**Al-Farabi Kazakh National University**

***Higher School of Medicine***

*Department of Fundamental Меdicine*

Tasks for practical lessons of the discipline

" Morphology and physiology of human body "

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| **1.** | **The lymphatic system:**  **Max grade – 2**   1. *List the functions of the lymphatic system;* 2. *Explain how lymph forms and returns to the bloodstream;* 3. *Name the major cells of the lymphatic system and state their functions;* 4. *Describe the structure and function of the red bone marrow, thymus, lymph nodes, tonsils, and spleen* |
| **2.** | **FLUID, ELECTROLYTE, AND ACID–BASE BALANCE  I**  Fluid Balance and Electrolyte Balance :  **Max grade – 2**   1. *Name the major fluid compartments;* 2. *List the body’s sources of water and routes of water loss;* 3. *Describe mechanisms of regulating water intake and output;* |
| **3.** | **FLUID, ELECTROLYTE, AND ACID–BASE BALANCE  I**I  Acid–Base Balance:  **Max grade – 2**   1. *List the functions of sodium and potassium;* 2. *Explain how electrolyte balance is regulated;* 3. *Describe three ways the body regulates pH.* |
| **4.** | **Histology of the  Lymphatic System**  Cells of the lymphatic system, types of lymphatic tissue, red bone marrow, thymus, lymph nodes, tonsils, and spleen:  **Max grade – 2**   1. *Name the major cells of the lymphatic system; N* 2. *Name and describe the types of lymphatic tissue;* 3. *Describe the structure of the red bone marrow, thymus, lymph nodes, tonsils, and spleen* |
| **5.** | **The digestive system I**  **General Anatomy and Digestive Processes**  **The Mouth Through Esophagus:**  **Max grade – 2**   1. *List the functions and major physiological processes of the digestive system;* 2. *Ddistinguish between mechanical and chemical digestion;* 3. *Identify the basic chemical process that underlies all chemical digestion, name the major substrates and products of this process;* 4. *List the regions of the digestive tract and the accessory organs of the digestive system;* 5. *Describe the general nervous and chemical controls over digestive;* 6. *Describe the gross anatomy of the digestive tract from the mouth through the esophagus;* 7. *Identify the esophagus in the model;* 8. *Describe the composition and functions of saliva;* 9. *Describe the nervous control of salivation and swallowing.* |
| **6.** | **The digestive system II**  **The Stomach, The Liver, Gallbladder, and Pancreas**  **Max grade – 2**   1. *Describe the gross anatomy of the stomach;* 2. *Identify the stomach in the model;* 3. *State the function of each type of epithelial cell in the gastric mucosa;* 4. *Identify the secretions of the stomach and state their functions;* 5. *Explain how the stomach produces hydrochloric acid and pepsin;* 6. *Describe the contractile responses of the stomach to food;* 7. *Describe the three phases of gastric function and how gastric activity is activated and inhibited.* 8. *Describe the gross anatomy of the liver, gallbladder, bile duct system, and pancreas;* 9. *Identify the liver, gallbladder, bile ducts, and pancreas in the model;* 10. *Describe the digestive secretions and functions of the liver, gallbladder, and pancreas;* 11. *Explain how hormones regulate secretion by the liver and pancreas.* |
| **7.** | **The digestive system III**  **The Small Intestine and Large Intestine**  **Max grade – 2**   1. *Describe the gross anatomy of the small intestine;* 2. *Identify the small intestine’s parts in the model, and in the picture;* 3. *State how the mucosa of the small intestine differs from that of the stomach, and explain the functional significance of the differences;* 4. *Define contact digestion and describe where it occurs; describe the types of movement that occur in the small intestine;* 5. *Describe how each major class of nutrients is chemically digested, name the enzymes involved;* 6. *Discuss the functional differences among these enzymes;* 7. *Describe how each type of nutrient is absorbed by the small intestine.* 8. *Describe the gross anatomy of the large intestine;* 9. *Summarize the functions of the large intestine;* 10. *Contrast the mucosa of the colon with that of the small intestine;* 11. *State the physiological significance of intestinal bacteria;* 12. *Discuss the types of contractions that occur in the colon;* 13. *Explain the neurological control of defecation.* |
| **8.** | **Histology of digestive system**  **Max grade – 2**  Microscopic Anatomy of digestive organs and tissue  *Oral cavity, pharynx, esophagus, stomach, small intestine, colon, duodenum, Liver, pancreas.*   1. *Identify organs, tissues and their structural components at the microscopic level.* 2. *Describe the general plan of the structure of the hollow organs of the digestive system.* 3. *Identify esophagus, its tissue structure in the upper, middle and lower third of the esophagus.* 4. *Identify the layers of the digestive tract; describe the microscopic anatomy of the stomach; state the function of each type of epithelial cell in the gastric mucosa;* 5. *Identify the cells of the glands of the stomach and intestinal epithelium at the microscopic and ultramicroscopic level;* |
| **9.** | **Nutrition and metabolism I**  **Nutrition**  **Max grade – 2**   1. *Describe some factors that regulate hunger and satiety;* 2. *Define nutrient and list the six major categories of nutrients;* 3. *State the function of each class of macronutrients, the approximate amounts required in the diet, and some major dietary sources of each;* 4. *Name the blood lipoproteins, state their functions, and describe how they differ from each other;* 5. *Name the major vitamins and minerals required by the body and the general functions they serve.* 6. *Identify the normal indicators of the blood lipoproteins, glucose, cholesterols taking into account age, sex and individual characteristics;* |
| **10.** | **Nutrition and metabolism II**  **Metabolic States and Metabolic Rate**  **Body Heat and Thermoregulation**  **Max grade – 2**   1. *Define* the *absorptive* and *postabsorptive states;* 2. *Explain what happens to carbohydrates, fats, and proteins in each of these states;* 3. *Describe the hormonal and nervous regulation of each state;* 4. *Define metabolic rate and basal metabolic rate;* 5. *Describe some factors that alter the metabolic rate;* 6. *Identify the principal sources of body heat;* 7. *Describe some factors that cause variations in body temperature;* 8. *Define and contrast the different forms of heat loss;* 9. *Describe how the hypothalamus monitors and controls body temperature;* 10. *Describe conditions in which the body temperature is excessively high or low.* |
| **11.** | **Current Control-2 --Digestive system**  **Max grade – 62**   1. Demonstrate knowledge of normal anatomy and physiology   (including histology) on the topic Digestive system and Lymphatic system 2. Demonstrate knowledge of physiology on the topic Fluid, Electrolyte and Acid-base balance |
| **12.** | **Histology of digestive system**  **Max grade – 2**  Microscopic Anatomy of digestive organs and tissue  *Oral cavity, pharynx, esophagus, stomach, small intestine, colon, duodenum, Liver, pancreas.*   1. *Describe the microscopic anatomy of the small intestine and large intestine; describe the mucosa of the small intestine and the mucosa of the colon.* 2. *Clarify the microscopic and ultramicroscopic structure of hepatocytes and their functional significance;* 3. *Describe of ​​the features of blood supply to the liver;* 4. *Sources of development of the liver and pancreas.* 5. *describe the microscopic anatomy of the liver, gallbladder, bile duct system, and pancreas;* |
| **13.** | **The Endocrine System I**  **Overview of the Endocrine System**  **The Hypothalamus and Pituitary Gland**  **Max grade – 2**   1. *Define hormone and endocrine system;* 2. *Name several organs of the endocrine system;* 3. *Identify the structure and lobuses the thyroid gland;* 4. *Contrast endocrine with exocrine glands; recognize the standard abbreviations for many hormones;* 5. *Describe similarities and differences between the nervous and endocrine systems.* 6. *Describe the structure and location of the remaining endocrine glands;* 7. *Name the hormones these endocrine glands produce, what stimulates their secretion, and their functions;* 8. *Discuss the hormones produced by organs and tissues other than the classical endocrine glands.* |
| **14.** | **The Endocrine System II**  **Other Endocrine Glands**  **Max grade – 2**   1. *Define hormone and endocrine system;* 2. *Name several organs of the endocrine system;* 3. *Identify the structure and lobuses the thyroid gland;* 4. *Contrast endocrine with exocrine glands; recognize the standard abbreviations for many hormones;* 5. *Describe similarities and differences between the nervous and endocrine systems.* 6. *Describe the structure and location of the remaining endocrine glands;* 7. *Name the hormones these endocrine glands produce, what stimulates their secretion, and their functions;* 8. *Discuss the hormones produced by organs and tissues other than the classical endocrine glands.* |
| **115.** | **The Endocrine System III**  **Hormones and Their Actions**  **Max grade – 2**   1. *Explain some general causes and examples of hormone hyposecretion and hypersecretion;* 2. *Briefly describe some common disorders of pituitary, thyroid, parathyroid, and adrenal function; in more detail,* |
| **116.** | **Histology of Endocrine System I**  **Microscopic Anatomy of endocrine organs and tissue**  **Endocrine system. Central endocrine system. Hypothalamus, pituitary, pineal gland.**  **Max grade – 2**   1. *Describe the microscopic anatomy of portion of the endocrine system;* 2. *Describe the histology of endocrine system;* 3. *Recognize the organs of the endocrine system on their constituent tissue elements at the microscopic and ultramicroscopic levels.* 4. *Characterize the embryonic sources of development and the general laws of the structure, morphofunctional features of the organs of the endocrine system* 5. *Explain the participation of the endocrine system in the regulation of various body functions.* |
| **17.** | **The Endocrine System III**  **Hormones and Their Actions**  **Endocrine Disorders**  **Max grade – 2**   1. *Explain some general causes and examples of hormone hyposecretion and hypersecretion;* 2. *Briefly describe some common disorders of pituitary, thyroid, parathyroid, and adrenal function; in more detail,* 3. *Describe the causes and pathology of diabetes mellitus;* |
| **18.** | **The Endocrine System IV**  **Stress and Adaptation**  **Eicosanoids and Other Signaling Molecules**  **Max grade – 2**   1. *Give a physiological definition of stress;* 2. *Discuss how the body adapts to stress through its endocrine and sympathetic nervous systems.* 3. *Explain what eicosanoids are and how they are produced;* 4. *Identify some classes and functions of eicosanoids;* 5. *Describe several physiological roles of prostaglandins* |
| **19.** | **Histology**  **Sexual Reproduction and Development**  **Max grade – 2**   1. *Define explain why sexual reproduction in humans requires two different types of gametes;* 2. *Enumerate the functions of the male and female reproductive systems;* 3. *Distinguish between the gonads of the two sexes, and between the internal and external genitalia.* 4. *Describe the anatomy of the male reproductive tract.* |
| **20.** | **Histology of Endocrine System II**  **Microscopic Anatomy of endocrine organs and tissue**  **Peripheral endocrine system. Adrenal gland, thyroid, parathyroid glands**.  **Max grade – 2**   1. *Recognize the organs of the endocrine system on their constituent tissue elements at the microscopic and ultramicroscopic levels.*   *Characterize the embryonic sources of development and the general laws of the structure, morphofunctional features of the organs of the endocrine system.* |
| **21.** | **Current control №2 --The Endocrine system**  **Max grade – 22**  Demonstrate knowledge of normal anatomy and physiology   (including histology) on the topic **The Endocrine system** |
| **22.** | **Histology Reproductive  System Male**  **Male reproductive system.**  **Max grade – 2**   1. *Identify the structural elements of the organs of the male reproductive system in histological specimens.* 2. *Explain ​​the features of spermatogenesis, the endocrine function of the testes,* 3. *Determine the tissue composition and layers of the vas deferens and additional organs of the male reproductive system****.*** 4. *Describe the microscopic anatomy of portion of the male urinary system.* |
| **23.** | **The male Reproductive system**  **Male Reproductive Anatomy**  **Max grade – 2**   1. *Define explain why sexual reproduction in humans requires two different types of gametes;* 2. *Enumerate the functions of the male and female reproductive systems;* 3. *Distinguish between the gonads of the two sexes, and between the internal and external genitalia.* 4. *Describe the anatomy of the male reproductive tract.* |
| **24.** | **Histology Reproductive System II Female -1**  **Female reproductive system: structure and functions of the ovary, ovogenesis, fallopian tubes**.  **Max grade – 2**   1. *Identify the structural elements of the organs of the female reproductive system in histological preparations.* 2. *Explain the features of ovogenesis. To master the endocrine functions of the ovaries.* 3. *Explain determine the tissue composition and membrane of the oviduct;* 4. *Define the microscopic anatomy of portion of the female urinary system* |
| **225.** | **Histology Reproductive System II Female -2**  **Female reproductive system: structure and functions of the uterus, vagina, ovarian-menstrual cycle; age-related changes; hormonal regulation.**  **Max grade – 2**   1. *Identify the structural elements of the organs of the female reproductive system in histological preparations.* 2. *Explain determine the tissue composition and membrane of the oviduct and uterus.* 3. *Explain ​​the ovarian-menstrual cycle and its regulation. To clarify the structural features of the mammary gland.* 4. *Define the microscopic anatomy of portion of the female urinary system.* |
| **26.** | **The male Reproductive System**  **Sperm and Semen**  **Male Sexual Response**  **Max grade – 2**   1. *Trace the pathway taken by a sperm cell from its formation to ejaculation, naming all the passages that it travels;* 2. *Describe the structure, locations, and functions of the male accessory glands, scrotum, and penis; and discuss male sexual development from puberty through andropause.* 3. *Explain the relevance of meiosis to sexual reproduction, state the stages of meiosis, and describe how it differs from mitosis;* 4. *Describe the stages in the production of sperm and eggs, how these stages relate to meiosis, and the major differences between sperm and egg production;* 5. *Give a functional description of the major components of semen and sperm cells*. |
| **27.** | **The Female Reproductive System I**  **Reproductive Anatomy : structure and functions of the ovary, ovogenesis, fallopian tubes**.  **Max grade – 2**   1. *Describe the anatomy of the ovaries;* 2. *Describe the gross anatomy of the female reproductive tract;* 3. *Relate the process of egg production to the cyclic changes in the ovary and uterus;* 4. *Describe the production of eggs and how it is correlated with cyclic changes in the ovaries and uterus;* 5. *Describe the physiological processes that occur in the female during sexual intercourse.* |
| **28.** | **Human development- Embryology I-II** **Human embryology**  **Sex cells. Early stages of development of the human embryo.**  **Max grade – 2**   1. *Identify Sex cells. Early stages of development of the human embryo.* 2. *Define the microscopic anatomy of portion of the embrion.* |
| **29.** | **The Female Reproductive System II**  **Oogenesis and the Sexual Cycle**  **Female Sexual Response**  **Max grade – 2**   1. *Describe the structure and function of the glands and other accessory organs of the female reproductive system;* 2. *Discuss female sexual development from puberty through menopause.* 3. Menstruation Cycle 4. Female Sexual Response |
| **30.** | **The Female Reproductive System III**  **Pregnancy and Childbirth**  **Lactation**  **Max grade – 2**   1. *Itemize the major hormones of pregnancy and describe their effects;* 2. *Describe the effects of pregnancy on a woman’s body;* 3. *Explain what happens in each stage of childbirth;* 4. *Discuss the hormonal control of lactation;* 5. *Discuss the composition of colostrum and breast milk* |
| **31.** | **Current control №3 The Reproductive system**  **Max grade – 24**  Demonstrate knowledge of normal anatomy and physiology   (including histology) on the topic **The Reproductive system** |
| **32** | **Human development- Embryology I-II** **Human embryology**  **Sex cells. Early stages of development of the human embryo.**  **Max grade – 2**   1. *Identify Sex cells. Early stages of development of the human embryo.*   *Define the microscopic anatomy of portion of the embrion.* |
| **33.** | **Human development- Embryology II Human embryology Fertilization. Splitting up.**  **Max grade – 2** |
| **34.** | **Human development- Embryology**  **Human embryology Gastrulation. Differentiation of germ layers, organogenesis.**  **Max grade – 2**   1. *Describe a micrograph of the umbilical cord, fetal and maternal parts of the placenta.* 2. *Define and Identify embrions cells.* |
| **35.** | **Human development- Embryology III-IV**  **Human embryology Gastrulation. Differentiation of germ layers, organogenesis.**  **Max grade – 2**   1. *Describe a micrograph of the umbilical cord, fetal and maternal parts of the placenta.* 2. *Define and Identify embrions cells.* |
| **36.** | **Current control №6--The Embryology**  **Max grade – 22**  Demonstrate knowledge of normal anatomy and physiology   (including histology) on the topic **The Embryology** |
| **37.** | **Histology of Nervous System**  **Nervous system I**  **Supportive Cells (Neuroglia)**  **Nervous tissue: nerve cells, neuroglia, nerve fibers, nerve endings**.  **Max grade – 2**   1. *General structure of neurocytes is the body and processes.* 2. *Concept of functional polarization of neurocytes.* 3. *Morphological and functional classification of neurocytes.* 4. *Structure of two types of nerve fibers.* 5. *Describe the name the six types of cells that aid neurons, and state their respective functions;* 6. *Describe the myelin sheath that is found around certain nerve fibers, and explain its importance;* 7. *Describe the relationship of unmyelinated nerve fibers to their supportive cells;* 8. *Explain how damaged nerve fibers regenerate*. |
| **38.** | **Histology of nervous System II -1**  **Nervous system. Peripheral nervous system. The spinal cord node. Spinal ganglion. Vegetative ganglion. Spinal cord.,**  **Max grade – 2**   1. *Identify the organs of the nervous system and their tissue elements at the microscopic and ultramicroscopic levels.* 2. *Characterize the embryonic sources of development and the general laws of the structure, morphofunctional features of the organs of the nervous system.* 3. *Reproduce simple and complex reflex arcs typical of the somatic and autonomic nervous system, taking into account their characteristics at the organ and cellular levels.* |
| **39.** | **Biophysics of  nervous System**  **Electrophysiology of Neurons**  **Synapses**  **Max grade – 2**   1. *Explain why a cell has an electrical charge difference (voltage) across its membrane;* 2. *Explain how stimulation of a neuron causes a local electrical response in its membrane;* 3. *Explain how local responses generate a nerve signal; explain how the nerve signal is conducted down an axon.* 4. *Explain how messages are transmitted from one neuron to another;* 5. *Give examples of neurotransmitters and neuromodulators and describe their actions;* 6. *Explain how stimulation of a postsynaptic cell is stopped* |
| **40.** | **Biophysics of  nervous System**  **Neural Integration**  **Max grade – 2**   1. *Explain how a neuron “decides” whether or not to generate action potentials;* 2. *Explain how the nervous system translates complex information into a simple code;* 3. *Explain how neurons work together in groups to process information and produce effective output;* 4. *Describe how memory works at the cellular and molecular levels.* |
| **41.** | **The Nervous System-The Spinal Cord I**  **The Spinal Cord**  **Max grade – 2**   1. *Identify the parts of spinal cord in the model;* 2. *Identify the innervation of the spinal cord’s branch;* 3. *State the three principal functions of the spinal cord;* 4. *Describe its gross and microscopic structure;* 5. *Trace the pathways followed by nerve signals traveling up and down the spinal cord.* |
| **42.** | **The Nervous System-The Spinal Cord**  **The Spinal nerves**  **Max grade – 2**   1. *Define describe the anatomy of nerves and ganglia in general;* 2. *Describe the attachments of a spinal nerve to the spinal cord;* 3. *Trace the branches of a spinal nerve distal to its attachments;* 4. *Name the five plexuses of spinal nerves and describe their general anatomy;* 5. *Name some major nerves that arise from each plexus;* 6. *Explain the relationship of dermatomes the spinal nerves.* |
| **43.** | **The nervous System-The Spinal Cord**  **Somatic Reflexes**  **Max grade – 2**   1. *Define reflex and explain how reflexes differ from other motor actions;* 2. *Describe the general components of a typical reflex arc;* 3. *Explain how the basic types of somatic reflexes function.* |
| **44.** | **Brain I Overview of the Brain Meninges, Ventricles, Cerebrospinal Fluid, and Blood Supply**  **Max grade – 2**   1. *Recognize the central organs of the nervous system of their constituent tissue elements at the microscopic and ultramicroscopic levels.* 2. *Formulate an idea of ​​the reflex activity of the cerebral cortex based on knowledge of its cyto- and myeloarchitectonics.* 3. *Properly describe the interneuronal connections of the cerebellar cortex.* 4. *Describe the major subdivisions and anatomical landmarks of the brain; describe the locations of its gray and white matter; identify the gray and white matter in the picture;* 5. *Describe the embryonic development of the CNS and relate this to adult brain anatomy; describe the meninges of the brain;* 6. *Describe the fluid-filled chambers within the brain;* 7. *Discuss the production, circulation, and function of the cerebrospinal fluid that fills these chambers;* 8. *Explain the significance of the brain barrier system.* |
| **45.** | **The nervous System - Brain II**  **The Hindbrain and Midbrain**  **Max grade – 2**   1. *List the components of the hindbrain and midbrain and their functions;* 2. *Describe the location and functions of the reticular formation.*   *Find and identify the Hindbrain and Midbrain in the model.* |
| **46.** | **The nervous System- Brain III**  **The Forebrain**  **Max grade – 2**   1. *Name the three major components of the diencephalon and describe their locations and functions;* 2. *Identify the five lobes of the cerebrum in the model and their functions;* 3. *Describe the three types of tracts in the cerebral white matter;*   *Describe the location and functions of the basal nuclei and limbic system.* |
| **47.** | **The nervous System - Brain IV**  **Integrative Functions of the Brain**  **Max grade – 2**   1. *List the types of brain waves and discuss their relationship to mental states;* 2. *Describe the stages of sleep, their relationship to the brain waves, and the neural mechanisms of sleep;* 3. *Identify the brain regions concerned with consciousness and thought, memory, emotion, sensation, motor control, and language;* 4. *Discuss the functional differences between the right and left cerebral hemispheres.* |
| **48.** | **Histology of nervous system**  **Central nervous system. Brain. The cerebral cortex. Cerebellum.** |
| **49.** | **Current Control №5-**  **The Nervous System - BRAIN**  **Max grade – 32**  Demonstrate knowledge of normal anatomy and physiology   (including histology) on the topic **The Nervous System and Sensory Organs** |
| **50.** | **The nervous System - The Cranial Nerves I**  **Max grade – 2**   1. *List the 12 cranial nerves by name and number;* 2. *Identify where each cranial nerve originates and terminates in the model and picture;* 3. *State the functions of each cranial nerve.* |
| **51.** | **The nervous System -The Cranial Nerves II**  **Max grade – 2**   1. *List the 12 cranial nerves by name and number;* 2. *Identify where each cranial nerve originates and terminates in the model and picture;* 3. *State the functions of each cranial nerve.* |
| **52.** | **Histology The Sensory Organs I**  **Organ of sight, organ of smell. Organs of hearing and balance, taste**.  **Max grade – 2**   1. *Describe the microscopic anatomy of the ear,* 2. *Describe the microscopic anatomy of the the eye,* 3. *Describe the microscopic anatomy of the organ of taste* 4. *Describe the microscopic anatomy of the organ of smell.* |
| **53.** | **The nervous System -The Autonomic Nervous System I**  **General Properties of the Autonomic Nervous System**  **Anatomy of the Autonomic Nervous System**  **Max grade – 2**   1. *Explain how the autonomic and somatic nervous systems differ in form and function;* 2. *Explain how the two divisions of the autonomic nervous system differ in general function.* 3. *Identify the anatomical components and nerve pathways of the sympathetic and parasympathetic divisions in the picture;* 4. *Discuss the relationship of the adrenal glands to the sympathetic nervous system;* 5. *Describe the enteric nervous system of the digestive tract and explain its significance;* 6. *Name the neurotransmitters employed at different synapses of the ANS;* 7. *Name the receptors for these neurotransmitters and explain how they relate to autonomic effects;* 8. *Explain how the ANS controls many target organs through dual innervation;* 9. *Explain how control is exerted in the absence of dual innervation.*   *Describe how the autonomic nervous system is influenced by the central nervous system* |
| **54.** | **The nervous System -The Autonomic Nervous System II**  **Autonomic Effects on Target Organs**  **Central Control of Autonomic Function**  **Max grade – 2** |
| **55.** | **The nervous System -The Sensory Organs I**  **Properties and Types of Sensory Receptors**  **The General Senses; The Chemical Senses**  **Max grade – 2**   1. *Define receptor and sense organ; list the four kinds of information obtained from sensory receptors, and describe how the nervous system encodes each type; outline three ways of classifying receptors.* 2. *List several types of somatosensory receptors;* 3. *Describe the projection pathways for the general senses; explain the mechanisms of pain and the spinal blocking of pain signals;* 4. *Explain how taste and smell receptors are stimulated; identify in the picture;* 5. *Describe the receptors and projection pathways for these two senses.* |
| **56.** | **Histology The Sensory Organs II**  **Organ of sight, organ of smell. Organs of hearing and balance, taste**.  **Max grade – 2**   1. *Describe the microscopic anatomy of the ear,* 2. *Describe the microscopic anatomy of the the eye,* 3. *Describe the microscopic anatomy of the organ of taste* 4. *Describe the microscopic anatomy of the organ of smell.* |
| **57.** | **The nervous System -The Sensory Organs II**  **The Chemical Senses—Taste and Smell**  **Max grade – 2**   1. *Describe the receptor cells for taste and smell and identify their anatomical locations;* 2. *Identify the five primary taste sensations and the chemicals that produce them;* 3. *Discuss factors other than taste that contribute to the flavor of food;* 4. *Iidentify the brain regions that process gustatory and olfactory information.* |
| **58.** | **The nervous System -The Sensory Organs III**  **Eye and Vision**  **Max grade – 2**   1. *Describe and identify the anatomy of the eye and its accessory structures in the picture and in the model;* 2. *Discuss the structure of the retina and its receptor cells;* 3. *Explain how the optical system of the eye creates an image on the retina;* 4. *Discuss how the retina converts this image to nerve signals;* 5. *Explain why different types of receptor cells and neural circuits are required for day and night vision;* 6. *Describe the mechanism of color vision; and trace the visual projection pathways in the brain.* |
| **59.** | **The nervous System -The Sensory Organs IV**  **Hearing and Equilibrium**  **Max grade – 2**   1. *Identify the properties of sound waves that account for pitch and loudness;* 2. *Describe the gross and microscopic anatomy of the ear;* 3. *Identify and find the structure of the ears in the model;* 4. *Explain how the ear converts vibrations to nerve signals and discriminates between sounds of different intensity and pitch;* 5. *Explain how the vestibular apparatus enables the brain to interpret the body’s position and movements;*   *Describe the pathways taken by auditory and vestibular signals to the brain.* |
| **60.** | **Current Control №6 --**  **The Nervous System and Sensory Organs**  **Max grade – 32**  Demonstrate knowledge of normal anatomy and physiology   (including histology) on the topic **The Nervous System and Sensory Organs** |

**Methodical instruction for tutorials**

**Aim:** apply knowledge of morphology (anatomy and histology) and physiology of organs and systems of the human body (respiratory, cardiovascular, hematopoietic, digestive, urinary, reproductive, endocrine, musculoskeletal and skin as an organ, nervous, sensory organs) in age and the sexual aspect of human organ systems for understanding vital processes and maintaining homeostasis;

**Learning outcomes:**

1. *demonstrate knowledge of anatomy, topography and visualization in the age and sexual aspects of human organ systems;*
2. *be able to identify cellular and non-cellular structures that make up the tissues of organ systems on microscopic specimens with an understanding of their formation and function;*
3. *demonstrate knowledge of the physiological processes that determine the activity and mechanisms of regulation of human organs and systems (blood circulation, respiration, digestion, excretion, movement, blood formation, functioning of the senses);*
4. *understand and apply knowledge of the neuro-endocrine regulation of homeostasis, metabolism in different situations;*
5. *understand the processes and anatomical and physiological processes during pregnancy, development and growth, involutional changes, with various physiological stress variants;*
6. *demonstrate knowledge of the physiology of higher nervous activity and the cognitive process;*
7. *be able to conduct research on basic physiological functions;*
8. *demonstrate analytical skills in the integration of knowledge of the anatomy, histology and function of the human body to understand and evaluate normal life processes.*
9. *demonstrate the ability to identify learning gaps and create strategies to enhance one’s own knowledge and skills.*
10. *communicate effectively with other students and teachers regarding medical and scientific information, articulate their opinions clearly when discussing the morphological structure and physiological processes, and work effectively as a member of the team.*

**Work schedule:**

1. Familiarize yourself with the basic and additional literature, use textbooks, the syllabus and present directions, Internet resources to prepare for seminars.
2. Be prepared for class and participate actively on case-discussion and problem solving group activities.
3. Use the examples (in this number cases and your own experience studied before) for illustration of theoretic material.
4. Use different tools for studying, discussion and visualisation of thoughts - drawing, mind maps, 3d-modelling.
5. Use the group work with cases for the development of teamwork skills, communication, problem solving and self-studying.

**Assessment points**

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| Week/date | Topic title (lectures, practical classes,  Independent work of students) | Max. grade |
| 1-1 | The lymphatic system and Immune system | 2 |
| 1-2 | FLUID, ELECTROLYTE, AND ACID–BASE BALANCE I  Fluid Balance Electrolyte Balance | 2 |
| 1-3 | FLUID, ELECTROLYTE, AND ACID–BASE BALANCE II  Acid–Base Balance | 2 |
| 1-4 | Histology of the  Lymphatic System  Cells of the lymphatic system, types of lymphatic tissue,  red bone marrow, thymus, lymph nodes, tonsils, and spleen | 2 |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers and Current control questions - work on mistakes. |  |
| 2-1 | The digestive system I  General Anatomy and Digestive Processes  The Mouth Through Esophagus | 2 |
| 2-2 | The digestive system II  The Stomach Liver, gallblader, pancreas |  |
| 2-3 | The digestive system III  The Small Intestine and Large Intestine | 2 |
| 2-4 | Histology of digestive system I  Microscopic Anatomy of digestive organs and tissue II  Topic: Digestive system. Middle section: small intestine, colon, duodenum. | 2 |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers - work on mistakes. |  |
| 3-1 | Nutrition and metabolism I  Nutrition | 2 |
| 3-2 | Nutrition and metabolism II  Metabolic States and Metabolic Rate  Body Heat and Thermoregulation | 2 |
| 3-3 | Current Control 1 | 62 |
| 3-4 | Histology of digestive system II  Microscopic Anatomy of digestive organs and tissue III Liver, pancreas | 2 |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers and Current control questions- work on mistakes. |  |
| 4-1 | The Endocrine System I  Overview of the Endocrine System  The Hypothalamus and Pituitary Gland  Other Endocrine Glands | 2 |
| 4-2 | The Endocrine System II  Other Endocrine Glands | 2 |
| 4-3 | The Endocrine System III.  Hormones and Their Actions | 2 |
| 4-4 | Histology of Endocrine System I  Microscopic Anatomy of endocrine organs and tissue  Endocrine system. Central endocrine system. Hypothalamus, pituitary, pineal gland. | 2 |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers and work on mistakes. |  |
| 5-1 | The Endocrine System III  Hormones and Their Actions to target cells  Endocrine Disorders | 2 |
| 5-2 | The Endocrine System IV  Stress and Adaptation  Eicosanoids and Other Signaling Molecules | 2 |
| 5-3 | Histology of Endocrine System II  Microscopic Anatomy of endocrine organs and tissue  Peripheral endocrine system. Adrenal gland, thyroid, parathyroid glands. | 2 |
| 5-4 | Histology Reproductive System  Sexual Reproduction and Development | 2 |
| IWS -1 |  |  |
| IWS with teacher | Consultation on design work IWS-1. Division into teams and distribution of topics to cases. Analysis of written answers - work on mistakes. |  |
|  | MIDTERM 1 | 100 |
| 6-1 | Current Control 2 | 22 |
| 6-2 | Histology Reproductive System I Male  Male reproductive system. | 2 |
| 6-3 | Male Reproductive Anatomy. Puberty, Hormonal Control, and Climacteric | 2 |
| 6-4 | Histology Female reproductive system: structure and functions of the ovary, ovogenesis, fallopian tubes. | 2 |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers- work on mistakes. |  |
| 7-1 | Histology Female reproductive system: structure and functions of the ovary, ovogenesis, fallopian tubes. | 2 |
| 7-2 | Sperm and Semen. Male Sexual Response | 2 |
| 7-3 | Female Reproductive Anatomy. Puberty and Menopause | 2 |
| 7-4 | Embryology I  Human embryology Sex cells. Early stages of development of the human embryo. | 2 |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers- work on mistakes. |  |
| 8-1 | Oogenesis and the Sexual Cycle. Female Sexual Response |  |
| 8-2 | Pregnancy and Childbirth. Lactation | 2 |
| 8-3 | Current control №3 Reproductive | 24 |
| 8-4 | Human embryology Sex cells. Early stages of development of the human embryo. | 2 |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers- work on mistakes. |  |
| 9-1 | Human embryology Fertilization. Splitting up. | 2 |
| 9-2 | Human embryology Gastrulation. Differentiation of germ layers, organogenesis. | 2 |
| 9-3 | Human embryology Gastrulation. Differentiation of germ layers, organogenesis. | 2 |
| 9-4 | Current control №4 | 22 |
| IWS -2 |  |  |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers- work on mistakes. |  |
| 10-1 | Biophysics of nervous System Electrophysiology of Neurons Synapses | 2 |
| 10-2 | Biophysics of nervous System Neural Integration | 2 |
| 10-3 | Histology of Nervous System Supportive Cells (Neuroglia) | 2 |
| 10-4 | Histology of Nervous System Peripheral nervous system. The spinal cord | 2 |
| IWS with teacher | Presentation of Independent work of the student -1 |  |
|  | Midterm 2 | 100 |
| 11-1 | The Nervous System-The Spinal Cord I  The Spinal Cord | 2 |
| 11-2 | The Nervous System-The Spinal Cord II  The Spinal nerves | 2 |
| 11-3 | The nervous System-The Spinal Cord III  Somatic Reflexes | 2 |
| 11-4 | Histology of nervous system II-2  Central nervous system. Brain. The cerebral cortex. Cerebellum. The nervous System - Brain I  Overview of the Brain Meninges, Ventricles, Cerebrospinal Fluid, and Blood Supply | 2 |
| IWS with teacher | Consultation on design work IWS-2. Division into teams and distribution of topics to cases. Analysis of written answers - work on mistakes. |  |
| 12-1 | Brain I Overview of the Brain Meninges, Ventricles, Cerebrospinal Fluid, and Blood Supply | 2 |
| 12-2 | Brain II The Hindbrain and Midbrain | 2 |
| 12-3 | Brain III The Forebrain | 2 |
| 12-4 | Histology The Sensory Organs Organ of sight, organ of smell. Organs of hearing and balance, taste. | 2 |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers and Current control questions- work on mistakes. |  |
| 13-1 | Brain IV Integrative Functions of the Brain | 2 |
| 13-2 | Current Control №5 | 32 |
| 13-3 | The Cranial Nerves I | 2 |
| 13-4 | Histology The Sensory Organs Organ of sight, organ of smell. Organs of hearing and balance, taste. | 2 |
| IWS with teacher | Consultation on anatomical structures for models according to the topics covered. Analysis of written answers - work on mistakes. |  |
| 14-1 | The Cranial Nerves II | 2 |
| 14-2 | The Autonomic Nervous System I General Properties and anatomy of the Autonomic Nervous System | 2 |
| 14-3 | The Autonomic Nervous System II Autonomic Effects on Target Organs. Central Control of Autonomic Function | 2 |
| 14-4 | Properties and Types of Sensory Receptors The General Senses; The Chemical Senses | 2 |
| IWS with teacher | Presentation of Independent work of the student -2 |  |
| 15-1 | Chemical Senses—Taste and Smell. Eye and Vision | 2 |
| 15-2 | Eye and Vision | 2 |
| 15-3 | The Sensory Organs IV Hearing and Equilibrium | 2 |
| 15-4 | Current control №6 | 32 |
| IWS with teacher | Сonsultation on covered topics. Analysis of written answers and Current control questions- work on mistakes. |  |
|  | MIDTERM 1 | 100 |
|  | Total | 300 |

**SOME TIPS ON TEAMWORK AND LEARNING [[1]](#footnote-1)**

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Therefore, group work is included as an essential component in the practical exercises of our course. In addition, it aims to provide a safe environment in which you can try out new ideas and practices and acquire relevant group skills. These can be tasks for performance in pairs, triples or small groups of 4-6 people (work with cases, tasks of the ISW, etc.).

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Below we provide some examples of constructive and destructive group behavior[[2]](#footnote-2)

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· formulate the desired result.

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Joint writing is one of the most difficult parts of group work. There are many ways to do this, and your group must decide how to separate the work of writing, comparing, editing, and finalizing your work. Writing in a group (six people crowd around the keyboard) is a recipe for conflict and lack of progress. The other extreme - when one person assumes all responsibility and ultimately does most of the work - is also unproductive and contributes to conflict.

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3- Co-writing. This is the most productive way to solve group problems and provides the greatest benefit from collaboration. For example: in each section, there is a writer and at least one reviewer, and each team member is the author of a section and a reviewer of another one.

All team members before finalization by **the editor** must review the final product. Alternatively, you can have one author with others, editors, add and review, and someone tidies the finished report.

Try to divide the writing of source documents into tasks and solve them individually or in pairs. After the first draft of the sections are written, send out all the components and read them. You will probably need to come together to discuss how to combine them so that they fit together. Any participants who were not involved in preparing the drafts can do part of this work. Then edit, improve and polish the draft. It’s convenient to collaborate on documents in Google documents.

When preparing a report / final document, regularly check the following:

- Is the purpose of the project clear from the report?

- Are the conclusions or recommendations clear?

- Do conclusions follow from the main part of the report?

- Do sections fit well?

- Does the report achieve goals (and evaluation criteria)?

- Are the necessary components sufficiently covered?

Whatever method you use, all group members must agree on the process and how they are going to maximize the collaborative approach to writing the final document.

**Monitoring team performance and coping**

Below is a checklist that includes a list of common problems that arise in a group work. Use it regularly to identify problems before they get out of hand. If serious problems and tensions arise, use it to determine where something might go wrong. First answer each question about yourself, and then give answer to this **question** about the group as a whole. Then gather a group and discuss where, in your opinion, problems may arise, and think about how you can overcome these problems.

Each participant must complete this checklist. You should do this exercise regularly to track and improve your team’s performance.

1. Answer each question regarding your teamwork.

2. Answer each question regarding the rest of the team.

3. Get together with your entire team and discuss where, in your opinion, any problems arise.

4. Discuss what you are going to do to overcome these problems.

**Checklist for self-assessment of team effectiveness.**

|  |  |  |  |
| --- | --- | --- | --- |
| You | I personally | Group as a whole | Comments |
| Effectively clarify your tasks and tasks at each stage? |  |  |  |
| Evaluate the progress of work? |  |  |  |
| We clarify and document everything that the group decided? |  |  |  |
| We clarify who will do what and how? |  |  |  |
| We clarify by what date each task should be done? |  |  |  |
| Setting meeting management rules? |  |  |  |
| Adhere to agreed rules? |  |  |  |
| Listening to each other? |  |  |  |
| Allow some team members to dominate? |  |  |  |
| Allow some team members to refuse / withdraw? |  |  |  |
| We sacrifice personal desires for the success of the team? |  |  |  |
| Recognize the feelings of other team members? |  |  |  |
| Making equal contributions to team progress? |  |  |  |
| Adhere to agreed rules for writing and naming files? |  |  |  |

**Points and Grade**

Group tasks and assignments mean that grades are given to the whole group based on the results of the work of the whole group. Everyone should be interested in ensuring the effective contribution of all members of the group and ensuring the high quality of the assignment. Sometimes, to assess the relative contribution of each to the group process, a form of peer-to-peer or peer review and a team assessment form will be used. This can be used to moderate assignment grades, or simply as a way to give feedback on your work in a group. The following are examples of student assessment criteria for team training.

|  |  |
| --- | --- |
| **№** | **Student assessment criteria in practical classes** |
| 1 | *Preparation for classes:*  He studies information focused on the case and problematic issues, uses various sources, and supports the statements with relevant links. |
| 2 | *Group skills and professional attitude:*  Demonstrates excellent attendance, reliability, responsibility Takes the initiative, takes an active part in the discussion, helps the teammates, willingly takes on tasks |
| 3 | *Communication skills:*  Actively listens, shows emotions according to the situation, is susceptible to non-verbal and emotional signals, shows respect and correctness in relation to others, helps to resolve misunderstandings and conflicts |
| 4 | *Feedback Skills:*  Demonstrates a high level of introspection, critically evaluates oneself and colleagues, provides constructive and objective feedback in a friendly manner, accepts feedback without opposition |
| 5 | *Skills of critical thinking and effective learning:*  Effectively participates in generating hypotheses and formulating problematic questions, gives relevant examples from life, skillfully applies knowledge to the problem / case under consideration, critically evaluates information, draws conclusions, explains and substantiates statements, draws diagrams and drawings, demonstrates a constant interest in the material being studied |
| 6 | *Theoretical knowledge and skills on the topic of the lesson:*  All key aspects are presented logically; accuracy, relevance of answers to the questions posed without redundancy; integration of theoretical issues; Use of relevant examples proper use of professional terminology |

**Literature:**

1. Kenneth S. Saladin, Robin K. McFarland,Christina A. Gan, Heather N. Cushman. Essentials of Anatomy &amp; Physiology -2nd ed.- Penn Plaza, McGraw-Hill Education, New York, NY 2018, -786 p.
2. Mazumdar, Sibani. Anatomy at a Glance: An Exam-Oriented Text / S. Mazumdar ; Calcutta National Medical College [et al.]. - 2nd ed. - New Delhi; London; Philadelphia: Jaypee, 2014. - 534 p.
3. James S. Lowe and Peter G. Anderson. Stevens & Lowe's Human Histology (Fourth Edition) Book ( 4th Edition ), P.-429. 2015.
4. Concise Medical Dictionary [Text]: monograph. - Oxford: Oxford University Press, 1996. - 719 с. - ISBN.
5. Computational Biochemistry and Biophysics [Electronic resource]: textbook / O. M. Becker et al.. - New York : Marcel Dekker, Inc., 2001. - 525 p. - ISBN.
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**Additional literature:**

1. USMLE Step 1 [Electronic resource] : Physiology: lecture notes / B. Wilson. - Electronic text data 10.4 Mb. - New York : Kaplan Medical, 2017. - 421 p. - The Main Page Title. - ISBN 978-1-5062-0876-3.
2. USMLE step 1 [Text] : lecture notes 2017 / ed.: J. White, D. Seiden. -New York: Kaplan medical, 2017. - 2714 p. - ISBN.
3. Wilson, Britt.  USMLE Step 1 [Electronic resource] : Physiology: lecture notes / B. Wilson. - Electronic text data 10.4 Mb. - New York : Kaplan Medical, 2017. - 421 p. - The Main Page Title. - ISBN.
4. Human Anatomy [Text] : For Students / B. D. Ghosh ; [Anatomical Society of India (West Bengal Chapter) et al.]. - 2nd ed. - New Delhi ; Panama City ; London : Jaypee, 2013. - 948 p. : il. - Ind.: p. 913-948. - ISBN.
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6. Latin and Fundamentals of Medical Terminology for Medical Students with Training English [Text] : educational man. / A. Zh. Shoibekova ; Kazakh National Medical University. - Almaty : Evero, 2016. - 163, [1] p. : tab. - Bibliogr.: p. 161. - ISBN.

**WWW resources:**

1. https://app.lecturio.com/#/
2. https://3d4medical.com/
3. https://www.youtube.com/channel/UCc\_I2c2bUtO0p4DVeo6-Kxg
4. University of Michigan Medical School

**SOME TIPS ON TEAM TEAMWORK AND LEARNING**[[3]](#footnote-3)

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2 - Each person writes one section - then it is difficult to make a single consistent report, and you will not know about the rest, except for your own section.

3- Co-writing. This is the most productive way to solve group problems and provides the greatest benefit from collaboration. For example: in each section, there is a writer and at least one reviewer, and each team member is the author of a section and a reviewer of another one.

All team members before finalization by **the editor** must review the final product. Alternatively, you can have one author with others, editors, add and review, and someone tidies the finished report.

Try to divide the writing of source documents into tasks and solve them individually or in pairs. After the first draft of the sections are written, send out all the components and read them. You will probably need to come together to discuss how to combine them so that they fit together. Any participants who were not involved in preparing the drafts can do part of this work. Then edit, improve and polish the draft. It’s convenient to collaborate on documents in Google documents.

When preparing a report / final document, regularly check the following:

- Is the purpose of the project clear from the report?

- Are the conclusions or recommendations clear?

- Do conclusions follow from the main part of the report?

- Do sections fit well?

- Does the report achieve goals (and evaluation criteria)?

- Are the necessary components sufficiently covered?

Whatever method you use, all group members must agree on the process and how they are going to maximize the collaborative approach to writing the final document.

**Monitoring team performance and coping**

Below is a checklist that includes a list of common problems that arise in a group work. Use it regularly to identify problems before they get out of hand. If serious problems and tensions arise, use it to determine where something might go wrong. First answer each question about yourself, and then give answer to this **question** about the group as a whole. Then gather a group and discuss where, in your opinion, problems may arise, and think about how you can overcome these problems.

Each participant must complete this checklist. You should do this exercise regularly to track and improve your team’s performance.

1. Answer each question regarding your teamwork.

2. Answer each question regarding the rest of the team.

3. Get together with your entire team and discuss where, in your opinion, any problems arise.

4. Discuss what you are going to do to overcome these problems.

**Checklist for self-assessment of team effectiveness.**

|  |  |  |  |
| --- | --- | --- | --- |
| You | I personally | Group as a whole | Comments |
| Effectively clarify your tasks and tasks at each stage? |  |  |  |
| Evaluate the progress of work? |  |  |  |
| We clarify and document everything that the group decided? |  |  |  |
| We clarify who will do what and how? |  |  |  |
| We clarify by what date each task should be done? |  |  |  |
| Setting meeting management rules? |  |  |  |
| Adhere to agreed rules? |  |  |  |
| Listening to each other? |  |  |  |
| Allow some team members to dominate? |  |  |  |
| Allow some team members to refuse / withdraw? |  |  |  |
| We sacrifice personal desires for the success of the team? |  |  |  |
| Recognize the feelings of other team members? |  |  |  |
| Making equal contributions to team progress? |  |  |  |
| Adhere to agreed rules for writing and naming files? |  |  |  |

**Points and Grade**

Group tasks and assignments mean that grades are given to the whole group based on the results of the work of the whole group. Everyone should be interested in ensuring the effective contribution of all members of the group and ensuring the high quality of the assignment. Sometimes, to assess the relative contribution of each to the group process, a form of peer-to-peer or peer review and a team assessment form will be used. This can be used to moderate assignment grades, or simply as a way to give feedback on your work in a group. The following are examples of student assessment criteria for team training.

|  |  |
| --- | --- |
| **№** | **Student assessment criteria in practical classes** |
| 1 | *Preparation for classes:*  He studies information focused on the case and problematic issues, uses various sources, and supports the statements with relevant links. |
| 2 | *Group skills and professional attitude:*  Demonstrates excellent attendance, reliability, responsibility Takes the initiative, takes an active part in the discussion, helps the teammates, willingly takes on tasks |
| 3 | *Communication skills:*  Actively listens, shows emotions according to the situation, is susceptible to non-verbal and emotional signals, shows respect and correctness in relation to others, helps to resolve misunderstandings and conflicts |
| 4 | *Feedback Skills:*  Demonstrates a high level of introspection, critically evaluates oneself and colleagues, provides constructive and objective feedback in a friendly manner, accepts feedback without opposition |
| 5 | *Skills of critical thinking and effective learning:*  Effectively participates in generating hypotheses and formulating problematic questions, gives relevant examples from life, skillfully applies knowledge to the problem / case under consideration, critically evaluates information, draws conclusions, explains and substantiates statements, draws diagrams and drawings, demonstrates a constant interest in the material being studied |
| 6 | *Theoretical knowledge and skills on the topic of the lesson:*  All key aspects are presented logically; accuracy, relevance of answers to the questions posed without redundancy; integration of theoretical issues; Use of relevant examples proper use of professional terminology |

1. adapted from UNSW Guide to Group Work <https://student.unsw.edu.au/groupwork>) [↑](#footnote-ref-1)
2. adapted from Brunt (1993): <https://tle.wisc.edu/solutions/engagement/constructive-and-destructive-groupbehaviors> [↑](#footnote-ref-2)
3. adapted from UNSW Guide to Group Work<https://student.unsw.edu.au/groupwork>) [↑](#footnote-ref-3)
4. adapted from Brunt (1993):<https://tle.wisc.edu/solutions/engagement/constructive-and-destructive-groupbehaviors> [↑](#footnote-ref-4)