EXERCISE 1

Pathophysiology of the endocrine system p.I.

1. **Physiology of the endocrine system.**
2. **Abnormalities of simple endocrinal regulatory circuit; abnormalities of hypothalamus-regulated hormones.**
3. **Antidiuretic hormone (Vasopressin, ADH) excess and deficiency – causes and consequences.**
4. **Prolactin excess.**
5. **Somatotropin (growth hormone [GH]) – causes and consequences of deficiency and excess.**
6. **Pathophysiology of the thyroid gland.**
   6.1. Causes of hypothyroidism, hyperthyroidism and goitre.
   6.2. Effects and symptoms of hyperthyroidism.
   6.3. Effects and symptoms of hypothyroidism.
7. **Abnormalities of calcium – phosphate balance.**

EXERCISE 2.

Pathophysiology of the endocrine system p.II.

1. **Causes of diabetes mellitus.**
2. **Acute effects of insulin deficiency.**
3. **Late complications of prolonged hyperglycemia.**
4. **Hyperinsulinism, hypoglycemia.**
5. **Adrenocorticoid Hormones – causes of abnormal release.**
   5.1. Causes of Cortisol and Aldosterone excess.
   5.2. Causes of Cortisol and Aldosterone deficiency.
   5.3. Effects and symptoms of Adrenocortical Hormone excess.
   5.4. Deficiency of Adrenocorticoid Hormones – Addison's disease.
6. **Causes and effects of Androgen excess and deficiency.**
7. **Effects of Female Sex Hormones excess and deficiency.**

8. **THE ENDOCRINE SYSTEM (part I & II)– QUIZ (20 questions).**

EXERCISE 3.

Pathophysiology of immunity.

1. **General features of the immune system.**

   1.1. Innate and adaptive immunity.
   2.2. Cells and tissues of the immune system
   (T lymphocytes, B lymphocytes, macrophages, dendritic cells, natural killer cells).
   2.3. Cytokines: messenger molecules of the immune system.
   2.4. Structure and function of histocompatibility molecules.

2. **Disorders of the immune system.**

2.1. Mechanism of hypersensitivity reactions
[type I hypersensitivity– immediate;
type II hypersensitivity – antibody–mediated;
type III hypersensitivity – immune complex mediated;
cell – mediated (type IV) hypersensitivity].

3. **Autoimmune diseases (immunologic tolerance, mechanisms of autoimmune diseases).**

4. **Immunologic deficiency syndromes (primary immunodefficiences; aquired immunodeficiency syndrome – AIDS)**

5. **Etiology, pathogenesis of HIV infection and AIDS.**

6. **Quiz – 10 questions.**

I Quiz
(exercises I – III plus lectures)

EXERCISE 4.
Patophysiology of blood vessels.

1. **General architecture and cellular composition of blood vessels.**
2. **Vascular wall cells and their response to injury (endothelial cells, vascular smooth muscle cells; vessel development, growth, and remodeling; intimal thickening a response to vascular intimal injury)**
3. **Arteriosclerosis:**
   - **natural history and main consequences of atherosclerosis**
   - **epidemiology and risk factors (age, sex, genetics, hyperlipidemia, hypertension, cigarette smoking, diabetes mellitus, other factors)**
   - **the role of endothelial injury, the role of inflammation, the role of lipids, the role of smooth muscle cells in the pathogenesis of atherosclerosis**
   - **other factors in atherogenesis.**
4. **Hypertension**
   - **types**
   - **pathogenesis (regulation of normal blood pressure; mechanism of essential hypertension; vascular pathology in hypertension).**
   - **the consequences of hypertension.**

EXERCISE 5.
Pathophysiology of the cardiovascular system p.I.

1. **Physiology of the conduction system of the heart, cardiac excitation, spread of excitation in the heart cardiac muscle.**

2. **Abnormalities of cardiac rhytm (tachycardia of ectopic origin, extrasystoles, conduction disorders in the AV node, changes in cell potential, reentry mechanisms).**
3. **Physiology of coronary blood flow (phasic flow, adaptation to O_2 demand, coronary reserve, myocardial energy metabolism).**
4. **Ischemic Heart Disease (epidemiology, pathogenesis: role of acute plaque change; role of inflammation; role of vasoconstriction).**

4.1 The clinical manifestations of Ischemic Heart Disease [Angina pectoris, Myocardial Infarction (MI); Chronic Ischemic Heart Disease with heart failure, Sudden cardiac Death].

4.1.1. Angina pectoris.

4.1.2. Myocardial Infarction (MI): transmural versus subendocardial, incidence and risk factors, pathogenesis – coronary arterial occlusion, myocardial response. Infarct modification by reperfusion. Clinical Features. Consequences and complications of myocardial infarction.

4.1.3. Chronic Ischemic Heart Disease

4.1.4. Sudden Cardiac Death.

EXERCISE 6

Pathophysiology of the cardiovascular system p.II

1. **Physiology of the cardiac muscle (myocardium, valves, cardiac cycle, cardiac output and its control, effects of aging on the heart).**
2. **Principal mechanisms of the cardiovascular dysfunction.**
3. **Heart failure (cardiac hypertrophy – pathophysiology and progression to failure; left-sided heart failure; right-sided heart failure).**
4. **Heart disease:**

4.1. Congenital heart disease (etiology and pathogenesis; left-to right shunts; right-to left shunts; obstructive congenital anomalies).

4.2. Ischemic Heart Disease.

4.3. Hypertensive Heart Disease.

4.3.1. Systemic (left-sided) hypertensive heart disease.

4.3.2. Pulmonary (right-sided) hypertensive heart disease (cor pulmonale).

4.4. Valvular Heart Disease.

4.4.1. Valvular degeneration caused by calcification.

4.4.2. Myxomatous degeneration of the mitral valve.

4.4.3. Rheumatic fever and rheumatic heart disease (pathogenesis,clinical features).

4.4.4. Infective endocarditis (etiology and pathogenesis, clinical features).

4.4.5. Noninfected vegetations.

4.4.6. Complications of artificial valves.

4.5. Cardiomyopaties.

4.5.1. Dilated cardiomyopathy (pathogenesis, clinical features).

4.5.2. Hypertrophic cardiomyopathy (pathogenesis and clinical features).

4.5.3. Restrictive cardiomyopathy.

4.6. Other specific causes of myocardial disease.

5. Mechanical consequences of left ventricular failure.

6. Neurohormonal consequences of heart failure. Myocardial remodeling.

7. Shock: causes, symptoms and consequences.

7.1 Compensatory mechanisms when there is a risk of hypovolemic shock.

II Quiz
(exercises 4-6 plus lectures)

EXERCISE 7.
Pathophysiology of respiration.

1. **Overview (abnormal ventilation, abnormal diffusion, abnormal perfusion).**
2. **Congenital anomalies.**
3. **Atelectasis.**
4. **Acute lung injury:**
   - **4.1. Pulmonary edema**
   - **4.2. Pathogenesis of Acute Respiratory Distress Syndrom.**
5. **Obstructive Pulmonary Diseases:**
   - **5.1. Emphysema – types, pathogenesis, clinical course.**
   - **5.2. Chronic Bronchitis – pathogenesis, clinical features.**
   - **5.3. Asthma – pathogenesis, clinical course.**
   - **5.4. Bronchiectases – etiology and pathogenesis.**
6. **Restrictive Pulmonary Diseases:**
   - **6.1. Fibrosing Diseases: Pathogenesis of Idiopathic Pulmonary Fibrosis, Pneumoconioses.**
   - **6.2. Granulomatous Diseases: etiology and pathogenesis of Sarcoidosis.**
7. **Pulmonary embolism, hemorrhage and infarction.**
8. **Pulmonary hypertension – pathogenesis, clinical course.**
9. **Pathophysiology of breathing regulation.**
   - **9.1. Modulators of respiratory neurons (excitatory; inhibitory).**
   - **9.2. Pathological breathing: Kussmaul breathing, Cheyne-Stokes breathing, Biot breathing, gasping.**
10. **Hypoxia and Hyperoxia – causes and consequences.**
11. **Quiz.**

EXERCISE 8.
Pathophysiology of the kidney.

1. **Physiology of the kidney (blood vessels, glomeruli, tubules,interstitium).**
2. **Clinical manifestations of renal diseases.**
3. **Abnormalities of glomerular function – reduced hydraulic conductivity, constriction of the vas afferents, constriction of the vas efferents, pathogenesis of the glomerular injury.**
4. **Mechanisms of progression in glomerular diseases.**
5. **Etiology and pathogenesis of acute glomerulonephritis.**
6. **Patophysiology of nephrotic syndrome.**
7. **Chronic glomerulonephritis - etiology and pathogenesis.**
8. **Diseases affecting tubules and interstitium: Acute Tubular Necrosis (ATN); Tubolointerstitial Nephritis.**

9. **Acute renal failure.**
10. **Chronic renal failure (causes, abnormal functions, abnormal regulation).**
11. **Diseases of blood vessels – malignant hypertension and accelerated nephrosclerosis, renal artery stenosis.**
12. **Pathogenesis of urolithiasis.**
13. **Quiz – 10 questions.**

EXERCISE 9.

Pathophysiology of the gastrointestinal tract (p I).

1. **Pathology of the esophagus.**
   - **1.1. Congenital anomalies – atresia and fistulas, webs, rings and stenosis.**
   - **1.2. Lesions associated with motor dysfunction – achalasia, hiatal hernia, diverticula, lacerations.**
   - **1.3. Esophagitis – reflux esophagitis, Barrett esophagus, infectious and chemical esophagitis.**

2. **Gastric mucosal physiology.**
   - **2.1. Acid secretion**
   - **2.2. Mucosal protection.**

3. **Pathology of the stomach**
   - **3.1. Gastritis – pathogenesis of acute and chronic gastritis**
     - **3.1.1. The role of Helicobacter pylori infection in the pathogenesis of chronic gastritis.**
   - **3.2. Pathogenesis of the peptic ulcer disease.**
   - **3.3. Etiopathogenesis of gastric carcinoma.**

4. **Pathophysiology of small and large intestine.**
   - **4.1. Physiology of the small intestinal and colonic mucosa, endocrine cells, intestine immune system, neuromuscular function.**
   - **4.2. Malabsorption syndromes (celiac disease, tropical sprue, Whipple disease, lactase deficiency, abetalipoproteinemia) – pathogenesis and systems consequences.**
   - **4.3. Idiopathic inflammatory Bowel Disease (Leśniowski-Crohn Disease, Ulcerative Colitis) – etiology and pathogenesis.**

III Quiz

(exercises 7-9 plus lectures)

EXERCISE 10.

Pathophysiology of the gastrointestinal tract (p II).

1. **Pathophysiology of the liver and gallbladder.**

a. **General features of hepatic disease (patterns of hepatic injury, hepatic injury and clinical consequences of liver disease).**
b. **Portal hypertension – causes, clinical consequences.**
c. **Bilirubin and bile formation; pathophysiology of jaundice; cholestasis.**
d. **Risk factors and pathogenesis of cholelithiasis.**

2. **Pathophysiology of pancreas.**
   a. **Pathogenesis of acute pancreatitis.**
   b. **Pathogenesis of chronic pancreatitis.**

EXERCISE 11.

Patophysiology of : acid-base balance
salt and water balance.

1. **Regulation of acid-base and salt-water balance.**
2. **Development of alkalosis**
3. **Development of acidosis**
4. **The effects of acidosis and alkalosis**
5. **Causes of hyperhydratation and dehydratation.**
6. **Most importanat effects of hyperhydratation and dehydratation**
7. **Abnormalities of potassium balance.**
8. **The effects of changed plasma K^+ concentration.**
9. **Abnormalities of magnesium balance**
10. **The effects of Mg^{2+} deficiency; the effects of Mg^{2+}excess.**
11. **Abnormalities of Calcium balance**
12. **The effects of hypocalcemia and hypercalcemia.**
13. **Abnormalities of phosphate balance.**
14. **Consequences of phosphate deficiency and phosphate excess.**
15. **Edema formation.**

IV Quiz

(exercises 10-11 plus lectures)

Possibility to complete credit.

Books:

1. Robbins and Cotran: Pathologic Basis of Disease, 8th edition
2. S.Silbernagl, F. Lang: Colour Atlas of Pathophysiology