HISTOLOGY AND EMBRYOLOGY

Histology and Embryology

（Code：BMS0562）

Guideline

I. Course Introduction

112 classes comprise 68 for lecturing, 44 for lab practice.

5.5 credits; 3th semester

II. Lecturing section

Division of Histology and Embryology, Department of Anatomy, School of Basic medicine

III. Attribution

Histology and Embryology is a very important basic medical course. It is usually an introductory course for medical students. This course focuses on the microstructure of human cells, tissues and organs, and the process of embryo develops. It is to let the medical students to master the basic medical knowledge. It is very important fundal subject for medical students to further study Physiology, Biochemistry, Pathology and clinical subjects.

IV. Requirements

This course is arranged after the international students (MBBS) finished learning the Chinese language and other related science, biology, etc, in Huazhong University of science and technology main campus. MBBS students are required to study the theory course at first and then to have the lab to observe the corresponding sections.

V. Compulsory subject

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Chapter 1 Introduction of Histology	2			
Chapter 2 Epithelial Tissue	2			3
Chapter 3 Connective tissue Proper	3			3
Chapter 4 Cartilage and Bone	3			3
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Chapter 7 Nervous Tissue	2			3
Chapter 8 Nervous System	2			
Chapter 9 Circulatory System	2			3
Chapter 10 Immune System	4			3
Chapter 11 Skin	1			1
Chapter 12 Eye and Ear	3			2
Chapter 13 Digestive Tract	4			3
Chapter 14 Digestive Glands	2			3
Chapter 15 Respiratory System	2			1
Chapter 16 Urinary System	2			2
Chapter 17 Endocrine System	4			3
Chapter 18 Male Reproductive System	2			3
Chapter 19 Female Reproductive System	4			3
Chapter 20 General instructions of Human Embryology	4			2

Chapter 21 Development of Cardiovascular System	4			
Chapter 22 Development of Digestive System and Respiratory System	2			
Chapter 23 Development of Face, Neck and Limbs	2			
Chapter 24 Development of Urogenital System	2			
Chapter 25 Development of Nervous System, Eye and Ear	2			
Chapter 26 Overview of Teratology	2			
Total	68			44

VI. References

1. Textbook

Anthony Mescher. Junqueira's Basic Histology (Text and Atlas, Fourteenth Edition). McGraw-Hill Education / Medical; 2015

Gray C. Schoenwolf, Steven B. Bleyl, Philip R. Brauer, Philippa H. Francis-West. Larsen's Human Embryology (Fifth Edition). Elsevier; 2014

2. Journal

(1) Histochemistry and Cell Biology. (https://www.springer.com/biomed/journal/418)
(2) Cell. (https://www.cell.com/)
(3) Neuron. (https://www.cell.com/neuron/home)
(4) Glia. (https://onlinelibrary.wiley.com/journal/10981136)
(5) Development. (http://dev.biologists.org/)

3. Website

http://www.sciencedirect.com/science/journals
http://pubs.rsc.org/
http://onlinelibrary.wiley.com/
http://link.springer.com/

VII. Course organization

10% attendence; 50% lab exam; 40% final theory exam

Chapter I Introduction of Histology

I. Objective and requirements

1. To know research contents of Histology and Embryology.
2. To master concept and basic type of tissue.
3. To know common research methods of Histology and Embryology.
4. To be familiar with constitution of a cell, a tissue and an organ.

II. Key points

1. The contents of Histology and Embryology.
2. The methods used in the research of Histology and Embryology.

III. Lecturing contents and important points

1. Research contents of Histology and Embryology; concept and basic type of tissue.
2. Common research methods of Histology and Embryology.

(1) The general technologies of light microscope: the most common procedure used in the study of tissues is the preparation of histologic sections. The meanings of acidophilia, basophilia, neutrophilia, argyrophilia, argentaffin and metachromasia.

(2) Methods of the fluorescence and phase contrast microscopy.

(3) Transmission and scanning electron microscopy: the preparation of the ultrathin; the meaning of electro-dense and electro-lucent; the preparation of scanning electron microscopy.

(4) Using methods and fundamental principles of common histo- and cytochemistry.

(5) Using methods and fundamental principles of immunohistochemistry.

(6) Using methods and fundamental principles in situ hybridization.

(7) Using methods and fundamental principles of autoradiography.

(8) Using methods of cell culture and tissue engineering.

(9) Architecture of a cell, a tissue and an organ in different planes.

(10) The most important units of measurement used in light and electron microscopy.

IV. Definitions

1. Acidophilia 2. Basophilia 3. Neutrophilia 4. Argyrophilia
5. Argentaffin 6. Metachromasia 7. Histochemistry 8. Immunohistochemistry

V. Study questions

1. What are main contents in the study of Histology and Embryology?
2. What methods are usually used in the research of Histology and Embryology?

Chapter 2 Epithelial Tissue

I. Objective and requirements

1. To master general features and classification of epithelial tissue.
2. To master structural feature, distribution and function of covering epithelium.
3. To master the microstructure and ultrastructure of microvilli, cilia and basement membrane as well as their function.
4. To be familiar with the basic structure and classification of exocrine glands, as well as their secretory model.
5. To be familiar with microstructural and ultrastructural feature of protein-secreting cells glycoprotein-secreting cells, steroid secreting cells and peptide-secreting cells.
6. To be familiar with ultrastructural feature and function of various kinds of cell junctions.
7. To know the concepts of gland cell, gland epithelium and gland.

II. Key points

1. The features and types of epithelial tissues.
2. The functions of different type of epithelial tissues. Cell junction between epithelial cells.

III. Lecturing contents and important points

1. General feature and classification of epithelial tissue: the concept of covering epithelium, gland epithelium, sensory epithelium and muscular epithelium.
2. Covering epithelium: general feature of covering epithelium and the evidence for classification of epithelial tissue. Structural feature and main function of simple squamous epithelium, simple cuboidal epithelium, simple columnar epithelium, pseudostratified ciliated columnar epithelium, transitional epithelium, stratified squamous epithelium and stratified columnar epithelium.
3. Specific feature of epithelium: microstructure, ultrastructure and function of microvilli, cilia, tight junction, adhesion belt, desmosome and gap junction. Composition of junctional complex. Microstructure, ultrastructure and function of basal membrane, plasma membrane infolding and semidesmosome.
4. Glandular epithelium and gland: the concepts of gland cell, gland epithelium and gland. The development of gland. General feature of endocrine and exocrine gland. Secretory model of exocrine gland. Microstructural and ultrastructural feature of protein-secreting cell, glycoprotein-secreting cells, steroid secreting cells and peptide-secreting cells. Basic structure and classification of exocrine glands: serous gland, mucous gland and mixed gland.

IV. Practice contents

1 Multimedia courseware: epithelial tissue.

2 Light microscopic specimens: simple squamous epithelium; simple columnar epithelium; pseudostratified ciliated columnar epithelium; transitional epithelium; stratified squamous epithelium.

3 Electron microscopic specimens: photographs: microvilli; cilia; tight junction; intermediate junction; desmosome and gap junction; plasma membrane infolding and semidesmosome. Basal membrane.

V. Definitions

1. Covering epithelium 2. Microvilli 3. Cilia 4. Tight junction
5. Adhesion belt 6. Desmosome 7. Gap junction 8. Semidesmosome

VI. Study questions

1. What are the general features of covering epithelium?
2. What are the types of epithelial tissues and their features?
3. The features of different cell junctions, cilia and microvilli?

Chapter 3 Collective tissue proper

I. Objective and requirements

1. To master the structural features and classification of connective tissue.
2. To master the structure and function of the cells in loose connective tissue.
3. To be familiar with the structure and function of reticular tissue.
4. To know the structure and function of dense connective tissue and adipose tissue.
5. To know the relationship between the tissue fluid and ground substance.

II. Key points

1. The features and types of collective tissue proper and their distribution and function.
2. The features and their function of the main cells and main fibers in the connective tissue proper.

III. Lecturing contents and important points

1 The origination, feature and classification of connective tissue.

2 Loose connective tissue: the feature and composition of loose connective tissue. Intercellular substance: the ultrastructure, physical and chemical feature, microstructure, and staining feature of collagen fiber, elastic fiber, and reticular fiber.

3 The composition, feature and function of ground substance. The microstructure, ultrastructure and function of fibroblast, fibrocyte, macrophage, plasma cell and mast cell. The microstructure, ultrastructure and function of adipose cell.

4 The microstructural feature, distribution and function of dense connective tissue.

5 Classification, structural feature and function of adipose tissue.

IV. Practice contents

1 Multimedia courseware: connective tissue proper.

2 Light microscopic specimens: loose connective tissue, macrophage, plasma cell, mast cell, dense connective tissue, adipose tissue (yellow), reticular tissue.

3 Electron microscopic specimens: fibroblast, macrophage, plasma cell, mast cell, collagen fiber，elastic fiber.

V. Definitions

1. Collective tissue proper 2. Loose connective tissue 3. Dense collective tissue

VI. Study questions

1. What are the features of connective tissue proper?
2. What are the types of connective tissue and their features?
3. The features and function of the main cells (plasma cell, macrophage, mast cell, fibroblast) in the connective tissue proper?

Chapter 4 Cartilage and Bone

I. Objective and requirements

1. To master the structure and distribution of hyaline cartilage.
2. To know the structure features and distribution of elastic cartilage and fibrocartilage.
3. To be familiar with the structure and the function of perichondrium. To know the growth manner of cartilage.
4. To master the structure of osseous tissue.
5. To know the role of the osteoblast and osteoclast in the regulation of blood calcium.
6. To master the structure of long bone.
7. To be familiar with two manners of osteogenesis.
8. To know the reconstruction process of bone and the factor to affect bone growth.

II. Key points

1. The structural features and types of cartilages.
2. The structure of bone and the growth of bone.

III. Lecturing contents and important points

1. Cartilage: the structural feature and classified basis of cartilage.
2. Hyaline cartilage： the structural feature and distribution of hyaline cartilage. The microstructural and ultrastructural feature of chondrocyte. The feature of matrix and fiber. The structure and function of perichondrium. The growth manner of cartilage: interstitial growth and appositional growth.
3. The structural features and distribution of elastic cartilage and fibrocartilage.
4. Bone
   a) The structure of osseous tissue: the conformation of osseous tissue; the structure and chemical component of bone matrix (bone lamella); the cell classification of osseous tissue; the microstructural and ultrastructure feature of osteocyte, osteoblast and osteoclast; the essential process of osteogenesis; the osteoid; the role of the osteoblast and osteoclast in the regulation of blood calcium.
   b) The structure of long bone: the structure of spongy bone and compact bone; inner circumferential lamella, outer circumferential lamella, osteon and interstitial lamella.
5. The osteogenesis: the process of intramembranous ossification; the process of endochondral ossification: cartilage model, perichondrial ossification, the formation of primary ossification center, the formation of secondary ossification center.
6. The growth and remodeling process of bone; the factor to affect bone development.

IV. Practice contents

1. Multimedia courseware: cartilage and bone.
2. Light microscopic specimens: hyaline cartilage, bone, decalcified bone, osteogenesis of long bone.
3. Electron micrographs: chondrocyte, osteocyte, osteoblast, osteoclast.

V. Definitions

1. Cartilage　2. osseous tissue　3. osteon　4. isogenous group
5. interstitial lamella　6. perforating canal　7. epiphyseal plate

VI. Study questions

1. What are the features of three cartilage tissues?
2. What is the constitution and histological structure of osseous tissue?

3. What is the process of long bone growth?

Chapter 5 Blood

I. Objective and requirements

1. To master light microscopic structure and function of blood formed element.
2. To be familiar with normal value of blood formed element.
3. To know the ultrastructural characteristic of various leucocyte and blood platelet.

II. Key points

1. The structural features and types of blood cells.

III. Lecturing contents and important points

1. The composition of blood, plasm and formed elements.
2. The erythrocyte: morphologic feature and function of erythrocyte and normal concentration of erythrocyte in blood. the relationship between the maintenance of normal form and energy from ATP. The structural characteristics of reticulocyte and significance of change in quantity.
3. Leucocyte: the classification of leucocyte. The microstructural, ultrastructural features and function of neutrophil, eosinophil, basophil, monocyte and lymphocyte. The quantity and percentage of various blood cells in normal blood.
4. Blood platelet: the microstructure, ultrastructure and function of blood platelet and the quantity of blood platelet in normal blood.

IV. Practice contents

1. Multimedia courseware: blood.
2. Light microscopic specimens: blood smear, reticulocyte.
3. Electron micrographs: erythrocyte, reticulocyte, leucocyte, platelet.

V. Definitions

1. Reticulocyte 2. Neutrophil 3. Eosinophil 4. Basophil
5. Monocyte 6. Lymphocyte 7. Platelet

VI. Study questions

1. What are the structure features of different type cells in blood?

Chapter 6 Muscle tissue

I. Objective and requirements

1. To master microstructures of 3 types of muscle tissue.
2. To master microstructural and ultrastructural similarities and differences between skeletal and cardiac muscle fibers.
3. To know ultrastructural features of smooth muscle.

II. Key points

1. The structural features of three types of muscle tissues.
2. The composition of sarcomere.

III. Lecturing contents and important points

1. The composition and general characteristics of muscle tissue.
2. Skeletal muscle: organization of skeletal muscle, epimysium, perimysium and endomysium. Microstructure of skeletal muscle fiber, myofibril, light and dark bands, sarcomere. Ultrastructure of skeletal muscle fiber, arrangement of thick and thin filaments, transverse tubule, sarcoplasmic reticulum, triad. Structural basis and mechanism of contraction of skeletal muscle fiber.
3. Cardiac muscle: the main microstructural and ultrastructural similarities and differences between skeletal and cardiac muscle fibers, ultrastructure and function of intercalated disc.
4. Smooth muscle: microstructural and ultrastructural features of smooth muscle fiber.

IV. Practice contents

1. Multimedia courseware: muscle tissue.
2. Light microscopic specimens: longitudinal and transverse sections of skeletal, cardiac and smooth muscles, intercalated disc of cardiac muscle.
3. Electron micrographs: skeletal muscle fiber, myofibril, sarcomere, cardiac muscle fiber and intercalated disc, smooth muscle fiber.

V. Definitions

1. Sarcomere 2. Intercalated disc 3. Dark band 4. Light band

VI. Study questions

1. What are the features of three types of muscle tissues?
2. What are the functions of three types of muscle tissues?

Chapter 7 Nervous tissue

I. Objective and requirements

1. To master the composition of nerve tissue, microstructure, ultrastructure and the classification of neurons.
2. To master the concept, the function and the structural features of synapse and know the classification of neurotransmitters.
3. To be familiar with the classification, light microscopic structure, distribution and function of neuroglial cells.
4. To master the classification, microstructure and ultrastructure of the nerve fibers, and know the structure of the nerve.
5. To be familiar with the classification, structure and function of the nerve endings, and master the structural features and function of the motor end plate.
6. To know the degeneration and regeneration of nerve fiber.

II. Key points

1. The structural features and types of neuron and glial cells.
2. The structure of synapse, nerve fibers and different types of nerve endings.

III. Lecturing contents and important points

1. The composition of nerve tissue: nerve cells and neuroglial cells.
2. Neurons: the classification of the neurons. The function of the neuronal membrane; the microstructure, ultrastructure and function of the cell body, dendrite and axon. The structural basis and significance of the axonal transport.
3. Synapse: the concept, function and classification of synapse. The microstructure and ultrastructure of synapse. The classification of neurotransmitters. The concept of receptor.
4. Neuroglial cells: the classification of neuroglial cells, the light microscopic structure and function of the glial cells in central nervous system (astrocytes, oligodendrocytes, microglia and ependymal cells) and in peripheral nervous system (Schwann cells and satellite cells).
5. Nerve fibers and nerves: the composition and classification of nerve fibers. The light microscopic structure of myelinated nerve fibers, neurolemma. The formation and ultrastructure of the myelin sheath. The formation and structural features of unmyelinated nerve fibers. The light microscopic structure of nerve.
6. Nerve endings: the classification of nerve endings. The structure and function of sensory nerve endings (free nerve endings, tactile corpuscle, lamellar corpuscle and muscle spindle); The structure and function of somatic motor nerve endings (motor end plate) and the structure and function of visceral motor nerve endings.
7. The degeneration and regeneration of nerve fibers.

IV. Practice contents

1. Multimedia courseware: nerve tissue.
2. Light microscopic specimens: nerve cells, Nissl bodies, neurofibril, synaptic bouton, neuroglial cells, myelinated nerve fibers, unmyelinated fibers, nerves, tactile corpuscle, lamellar corpuscle, muscle spindle, motor end plate.
3. Electron micrographs: nerve cells, chemical synapses, myelinated nerve fibers, unmyelinated fibers, motor end plate.

V. Definitions

1. Neuron 2. Axon 3. Dendrite 4. Synapse 5. Nerve fiber 6. Myelinated nerve

fibers

7. Nerve ending

VI. Study questions

1. What are the features of neurons and glial cells?
2. What are the structures of two types of nerve fibers?
3. The types of nerve ending and their characteristics.

Chapter 8 Nervous System

I. Objective and requirements

1. To be familiar with the general structure of the gray matter of the spinal cord, cerebral cortex and cerebellar cortex.
2. To be familiar with the classification and structure of ganglia.
3. To master the structure and function of the blood-brain barrier.
4. To know the structure and function of the meninges and choroids plexus.

II. Key points

1. The structure of the gray and white matters of the spinal cord; the feature of Pyramidal cells in the cerebral cortex; the feature of Purkinje cell in the cerebellar cortex; delamination of the cerebral cortex.
2. The classification of ganglia, the structure of the cerebrospinal and autonomic ganglia.
3. The composition, structural features and function of the blood-brain barrier

III. Lecturing contents and important points

1. The structure of the gray and white matters of the spinal cord; the pyramidal cells, granular cells and fusiform cells in the cerebral cortex; delamination of the cerebral cortex and the connections between neurons in the cerebral cortex; delamination of the cerebellar cortex and the neurons in the cerebellar cortex, the connections between neurons in the cerebellar cortex.
2. The classification of ganglia, the structure of the cerebrospinal and autonomic ganglia.
3. The composition of the meninges and choroids plexus, the origin, components and circulation of the cerebrospinal fluid.
4. The composition, structural features and function of the blood-brain barrier.

IV. Practice contents

1. Multimedia courseware: nervous system.
2. Light microscopic specimens: cerebral cortex, cerebellar cortex, spinal cord, spinal ganglion, sympathetic ganglion.

V. Definitions

1. Grey matte 2. White matter 3. Ganglion 4. Blood-brain barrier 5. Meninges 6. Choroids plexus 7. Cerebrospinal fluid

VI. Study questions

1. What is the composition, structural features and function of blood-brain barrier?

Chapter 9 Circulatory System

I. Objective and requirements

1. To be familiar with the ultrastructure of continuous capillary, fenestrated capillary and sinusoid capillary.
2. To master the microstructures of large artery, medium-sized artery and small artery.
3. To know the microstructural features of veins.
4. To master the microstructures of the heart wall. To master the distribution and microstructure of Purkinje fiber.
5. To know the components of the heart conducting system.
6. To know the microstructures of the lymphatic vascular system.

II. Key points

1. Microstructures and functions of large, medium-sized and small arteries.
2. Microstructural characters of large, medium- sized, and small veins.
3. Three layers of the heart wall, microstructures of Purkinje fibers.
4. The general structures and classification of capillaries. The ultrastructure of continuous, fenestrated and sinusoid capillary.

III. Lecturing contents and important points

1. The general structures and classification of capillaries. The ultrastructure of continuous, fenestrated and sinusoid capillary.
2. Microstructures and functions of large, medium-sized and small arteries.
3. Microstructural characters of large, medium- sized, and small veins.
4. Three layers of the heart wall, microstructures of Purkinje fibers and heart valves. The components of the heart conducting system.
5. Lymphatic vascular system: the microstructures of small lymphatic vessel.

IV. Practice contents

1. Multimedia courseware: circulatory system.
2. Light microscopic specimens: small artery and vein (containing capillary and lymphatic vessel), medium-sized artery and vein, large artery and heart wall.
3. Electron micrographs: continuous, fenestrated and sinusoid capillary.

V. Definitions

1. Continuous capillary 2. Fenestrated capillary 3. Sinusoid capillary
4. Purkinje fibers

VI. Study questions

1. What is the structural difference between medium-sized artery and large artery?
2. What is the classification of capillaries and their features in EM?

Chapter 10 Immune System

I. Objective and requirements

1. To know components of the immune system and classification of lymphatic cells.
2. To be familiar with the distribution and function of macrophage and other antigen presenting cells.
3. To master the classification, basic structure and function of lymphoid tissues.
4. To know the components of central lymphoid organs and peripheral lymphoid organs.
5. To master the structure and function of thymus.
6. To master the structure and function of lymph node and spleen.
7. To know the pathway and significance of lymphocytes recirculation in the body.
8. To be familiar with the structures and functions of palatine tonsils.
9. To know the components, distribution and function of the mononuclear phagocyte system.

II. Key points

1. Basic components of lymphoid tissues; structural characters of lymphoid nodule and diffuse lymphoid tissue and their relationship.
2. Structural features of thymus, lymph node and spleen.

III. Lecturing contents and important points

1. Components of the immune system; concept of the immunity.
2. The mainly types and function of lymphocytes.
3. Basic components of lymphoid tissues; structural characters of lymphoid nodule and diffuse lymphoid tissue and their relationship.
4. Components of central lymphoid organs and peripheral lymphoid organs.
5. Structure of the thymus: cortex and medulla; structure and function of thymic epithelial cells and thymic corpuscle; blood- thymus barrier and function of thymus.
6. Structure of the lymph node: cortex and medulla; constitution, structural characters and functions of the cortex and medulla; follicular dendritic cells and interdigitating cells; structures and function of postcapillary venule; lymphatic vessel in the lymph node; blood vessels and function of the lymph node; pathway and significance of recirculation of lymphocytes.
7. Structures of the spleen: white pulp, red pulp and marginal zone; structural characters of periarterial lymphatic sheath, splenic corpuscle, splenic cord and splenic sinus; blood circulation and function of the spleen.
8. Structural characters and functions of the palatine tonsils.
9. Components, distribution and functions of the mononuclear phagocyte system; origin of the macrophage.

IV. Practice contents

1. Multimedia courseware: immune system.
2. Light microscopic specimens: thymus, lymph node, spleen and palatine tonsils.
3. Electron micrographs: macrophage and splenic sinus.

V. Definitions

1. Lymphoid tissue 2. Lymphoid nodule 3. Blood-thymus barrier
4. Thymic corpuscle 5. Periarterial lymphatic sheath

VI. Study questions

1. Describe the paths and significance of the recirculation of lymphocyte.

2. Compare the similarities and differences of the structure and function between lymph node and spleen.

Chapter 11 Skin

I. Objective and requirements

1. To master the main structure of the skin. Know the keratinization process of the keratinocyte.
2. To know the light microscopic structure, ultrastructure, distribution and function of the melanocytes.
3. To know the light microscopic structure, distribution and function of Langerhans cell and Merkel's cell.
4. To be familiar with the light microscopic structure and function of the hair, the sweat gland and the sebaceous gland.

II. Key points

1. Layers of the epidermis, light microscopic structures of each layer of the epidermis.
2. Light microscopic structural features of sweat glands.
3. Light microscopic structures and functions of sebaceous glands.
4. Light microscopic structures of the hair.

III. Lecturing contents and important points

1. Structure of the epidermis and the dermis.
2. Layers of the epidermis, light microscopic structures and ultrastructure of each layer of the epidermis. The process of keratinization of the epidermis.
3. Light microscopic structure, ultrastructure, distribution and function of melanocytes.
4. Light microscopic structures, distribution and function of Langerhans cell and Merkel's cell.
5. Structures of the papillary layer and reticular layer of the dermis.
6. Structure of the hypodermis.
7. Light microscopic structural and ultrastructural features and functions of merocrine and apocrine sweat glands. Light microscopic structures and functions of sebaceous glands. Light microscopic structures of the hair: main structures of hair follicle, hair bulb, and hair papilla. Hair growth and replacement.
8. Location, structure and function of arrector pili muscle.

IV. Practice contents

1. Multimedia courseware: skin and skin appendages
2. Light microscopic specimens: the skin of human finger, human scalp.

V. Definitions

1. Epidermis 2. Dermis 3. Hair bulb

VI. Study questions

1. According to the process of keratinization, describe the morphological and structural change of keratinocytes in different layers of epidermis.
2. Describe the structure of hair and the process of its growth and renewal.

Chapter 12 Eye and Ear

I. Objective and requirements

1. To master structures and functions of each layer in wall of the eyeball.
2. To master structures of the eyelid.
3. To know general structures of the external, middle and inner ear.
4. To be familiar with locations, structures and functions of the spiral organ.
5. To know the location, structures and functions of the crista ampullaris and the maculae acustica.
6. To master structures of the membrane cochlea duct.

II. Key points

1. The layers and structural feature of the wall of eyeball.
2. The structural feature and function of rod cell and cone cell in the retina.
3. The structural feature of each wall of the membrane cochlea duct. The structural feature and function of the spiral organ.

III. Lecturing contents and important points

1. The fibrosa: structures and physiological feature of each layer of the cornea. Structures of the sclera. Structures and functions of the limbus, the scleral spur, the scleral venous sinus, and the trabecular meshwork.
2. The vascular layer: structures of the iris, location and function of the pupil sphincter muscle and the pupil dilatator muscle. Structures of the ciliary body. Walking direction and function of fibers of the ciliary muscles, location and function of the ciliary processes and the ciliary zonule, epithelium of the ciliary body and its relation with the formation of the aqueous humor. Structures and function of the choroid.
3. The retina: layers of the retina. Light microscopic structures and ultrastructure and functions of the pigment epithelial cells. Light microscopic structures and ultrastructure and functions of the cone cells and the rod cells. Structures and functions of the bipolar cells, and the ganglion cells. Structural features and functions of macula lutea. Location of optic disc and optic nerve.
4. Inclusion: structure and function of the lens. Formation, circulatory pathway and functions of aqueous humor. Structures and function of vitreous body.
5. Eyelid: structures of each layer of the eyelid. Structural features of the tarsal glands, the Zeis glands and the Moll glands.
6. The inner ear: Structures of the osseous labyrinth and its wall. Structures of the membranous labyrinth. Location, light microscopic structures, ultrastructure and function of the crista ampullaris and the maculae acustica. Structures of each wall of the membrane cochlea duct. Structures and function of the spiral organ. Origin and function of the endolymphatic and perilymphatic fluid.

IV. Practice contents

1. Multimedia courseware: the eye and the ear.
2. Light microscopic speciments: the eyeball, the eyelid and the inner ear.
3. Electron micrographs: the pigment epithelial cell, the rod cell, the cone cell, the spiral organ and the maculae acustica.

V. Definitions

1. Macula lutea and central fovea 2. Scleral venous sinus 3. Optic disk 4.Visual cell
5. Tarsus 6. Crista ampullaris 7. Spiral organ

VI. Study questions

1. Describe the differences between rod cell and cone cell in structure and function.
2. Describe the composition and function of each layer of the retina.
3. Try to describe the light microscopic structure of the cornea.
4. Try to describe the light microscopic structure of the iris.

Chapter 13 Digestive Tract

I. Objective and requirements

1. To master the general structure and function of digestive tract.
2. To master the histologic characteristic of each segments of digestive tract.
3. To be familiar with the distribution, types and function of gastrointestinal endocrine cells.

II. Key points

1. General structure of digestive tract.
2. Histologic structural character of esophagus, duodenum, jejunum and ileum.
3. Light microscopic structure, ultrastructure and function of parietal cells and chief cells.

III. Lecturing contents and important points

1. General structure of digestive tract: four layers.
2. Esophagus: histologic structural character of esophagus.
3. Stomach: structural character of mucosa; light microscopic structure, ultrastructure and function of parietal cells and chief cells; pyloric glands.
4. Small intestine: structural character of duodenum, jejunum and ileum; structure and distribution of the intestinal glands and duodenal glands; structure and function of Paneth cells.
5. Large intestine: structural character and function of colon and appendix.
6. Immunity in the digestive tract: distribution of the lymphatic tissue in the digestive tract.
7. Gastrointestinal endocrine cells: distribution, names, function, light microscopic structure and ultrastructure of gastrointestinal endocrine cells.
8. Blood vessels, lymphatic vessels and nerve fibers in the digestive tract.

IV. Practice contents

1. Multimedia courseware: digestive tract.
2. Light microscopic specimens: esophagus, fundus of the stomach, pylorus, duodenum, jejunum, ileum, colon and appendix, gastrointestinal endocrine cells, Paneth cells and blood vessels in the villi and myenteric nerve plexus nerve plexus.
3. Electron micrographs: parietal cell, chief cell, small intestine epithelium and gastrointestinal endocrine cells.

V. Definitions

1. Plicae	2. Serosa	3. Oxyntic cell
4. Tubulovesicular system	5. Intestinal villi	6. Small intestinal gland
7. Duodenal gland	8. Paneth's cell	9. Central lacteal

VI. Study questions

1. Try to compare the structural feature of the mucosa of esophagus, stomach, small intestine and colon.
2. Compare the structure and function of the parietal cell and the chief cell in the body of stomach.
3. Compare the structural feather of duodenum, jejunum and ileum.
4. Expound the particularity and significance of lymphatic tissue in digestive tract.

Chapter 14 Digestive Glands

I. Objective and requirements

1. To be familiar with the structural characteristics of serous, mucous and mixed acini.
2. To master the structural and functional characteristics of the pancreas.
3. To master the fundamental structure of liver lobule and portal area.
4. To master the microstructures of the hepatocyte and hepatic sinusoid, and their functions.
5. To master the liver double blood supply and its relationship with liver function.
6. To be familiar with the secretory pathway of the bile in the liver.
7. To know the structure of the bile gallbladder and bile duct.

II. Key points

1. The structural characteristics of the serous, mucous and mixed acini.
2. The cellular components and distribution of pancreatic islets; the distribution of A, B, D, and PP cells in pancreatic islets; the electronic microscopic characteristics and the functions of A, B, D, and PP cells.
3. The structural features of liver lobules and portal area in the liver.

III. Lecturing contents and important points

1. Major salivary glands: the general structures of the major salivary gland.
2. The structural characteristics of the serous, mucous and mixed acini.
3. The structural characteristics of the intercalated duct and the striated duct (secretory duct).
4. Exocrine portion of pancreas: the structural and functional characteristics of the pancreatic acini; the structures of the ducts.
5. Endocrine portion of pancreas: the cellular components and distribution of pancreatic islets; the distribution of A, B, D, and PP cells in pancreatic islets; the electronic microscopic characteristics and the functions of A, B, D, and PP cells.
6. Liver: the fundamental structure of liver including liver lobule and portal area. Hepatic lobule: the structures of the live plates and central vein; the light, electron microscopic structural characteristics and main functions of the hepatocyte; the location and microscopic structure of the bile canaliculi; the location and structure of the hepatic sinusoid; the microstructure and functions of Kupffer cell; the location of the perisinusoidal space; the structure and function of the fat-storing cell.
7. Portal area: the location and components of the portal area; double blood supply of the liver; the characteristics and function of hepatic blood circulation.
9. The intrahepatic bile ducts.
10. The structures of gallbladder and cystic duct.

IV. Practice contents

1. Multimedia courseware: digestive glands.
2. Light microscopic specimens: parotid gland, submandibular gland, pancreas, human liver, pig liver, Kupffer cells, bile canaliculi, endocrine pancreas.
3. Electron micrographs: pancreatic acinar cells; the A, B, D, PP cells in the islet of Langerhans; hepatocyte and bile canaliculus; hepatic sinusoid; perisinusoidal space and fat-storing

V. Definitions

1. Pancreatic islet 2. Hepatic plate 3. Perisinusoidal space
4. Sublobular vein 5. Bile canaliculus 6. Portal area 7. Kupffer cell

VI. Study questions

1. Please compare the differences of three types of salivary glands in structures and secretion features.
2. Please compare the differences of parotid gland and pars exocrine of pancreas in structure and function.
3. Please describe the structural features of hepatocyte and its function.
4. Please describe the structures of hepatic sinus and perisinusoidal space and their functions.

Chapter 15 Respiratory System

I. Objective and requirements

1. To know the structural characteristics of the respiratory and olfactory portions of the nasal cavity.
2. To master the structural characteristics of the larynx mucosa.
3. To master the fundamental structure of the wall of trachea.
4. To master the branches of the bronchial tree and the components of each branch.
5. To identify the various segments of the bronchial tree.
6. To compare the terminal and respiratory bronchioles.
7. To master the structure of the alveolar septum.
8. To master the components and function of the blood-air barrier.
9. To master the microstructures and function of alveoli.
10. To be familiar with the blood supply of the lung.

II. Key points

1. The structural feature of trachea.
2. The structural change of different components in the conducting portion and respiratory portion.
3. The constitution of blood-air barrier.

III. Lecturing contents and important points

1. Nasal cavity: the microscope structures and functions of the vestibular, respiratory and olfactory regions.
2. Larynx: the structural characteristics of the larynx mucosa.
3. Trachea and primary bronchus: the structure of the trachea and primary bronchus.
4. Lung: the general structure of the lung, components of trachea tree, pulmonary lobule, structural change of different components in conducting portion, structural characteristics of terminal bronchiole, respiratory bronchiole, alveolar duct, alveolar sac and alveoli, the light and electron microscopic structure and function of Type Ⅰ and Ⅱ cells, the components of alveolar septum, alveolar pore, the components of the blood-air barrier and its function, pulmonary macrophages, pulmonary blood vessels and blood circulations, pulmonary lymphatic vessels.

IV. Practice contents

1. Multimedia courseware: respiratory system.
2. Light microscopic specimens: the olfactory mucosa of the nasal cavity, the larynx, trachea, the lung.
3. Electron macrographs: ciliated columnar epithelium in the trachea; Type Ⅰ and Ⅱ alveolar cells; blood-air barrier.

V. Definitions

1. Pulmonary lobule 2. Bronchiole 3. Terminal bronchiole 4. Respiratory bronchiole 5. Alveolar duct 6. Alveolar sac 7. Pulmonary alveolus 8. Type Ⅰ alveolar cell 9. Type Ⅱ alveolar cell 10. Surfactant 11. Alveolar septum 12. Dust cell 13. Alveolar pore 14.. Blood-air barrier

VI. Study questions

1. State the structural varying pattern of the wall of conducting portion in the lung.

2. Describe the structure of alveoli and its' role in respiratory function.

Chapter 16 Urinary System

I. Objective and requirements

1. To be familiar with the general structure of the kidney.
2. To master the components, distribution, light microscopic structure, ultrastructure and function of the nephron.
3. To master the location, light microscopic structure and function of the collecting tubule system.
4. To master the constitution, histological structure and function of the juxtaglomerular apparatus.
5. To know the components, distribution of the renal interstitial tissue and the function of interstitial cells in the kidney.
6. To be familiar with the renal blood circulation and its feature.
7. To know the renal lymphatic and nerve distribution.
8. To know the endocrine function of the kidney.
9. To be familiar with the general structure of the ureter and the bladder.

II. Key points

1. The general structure of the kidney.
2. The components of the nephron.
3. The structural differences of proximal convoluted tubule and distal convoluted tubule.
4. The components of the juxtaglomerular apparatus and their location.

III. Lecturing contents and important points

1. The general structure of the kidney: the location and constitution of the capsule, cortex, medulla, cortical labyrinth, medullary ray, and cortical column. the constitution of the renal tubules. the components of the renal lobule and renal lobe.
2. Nephron: the components of the nephron and the location of every part. The light microscopic structure, ultrastructure and function of the renal corpuscle (glomerulus, intraglomerular mesangium and intraglomerular mesangial cell, renal capsule). The constitution of the filtration barrier and its function. the light microscopic structure, ultrastructure and their function of the renal tubules (proximal convoluted tubule and straight tubule, thin segment, distal straight tubule and convoluted tubule). The components of the medullary loop. Cortical nephron and juxtamedullary nephron.
3. Collecting tubules: the sections of the collecting tubules and their light microscopic structure, ultrastructure and function.
4. Juxtaglomerular apparatus: the components of the juxtaglomerular apparatus and their location. The light microscopic structure, ultrastructure and function of the juxtaglomerular cells. The structural specialty and function of the macula densa. The structural feature of the extraglomerular mesangial cells.
5. Renal interstitial tissue: its constitution and distribution, the function of the interstitial cells.
6. The renal blood circulation: the renal blood circulation pathway and its characteristic, the relationship among the renal blood circulation and the formation of original urine, the function of reabsorption and secretion of the renal tubules, and the urinary concentration.
7. The distribution of the renal lymphatic vessels and nerves.
8. The endocrine function of the kidney.
9. Excretory passages. The general structure of the ureters and bladder.

IV. Practice contents

1. Multimedia courseware: urinary system.
2. Light microscopic specimens: kidney, juxtaglomerular cell, macula densa, the renal blood vessels injected with ink, ureter and bladder.
3. Electron micrographs: the renal corpuscle, the capillary loop of the renal corpuscle, podocyte, the filtration barrier, mesangial cell, the proximal tubule, the distal tubule, thin segment.

V. Definitions

1. Renal tubule
2. Glomerulus
3. Henle's loop
4. Intraglomerular mesangial cell
5. Filtration barrier
6. Nephron

VI. Study questions

1. Describe the composition and distribution of the nephron.
2. Try to describe the structures associated with the formation of the primary urine.
3. Compare the difference between light microscope and ultrastructure of proximal and distal convoluted tubules.
4. Discusses the composition, morphology, structure and function of juxtaglomerular complex.

Chapter 17 Endocrine System

I. Objective and requirements

1. To be familiar with general structure of the endocrine gland.
2. To master the nitrogenous and steroid hormone-secreting cell's ultrastructure feature.
3. To master light microscopic structure and secreted hormone of the thyroid, parathyroid gland, adrenal gland and hypophysis.
4. To master conformation and significance of hypophyseal portal system.
5. To master relationship between hypothalamus and hypophysis.

II. Key points

1. The ultrastructural features of the nitrogen and steroid hormone secreting cells.
2. The structural features of the thyroid, the adrenal gland and the hypophysis.
3. The constitution and significance of hypophyseal portal system.

III. Lecturing contents and important points

1. The endocrine gland's general construction. The ultrastructural features of the nitrogen and steroid hormone secreting cells.
2. General constitution of the thyroid. Light microstructure, ultrastructure, and function of the thyroid follicular epithelium.
3. General structure of the parathyroid. Light microstructure and function of the chief cell. Light microstructure of the eosinophil.
4. General constitution of the adrenal gland: light microstructure and function of each zone in the cortex, light microstructure, ultrastructure, and function of cells in the medulla, the distributed characteristics of adrenal vessel.
5. Adenohypophysis: general structure of the pars distalis. Light microstructure, ultrastructure and function of the acidophil and basophil. Light microstructure and function of the chromophobe. Structure features of pars intermedia and pars tuberalis.
6. Neurohypophysis: light microstructure of pars nervosa. Light microstructure and function of the pituicyte. Herring bodies.
7. Blood vessel distribution of the hypophysis. The constitution and significance of hypophyseal portal system.
8. The relationship between hypothalamus and hypophyseal pars distalis. The axonal terminal of neuroendocrine cells from arcuate nucleus of hypothalamus distributed and the pathway by which the produced hormone was transported to pars distalis.
9. Relationship between hypothalamus and neurohypophysis. Pathway that supraoptic nucleus and paraventricular nucleus's hormone reached to pars distalis.

IV. Practice contents

1. Multimedia courseware：the endocrine system.
2. Light microscopic specimens： thyroid, parafollicular cells, parathyroid, adrenal gland, hypophysis.

V. Definitions

1.Thyroid follicle 2. Zona glomerulosa 3. Zona fasciculate 4. Zona reticularis 5. Herring bodies 6. Hypophyseal portal system

VI. Study questions

1. Compare the structural characteristics of cells secreting nitrogen hormones and the cells secreting steroid hormones.

2. Describe the ultrastructure of thyroid follicular epithelial cells and the synthesis, storage and release of thyroid hormones.
3. Describe the structure and function of adrenal gland cortex.
4. Briefly describe the structure and function of the pituitary gland.
5. Describe the relationship between hypothalamus and hypophysis, and the relationship between hypothalamus and neurohypophysis.

Chapter 18 Male Reproductive System

I. Objective and requirements

1. To know general structure of the testis.
2. To master histological structure of the seminiferous tubules, spermatogenesis and spermiogenesis, conformation and function of the blood-testis barrier.
3. To master light microscopic structure, ultrastructure and function of the interstitial cells (Leydig cells).
4. To master histological structure and function of the epididymis.
5. To master histological structure and function of the prostate.
6. To know histological structure of the ductus deferens

II. Key points

1. The structural features and distribution of all types of spermatogenic cells.
2. The Process of spermatogenesis and spermiogenesis.

III. Lecturing contents and important points

1. General structure of the testis.
2. The histological structure of the seminiferous tubules: histologic structure of the seminiferous tubule, the structural features and distribution of all types of spermatogenic cells. The process of the spermatogenesis. The process of spermiogenesis. Light microstructure, ultrastructural features of the spermatozoon. Light microstructure, ultrastructural features and functions of the sustentacular cell.
3. Conformation and functions of the blood-testis barrier.
4. The histological structure of the tubuli recti and rete testis.
5. Light microstructure, ultrastructural features and functions of the interstitial cell.
6. The endocrine regulation of testicular function.
7. Epididymis: Histological structure and function of the efferent duct and ductus epididymis.
8. The histological structure of the ductus deferens.
9. Prostate: prostatic conformation, alveolar construction feature, interstitial histological construction features. Variation of the prostatic structure with age.

IV. Practice contents

1. Multimedia courseware: the male reproductive system.
2. Light microscopic specimens: testis, epididymis, ductus deferens, prostate, spermatozoa smear.
3. Electron micrographs: spermatogenic cells, sustentacular cell, spermatozoon, interstitial cell.

V. Definitions

1. Spermatogenesis 2. Blood-testis barrier 3. Spermiogenesis

VI. Study questions

1. State the light microstructure, ultrastructural features and function of the sustentacular cell.
2. State the light microstructure, ultrastructural features and function of the interstitial cell.
3. State the process of spermiogenesis.

Chapter 19 Female Reproductive System

I. Objective and requirements

1. To know the general structure of the ovary. Master the follicles' development, maturation and ovulation.
2. To master the formation of the corpus luteum, its degeneration and function.
3. To know the follicular atresia, interstitial gland and hilus cell.
4. To know the blood vessels, lymphatic and nerve distribution of the ovary.
5. To be familiar with the histological structure of the oviduct.
6. To know about the general structure of the uterine wall. Master the relationship between the cyclical changes of the ovary and the endometrium.
7. To be familiar with the cervical histological structure.
8. To know the histological structural specialty of different period mammary glands.

II. Key points

1. The histological structure and endocrine function of different stage follicles during their development and maturity.
2. The cyclical change of the endometrium in the light microscope.

III. Lecturing contents and important points

1. Ovary: the general structure of the ovary. The histological structure and endocrine function of different stage follicles during their development and maturity. The mechanism and process of ovulation. The maturation division of oocytes. The formation and degeneration of the corpus luteum and its histological structure and endocrine function. Follicular atresia and interstitial glands. The hilus cells of the ovary. The relationship between the structure and function of the ovary and the anterior pituitary hormones. The distribution of blood and lymphatic vessels, and the innervation of the ovary.
2. Oviduct: the general structure of the oviduct; the structural characteristic and function of every part.
3. Uterus: the general structure of the uterine wall; the functional layer and basal layer of the endometrium; the cyclical change of the endometrium and the relationship between this change and the periodic change of the ovary; the light microscopic structure and ultrastructure specialty of endometrium proliferative phase and secretory phase; the mechanism of menstrual endometrium necrosis; the neuroendocrine regulation on the cyclical changes of the ovary and endometrium; the histological structure of the cervix, the structural specialty of the cervical endometrium.
4. Mammary gland: the general structure of the mammary glands; the structural specialty of the inactive and active phase (gestation and lactation) mammary glands.

IV. Practice contents

1. Multimedia courseware: female reproductive system.
2. Light microscopic specimens: ovary, oviduct, uterus, cervix, inactive mammary gland, active mammary gland.
3. Electron observation micrographs: oocyte, zona pellucida, corona radiata, oviduct epithelium, endometrium epithelium and uterine glands.

V. Definitions

1. Zona pellucida 2. Cumulus oophorus 3. Ovulation 4. Corpus luteum 5. Menstrual cycle

VI. Study questions

1. Describe the changes in morphology and structure during follicular development.
2. Describe the menstral cycle changes of the endometrium and its relationship with the ovary.
3. Describe the formation, function and change of the corpus luteum.

Chapter 20 General instructions of Human Embryology

I. Objective and requirements

1. To know research contents and significances of the embryology.
2. To know research methods of the embryology.
3. To know maturation procedure of the germ cells. To master capacitation and fertilization of the spermatozoon.
4. To master the procedure of the implantation. To master early developmental procedure of the embryo (1~3 weeks).
5. To be familiar with developmental procedure of the embryo (4~8 weeks).
6. To know contour characters of the embryo and conjecture of embryonic age.
7. To be familiar with the formation, structures and functions of the fetal membrane.
8. To master structures and functions of the placenta.
9. To know formation of the twins, multiple births and conjoined twins.

II. Key points

1. The research contents and significances of the embryology
2. Sperm capacitation and fertilization. The formation and implantation of blastocysts; decidua and primary villi formation; the formation of three germ layers; the differentiation of neuroectoderm; the structure and function of placenta.
3. Three the formation of the germ layer; the formation and structure of the fetal membranes; the structure and function of the placenta.

III. Lecturing contents and important points

1. Research contents and significances of the embryology.
2. History of the embryology and modern embryology.
3. Research methods of the embryology.
4. General situation of the human embryo development; mature of the germ cell; capacitation of the spermatozoon.
5. Fertilization to formation of the blastocyst: time, position, condition, procedure and significance of the fertilization; procedure of the cleavage; structural characters of the morula and blastocyst; inner cell mass and trophoblast.
6. Implantation: cytotrophoblast, syncytiotrophoblast, reaction of the deciduas; three portions of the deciduas; implantation (procedure, condition, heterotopic implantation and reason).
7. Development of bilaminar germ disc and relationship structures: formation of the amniotic cavity and yolk sac; components of bilaminar germ disc; formation of epiblast, hypoblast, extraembryonic mesoderm and extraembryonic cavity.
8. Development of trilaminar germ disc and relationship structures; formation of primitive streak, primitive node, primitive pit, primitive groove, ectoderm, mesoderm and endoderm. Formation and differentiation of notochordal tube. Components and position of oropharyngeal membrane and cloacal membrane.
9. Differentiation of trilaminar germ disc and formation of embryonic body; differentiation of ectoderm, mesoderm and endoderm; formation of embryonic contour.
10. Fetal membrane: components and differentiation of fetal membrane; formation of the amniotic cavity, yolk sac, allantois and umbilical cord.
11. Structures and function of the placenta.

12. Conjecture of embryonic age.
13. Twins, multiple births and conjoined twins.

IV. Practice contents

Multimedia courseware, teaching specimen and model: early human development.

V. Definitions

Embryology, teratology, reproductive engineering， capacitation, fertilization, acrosome reaction, zona reaction, zygote, cleavage, blastomere, morula, blastocyst, trophoblast, inner cell mass, implantation, imbed, syncytiotrophoblast, cytotrophoblast, deciduas capsularis, decidual parietalis, deciduas basalis, placenta previa, ectopic pregnancy, embryonic disc, epiblast, hypoblast, primitive streak, primitive node, primitive groove, primitive pit, mesoderm, endoderm, ectoderm, notochord, teratoma, notochord, intraembryonic mesoderm, trilaminar germ disc, cloacal membrane, allantois, chorion, chorion leave, villous leave, neural plate, neural tube, paraxial mesoderm, somite, intermediate mesoderm, lateral mesoderm, parietal mesoderm, visceral mesoderm, fetal membrane, amniotic membrane, amniotic fluid, yolk sac, allantois, umbilical cord, placenta, placental barrier, twins, multiple births, conjoined twins

VI. Study questions

1. Describe the process and conditions for the blastocyst implantation of.
2. Try to describe the formation of the bilaminar and trilaminar germ discs.
3. Try to describe the formation and evolution of the chorionic membrane.
4. Describe the differentiation of the neuroectoderm.
5. Try to describe the structure and function of the placenta.

Chapter 21 Development of Cardiovascular System

I. Objective and requirements

1. To know development of establishment of primitive cardiovascular system
2. To master development of heart and congenital malformation of heart and large vessels.
3. To be familiar with pathway and characteristic of fetus blood circulation and postnatal alteration.

II. Key points

1. The internal separation of the heart.
2. The causes of atrial septal defect, ventricular septal defect, tetralogy of Fallot and patent ductus arteriosus.

III. Lecturing contents and important points

1. The extraembryonic and intraembryonic vessels establishment.
2. Primitive cardiovascular system establishment.
3. Formation of the primitive: Formation, translocation and fusion of the pericardial coelom and heart tube, initial structure of the primitive heart wall.
4. Establish of the heart contour: Formation and translocation of the trunus arteriosus, bulbus cordis, ventricle, auricle and venous sinus.
5. Internal partition of the heart: Partition of the atrioventricular canal and formation of the atrioventricular valve; partitioning of the primitive atria; develop of the venous sinus and

formation of the permanent atria; partitioning of the primitive ventricle; partitioning of the trunus arteriosus and bulbus cordis; formation of the semilumar valve.

6. Blood circulation of the fetus and postnatal alteration. Pathway and characteristic of the fetus blood circulation and postnatal alteration of them.
7. Common congenital malformation of the cardiovascular system: arterial septal defect, ventricular septal defect, displacement of the aorta and pulmonary artery, aortic stenosis or pulmonary artery stenosis, persistent truncus arteriosus, tetralogy of Fallot, patent arterial duct.

IV. Definitions

Blood island, pericardiac coelom, cardiogenic plate, cardiac tube, bulbus cordis, sinus venosus, truncus arteriosus, endocardiac cushion, foramen ovale, atrial septal defect, ventricular septal defect, tetralogy of Fallot

V. Study questions

1. Describe the division process of the primitive atrium and the formation process of left and right atrium.
2. Describe the formation of the left and right ventricles
3. What are the characteristics of fetal blood circulation? What are the changes after birth?
4. Describe the causes of atrial septal defect, ventricular septal defect and tetralogy of Fallot.

Chapter 22 Development of Digestive System and Respiratory System

I. Objective and requirements

1. To master formation and differentiation of the primitive gut.
2. To master differentiation of the pharyngeal pouch.
3. To know development of the tongue.
4. To master development of the esophagus, the stomach and intestine and congenital malformation.
5. To master development and congenital malformation of the liver, the gallbladder and the pancreas.
6. To be familiar with function of the embryonic liver.
7. To know development and congenital malformation of the larynx, the trachea and the lung.

II. Key points

1. The evolution of the pharynx sac.
2. The formation and evolution of the midgut loop.
3. The developmental process of the liver and the pancreas.
4. The causes of thyroglossal duct cyst, congenital umbilical hernia, Meckel's diverticulum, congenital aganglionical megacolon, and hyaline membrane disease.

III. Lecturing contents and important points

1. Differentiation of the primitive pharynx: differentiation of the pharyngeal pouch. Development of the tongue.
2. Development of the esophagus and the stomach.
3. Development of the intestine: formation of the midgut loop and physiological umbilical hernia. Rotation of the midgut loop; segregation and differentiation of the cloaca; anal membrane and anal pit.

4. Development of the liver and the gallbladder: development of the hepatic diverticulum; formation of the liver; functions of the embryonic liver and formation of the gallbladder and the bile duct.
5. Development of the pancreas: development and fusion of the dorsal pancreas and the ventral pancreas; formation of the main pancreatic duct; development of the islets of Langerhans.
6. Development of major salivary gland.
7. Common congenital malformation of the digestive system: atresia and stenosis of the esophagus and the duodenum; congenital umbilical; umbilical fistula; Meckel's diverticulum; congenital aganglionical megacolon, imperforate anus; anomaly rotations of the midgut loop; situs inversus viscerum; biliary atresia and annular pancreas.
8. Development of the laryngotracheal groove; formation of the larynx, the trachea and the lung.
9. Common congenital malformation of the respiratory system: stenosis or atresia of the larynx and the trachea; tracheoesophageal fistula; hyaline membrane disease and pulmonary hypolasia.

IV. Definitions

Primitive gut, foregut , midgut , hindgut , thyroglossal duct, umbilical coelom , midgut loop , caecal bud , cloaca , urorectal septum , urogenital sinus , hepatic diverticulum , urogenital membrane, anal membrane , ventral pancreas bud , dorsal pancreas bud, thyroglossal cyst , congenital umbilical hernia , Meckel' s diverticulum, umbilical fistula, laryngotracheal groove, laryngotracheal diverticulum , tracheoesophageal fistula , hyaline membrane disease, lung bud

VI. Study questions

1. Write the formation of primitive digestive tract and the organ names of each segment.
2. Describe the evolution of the loop of the midgut.
3. Describe the process of the occurrence of the liver and the pancreas.

Chapter 23 Development of Face, Neck and Limbs

I. Objective and requirements

1. To be familiar with development of frontonasal prominence and pharyngeal arches.
2. To master formation of the face and palate and congenital malformation.
3. To know development of the tooth and the neck.
4. To be familiar with development of the limbs and common congenital malformation.

II. Key points

1. The development of frontonasal prominence, maxillary process, mandibular process, the formation of nose and lip.
2. The occurrence of median palatine process, lateral palatine process; the formation of palate.
3. The causes of cleft lip, facial cleft, cleft palate and limb congenital malformations.

III. Teaching contents and important points

1. Development of the bronchial apparatus: formation of frontonasal prominence, heart prominence, pharyngeal arches and branchial groove; constructive relationship of pharyngeal arches and branchial groove, branchial membrane and branchial groove and branchial pouch.
2. Formation of the face: development of frontonasal prominence, maxillary prominence and mandibular prominence; formation of the nose and mouth cavity; position and change of the eyes and outer ears.

3. Development of the palate: development and coalescence of median palatine process and lateral palatine process; formation of the nasal cavity.
4. Development of the tooth.
5. Formation of the neck.
6. Development of the limbs: formation and differentiation of the upper and lower limb buds.
7. Common congenital malformation of the face, the neck and the limbs: cleft lip, oblique facial cleft, cleft palate and cervical cyst; reason of congenital malformation of the limbs.

IV. Definitions

frontonasal process , heart process, branchial arch, branchial groove , pharyngeal pouch , branchial membrane , branchial apparatus, maxillary process, mandibular process , stomodeum, nasal placode , nasal pit, median nasal process , lateral nasal process, median palatine process, lateral palatine process , cleft lip , limb bud, cleft palate , oblique facial cleft

V. Study questions

1. Try to describe the formation procedure of the face and palatine.
2. Describe the causes of cleft lip and cleft palate.

Chapter 24 Development of Urogenital System

I. Objective and requirements

1. To know development of pronephros and mesonephros.
2. To master development and congenital malformation of metanephros and ureter.
3. To master formation and develop of urogenital sinus.
4. To master development of genital gland and mechanism of sexual differentiation.
5. To master development of genital duct and sexual differentiation.
6. To be familiar with development of external genitals and sexual differentiation.
7. To be familiar with the congenital malformation of genital system.

II. Key points

1. The formation and evolution of ureteral bud and metanephrogenic blastema.
2. The formation, segmentation and evolution of the urogenital sinus.
3. The developmental process of the testis and ovary.
4. The evolution of the mesonephric duct, mesonephric tubules and paramesonephric duct in the development of male and female embryos.
5. The causes of cryptorchidism, congenital inguinal hernia and hermaphroditism.

III. Lecturing contents and important points

1. Development of the kidney and ureter development of the pronephric tubule and pronephric duct. Development of the mesonephric tubule and mesonephric duct (Wolffian duct). Formation and development of ureteric bud and metanephrogenic blastema. Migration of the metanephros.
2. Development of the bladder and urethra Formation, segmentaion and development of the urogenital sinus.
3. Congenital malformation Polycystic kidney, ectopic kidney, horseshoe kidney, no

development of kidney, double ureter, ectopia of urinary bladder, fistula of urachus.

4. Development of the genital gland Formation of the gonadal ridge, origen of primordial germ cell; relationship of sex differentiation of the genital gland to H-Y antigen; development of the testes; development of the ovary; descent of the testes and ovary.
5. Development of the genital duct. Formation of the mesonephric duct (Wolffian duct), paramesonephric duct (Müller duct); development of the mesonephric duct, mesonephric tubule, paramesonephric duct in male and female embryo and relationship of them to hormones.
6. Development of the external genital organs. Formation and differentiation of the genital tubercle, urogenital fold, labioscrotal swelling and relationship of them to androgen.
7. Congenital malformation: Cryptorchidism, congenital inguinal hernia, malformation of uterus, atresia of vagina, hermaphrodism, androgen insensitive syndrome, syndrome hypospadia.

IV. Definitions

Nephrotome, nephrogenic cord, urogenotal ridge, mesonephric ridge, genital ridge, pronephros, pronephric tubule, pronephric duct, mesonephric duct, mesonephros, mesonephric tubule, ureteric bud, metanephrogenic tissue, metanephros, polycystic kidney, urachal fistula, primary sex cord, testis cord, paramesonephric duct, sinus tubercle

VI. Study questions

1. Try to describe the developmental process of the kidneys of the posterior kidney.
2. Describe the differentiation process of undifferentiated gonads to testis and ovary.

Chapter 25 The Development of Nervous System, Eye and Ear

I. Objective and requirements

1. To know the geneses and early differentiations of neural tube and neural crest.
2. To know the geneses of spinal cord and brain.
3. To be familiar with the genesis of spinal cord and its relation with spinal column.
4. To know the geneses of nerve ganglia and peripheral nerves.
5. To be familiar with the common malformations of the nerve system.
6. To know the geneses and the congenital malformations of the eye.
7. To know the geneses and the congenital malformations of the ear.

II. Key points

1. The occurrence and differentiation of nerve canal and neural crest.
2. The formation and evolution of the cerebral vesicles.
3. The occurrence of the pituitary gland.
4. The common congenital malformations of the nervous system.
5. The occurrence of the eyeball and the inner ear.
6. A common congenital malformation of eye and ear.

III. Lecturing contents and important points

1. The development and early differentiations of neural tube and neural crest: formation and development of the neural tube. Migration and differentiation of nerve crest cells.
2. Differentiations of the neuroepithelium. Differentiations of the neurons and formation of their relationship with target cells.
3. The development of neuroglia.

4. The development of spinal cord: the genesis of spinal cord and its relation with spinal column.
5. The development of brain: formations and developments of brain vesicles. Development of brain walls. Histological genesis of cerebral cortex and cerebellar cortex.
6. The development of nerve ganglia and peripheral nerves.
7. Common malformations of the nerve system: the defects of nerve tube. Hydrocephalus.
8. The development of the eye: The development of the eyeball: formation and development of optic cup. Development of the retina, the optic nerve, the lens, the cornea, the ciliary body, the iris, and the chamber of the eye. The development of the eyelid and lacrimal gland. The congenital malformations of the eye: congenital aniridia, congenital cataract, congenital glaucoma.
9. The development of the ear: The development of inner ear. The development of middle ear. The development of external ear. The congenital malformations of the ear: congenital preauricular fistula, stenosis of external acoustic meatus, congenital deafness.

IV. Definitions

Neuroepithelium, brain vesicle, cerebellar plate, optic vesicle, otic placode, anencephaly, myeloschisis, spina bifida, hydrocephalus, congenital cataract, congenital glaucoma, congenital deafness

V. Study questions

1. Describe the migration and differentiation of neural crest cells.
2. Try to describe the formation and evolution of the optic cup.
3. Describe the causes of congenital cataract and congenital deafness.

Chapter 26 Overview of Teratology

I. Objective and requirements

1. To know conception and classify of the congenital malformation.
2. To be familiar with the factors and their roles to induce congenital malformation formation.
3. To master the susceptible period for malformations of main organs during embryonic period.
4. To be familiar with prevention and diagnosis of the congenital malformation, and know precautionary measures for the congenital malformation.

II. Key points

1. The causes of congenital malformations.
2. The precautionary measures for congenital malformations.

III. Lecturing contents and important points

1. Conception and classify of the congenital malformation.
2. Genetics of the congenital malformation: The relation of the congenital malformation with hereditary factors. Chromosome aberration-induced and gene mutation-induced malformation.
3. The relation of malformation with environment factors: organic teratogen, physical teratogen, drugs, chemical substances, and other factors.
4. Interaction of environment factors and hereditary factors in the malformation genesis.
5. The susceptible period during embryonic period maybe induce the malformation.
6. Diagnosis of the congenital malformation: the paracentesis to amnion, ultrasonic examination and examination with X-ray.

7. Clinic treatment of the congenital malformation.

IV. Definitions

Congenital malformation, teratology, chromosome aberration, gene mutation, teratogen, susceptible period

V. Study questions

1. What are the factors associated with congenital malformations?
2. Try to write the main measures to prevent congenital malformation.