 Glucocorticoids** • List the adrenal cortex hormones • Explain the synthesis & chemical structure of glucocorticoids • Describe the mechanism of action & of metabolic functions glucocorticoids • Discuss the regulation of glucocorticoids • Describe the clinical diseases and complication associated with glucocorticoids 12 **Mineralocorticoids** • Explain the synthesis & chemical structure of mineralocorticoids • Describe the mechanism of action & metabolic functions of mineralocorticoids • Discuss the regulation of mineralocorticoids • Describe the clinical diseases and complication associated with mineralocorticoids **13 Adrenal Medullary Hormones** • List the adrenal medullary hormones • Explain the synthesis & chemical structure of adrenal medullary hormones • Describe the mechanism of action & metabolic functions of adrenal medullary hormones • Discuss the regulation of adrenal medullary hormones • Describe the clinical diseases and complication associated with adrenal medullary hormones
PHYSIOLOGY	**1. Introduction to Endocrinology: Control and Feedback.** • Define hormone, target cell, and receptor • Contrast the term endocrine, paracrine, and autocrine • Classify hormones

	• Describe the concept of a second messenger • Explain the principles of negative and positive feedback of hormonal secretion **2. Hypothalamus and anterior pituitary hormones.** • Name hypothalamic factors that control secretion of anterior pituitary hormones • Name various cells of ant pituitary responsible for synthesis of hormones • Describe the functions and regulation of GH, FSH, LH, ACTH, TSH and prolactin • Explain the hypothalamic hypophyseal portal system. **3. Functions of Growth Hormone and associated disorders** • Describe the functions and regulation of grown hormone. • Describe the disorders associated with hypo and hyper secretion of GH. **4. Hormones of posterior pituitary and related disorders.** • Describe the secretion of oxytocin and ADH • Explain the mechanism of action and regulation of oxytocin and ADH **5. Functions of thyroid hormones** • Explain the formation and secretion of T3 and T4 • Discuss the importance of iodine metabolism and iodine pump • Describe actions of thyroid hormone on development and metabolism and associated disorders • Describe the role of TSH on regulation of thyroid hormones **6. Functions of Parathyroid and Calcitonin hormone (calcium Homeostasis)** • Describe the synthesis of parathyroid and calcitonin hormone

	• Explain the effects of parathyroid hormone on calcium balance • Describe the factors that regulate the activities of osteoclasts and osteoblasts • Describe the relationship between PTH and active form of vit D • Explain the regulation of calcitonin secretion. • List the disorders associated with calcium homeostasis (tetany, Chovstek's sign) **7. Hormonal secretion of pancreas (Insulin)** • Explain the synthesis of insulin • Describe insulin receptor • Explain the role of insulin in maintaining blood glucose concentration • Differentiate between neurogenic and nephrogenic diabetes insipidus **8. Hormonal secretion of pancreas (Glucagon, somatostatin)** • Describe principal actions of glucagon and its regulation. • Explain the functions of somatostatin on blood glucose **9. Adrenal cortex (Functions of Glucocorticoids)** • Explain the synthesis of glucocorticoid hormones • Identify the actions of glucocorticoids on metabolism and target cells • Discuss the mechanism for regulation of glucocorticoid secretion. • Describe the disorders associated with glucocorticoid hormones. (Addison's disease, Cushing syndrome) **10. Adrenal cortex (Functions of mineralocorticoids)**

	• Define Aldosterone escape, Primary Aldosterone's and Androgenetic Syndrome • Explain the mechanism of action of mineralocorticoids. • Discuss the mechanism of actions of aldosterone and its regulation. **11. Adrenal Medulla (secretion, function and disorders)** • Explain the mechanism of secretion and actions of medullary hormones. • List the types of adrenergic receptors and their functions on target organs. • Enumerate consequences of over and under secretion of medullary hormones (pheochromocytoma)
PRACTICALS **ANATOMY**	After observing the given slides, students should be able to describe the following microscopic structures: 1. Pituitary gland 2. Thyroid and parathyroid 3. Pancreas 4. Adrenal gland
BIOCHEMISTRY	**1. Thyroid Function Tests** • Identify the chemical tests and bio-techniques to estimate the functions of the thyroid glands • Interpret clinical conditions correlated with their laboratory investigations. **2. Diabetes Mellitus Tests** • Enumerate the chemical tests to detect diabetes mellitus • Describe the diabetes diagnostic criteria • Outline the method for estimation of blood glucose by glucometer • Describe the principle of glucometer

	• Perform blood glucose estimation by glucometer • Interpret clinical conditions correlated with their laboratory investigations **3. Oral Glucose Tolerance Test** • Explain the significance of OGTT and glucose challenge tests • Explain the method of performance of OGTT and GCT • Perform OGTT and GCT • Interpret the results of Oral Glucose Tolerance Test & GCT • Estimate urine glucose with urine glucose reagent strip • Interpret clinical conditions correlated with their laboratory investigations
TUTORIAL **BIOCHEMISTRY**	**1. Pituitary Hormones (e.g. Gigantism, Acromegaly, Dwarfism etc.)** • Discuss the clinical importance of Pituitary hormones • Interpret clinical conditions correlated with their laboratory investigations **2. Thyroid & Adrenal Hormones (Goiter, Hypothyroidism & Hyperthyroidism, Addison's diseases)** • Discuss the clinical importance of thyroid & adrenal hormones • Interpret clinical conditions correlated with their laboratory investigations **3. Pancreatic hormones Pancreatic hormones (Diabetes Mellitus)** • Discuss the clinical importance of pancreatic hormones • Interpret clinical conditions correlated with their laboratory investigations **4. Diabetes Mellitus Tests** • Enumerate the biochemical tests to detect Diabetes Mellitus • Describe the Diabetes diagnostic criteria correlated with their laboratory investigations

PHYSIOLOGY	**1. Role of insulin in Diabetes Mellitus** • Discuss the role of various types of Insulin in the management of Diabetes Mellitus **2. Consequences of Hypo and Hyperthyroidism** • Explain the causes, sign and symptoms associated with hypo and hyperthyroidism: (Toxic goiter, Thyrotoxicosis, Graves' disease, Thyroid adenoma, Endemic colloid goiter, Idiopathic Nontoxic Colloid goiter)
INTERNAL ASSESSMENT	• Continuous monitoring of attendance and practical assessment in short groups. • It may be in the form of MCQs, assignments, stages/sub-stages, projects, quiz or OSPE. • Internal assessment carries 20% weightage in the final examination.
ANNUAL EXAMINATION	• Theory (MCQs) and Practical OSPE (observed + un observed).
MODULE EVALATION	• The module will be evaluated according to HEC & JSMU policies.