

Dear students,

congratulations! At this very moment, you have come across material that we believe will be beneficial to you in your study of (not only) the subject of histology and embryology.

We have compiled in a comprehensive form all the topics of general and special histology that you may encounter during your studies in the first and second year. No topic has been left out, so you can be sure that the material presented will prepare you well for the examination in our subject, but will also serve you well in higher years in preparation for subsequent subjects.

We have endeavoured to help you effectively acquire the key knowledge in our subject, but our main aim remains that you not only learn, but more importantly understand and are able to apply the knowledge you have acquired. Therefore, even to answer some of the more difficult questions, you need to combine several pieces of knowledge. Of course, to really understand why an answer is right or wrong, you need to study from the recommended literature, to which you are hereby referred.

You have in front of you a set of questions divided into 24 chapters exactly according to the topics covered in the lectures and practical exercises of the summer and winter semesters. Each topic contains approximately 40 to 50 questions, which are didactically divided into approximately two equal halves. We recommend that you start with the first half first, as this will teach you to focus on the essentials, creating a sort of solid outline on which you can "stick" more and more knowledge. You will recognise these questions by the longer, more explicative answers and by the wording of the questions themselves, starting with "Decide whether...". You can then continue with the second half, where you will find questions often discussing particular problems and details. You will recognise these by the precise focus of the question and the (usually) shorter answer. The chapters on special histology also always include 10 questions directed at the development and congenital developmental defects of particular organ systems. For your better orientation, these questions are highlighted in

brown. At the end of each chapter, on a separate page, you will find the key to the correct answers. In this way you will be able to test yourself; the correct answers are not marked directly next to the options.

We are aware that most of you will spend time with the questions because they will be part of the final exam. However, we hope that at the end you will understand for yourselves that these questions were not created to torment you with new responsibilities, but to make your study of our admittedly difficult but beautiful subject as easy as possible.

The team of authors

Winter Semester: Special Histology  
(Microscopic Anatomy of the Organ  
Systems)

## Chapter One: Cardiovascular system

### 1. Decide whether the following statements about the heart are true T or false F:

- a) The epicardium is the most superficial layer of the heart wall.
- b) The endothelium is a layer of the endocardium that is in direct contact with the blood.
- c) The thickest layer of the heart wall is the myocardium.
- d) Cells of the cardiac conduction system are found in the subendothelial layer of the endocardium.

### 2. Decide whether the following statements about the heart are true T or false F:

- a) The myocardium is made up of layers of smooth muscle.
- b) Purkinje fibers are specialized nerve fibers of the cardiac conduction system.
- c) The epicardium and the visceral layer of the pericardium are identical structures.
- d) The epicardium includes a subepicardial layer with a large amount of adipose tissue.

### 3. Decide whether the following statements about the heart are true T or false F:

- a) Purkinje fibers are modified cardiomyocytes of the cardiac conduction system.
- b) The pericardium is a serous membrane formed by the parietal and visceral layers between which the pericardial cavity is located.
- c) The subepicardial layer contains branches of coronary arteries.
- d) The endocardium is lined by a single layer of mesothelial cells.

**4. Decide whether the following statements about the heart are true T or false F:**

- a) The thickest layer of the heart wall is the endocardium.
- b) Purkinje fibers are localized in the subendocardial layer of the heart ventricles.
- c) The heart like blood vessels has three basic layers - endocardium, myocardium and epicardium.
- d) Cardiomyocytes of the working myocardium are larger than Purkinje fibers.

**5. Decide whether the following statements about the heart are true T or false F:**

- a) The subendothelial layer consists of a dense connective tissue.
- b) Epicardium is synonymous with the parietal layer of the pericardium.
- c) Purkinje fibers contain myofibrils, particularly around the nucleus.
- d) Cardiac skeleton is formed by rings of a dense irregular connective tissue.

**6. Decide whether the following statements about the arteries are true T or false F:**

- a) The thickest wall of arteries is tunica media.
- b) Muscular arteries contain predominantly elastic membranes in tunica media.
- c) An example of an elastic artery is the aorta.
- d) Most arteries in the human body are of a muscular type.

**7. Decide whether the following statements about the arteries are true T or false F:**

- a) Arteries tend to have a regular lumen.
- b) Fenestrated elastic membranes are found, for example, in the aorta.
- c) Elastic arteries are mainly peripheral arteries of medium and small calibre.

- d) The internal elastic membrane of muscular arteries is generally well developed.

**8. Decide whether the following statements about the arteries are true T or false F:**

- a) Up to 40 layers of smooth muscle cells are observed in tunica media of muscular arteries.
- b) Tunica adventitia is the most developed layer in arteries.
- c) Elastic arteries have no vasa vasorum in the wall - all nutrients and oxygen are supplied by diffusion from the circulating blood.
- d) The internal elastic membrane of arterioles is usually well developed.

**9. Decide whether the following statements about the arteries are true T or false F:**

- a) Tunica media of arterioles consists of 1-5 layers of smooth muscle cells.
- b) The subendothelial layer of elastic arterioles may contain smooth muscle cells.
- c) Tunica adventitia of elastic arteries contains both vasa vasorum and nervi vasorum.
- d) The only difference between muscular and elastic arteries is the structure of the media.

**10. Decide whether the following statements about the arteries are true T or false F:**

- a) The endothelium of all types of arteries consists of a single layer of flat cells which are in direct contact with the blood.
- b) All largest arteries leaving the heart are of elastic type.
- c) Arteries generally have an irregular, collapsed lumen.

d) The external elastic membrane is best developed in arterioles.

**11. Decide whether the following statements about the veins are true T or false F:**

- a) The thickest layer of the vein wall is tunica adventitia.
- b) Postcapillaries are the smallest veins, consisting only of endothelium and pericytes.
- c) In muscular venules, smooth muscle cells are gradually replaced by pericytes.
- d) The venous valves are duplications of tunica intima.

**12. Decide whether the following statements about the veins are true T or false F:**

- a) Small caliber veins are characterized by a well defined lamina elastica interna.
- b) Large veins contain many smooth muscle cells in tunica adventitia in the direction of the long axis of the vein.
- c) Veins generally have an irregular lumen when cut transversally.
- d) Most smooth muscle cells in the wall of large veins are found in tunica media.

**13. Decide whether the following statements about the veins are true T or false F:**

- a) Unlike the wall of arteries, the wall of veins does not contain vasa vasorum.
- b) The thickest layer of the vein wall is tunica intima.
- c) The collapsed, irregular lumen is one of the main features that distinguishes veins from arteries on section.
- d) Vasa vasorum of the vein walls are more numerous than in the arteries because the blood circulating in the veins is poor in oxygen and nutrients.

**14. Decide whether the following statements about the veins are true T or false F:**

- a) The thickest layer of the vein wall is tunica media.
- b) Venules have a wider lumen than postcapillaries.
- c) Erythrocytes are often seen in the lumen of venules.
- d) Tunica adventitia is best visible in collecting venules.

**15. Decide whether the following statements about the veins are true T or false F:**

- a) Venous valves are duplications of tunica media.
- b) Smooth muscle cells of the vein wall can produce all components of the extracellular matrix.
- c) Venous valves are most abundant in veins of the lower extremities.
- d) All veins in the human body, without exception, are lined by flat endothelial cells.

**16. Decide whether the following statements about the capillaries are true T or false**

**F:**

- a) Sinusoids are capillaries with a continuous lining.
- b) Capillaries with fenestrations without diaphragms (capillaries with pores) are found only in the glomeruli of the renal corpuscle.
- c) Capillaries with a continuous epithelium are found, for example, in a connective tissue or skeletal muscle.
- d) Fenestrated capillaries are localized, for example, in the intestine or endocrine organs.



**17. Decide whether the following statements about the capillaries are true T or false**

**F:**

- a) Sinusoids have a wide lumen, fenestrations, pores, and a discontinuous basal lamina.
- b) Sinusoids are found in the spleen and liver.
- c) The different types of capillaries can be reliably distinguished under the light microscope.
- d) Sinusoids are about 7 micrometers in diameter.

**18. Decide whether the following statements about the capillaries are true T or false**

**F:**

- a) Capillaries with a continuous lining are also called somatic capillaries.
- b) Capillaries with fenestrations are also known as visceral capillaries.
- c) Capillaries, like other blood vessels, are made up of three layers.
- d) Pericytes around capillaries are capable of contraction.

**19. Decide whether the following statements about the capillaries are true T or false**

**F:**

- a) Capillaries with continuous lining are found, for example, in the adenohypophysis or bone marrow.
- b) Sinusoids have a wider lumen compared to other types of capillaries.
- c) The width of the lumen is the only feature that distinguishes sinusoids from other types of capillaries.
- d) Sinusoids are found in the bone marrow or adenohypophysis.

**20. Decide whether the following statements about the capillaries are true T or false**

**F:**

- a) Capillaries with a continuous lining are found in organs with intensive metabolism.
- b) All capillaries have a diameter of about 40 micrometers.
- c) Capillaries do not have their own tunica media; its function is replaced by pericytes.
- d) Pericytes can influence capillary permeability.

**21. What is the most common tissue found in the walls of arteries?**

- a) elastic tissue
- b) dense connective tissue
- c) muscle tissue
- d) epithelial tissue

**22. What are the different types of capillaries?**

- a) of continuous type
- b) fenestrated
- c) of muscle type
- d) sinusoids

**23. In which organs are fenestrated capillaries found?**

- a) small intestine mucosa
- b) brain
- c) most of endocrine glands

- d) skeletal muscles

**24. Which of the following statements about the valves in vessels are true?**

- a) are most commonly found in the arteries of the lower extremities
- b) are duplicature of tunica intima together with tunica media
- c) are covered by the endothelium
- d) prevent backflow of blood in the extremities

**25. Which of the following statements about the pericytes are true?**

- a) wrap around the endothelial cells
- b) in brain capillaries, they help form the blood-brain barrier
- c) are present in the tunica media of the larger arteries
- d) communicate with each other using gap junctions
- e) have spindle-shaped morphology without cytoplasmic projections

**26. How does a vein differ from a comparably sized artery?**

- a) the vein has thicker tunica media
- b) the vein can contain valves
- c) the vein more often contains blood
- d) the vein has a more regular lumen
- e) the vein may not contain tunica intima
- f) vein usually has a greater representation of smooth muscle in the tunica adventitia

**27. What are the arteries of elastic type?**

- a) arteria pudenda media
- b) arteria mesenterica inferior
- c) aorta
- d) truncus pulmonalis

**28. How lymphatic capillaries differ from blood capillaries?**

- a) start blindly
- b) usually have a smaller diameter
- c) erythrocytes are found here, but in smaller quantities
- d) have a looser endothelium with larger fenestrae

**29. How do we selectively visualize typical structures in the tunica media of the aorta?**

- a) resorcin-fuchsin
- b) azan
- c) HE
- d) sudan black
- e) orcein

**30. Which of the following statements about the vasa vasorum are true?**

- a) are not located in the tunica media of the arteries
- b) are more abundant in the wall of veins than in arteries
- c) serve to supply the walls of blood vessels with oxygen and nutrients
- d) larger vasa vasorum may contain additional vasa vasorum in their wall

**31. Which of the following statements about the membrana elastica interna are true?**

- a) forms the boundary between the tunica media and tunica adventitia in many arteries
- b) despite its name, it is not made up of elastic fibres
- c) it is most pronounced in muscular arteries
- d) in histological slides runs in a wavy pattern

**32. Which of the following general statements about the capillaries are true?**

- a) their tunica media is made of 2 to 5 layers of smooth muscle cells
- b) their wall can contain pericytes
- c) are lined by flat endothelial cells and their lamina basalis, which may be continuous or discontinuous
- d) their endothelium is composed of cuboidal cells and deposited on the lamina basalis

**33. Which of the following general statements about the Purkinje fibers are true?**

- a) are located in the subendocardial connective tissue
- b) are made up of specialized neurons
- c) specialise in spreading action potential
- d) contain a lot of glycogen, so their cytoplasm is bright in HE-stained paraffin sections
- e) are found on atrial preparations of the heart

**34. Which of the following statements about the endothelium are true?**

- a) is also found in the brain capillaries
- b) the endocardium of the heart is lined with cuboidal endothelial cells
- c) forms the innermost single layer lining of vessels and is deposited longitudinally in the direction of blood flow
- d) is often considered the largest endocrine organ in the human body
- e) is not found in lymphatic vessels

**35. What tissue is the epicardium covered with?**

- a) stratified squamous epithelium
- b) loose connective tissue
- c) simple squamous epithelium
- d) dense connective tissue (capsule)

**36. Which of the following cell junctions are a typical structure of an intercalated disc?**

- a) gap junctions
- b) zonulae occludentes
- c) fasciae adherentes
- d) hemidesmosomes
- e) desmosomes

**37. What are the hormones produced by the myocardium called?**

- a) atrial natriuretic factor
- b) cardiac natriuretic peptide

- c) antidiuretic hormone
- d) brain natriuretic peptide

**38. In the following statement, correct the word to make this statement correct:  
Vasculogenesis is the physiological process through which new blood vessels form from pre-existing vessels formed in the earlier stages**

- a) Vasculogenesis → Angiogenesis
- b) physiological → always pathological
- c) blood → lymphatic
- d) pre-existing vessels → pre-existing blood islands

**39. Which of the pairs are correct?**

- a) membrana elastic interna - muscular artery
- b) Purkinje fibers - gap junctions
- c) pericardial cavity - mesothelium
- d) papillary muscles - smooth muscle cells
- e) tachycardia - nervus vagus

**40. What are the average diameters of the different blood vessels in adulthood?**

- a) elastic arteries: 1 to 4 cm
- b) capillaries: 50 to 150  $\mu\text{m}$
- c) arterioles: 10 to 100  $\mu\text{m}$
- d) muscular arteries: 0,1 to 10 mm

**41. Decide whether the following statements about the development of the cardiovascular system are true T or false F:**

- a) The cardiovascular system begins to develop in the 5th week after fertilization.
- b) The heart begins to develop as two endocardial heart tubes, which fuse together to form a single heart tube.
- c) The first blood vessels develop extraembryonically in the wall of the yolk sac.
- d) Ductus venosus is the junction between the umbilical vein and the inferior vena cava, bypassing the liver.

**42. Decide whether the following statements about the development of the cardiovascular system are true T or false F:**

- a) The heart begins to beat 22-23 days after fertilization.
- b) The dorsal aorta arises from the intermediate mesoderm.
- c) First blood vessels begin to develop from the splanchnopleura of the lateral mesoderm.
- d) The right vitelline vein gives rise to the portal circulation of the liver.

**43. Decide whether the following statements about the development of the cardiovascular system are true T or false F:**

- a) Bulbus cordis is the part of the primitive heart from which the atria develop.
- b) The cardinal veins flow from the wall of the yolk sac into the sinus venosus.
- c) The aortic sac is associated with the outflow part of the primitive heart.
- d) Foramen primum gives rise to future foramen ovale.



**44. Decide whether the following statements about the development of the cardiovascular system are true T or false F:**

- a) Sinus venosus is partly involved in the development of the atria.
- b) During septation of the heart, the septum intermedium is formed, which gives rise to the right and left atria.
- c) Septation of the atria and ventricles does not occur simultaneously - the atria divide first, followed by the ventricles.
- d) After the septum primum has attached to the septum intermedium, apoptosis forms an opening in the septum primum called the foramen secundum.

**45. Decide whether the following statements about the development of the cardiovascular system are true T or false F:**

- a) Foramen ovale patens (apertum) is a congenital developmental defect of septation of the ventricles.
- b) Cor sigmoideum already occurs at the stage of paired endocardial heart tubes.
- c) Bulbar ridges and ridges in the truncus arteriosus are associated with the development of the future aorta and truncus pulmonalis, and neural crest cells are involved in their formation.
- d) The septum aorticopulmonale has a spiral course and is therefore also referred to as the septum spirale.

**46. From what tissue are the very first blood islands formed?**

- a) splanchnic mesoderm
- b) neural crest cells
- c) extraembryonic mesenchyme

d) epiblast

**47. What are the tributaries of the sinus venosus during embryonic development?**

- a) vitelline vein
- b) dorsal aorta
- c) common cardinal vein (duct of Cuvier)
- d) umbilical vein

**48. Which of the following pairs of embryonic vessels and the definitive vessels formed from them are correct?**

- a) 2nd aortic arch - maxillary artery
- b) vitelline artery - coeliac trunk
- c) right umbilical vein - hepatic veins
- d) left 4th aortic arch - left pulmonary artery

**49. Which of the following happen during cardiac looping?**

- a) primitive atrium moves cranially and dorsally
- b) sinus venosus becomes part of right ventricle
- c) the right and left atrium develop symmetrically
- d) bulbus cordis continues to expand

**50. Which structures may be dysfunctional in atrial septal defects?**

- a) cono-truncal ridges
- b) septum intermedium

- c) septum primum
- d) septum secundum

## Chapter One answers:

- |          |         |         |         |
|----------|---------|---------|---------|
| 1) abc   | 14) bc  | 27) cd  | 40) ad  |
| 2) cd    | 15) bc  | 28) ad  | 41) bcd |
| 3) abc   | 16) bcd | 29) ae  | 42) ad  |
| 4) bc    | 17) ab  | 30) bcd | 43) c   |
| 5) d     | 18) abd | 31) cd  | 44) ad  |
| 6) acd   | 19) bd  | 32) bc  | 45) cd  |
| 7) abd   | 20) cd  | 33) acd | 46) c   |
| 8) a     | 21) c   | 34) acd | 47) acd |
| 9) abc   | 22) abd | 35) c   | 48) b   |
| 10) ab   | 23) ac  | 36) ace | 49) ab  |
| 11) abcd | 24) cd  | 37) ad  | 50) cd  |
| 12) bc   | 25) abd | 38) ad  |         |
| 13) cd   | 26) bcf | 39) abc |         |

## Chapter Two: Lymphatic tissue

**1. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) The lymph node is an encapsulated lymphatic organ.
- b) All secondary lymphatic organs have both afferent and efferent lymphatic vessels.
- c) The paracortex of a lymph node consists of lymphatic follicles.
- d) Lymphatic follicles together with dendritic cells are key components of the lymph node cortex.

**2. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) Impregnation with silver salts shows reticular fibers which form a fine stroma of the lymph node.
- b) The lymph node contains only efferent lymphatic vessels.
- c) Palatine tonsils are covered by a stratified squamous non-keratinized epithelium.
- d) Tonsils are part of the MALT system - mucosa-associated lymphatic tissue.

**3. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) A lymph node is also called a lymphatic follicle.
- b) Lymphatic follicles form B-dependent zones in secondary lymphatic organs.
- c) Tonsils are partially encapsulated lymphatic organs.

d) A primary lymphatic follicle has a bright germinal center.

**4. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) Secondary activated lymphatic follicles have a bright germinal center.
- b) The MALT system is a non-encapsulated organ of the lymphatic system.
- c) Palatine tonsils are covered by a stratified columnar epithelium with cilia and goblet cells.
- d) The marginal sinus lies just below the lymph node capsule and receives lymph from afferent lymphatic vessels.

**5. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) Primary lymphatic follicles contain B lymphocytes that have not yet come into contact with an antigen.
- b) The paracortex of the lymph node is a T-dependent zone that is not organized into lymphatic follicles.
- c) The lymph node is a lymph filter between afferent and efferent lymphatic vessels.
- d) Tonsils are the only component of the MALT system.

**6. Decide whether the following statements about the thymus are true T or false F:**

- a) The thymus is a primary lymphatic organ.
- b) The stroma of a thymus is formed by a reticular connective tissue.
- c) The cortex of a thymus contains lymphatic follicles.

d) T lymphocytes acquire immunocompetence in the thymus.

**7. Decide whether the following statements about the thymus are true T or false F:**

- a) The reticular epithelium in the thymus provides support for T lymphocytes.
- b) Thymus parenchyma is divided into pseudolobules by connective tissue septa.
- c) The thymus cortex contains developing T lymphocytes, giving it a dark appearance in basic hematoxylin and eosin staining.
- d) Hassall's bodies are observed in thymic cortex.

**8. Decide whether the following statements about the thymus are true T or false F:**

- a) Thymus contains both afferent and efferent lymphatic vessels.
- b) Maturation of B-lymphocytes takes place in the thymus.
- c) Hassall's bodies are found in thymic medulla.
- d) Hassall's bodies resemble layers of an onion in histological slides from a thymus.

**9. Decide whether the following statements about the thymus are true T or false F:**

- a) Thymus reaches its maximum size in adulthood.
- b) Thymic cortex is paler when stained with hematoxylin and eosin.
- c) Connective tissue septa divide the thymus into right lobules.
- d) During process of maturation, T lymphocytes in the thymus are separated from blood by the hematotymic barrier.

**10. Decide whether the following statements about the thymus are true T or false F:**

- a) Thymus contains only efferent lymphatic vessels.
- b) Hassall's bodies are clearly eosinophilic structures of the thymic medulla.
- c) Involution of the thymus occur during aging and causes its disappearance.
- d) Up to 97% of naive T lymphocytes are lost through the process of positive selection in the cortex of the thymus.

**11. Decide whether the following statements about the spleen are true T or false F:**

- a) In the spleen we distinguish a peripheral cortex and an inner medulla which is common to several pseudolobules.
- b) White pulp of the spleen is made up of splenic lymphatic follicles.
- c) PALS is part of the red pulp of the spleen.
- d) Arteriola centralis is located peripherally on histological slides from splenic lymphatic follicles.

**12. Decide whether the following statements about the spleen are true T or false F:**

- a) Stroma of the spleen is formed by cords of Billroth of the red pulp as part of the reticular connective tissue.
- b) Red pulp of the spleen contains continuous capillaries.
- c) Trabeculae divide the spleen into true lobes.
- d) All types of blood formed elements are part of the red pulp.

**13. Decide whether the following statements about the spleen are true T or false F:**

- a) PALS of the white pulp of the spleen is a T-dependent zone.
- b) Splenic lymphatic follicles are part of the red pulp of the spleen.



- c) Red pulp of the spleen is composed of reticular epithelium.
- d) Spleen has only closed type of blood microcirculation.

**14. Decide whether the following statements about the spleen are true T or false F:**

- a) Wide sinusoids are typically found in the red pulp of the spleen.
- b) In the closed circulation, blood from the penicillary arteries flows between the cords of the red pulp.
- c) Spleen is a secondary lymphatic organ whose stroma is formed by a reticular tissue.
- d) Spleen is the largest lymphatic organ in the human body.

**15. Decide whether the following statements about the spleen are true T or false F:**

- a) White pulp of the spleen is composed exclusively of primary lymphatic nodules.
- b) Old erythrocytes that are unable to pass through the cords of the red pulp back to the sinusoids are phagocytosed by macrophages.
- c) The blood circulation of the human spleen is both open and closed, with the open system being predominant.
- d) Spleen is the only lymphatic organ in the human body where lymphatic tissue is always associated with arteries.

**16. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) Processus vermiformis is part of a MALT system.
- b) Lymphatic nodules in the processus vermiformis are mostly of primary type.

- c) The germinal center of lymphatic nodules is a morphological manifestation of activated humoral adaptive immunity.
- d) MALT system can be found in the digestive and respiratory systems, where it is called GALT and BALT respectively.

**17. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) Primary lymphatic organs include the thymus and bone marrow.
- b) The thymus consists of a darker peripheral cortex and a lighter central medulla.
- c) Capsules of all lymphatic organs are made up of a dense connective tissue.
- d) Secondary lymphatic organs do not contain lymphatic nodules.

**18. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) PALS of the spleen is located around sinusoids.
- b) Thymus is the only lymphatic organ stroma of which is formed by epithelium rather than connective tissue.
- c) Peyer's patches of a small intestine are part of the MALT, more precisely the GALT system.
- d) The germinal center contains both centroblasts and centrocytes which results in paler staining of the center of the lymphatic follicle in hematoxylin and eosin.

**19. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) We can easily distinguish individual cell populations within a germinative center when using conventional staining methods.
- b) PALS is a T-dependent zone of the red splenic pulp.
- c) White and red pulp are names based on the staining of these splenic components using hematoxylin and eosin.
- d) The palatine tonsil as a part of the Waldeyer's lymphatic ring is lined by a stratified squamous non-keratinized epithelium.

**20. Decide whether the following statements about the lymphatic system are true T or false F:**

- a) The stroma of tonsils is composed of a reticular epithelium.
- b) Because tonsils are in constant contact with the external environment, they always contain at least one secondary lymphatic nodule.
- c) The red pulp of the spleen is composed of reticular connective tissue, macrophages, blood vessels including wide sinusoids, and all formed blood elements with a predominance of erythrocytes.
- d) The parenchyma of a thymus is divided into right lobes by connective tissue septa.

**21. What are the primary lymphoid organs?**

- a) thymus
- b) yellow bone marrow
- c) palatine tonsil
- d) red bone marrow
- e) spleen

**22. Where HEV (high endothelial venules) can be found?**

- a) spleen
- b) thymic cortex
- c) paracortex of the lymph node
- d) Peyer's patches
- e) medulla of the lymph node
- f) tonsils of Waldeyer's ring

**23. What are the T-dependent zones of different lymphoid organs?**

- a) splenic red pulp
- b) periarteriolar lymphatic sheath of the spleen
- c) deep cortex (paracortex) of the lymph node
- d) cortex of the lymph node
- e) splenic Malpighian corpuscle

**24. Which of the following statements about the thymus are true?**

- a) its cortex is a primary lymphoid organ
- b) its trabeculae divide the parenchyma into pseudolobules
- c) in its medulla, B-lymphocytes can be seen
- d) in its cortex, the corpuscles (bodies) of Hassal are formed

**25. Which of the following statements about the hemothymic barrier are true?**

- a) is mostly formed by Hassal's corpuscles (bodies)
- b) its main purpose is to prevent cortical T lymphocytes from interacting with foreign macromolecules

- c) is a functional and selective barrier separating T-lymphocytes from blood in the medulla of the thymus
- d) is co-formed by continuous blood capillaries
- e) is co-formed by type I epithelial reticular cells

**26. What structures can be found in the spleen?**

- a) marginal zone
- b) Hassal's corpuscles
- c) cords of Billroth
- d) periarteriolar lymphatic sheath
- e) sinusoids
- f) paracortex

**27. Which of the following statements about the lymph are true?**

- a) is enriched with antibodies as it passes through the medullary cords of lymph nodes
- b) the transfer of tissue fluid into lymphatic capillaries leads to its production
- c) can contain also erythrocytes
- d) does not contain T-lymphocytes or macrophages
- e) it is generally similar to blood plasma
- f) also transports fats from the digestive system
- g) is picking up bacteria and transports them to the circulation

**28. What do the spleen and lymph node have in common?**

- a) filter the blood

- b) contain sinusoids (sinuses)
- c) contain lymphatic follicles
- d) are capsulated

**29. What do lymphatic and blood vessels have in common?**

- a) both can have valves
- b) are lined with endothelium
- c) both start blindly in the intercellular spaces
- d) both are entering the tonsils

**30. Which of the following statements about the lymphatic follicles are true?**

- a) the development of their germinal center corresponds to the humoral immune response of B-lymphocytes
- b) secondary lymphoid follicles do not have a mature germinal centre
- c) their mantle zone contains centroblasts
- d) contain follicular dendritic cells

**31. Where under physiological conditions can a lymphoid follicle be found?**

- a) in the tonsilla pharyngea
- b) in the spleen
- c) in the thymic cortex
- d) in the paracortex of the lymph node

**32. What different sinuses can be found in the lymph node?**

- a) subcapsular (marginal) sinus

- b) venous sinus
- c) peritrabecular (intermediary) sinus
- d) medullary sinus
- e) paranasal sinus

**33. The reticular tissue creates a delicate stroma of which lymphoid organs?**

- a) spleen
- b) lymph node
- c) thymus
- d) bone marrow

**34. Which of the following statements about the T-lymphocyte are true?**

- a) acquires his immunocompetence in the thymus
- b) its activated stage is called a plasma cell and produces antibodies
- c) in the lymph node, it is predominantly found in the cortical part of the lymph node
- d) it is also responsible for cell-specific immunity
- e) in the spleen it is predominantly found in the periarteriolar lymphatic sheath (PALS)
- f) once activated, it is responsible for the humoral component of the immune response - it produces complement proteins
- g) the nucleus-cytoplasm ratio is shifted in favour of the nucleus

**35. Which of the following statements about the tonsils are true?**

- a) are completely encapsulated

- b) lymph is supplied to them by afferent lymphatic vessels (several)
- c) their epithelium may be interspersed with lymphocytes (follicle associated epithelium)
- d) they do not contain lymphatic nodules

**36. Which of the following pairs related to the lymph node are correct?**

- a) medullary cords - macrophages
- b) paracortex - high endothelial venules
- c) stroma - argyrophilic nature
- d) capsule - plasma cells
- e) subcapsular (marginal) sinus - plasma cells

**37. Which of the following statements about the immunity are true?**

- a) a clone is a collection of cells of genetically identical origin
- b) activated macrophages secrete cytokines with the function of chemotaxis and promoting inflammation
- c) phagocytosis is one of the cellular mechanisms of acquired immunity
- d) antigen-presenting cells have MHC class II molecules

**38. Which description of all the secondary lymphoid organs are true?**

- a) contain lymphatic follicles
- b) their delicate stroma is made of reticular epithelial cells
- c) contain crypts with detritus
- d) are filtering lymph
- e) possess afferent lymphatic vessels



**39. Which of the following statements about the Hassal's corpuscles are true?**

- a) occur in the thymic cortex
- b) disappear during thymic involution at puberty and adulthood
- c) are clusters of degenerating and transformed T lymphocytes
- d) are formed from eosinophilic type VI epithelial reticular cells
- e) their epithelial cells contain keratohyalin

**40. Decide whether the following statements about the development of the lymphatic system are true T or false F:**

- a) The reticular epithelium of the thymus develops from the first ectodermal pharyngeal cleft.
- b) The spleen develops from mesenchymal cells located between the layers of the dorsal mesogastrium.
- c) The palatine tonsil develops from the 2nd endodermal pharyngeal pouch and surrounding mesenchyme.
- d) The lymph nodes are of endodermal origin.

**41. Decide whether the following statements about the development of the lymphatic system are true T or false F:**

- a) The reticular epithelium of the thymus develops from the third endodermal pharyngeal pouch.
- b) The spleen develops from the endoderm of the foregut.
- c) The palatine tonsil develops from the third endodermal pharyngeal pouch and surrounding mesenchyme.
- d) Neural crest cells play an important role in the development of the thymus.

**42. Which pharyngeal pouches contribute to the formation of lymphoid organs?**

- a) 1st
- b) 2nd
- c) 3rd
- d) 4th

**43. Which of the following statements about the development of the spleen are true?**

- a) develops from the mesenchymal condensation in the lesser sac
- b) accessory spleens may develop near the hilum of the spleen
- c) is derivative of the gut endoderm
- d) is derivative of the mesoderm

**44. Which of the following statements about the development of the lymphatic vessels are true?**

- a) start to appear together with blood vessels
- b) arise by the processes of vasculogenesis and angiogenesis
- c) arise from mesodermal precursors
- d) arise from the extraembryonic mesoderm

**45. Which element would likely be missing in a newborn case where the innate immune system is functional but the adaptive immune system is not yet developed?**

- a) intact covering epidermis
- b) macrophages

- c) neutrophils
- d) IgMs

**46. Which of the following zones of the lymphoid organs would atrophy in case of a developmental disorder involving the third pharyngeal pouch?**

- a) paracortex of the lymph nodes
- b) red pulp of the spleen
- c) PALS of the spleen
- d) medulla of the lymph nodes
- e) cortex of the lymph nodes
- f) mantle zone of Malpighian corpuscles of the spleen

## Chapter Two answers:

- |         |         |          |         |
|---------|---------|----------|---------|
| 1) ad   | 13) a   | 25) bde  | 37) abd |
| 2) acd  | 14) acd | 26) acde | 38) a   |
| 3) bc   | 15) bcd | 27) abef | 39) de  |
| 4) abd  | 16) acd | 28) bcd  | 40) bc  |
| 5) abc  | 17) abc | 29) ab   | 41) ad  |
| 6) ad   | 18) bcd | 30) ad   | 42) bc  |
| 7) abc  | 19) d   | 31) ab   | 43) abd |
| 8) cd   | 20) bc  | 32) acd  | 44) bc  |
| 9) d    | 21) ad  | 33) abd  | 45) d   |
| 10) abd | 22) cdf | 34) adeg | 46) ac  |
| 11) bd  | 23) bc  | 35) c    |         |
| 12) ad  | 24) abc | 36) abc  |         |

## Chapter Three: Endocrine system

**1. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Histologically, the neurohypophysis is composed of endocrine glandular epithelium.
- b) Herring neurosecretory bodies are found in pars distalis of the adenohypophysis.
- c) Chromophilic cells are part of the adenohypophysis.
- d) Like the liver, the adenohypophysis contains a portal system.

**2. Decide whether the following statements about the endocrine system are true T or false F:**

- a) The neurohypophysis is histologically a nervous tissue that does not contain glandular epithelial cells and does not produce hormones.
- b) Chromophobic and chromophilic cells are the two main cell populations of the adenohypophysis and are present in approximately equal numbers.
- c) Acidophilic cells of the adenohypophysis produce hormones that act on other endocrine glands in the body.
- d) Acidophilic cells of the adenohypophysis are more numerous than basophilic cells.

**3. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Herring bodies represent accumulations of vesicles containing antidiuretic hormone and oxytocin.
- b) Hormones stored in Herring bodies are the product of neurons in the hypothalamus.
- c) Pituicytes are one of the cell populations of the adenohypophysis.
- d) Glandotropic hormones are a product of the basophilic cells of the adenohypophysis.

**4. Decide whether the following statements about the endocrine system are true T or false F:**

- a) The hypophyseal-portal system is formed by two capillary beds connected in series.
- b) The adenohypophysis contains capillaries with a continuous endothelial lining.
- c) Rathke's follicles are found in the neurohypophysis as remnants of the Rathke's pouch.
- d) Chromophilic cells of the adenohypophysis produce liberins and statins.

**5. Decide whether the following statements about the endocrine system are true T or false F:**

- a) The adenohypophysis is composed of endocrine glandular epithelium arranged in irregular cords and nests.
- b) Pituicytes are neuroglial cells of the neurohypophysis.
- c) The adenohypophysis contains two populations of cells - chromophobic and chromaffin.

- d) The pituitary gland is a gland functionally superior to the hypothalamus, the activity of which it influences.

**6. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Basophilic cells make up about 10% of epithelial cells of the adenohypophysis.
- b) The hypothalamus has a superior position within the hypothalamo-hypophyseal axis.
- c) The neurohypophysis contains mainly Herring bodies, unmyelinated axons, and pituicytes.
- d) Chromophobic cells are a distinct cell population of the adenohypophysis.

**7. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Chromophobic cells of the adenohypophysis stain pink with eosin.
- b) The adenohypophysis contains capillaries with fenestrations.
- c) The adenohypophysis and neurohypophysis are morphologically and functionally identical.
- d) Folliculostellate cells are glial cells of the neurohypophysis.

**8. Decide whether the following statements about the endocrine system are true T or false F:**

- a) The pineal gland contains glial cells called pituitary cells.

- b) The parenchyma of the pineal gland is formed by the endocrine glandular epithelium.
- c) The two main cell populations of the pineal gland are astrocytes and pinealocytes.
- d) The product of the pinealocytes is melatonin, which regulates circadian rhythms.

**9. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Part of the pineal gland are extracellular calcified bodies called corpora arenacea.
- b) A pinealocyte is a spherical cell without processes.
- c) Astrocytes of the pineal gland can be distinguished from pinealocytes by the shape of the nucleus.
- d) Astrocytes have a dark flattened nucleus.

**10. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Pinealocytes have a large nucleus with 1-2 visible nucleoli.
- b) Connective tissue arising from the pia mater divides the parenchyma of the pineal gland into lobules.
- c) Melatonin is a product of astrocytes of the pineal gland.
- d) A large number of myelinated axons surround the pinealocytes and astrocytes of the pineal gland.



**11. Decide whether the following statements about the endocrine system are true T or false F:**

- a) The thyroid gland is an endocrine organ with a follicular arrangement of glandular epithelium.
- b) T<sub>3</sub> and T<sub>4</sub> are products of parafollicular thyroid cells.
- c) Colloid is the name given to the storage form of thyroid hormones with thyroglobulin being the basic component.
- d) The stroma of the thyroid gland contains many fenestrated capillaries.

**12. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Chief cells of the parathyroid gland have an acidophilic cytoplasm
- b) Oxyphilic cells of the parathyroid gland produce parathormone.
- c) The parathyroid gland contains several fat cells, the number of which increases with age.
- d) Oxyphilic cells of the parathyroid gland form clusters and are less numerous than chief cells.

**13. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Chief cells of the parathyroid gland are larger than oxyphilic cells.
- b) Chief cells of the parathyroid gland have a basophilic cytoplasm and oxyphilic cells have an eosinophilic cytoplasm.
- c) The surface of the parathyroid gland is covered by a fibrous capsule.
- d) The stroma of the parathyroid gland contains capillaries with a continuous endothelial lining.

**14. Decide whether the following statements about the endocrine system are true T or false F:**

- a) The thyroid gland contains parafollicular cells which produce calcitonin.
- b) Follicular cells of the thyroid gland are lining follicles in a single layer.
- c) Parafollicular cells of the thyroid gland are located in the fibrous stroma.
- d) Thyroid follicular cells are about a thousand times less numerous than parafollicular cells.

**15. Decide whether the following statements about the endocrine system are true T or false F:**

- a) The thyroid gland is covered by a connective tissue capsule.
- b) The amount of fat cells in the parathyroid gland decreases with age.
- c) The parathyroid gland is an example of a follicular arrangement of glandular epithelium.
- d) Parafollicular thyroid cells are larger and less numerous than follicular cells.

**16. Decide whether the following statements about the endocrine system are true T or false F:**

- a) The adrenal cortex contains chromaffin cells.
- b) Chromaffin cells of the adrenal gland are named after the staining of their cytoplasm.
- c) Zona fasciculata of the adrenal cortex is the thickest of its three layers.
- d) Zona reticularis of the adrenal cortex is located at the border with the medulla.

**17. Decide whether the following statements about the endocrine system are true T or false F:**

- a) The adrenal medulla is a developmentally modified sympathetic ganglion.
- b) Chromaffin cells of the adrenal medulla have an affinity for chromium salts.
- c) Cells of zona fasciculata of the adrenal cortex have a dark cytoplasm.
- d) Zona fasciculata of the adrenal cortex is located just below the capsule.

**18. Decide whether the following statements about the endocrine system are true T or false F:**

- a) A chromaffin cell is a modified postsynaptic neuron of the adrenal gland medulla that produces catecholamines.
- b) The stroma of the adrenal cortex is made up of a dense connective tissue.
- c) Capillaries of the adrenal cortex are of fenestrated type.
- d) Cells of zona fasciculata of the adrenal cortex are pale due to the high content of fat droplets.

**19. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Lipofuscin granules can be seen in epithelial cells of zona reticularis of the adrenal cortex.
- b) Glandular cells of the adrenal cortex are surrounded by a rich network of capillaries with a continuous endothelial lining.
- c) The inner stroma of the adrenal cortex is formed by a network of fine reticular fibers.
- d) The adrenal cortex and medulla are developmentally and morphologically distinct.

**20. Decide whether the following statements about the endocrine system are true T or false F:**

- a) Although not part of the endocrine system, hormones are also produced by several other organs, such as the thymus, liver, and heart.
- b) All components of the parenchyma of endocrine organs are always formed by glandular epithelium.
- c) Endocrine glands are called glandulae sine ductibus in Latin.
- d) Each hormone-producing organ is called an endocrine gland.

**21. Which of the following endocrine glands have cells arranged in cords?**

- a) adrenal cortex
- b) adenohypophysis
- c) neurohypophysis
- d) thyroid

**22. Which of the following statements about the thyroid gland are true?**

- a) height of its follicular cells depends on their activity
- b) its hormones, T<sub>3</sub> and T<sub>4</sub> are stored intracellularly
- c) its parafollicular cells are producing hormone parathormone
- d) its colloid is basophilic
- e) is follicular type of endocrine gland

**23. What are the glands in which glial cells can be found?**

- a) neurohypophysis
- b) adenohypophysis

- c) adrenal medulla
- d) pineal gland
- e) thyroid

**24. Which of the cell-product pairs are correct?**

- a) chromaffin cells - catecholamines
- b) acidophils - prolactin
- c) basophils - proopiomelanocortin (POMC)
- d) oxyphil cells - parathormone
- e) pinealocytes - melanin
- f) pituicytes - antidiuretic hormone (ADH)

**25. What are the typical characteristics of endocrine glands?**

- a) production of enzymes
- b) presence of fenestrated capillaries
- c) epithelial or neuronal origin of their cells
- d) are ductless
- e) their secretion is often regulated by feedback mechanisms

**26. What structures can be seen in the neurohypophysis?**

- a) Hassal's bodies
- b) Herring bodies
- c) unmyelinated axons
- d) pinealocytes

**27. What histological structures can be seen in the pineal gland?**

- a) pinealocytes
- b) pituicytes
- c) pial capsule
- d) brain sand
- e) interstitial cells
- f) colloid

**28. What are the parts of the neurohypophysis?**

- a) infundibulum
- b) pars tuberalis
- c) pars nervosa
- d) pars distalis
- e) pars intermedia

**29. In the following statement, correct the word to make this statement correct:**

**Neurons from the hypothalamic nuclei secrete releasing hormone into a hypothalamo-hypophysial portal system that flows from the hypothalamus to the posterior pituitary.**

- a) Neurons → Pituicytes
- b) releasing → inhibiting
- c) posterior → anterior
- d) hypothalamic → epithalamic

**30. What are the ways that parathormone increases the level of serum calcium?**

- a) increases bone resorption
- b) decreases  $\text{Ca}^{2+}$  bile excretion
- c) increases kidney reabsorption
- d) decreases kidney reabsorption
- e) increases calcium absorption from the small intestine

**31. ADH (antidiuretic hormone, vasopressin) enters the systemic circulation through fenestrated capillaries that are present in which of the following anatomic locations?**

- a) eminentia mediana in infundibulum
- b) pars nervosa of the posterior pituitary
- c) paraventricular nucleus of the hypothalamus
- d) pars tuberalis of the anterior pituitary
- e) at the site of the pituitary gland where pituicytes occur
- f) at the site of terminal branches of inferior hypophyseal arteries

**32. Which of the following terms best describes the biochemical composition of the material stored within the thyroid follicles?**

- a) proteoglycan
- b) big glycoprotein
- c) pentapeptide
- d) steroid precursor
- e) complex carbohydrate
- f) thyroglobulin

**33. Which of the following statements about the parathyroid parenchyme are true?**

- a) contains the endocrine cells that are arranged in the follicles
- b) its cells are of two types – chief cells and oxyphil cells
- c) its predominant cell type is oxyphil cell
- d) its cells are in close connection with the continuous capillaries

**34. Which of the following applies to steroid hormones?**

- a) are generally synthesized from cholesterol
- b) their source are also gonads and placenta
- c) can't pass through the cell membrane
- d) their receptors may be nuclear
- e) are produced by a polyhedral epithelioid cells with a single eccentrically located ovoid nucleus and with rod-shaped crystal-like structures 3 to 20 micrometres in diameter (Reinke crystals)
- f) their production can be stimulated by growth hormone

**35. Which of the following statements about the products of adrenal gland are true?**

- a) zona fasciculata of the cortex produces hormone aldosterone
- b) its medulla produces hormone dopamine
- c) its medulla produces hormone noradrenaline (norepinephrine)
- d) its cortex produces catecholamines



**36. Where can the cells with abundant smooth ER, many mitochondria of the special - tubular type, and many lipid droplets that give them a vacuolated appearance come from?**

- a) pars distalis adenohipophysis
- b) zona fasciculata of the adrenal cortex
- c) adrenal medulla
- d) zona reticularis of the adrenal cortex

**37. Where is colloid located as a filling of hollow formations within endocrine glands?**

- a) in pars intermedia of the adenohipophysis
- b) around acervulus cerebri in pineal gland
- c) in thyroid follicles
- d) in lymphatic follicles

**38. Which of the following statements are true?**

- a) the reticular fibers are found in the adrenal stroma (visible after silver salt impregnation / staining)
- b) cells of adrenal medulla have characteristic features steroid-secreting cell
- c) parafollicular cells are part of the parenchyma of the parathyroid glands
- d) thyroid gland consists of the endocrine cells arranged into the cords
- e) adrenal medulla possesses chromaffin cells that are modified sympathetic postganglionic neurons

**39. Which cells of the adenohypophysis belong to the basophilic cells?**

- a) adrenocorticotrophs
- b) somatotrophs
- c) lactotrophs
- d) gonadotrophs

**40. The cells of the adrenal cortex have a morphological peculiarities. What are these?**

- a) their mitochondria have a tubular arrangement of the inner membrane
- b) their nuclei are strongly dominated by euchromatin
- c) contain lipid inclusions
- d) their cytoplasm has a foamy appearance in routine staining

**41. Decide whether the following statements about the development of the endocrine system are true T or false F:**

- a) Rathke's pouch is the ectodermal basis of the adenohypophysis.
- b) Foramen caecum of the tongue is a remnant of the descent of the basis for the parathyroid gland.
- c) The adrenal medulla develops as a modified sympathetic ganglion.
- d) The basis of the parafollicular cells of the thyroid gland is the ultimobranchial body.

**42. Decide whether the following statements about the development of the endocrine system are true T or false F:**

- a) The glandular epithelium of the parathyroid glands originates from the endoderm of the 3rd and 4th pharyngeal pouches.
- b) The posterior lobe of the pituitary gland is derived from the neuroectoderm of the midbrain.
- c) The ultimobranchial body gives rise to the entire thyroid gland.
- d) Migration of neural crest cells is essential for proper development of the adrenal medulla.

**43. Decide whether the following statements about the development of the endocrine system are true T or false F:**

- a) Descending base of the thyroid gland communicates with the cavity of the primitive pharynx through a duct called ductus thyroglossus.
- b) Ductus thyroglossus normally disappears and its remnant is the foramen caecum at the root of the tongue.
- c) The glandular epithelium of the superior parathyroid gland develops from the endoderm of the 3rd pharyngeal pouch.
- d) The glandular epithelium of the inferior parathyroid gland develops from the endoderm of the 4th pharyngeal pouch.

**44. Decide whether the following statements about the development of the endocrine system are true T or false F:**

- a) Rathke's pouch is the basis for the posterior lobe of the pituitary gland.
- b) The adrenal cortex differentiates from the choroidal epithelium.
- c) The glandular epithelium of the superior parathyroid gland develops from the endoderm of the 4th pharyngeal pouch.

- d) The glandular epithelium of the inferior parathyroid develops from the endoderm of the 3rd pharyngeal pouch.

**45. Decide whether the following statements about the development of the endocrine system are true T or false F:**

- a) The pyramidal lobe is an accessory lobe of the thyroid gland that develops if the distal end of the thyroglossal duct does not disappear.
- b) The adrenal cortex originates from the neural crest neuroectoderm.
- c) The ultimobranchial body is the basis of the thyroid follicular cells.
- d) Paraganglia originates from the neuroectoderm of the neural tube.

**46. Which endocrine tissues are derived from neural crest cells?**

- a) chief cells of parathyroid gland
- b) cells of APUD system / DES (diffuse endocrine system)
- c) adrenal medulla
- d) parafollicular C-cells
- e) pars nervosa of neurohypophysis

**47. Which of the following statements about the thyroid primordium are true?**

- a) originates in ectoderm of the stomodeum
- b) extends caudally in the form of a ductus thyreoglossus
- c) originate at the apex of foramen caecum
- d) is formed from the endoderm

**48. Which of the following endocrine glands originates in the third pharyngeal pouch?**

- a) adenohipophysis
- b) thyroid gland
- c) superior parathyroid gland
- d) inferior parathyroid gland

**49. What is the embryonic origin of adrenal cortex?**

- a) neural crest cells
- b) coelomic epithelium
- c) yolk sac
- d) endoderm

**50. From what structure does the adenohipophysis arise?**

- a) epithelium of the stomodeum
- b) Rathke's pouch
- c) diencephalon
- d) second pharyngeal pouch
- e) metencephalon

## Chapter Three answers:

- |         |          |          |         |
|---------|----------|----------|---------|
| 1) cd   | 14) ab   | 27) acde | 40) acd |
| 2) abd  | 15) ad   | 28) ac   | 41) acd |
| 3) abd  | 16) cd   | 29) bc   | 42) abd |
| 4) a    | 17) ab   | 30) ace  | 43) ab  |
| 5) ab   | 18) acd  | 31) bef  | 44) bcd |
| 6) abc  | 19) acd  | 32) bf   | 45) a   |
| 7) b    | 20) ac   | 33) b    | 46) cd  |
| 8) cd   | 21) ab   | 34) abde | 47) bcd |
| 9) acd  | 22) ae   | 35) bc   | 48) d   |
| 10) ab  | 23) acd  | 36) bd   | 49) b   |
| 11) acd | 24) abc  | 37) ac   | 50) ab  |
| 12) cd  | 25) bcde | 38) ae   |         |
| 13) bc  | 26) bc   | 39) ad   |         |

## Chapter Four: Gastrointestinal system 1 (digestive tract)

**1. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) The tongue is mainly made up of bundles of smooth muscle cells.
- b) Circumvallate papillae are the most numerous types of papillae on the dorsum of the tongue.
- c) The root of a tongue contains many lymphatic nodules.
- d) Serous von Ebner's glands are found in lamina propria of tongue mucosa in the region of circumvallate papillae.

**2. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Apices of filiform papillae may be partially keratinized (parakeratinized).
- b) Weber's glands of the root of a tongue produce a mucous secretion.
- c) Dental enamel is the hardest tissue in the human body.
- d) The dental pulp develops from the enamel.

**3. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Filiform papillae of the dorsum of the tongue are the most numerous.
- b) Core of the tongue is made up of striated muscle.
- c) In front of the terminal sulcus on the tongue, there are 8-12 circumvallate papillae.
- d) Filiform papillae do not contain taste buds.

**4. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Bodies of odontoblasts are localized at the border between enamel and dentin.
- b) Taste buds are in lamina propria of the papillae of the tongue.
- c) When stained with hematoxylin and eosin, taste buds are paler than surrounding epithelial cells.
- d) All papillae of the tongue are covered by a stratified squamous non-keratinized epithelium (partially keratinized in some places).

**5. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Cementum is a calcified layer of the tooth that covers the root dentin and is similar in composition to a fibrous bone.
- b) All papillae are located on the root of a tongue.
- c) Von Ebner's glands are in the root of a tongue.
- d) Weber's serous glands are in lamina propria beneath the epithelium of tongue papillae.

**6. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) The muscular layer of an oesophageal wall consists of smooth muscle at its entire length.
- b) The esophagus is lined by a stratified squamous non-keratinized epithelium.
- c) Tunica serosa is the most superficial layer of the esophagus throughout its entire length.
- d) The esophageal wall does not contain any exocrine glands.



**7. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) The musculature of the middle third of the esophagus consists of both smooth and striated muscle.
- b) The most cranial third of the esophagus (pars cervicalis) contains in the muscular layer a type of muscle with syncytium being its morphological unit.
- c) Tunica adventitia is a connective tissue layer that connects the cervical and thoracic parts of the esophagus to the surrounding area.
- d) Esophageal wall may contain glands both in the mucosal connective tissue and in the submucosa.

**8. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) The stomach is lined by a simple columnar epithelium.
- b) The fundus and body of the stomach contain glands composed of 5 different cell types.
- c) Chief cells of the gastric glands display typical features of proteosynthetically active cells, including a basophilic cytoplasm.
- d) Parietal cells of the gastric glands are the largest and have an eosinophilic cytoplasm.

**9. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Chief cells of the gastric glands are located mainly in the neck region.
- b) The muscular layer of the stomach wall is made up of the inner oblique, middle circular, and outer longitudinal layer of smooth muscle.
- c) The surface of the stomach is covered by tunica adventitia.

- d) Gastric pits are lined by mucous cells.

**10. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Stomach pyloric glands are branched tubular with a predominance of mucous cells.
- b) Parietal cells of gastric glands have a pyramidal shape, eosinophilic cytoplasm, and produce HCl and intrinsic factor.
- c) Mucous cells of the gastric glands are PAS positive.
- d) Chief cells are characterized by their basophilic cytoplasm and their location mainly in the fundus of the gastric glands.

**11. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Microvilli of the small intestine are processes made up of the mucosal epithelium and lamina propria.
- b) Microvilli on the surface of enterocytes form the brush border.
- c) Large intestine contains simple tubular glands in lamina propria of the mucosa, called Lieberkühn crypts.
- d) Paneth cells are immune cells of the glands of the small intestine but can also be found in the appendix.

**12. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Small intestine is lined by a simple columnar epithelium.

- b) Renewal of enterocytes of the small intestine takes around 6 days.
- c) PAS-positive goblet cells are part of the epithelial lining of the small intestine.
- d) Mucosa of the large intestine forms villi.

**13. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Crypts of the large intestine contain mainly goblet cells.
- b) Villi of the small intestine represent submucosal folds.
- c) Peyer's patches are found mainly in the aboral sections of the large intestine.
- d) Paneth cells are found predominantly in the neck region of Lieberkühn crypts.

**14. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) The entire length of the large intestine is covered with serosa.
- b) The epithelial lining of the small intestine including the glands consists of 6 different cell types.
- c) The small intestine enlarges its absorptive surface by three types of structures - circular folds, villi, and microvilli.
- d) Goblet cells are much more numerous in the large intestine than in the small intestine.

**15. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Circular folds or Kerckring's valves are formed by folds of the submucosa, villi by folds of the mucosa, and microvilli by folds of the cytoplasmic membrane of enterocytes.
- b) The entire length of the small intestine is covered by serosa.
- c) The epithelium of the small intestine contains 6 cell types - enterocytes, goblet cells, enteroendocrine cells, undifferentiated stem cells, M cells and Paneth cells.
- d) A lymphatic capillary, called the lacteal (chylous capillary), runs through the center of each villus of the small intestine.

**16. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) The wall of the digestive tract is generally made up of 4 layers - tunica mucosa, tunica submucosa, tunica muscularis, and tunica adventitia/serosa.
- b) The muscular wall of the digestive tube is generally composed of an inner longitudinal and outer circular layer.
- c) Submucosa contains the myenteric Auerbach's plexus.
- d) Lamina muscularis mucosae is always composed of smooth muscles.

**17. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) The general structure of the digestive tract is similar in all its sections having the greatest differences within the mucosa.
- b) Meissner's nerve plexus is part of the mucosa of the digestive tube.
- c) The duodenum contains the mucous Brunner glands in the submucosa.

d) Villi have the same shape in all parts of a small intestine.

**18. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) The boundary between a loose connective tissue of lamina propria and that of submucosa is tunica muscularis externa.
- b) The digestive tube is lined by two main types of epithelia - stratified squamous non-keratinized and simple columnar.
- c) Tunica adventitia of the digestive tube is a connective tissue layer covered with a mesothelium.
- d) Tunica muscularis of the digestive tube is generally composed of an inner circular and an outer longitudinal layer.

**19. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) The main difference between a large and small intestine is that the large intestine does not contain villi or Lieberkühn's crypts.
- b) Cajal's interstitial cells act as pacemakers in the digestive tube.
- c) Tunica serosa covers organs of the digestive tube located in the peritoneum and is composed of a connective tissue and a single layer of flat mesothelial cells.
- d) The myenteric Auerbach's plexus is located between two layers of tunica muscularis.

**20. Decide whether the following statements about the gastrointestinal tract are true T or false F:**

- a) Lamina muscularis mucosae consists of two layers of smooth muscle.
- b) A simple columnar epithelium lines the entire length of the digestive tube.
- c) Duodenum has no glands in its wall.
- d) A simple columnar epithelium along the entire length of the alimentary canal serves exclusively for nutrient absorption.

**21. Why the lip is red?**

- a) the epithelium of the red lip is richly vascularized, the blood vessels in the epithelium show through
- b) the lamina propria of the red lip contains myoglobin
- c) stratum lucidum renders epithelium of the red lip transparent
- d) extensive vascularity allows the color of the blood to show through

**22. What type of lingual papillae form a line in front of the sulcus terminalis?**

- a) papillae vallatae
- b) papillae fungiformes
- c) papillae filiforme
- d) papillae folatae

**23. Where the taste buds are not located?**

- a) filiform papillae
- b) fungiform papillae
- c) circumvallate papillae

d) vermilion

**24. Which of the following statements about the glands located in the middle part of esophagus are true?**

- a) are found in tunica submucosa
- b) secrete acid mucin for lubrication
- c) are mixed seromucous glands
- d) are typical mucosal glands

**25. Which of the following statements about esophageal wall are true?**

- a) tunica muscularis in its aboral third is made up of smooth muscle
- b) it is mainly covered by serosa
- c) inner layer of its tunica muscularis is oriented circularly
- d) the epithelium in its aboral third transitions from stratified to simple
- e) keratinization of epithelium does not normally occur

**26. Which of these stomach-related pairs are correct?**

- a) hydrochloric acid - chief cells
- b) pepsinogen - chief cells
- c) intrinsic factor - parietal cells
- d) gastrin - enteroendocrine cells

**27. What do the pyloric and cardiac glands of the stomach have in common?**

- a) are located in submucosa

- b) presence of enteroendocrine cells
- c) presence of mucous cells
- d) morphology of shallow pits into which they are opened

**28. Which structures of the small intestine serve to increase the absorptive surface area?**

- a) stereocilia
- b) papillae
- c) circular folds (valves of Kerckring)
- d) intestinal villi
- e) microvilli
- f) striated (brush) border

**29. What do the esophagus and the duodenum have in common?**

- a) plexus Auerbachii
- b) Paneth cells
- c) submucosal glands
- d) lacteal
- e) type of epithelial lining
- f) inner circular layer of tunica muscularis externa

**30. Which of the following statements about the stomach tunica muscularis are true?**

- a) consists of three sublayers
- b) outer sublayer is oriented obliquely



- c) Auerbach's plexus is not developed here
- d) its longitudinal bands are called "teniae"

**31. In the following statement, correct the word to make this statement correct: Villi have a central blood vessel known as a lacteal, which is crucial for the absorption of lipids from the intestine.**

- a) Villi → Microvilli
- b) blood → lymphatic
- c) lacteal → sinusoid
- d) lipids → carbohydrates
- e) intestine → stomach

**32. What structures are typical of the esophagus?**

- a) stratified squamous non-keratinized epithelium
- b) mostly circular smooth muscle of lamina muscularis mucosae
- c) smooth muscle layer
- d) cross striated muscle layer
- e) Meissner's plexus

**33. Which of the following general statements about the wall of gastrointestinal tract are true?**

- a) its tunica mucosa consists of lamina epithelialis, lamina propria and lamina muscularis mucosae
- b) most organs of the digestive tract have muscles arranged in the inner longitudinal and outer circular layer

- c) simple squamous epithelium can be found on its outer surface
- d) tunica adventitia is where the wall is directly attached to adjoining structures
- e) the circular smooth muscle layers forms sphincters at specific locations

**34. Which of the following statements about diffuse lymphatic tissue in gastrointestinal tract are true?**

- a) Peyer's patches are found in duodenal mucosa
- b) aggregated lymphatic nodules is present in the appendix
- c) M (microfold) cells initiate mucosal immunity responses in GALT
- d) Paneth cells initiate mucosal immunity responses in GALT

**35. Which of the following cells have basophilic cytoplasm?**

- a) serous cells
- b) Paneth cells (basal part)
- c) gastric chief cells
- d) gastric parietal cells
- e) mucous cell
- f) Paneth cells (apical part)

**36. Which of the following statements about the absorptive cell of small intestine are true**

- a) is called colonocyte
- b) absorb lipids by active transport
- c) possesses microvilli on its apical surface
- d) is the most numerous of all epithelial cells

- e) synthesize triglycerides from absorbed lipids

**37. Which of the following statements about the blood capillaries in jejunal mucosa are true?**

- a) are nourishing also avascular mucosal epithelium
- b) are responsible for dietary fat uptake
- c) are located in areolar loose connective tissue
- d) are capillaries of continuous type

**38. What do the stomach and small intestine have in common?**

- a) presence of MALT system in tunica mucosa and/or tunica submucosa
- b) Brunner's glands
- c) Paneth cells
- d) enteroendocrine cells
- e) simple columnar epithelium

**39. What are the typical submucosal glands in the wall of the digestive tract?**

- a) Brunner's glands in duodenum
- b) glandulae gastricae propriae
- c) submucosal mucous-secreting esophageal glands
- d) crypts of Lieberkühn

**40. What are the functions of the oral cavity?**

- a) mechanical grinding of food

- b) initiation of sacharide digestion
- c) initiation of lipid digestion
- d) participation in phonation

**41. Decide whether the following statements about the development of the gastrointestinal tract are true T or false F:**

- a) The stomach rotates 90 degrees clockwise around its longitudinal axis during development.
- b) Branches of the foregut are vascularized by the celiac trunk.
- c) The axis of rotation of the midgut is the inferior mesenteric artery.
- d) The entire duodenum arises from the midgut.

**42. Decide whether the following statements about the development of the gastrointestinal tract are true T or false F:**

- a) The finding of an intestinal loop in the umbilicus is always a pathological condition.
- b) The midgut rotates a total of 270 degrees anti-clockwise (when seen from the front).
- c) Linea dentata (pectinata) is the boundary between the epithelium of the anal canal, derived from the endoderm of the hindgut, and the epithelium derived from the ectoderm of the proctodeum.
- d) The superior mesenteric artery supplies the hindgut vasculature.

**43. Decide whether the following statements about the development of the gastrointestinal tract are true T or false F:**

- a) Isthmus faucium is the location of the oropharyngeal membrane during development.
- b) The oral cavity is derived from the endoderm of the foregut.
- c) Rotation of the stomach causes left vagus nerve to innervate the anterior wall of the stomach.
- d) Derivatives of the midgut are vascularly supplied by the superior mesenteric artery.

**44. Decide whether the following statements about the development of the gastrointestinal tract are true T or false F:**

- a) The epithelium of the entire digestive tube is derived from the endoderm of the primitive intestine.
- b) Failure of the midgut to complete rotation may result in a congenital developmental defect in which the cecum is located below the liver.
- c) Meckel's diverticulum is associated with abnormal development of the allantois.
- d) Duodenum develops partly from the foregut and partly from the midgut.

**45. Decide whether the following statements about the development of the gastrointestinal tract are true T or false F:**

- a) Hirschsprung's disease is caused by a defect in the migration of neural crest cells to the intestinal primordium.
- b) Proctodeum is of endodermal origin.
- c) If the midgut rotates clockwise (when viewed from the front), the rotation is reversed, and the transverse colon lies behind the duodenum.

d) Meckel's diverticulum arises as a remnant of the omphaloenteric duct.

**46. What structures develop from the cloaca?**

- a) allantois
- b) anorectal canal
- c) vitelline vessels
- d) urogenital sinus

**47. Which of the following statements about the physiological umbilical herniation of intestinal loop are true?**

- a) it also rotates around the axis of the arteria mesenterica superior
- b) it happens in the 13th week
- c) rotates in a counterclockwise direction
- d) it retracts into the abdomen in the 10th week
- e) overall, the intestinal loop rotates 360 degrees

**48. Which components of the digestive tube are neural crest derivatives?**

- a) Meckel's diverticulum
- b) enteric nervous system
- c) lacteals
- d) enteroendocrine cells

49. What is the name of the midgut and yolk sac coupling?

- a) allantois
- b) ductus omphaloentericus
- c) hindgut
- d) vitelline duct
- e) cloaca

50. Epithelial lining of which primordia of the tongue are of ectodermal origin?

- a) lateral lingual swellings
- b) copula
- c) ductus thyreoglossus
- d) tuberculum impar

## Chapter Four answers:

- |          |         |          |         |
|----------|---------|----------|---------|
| 1) cd    | 14) bcd | 27) bc   | 40) abd |
| 2) abc   | 15) acd | 28) cdef | 41) ab  |
| 3) abcd  | 16) ad  | 29) acf  | 42) bc  |
| 4) cd    | 17) ac  | 30) a    | 43) acd |
| 5) a     | 18) bd  | 31) b    | 44) bd  |
| 6) b     | 19) bcd | 32) acde | 45) acd |
| 7) abcd  | 20) a   | 33) acde | 46) abd |
| 8) abcd  | 21) d   | 34) bc   | 47) acd |
| 9) bd    | 22) a   | 35) abc  | 48) b   |
| 10) abcd | 23) ad  | 36) cd   | 49) bd  |
| 11) bcd  | 24) ab  | 37) ac   | 50) ad  |
| 12) abc  | 25) ace | 38) ade  |         |
| 13) a    | 26) bcd | 39) ac   |         |



## Chapter Five: Gastrointestinal system 2 (GIT associated glands)

**1. Decide whether the following statements about the salivary glands are true T or false F:**

- a) Striated ducts have a strongly basophilic cytoplasm.
- b) Parotid gland is a purely serous gland.
- c) Mucous tubules predominate over serous acini in sublingual gland.
- d) Submandibular gland is a mixed tubulo-acinar gland with a predominance of serous acini.

**2. Decide whether the following statements about the salivary glands are true T or false F:**

- a) Lunulae of Gianuzzi are probably an artefact of histological processing of a sublingual gland tissue.
- b) Striated ducts have many lysosomes in the basal labyrinth.
- c) Intercalated ducts of large salivary glands are lined by a cuboidal epithelium.
- d) Interlobar ducts of large salivary glands are lined by a stratified columnar epithelium.

**3. Decide whether the following statements about the salivary glands are true T or false F:**

- a) A basal labyrinth with many mitochondria is a typical feature of striated ducts at the ultrastructural level.
- b) Parotid gland is a mixed seromucous gland.
- c) Many adipocytes are found among the parenchymal cells of a parotid gland.

- d) The predominance of mucous tubules in a sublingual gland causes the gland to be predominantly dark basophilic when stained with hematoxylin and eosin.

**4. Decide whether the following statements about the gallbladder are true T or false F:**

- a) Gallbladder has a basic wall structure identical to the rest of the digestive tube.
- b) Gallbladder is lined by a simple columnar epithelium.
- c) Rokitansky-Aschoff sinuses are found in the submucosa of a gallbladder.
- d) The entire surface of a gallbladder is covered by serosa.

**5. Decide whether the following statements about the gallbladder are true T or false F:**

- a) The basic difference in the structure of a gallbladder wall compared to the rest of a digestive tract is that the gallbladder lacks lamina muscularis mucosae and submucosa.
- b) The free surface of the gallbladder is covered by serosa, while the area adjacent to the liver is covered by adventitia.
- c) Cholecystocytes lining a gallbladder have cilia on their surface.
- d) Gallbladder is lined by a simple cuboidal epithelium.

**6. Decide whether the following statements about the pancreas are true T or false F:**

- a) The pancreas, like the parotid gland, contains intercalated ducts.

- b) The pancreas is a purely exocrine gland.
- c) Exocrine part of the pancreas consists of serous acini and a system of ducts.
- d) The pancreas contains no striated ducts.

**7. Decide whether the following statements about the pancreas are true T or false**

**F:**

- a) B-cells are located predominantly in the center of the islets of Langerhans.
- b) All endocrine cells of the islets of Langerhans can be reliably distinguished by hematoxylin and eosin staining.
- c) Serous acini are responsible for the secretion of insulin and glucagon.
- d) B cells make up to 70% of all cells in the islets of Langerhans.

**8. Decide whether the following statements about the pancreas are true T or false**

**F:**

- a) The pancreas contains both exocrine and endocrine parts and is therefore classified as a mixed seromucous gland.
- b) A-cells are less numerous than B-cells and are found predominantly on the periphery of the islets of Langerhans.
- c) Pancreatic islets of Langerhans form digestive enzymes.
- d) The endocrine part of a pancreas predominates over the exocrine portion of the pancreatic parenchyma.

**9. Decide whether the following statements about the pancreas are true T or false**

**F:**

- a) Serous acini of the pancreas are made up of A and B cells.

- b) Intercalated ducts start directly in acini and are formed by centroacinar cells.
- c) The pancreas is distinguished from the parotid gland mainly by the presence of many fat cells between the islets of Langerhans.
- d) Striated pancreatic ducts secondarily regulate a mixture of digestive enzymes.

**10. Decide whether the following statements about the pancreas are true T or false F:**

- a) Islets of Langerhans of the pancreas contain 4 main cell types - A, B, D and F (PP) cells.
- b) Hematoxylin and eosin shows A-cells in red at the periphery of the islets of Langerhans.
- c) The pancreas is a purely endocrine gland.
- d) In hematoxylin and eosin staining, the islets of Langerhans are seen as lighter parts of the parenchyma in the predominantly dark basophilic exocrine portion.

**11. Decide whether the following statements about the liver are true T or false F:**

- a) The liver produces several hormones in addition to exocrine secretion (bile).
- b) Canaliculi biliferi do not have their own epithelial lining, they are formed only by neighboring hepatocytes.
- c) Classic hepatic lobule (old name lobulus venae centralis) is the basic morphological unit of the liver parenchyma.
- d) Trias hepatica contains only three structures - the interlobular bile duct, the vena cava, and the artery.

**12. Decide whether the following statements about the liver are true T or false F:**

- a) In addition to the interlobular vein, artery and bile duct, the portal triad contains other structures such as lymphatic vessels and autonomic nerves.
- b) The interlobular bile duct can be distinguished from the vessels in section mainly by the height of the epithelial lining.
- c) The liver contains capillaries with a continuous lining between the hepatocytes.
- d) The bile ducts of Hering have a wall composed partly of hepatocytes and partly of cholangiocytes and stem cells.

**13. Decide whether the following statements about the liver are true T or false F:**

- a) Trias hepatica contains bile capillaries.
- b) The basic morphological unit of the liver parenchyma has a central vein in the center and portobiliary spaces at the angles.
- c) The liver is the largest gland in the human body.
- d) Disse's space is part of the portal triad.

**14. Decide whether the following statements about the liver are true T or false F:**

- a) The portal lobe is of hexagonal shape on the tissue section.
- b) The portobiliary space is in the center of the portal lobe.
- c) The basic morphological unit of the liver parenchyma is the hepatic acinus.
- d) Kupffer cells are specialized macrophages of the liver.

**15. Decide whether the following statements about the liver are true T or false F:**

- a) The hepatic acinus is the basic functional unit of the liver parenchyma.

- b) Kupffer cells are a reservoir of vitamin A.
- c) Capsula fibrosa hepatis Glissoni is the liver capsule formed by a dense irregular connective tissue.
- d) The perisinusoidal (Disse's) space is found in the middle of the portal triad.

**16. Decide whether the following statements about the liver are true T or false F:**

- a) The Ito cell is in the perisinusoidal space and serves as a reservoir for vitamin A.
- b) The portal lobe is of triangular shape.
- c) The capillary network in the liver consists of sinusoids with a discontinuous lining.
- d) Kupffer cells are part of the lining of hepatic sinusoids.

**17. Decide whether the following statements about the liver are true T or false F:**

- a) A hepatocyte can contain two nuclei.
- b) A hepatocyte is a polygonal polarized epithelial cell.
- c) The bile pole of a hepatocyte is facing into Disse's compartment.
- d) The major exocrine secretory product of the liver is angiotensinogen.

**18. Decide whether the following statements about the liver are true T or false F:**

- a) The liver has a very limited regenerative capacity.
- b) The hepatocyte contains all typical organelles and many inclusions due to its high metabolic activity.
- c) The vascular pole of a hepatocyte has microvilli on its surface that are facing into Disse's space.

d) The portal triad is in the center of a hepatic acinus.

**19. Decide whether the following statements about the liver are true T or false F:**

- a) Fine stroma of the liver consists of a dense connective tissue.
- b) The portal triad is part of Disse's compartment.
- c) Substances that pass between hepatocytes and blood must pass through Disse's space.
- d) Venae centrales are a type of hepatic sinusoids.

**20. Decide whether the following statements about the liver are true T or false F:**

- a) A hepatocyte is a polygonal cell without apical and basolateral polarization.
- b) A hepatocyte always has one centrally located nucleus.
- c) In human, thick connective tissue septa between individual classic hepatic lobules can be well distinguished by trichrome staining.
- d) Dividing the liver into hepatic acini helps to functionally subdivide the parenchymal compartments in terms of the dynamics of substance exchange and respiratory gases.

**21. Which of the following statements about the islets of Langerhans are true?**

- a) are surrounded by exocrine components
- b) are avascular
- c) their most common cell type is  $\beta$  cell
- d) are composed of chromaffin cells

**22. What can a hepatocyte store in its cytoplasm?**

- a) vitamin A
- b) vitamin D
- c) iron (ferritin)
- d) glycogen

**23. Which terms are closely related to intrahepatic bile ducts?**

- a) cholangiocyte
- b) canal of Hering
- c) Rokitansky-Aschoff sinuses
- d) space of Dissé
- e) Kupffer cell

**24. Which of the following cells is most similar to the epithelial cell of the gallbladder mucosa?**

- a) Paneth cell
- b) hepatocyte
- c) serous cell
- d) enterocyte

**25. Which of the following glands is most similar histologically to the exocrine pancreas?**

- a) Ebner's gland
- b) Webber's gland
- c) sublingual gland



- d) liver
- e) endocrine pancreas

**26. Which of the following statements about the exocrine pancreas are true?**

- a) contains centroacinar cells
- b) its acinar cells contain zymogen granules in apical cytoplasm
- c) possesses striated intralobular duct
- d) possesses fenestrated capillaries
- e) its acini contain serous cells

**27. Which of these pairs are correct?**

- a) striated duct - parotid gland
- b) perisinusoidal space - space of Mall
- c) tunica submucosa - gall bladder
- d) liver sinusoids - Kupffer cells
- e) Ito (stellate) cells - space of Dissé

**28. What is the name of the cell in the gland of the digestive system whose product regulates growth hormone release from the adenohypophysis?**

- a)  $\delta$  (D) cell
- b) hepatocyte
- c)  $\alpha$  (A) cell
- d) PP cell

**29. C peptide is secreted from secretory cells along with insulin. Function of what cells are we assessing when measuring urinary C-peptide excretion?**

- a) pancreatic acinar cells
- b) enteroendocrine cells
- c)  $\alpha$  (A) cell
- d)  $\beta$  (B) cell

**30. Which of the following glands contain serous secretory cells?**

- a) pancreas
- b) submandibular gland
- c) liver
- d) parotid gland
- e) sublingual gland

**31. Which of the following statements about the ducts of digestive glands are true?**

- a) centroacinar cells are proximal portion of duct system of large salivary glands
- b) epithelial cells of striated ducts contain numerous mitochondria
- c) cholangiocytes are present both in the intrahepatal and extrahepatal bile ducts
- d) intrahepatal bile capillaries are also called space of Dissé

**32. What cells can you find in the liver parenchyma?**

- a) hepatocytes
- b) endothelial cells
- c) stellate (Ito) cells

- d) PP cells
- e) Kupffer cells
- f) cholangiocytes

**33. What is the name of the cell whose product is responsible for lipid emulsification in the small intestine?**

- a)  $\beta$  (B) cell
- b) stellate (Ito) cell
- c) acinar cell
- d) hepatocyte
- e) enterocyte

**34. Which of the following statements about the wall of gall bladder are true?**

- a) its tunica mucosa contains numerous serous glands producing bile
- b) has no tunica submucosa
- c) exhibits huge folds which are covered by tall simple columnar epithelium with microvilli
- d) has no tunica muscularis

**35. Which structure is in the center of portal lobule?**

- a) space of Mall
- b) central vein
- c) portobiliary space (portal canals)
- d) sinusoid
- e) portal triad

**36. Which of the following statements about the space of Dissé are true?**

- a) is between the basal surfaces of hepatocytes and basal surfaces of endothelial cells
- b) represents the barrier between the hepatocytes and bile capillaries
- c) contains projections of microvilli of hepatocytes
- d) contains stellate (Ito) cells

**37. Which of the following statements about the Giannuzzi lunulae (serous demilunes or crescents of Giannuzzi) are true?**

- a) are found in pure serous glands
- b) are artifact of the routine fixation method
- c) are serous cells at the distal end of mucous tubuloalveolar secretory unit of certain salivary glands
- d) are semilunar shaped cells of the intercalated ducts

**38. What is the truth about mucinogen granules?**

- a) are synthesized and stored within the mucous cells
- b) can be found in secretory portion of submandibular gland
- c) are also termed as zymogenic granules
- d) can be visualized using the Alcian blue dye

**39. In which of the following actions are the striated ducts of large salivary glands involved?**

- a) secretion of  $\text{HCO}_3^-$
- b) absorption of  $\text{Cl}^-$

- c) reabsorption of Na<sup>+</sup>
- d) secretion of IgA (secretory antibody)

**40. Which of the following statements about the classic lobule (lobulus venae centralis) are true?**

- a) contains cords of hepatocytes
- b) has roughly hexagonal shape
- c) in the place of contact of three lobules is portal canal (portobiliary space) with canal of Hering
- d) portal vein is in its center

**41. Decide whether the following statements about the development of the digestive glands are true T or false F:**

- a) All cell populations of the liver are derived from the endoderm of the foregut.
- b) Most of the pancreas develops from the anterior base of the pancreatic duct.
- c) Pancreas anulare is formed when the anterior base of the pancreas bifurcates and wraps around the base of the duodenum from opposite sides.
- d) Kupffer cells arise from the mesenchyme in the septum transversum.

**42. Decide whether the following statements about the development of the digestive glands are true T or false F:**

- a) The cranial part of the hepatic diverticulum gives rise to the gallbladder.
- b) Hepatocytes are derived from the endoderm of the foregut.
- c) The posterior base of the pancreas gives rise to the head, body, and tail portions of the pancreas.

- d) The base of the pancreas originates in the midgut region.

**43. Decide whether the following statements about the development of the digestive glands are true T or false F:**

- a) Hepatocytes originate from the mesenchyme of the transverse septum.
- b) The pancreas develops from a single base that grows out of the foregut.
- c) The cranial part of the hepatic diverticulum gives rise to the liver parenchyma.
- d) The caudal part of the hepatic diverticulum gives rise to the gallbladder.

**44. Decide whether the following statements about the development of the digestive glands are true T or false F:**

- a) The basis of the largest digestive gland develops in the region of the foregut.
- b) Pancreas anulare is the result of a defect in the development of the posterior base of the pancreas.
- c) The fibrous stroma of the liver originates from the mesenchyme in the transverse septum.
- d) Pancreas divisum is a congenital developmental defect resulting from a defect in the junction of the ducts of the anterior and posterior bases of the pancreas.

**45. Decide whether the following statements about the development of the digestive glands are true T or false F:**

- a) Hepatocytes have the same embryonic origin as Kupffer cells.
- b) The transverse septum influences the formation and development of the base of the liver.

- c) The uncinata process of the pancreas develops from the dorsal base of the pancreas.
- d) The parotid gland is of ectodermal origin, whereas the submandibular and sublingual glands are of endodermal origin.

**46. Which of the following statements about the development of the parotid gland are true?**

- a) the epithelium-lined ductal junction between the developing acini and the oral cavity gives rise to the Stensen's duct
- b) develops from a groove-like invagination of endoderm
- c) its secretory portion originates from the underlying mesenchyme
- d) develops from a groove-like invagination of ectoderm

**47. What anatomical parts of the definitive pancreas are derived from the former ventral pancreas?**

- a) upper part of the head
- b) lower part of the head
- c) uncinata process
- d) tail

**48. Which of the following statements about the origin of the liver connective tissue are true?**

- a) originates from the hepatic cords
- b) originate from the dorsal mesentery
- c) originate from the ventral mesentery

- d) originate from the mesenchyme of the mesoderm

**49. Which of the following statements about the hepatic diverticulum are true?**

- a) originates from the foregut
- b) gives rise to cords of hepatoblasts
- c) gives rise to hepatic sinusoids
- d) later it develops into a hepatic plate

**50. How can the presence of accessory pancreatic duct in 7% of the population be explained?**

- a) because the common pancreatic bud in these people split into two
- b) because the pancreas primordia are established on two places that may not connect
- c) the dorsal pancreatic bud persisted and its ductal system gave rise to the accessory pancreatic duct
- d) because they have developed pancreas anullare



## Chapter Five answers:

- |         |          |           |         |
|---------|----------|-----------|---------|
| 1) bcd  | 14) bd   | 27) ade   | 40) ab  |
| 2) ad   | 15) ac   | 28) a     | 41) cd  |
| 3) ac   | 16) abcd | 29) d     | 42) bc  |
| 4) b    | 17) ab   | 30) abde  | 43) cd  |
| 5) ab   | 18) bc   | 31) bc    | 44) acd |
| 6) acd  | 19) c    | 32) abcef | 45) bd  |
| 7) ad   | 20) d    | 33) d     | 46) ad  |
| 8) b    | 21) ac   | 34) bc    | 47) bc  |
| 9) b    | 22) cd   | 35) ce    | 48) cd  |
| 10) ad  | 23) ab   | 36) acd   | 49) ab  |
| 11) abc | 24) d    | 37) bc    | 50) bc  |
| 12) abd | 25) a    | 38) abd   |         |
| 13) bc  | 26) abe  | 39) ac    |         |

## Chapter Six: Tooth (only for Dentistry students)

**1. Decide whether the following statements about the tooth are true T or false F:**

- a) Secretory ameloblast is a cell with Tomes's process protruding from its apical surface.
- b) Hunter-Schreger bands can be observed in the tooth enamel when stained with hematoxylin and eosin.
- c) Ameloblasts disappear after the tooth eruption.
- d) There are two basic types of enamel - prismatic and aprismatic.

**2. Decide whether the following statements about the tooth are true T or false F:**

- a) Odontoblasts are epithelioidally arranged cells at the border of dentin and dental pulp of a mature tooth.
- b) Odontoblasts send out an apical Tomes's fiber that runs in the dentin tubules.
- c) Dentin covers the dental crown.
- d) Enamel prisms always extend through the entire width of the enamel.

**3. Decide whether the following statements about the tooth are true T or false F:**

- a) Hunter-Schreger bands are optical artefacts of sectioning.
- b) About 70% of the enamel mass is inorganic.
- c) The crown of the tooth is covered with cementum and the root is covered with enamel.
- d) The formation of primary enamel takes place throughout whole life.

**4. Decide whether the following statements about the tooth are true T or false F:**

- a) Dentin tubules pass through the entire width of the dentin.
- b) Dentin mineralises continuously; therefore, it has a homogeneous appearance.
- c) There is a sheath of dentin at the border between dentin and pulp.
- d) Just above the surface of the odontoblasts, close to the pulp, there is unmineralized predentin.

**5. Decide whether the following statements about the tooth are true T or false F:**

- a) Predentin stains pink when stained with hematoxylin and eosin.
- b) Growth lines of von Ebner correspond to the periodic progression of dentin mineralization.
- c) Tomes' fibers are part of the intercellular matrix of dentin - the dentin matrix.
- d) Tomes's fiber is synonymous with Tomes's process.

**6. Decide whether the following statements about the tooth are true T or false F:**

- a) Cementum is part of periodontium.
- b) Cementum covers the dentin of both the root and the crown.
- c) Pulp is an avascular tissue.
- d) The subodontoblast (Weil's) zone is the innermost layer of the dental pulp.

**7. Decide whether the following statements about the tooth are true T or false F:**

- a) Lymphocytes and plasma cells are fixed cells of the dental pulp.
- b) Pulpocytes are immune cells found in the dental pulp.
- c) Dental pulp fills both the pulp cavity and the root canals.

- d) The extracellular matrix of the dental pulp contains reticular fibers in addition to amorphous material.

**8. Decide whether the following statements about the tooth are true T or false F:**

- a) In composition, cementum resembles a compact bone containing Haversian systems.
- b) Cementum has irregular thickness throughout.
- c) The organic component of cementum is predominantly type II collagen.
- d) Precementum is a heavily calcified layer on the surface of the cementum.

**9. Decide whether the following statements about the tooth are true T or false F:**

- a) The interdentin represents the transition zone between the pre dentin and the mineralized dentin.
- b) Cementum is thickest in the cervical region.
- c) The dentin contains many blood vessels.
- d) Tertiary dentin is also called reactive (reparative) dentin because it forms in response to various external influences, such as dental caries.

**10. Decide whether the following statements about the tooth are true T or false F:**

- a) Pulpocytes belong to the fixed cells of the dental pulp.
- b) The mucous connective tissue of the dental pulp contains many collagen fibers and a minimum of amorphous material.
- c) The dental pulp is a very well vascularized and innervated soft tissue of the tooth.

- d) Biopolar fibroblasts form a single distinct layer with odontoblasts in the tooth enamel.

**11. Decide whether the following statements about the periodontium are true T or false F:**

- a) The gingiva covers part of the alveolar processes of the jawbone, the neck region of the tooth, and part of the anatomical crown of the tooth.
- b) Gingiva alveolaris is sharply demarcated from the surrounding oral mucosa by the mucogingival junction (line).
- c) Gingiva marginalis is the non-moving part of the gingiva.
- d) Gingiva alveolaris is the name given to the mobile part of the gingiva.

**12. Decide whether the following statements about the periodontium are true T or false F:**

- a) The mucoperiosteum is the direct connection between the periosteum and the gingiva.
- b) Elastic fibers of the periodontal ligament attach to the tooth socket on one side and to the cementum on the other.
- c) The gingiva is formed by a mechanically resistant chewing type of mucosa.
- d) The periodontal ligament has the structure of a dense connective tissue.

**13. Decide whether the following statements about the periodontium are true T or false F:**

- a) The alveolar bone is covered by the periosteum.
- b) Periodontal ligament is a synonym for periodontium.

- c) Alveolar fibers are collagen fibers running between the cementum and the bone of the tooth socket.
- d) Periodontal ligament contains a predominance of collagen fibers with a small number of cells and amorphous material.

**14. Decide whether the following statements about the periodontium are true T or false F:**

- a) Periodontal ligament contains progenitor cells that serve to rebuild the bone of the tooth socket.
- b) The gingiva consists of an epithelium, lamina propria, and submucosal connective tissue.
- c) Periodontium is a term that includes the following structures: periodontal ligament, cementum, alveolar bone, and gingiva.
- d) Sharpey's fibers are elastic fibers present in the periodontal ligament.

**15. Decide whether the following statements about the periodontium are true T or false F:**

- a) Primary collagen fibers in the lamina propria of the gingiva are classified according to their course as dentogingival, alveologingival, and circular.
- b) Collagen fibers of the periodontal ligament attach to the tooth socket on one side and to the enamel on the other.
- c) Mucoperiosteum represents the direct connection between the periosteum and the gingiva.
- d) The alveolar bone is part of the periodontal ligament.

**16. Decide whether the following statements about the periodontium are true T or false F:**

- a) The alveolar bone is not covered by the periosteum.
- b) Gingiva marginalis is the movable part of the gingiva.
- c) The junctional epithelium/epithelial attachment of Gottlieb consists of a single layer of columnar cells.
- d) Linea mucogingivalis is the line that separates the free gingiva from the oral mucosa.

**17. Decide whether the following statements about the periodontium are true T or false F:**

- a) The periodontal ligament consists only of collagen fibers that run between the cementum and the alveolar bone.
- b) The periodontal ligament contains many connective tissue cells with few fibers.
- c) The alveolar bone (the bone of the tooth socket) has the capacity for intensive rapid remodelling.
- d) The gingiva consists of stratified non-keratinized squamous epithelium, which may slightly keratinize in some places.

**18. Decide whether the following statements about the periodontium are true T or false F:**

- a) The alveolar bone is part of the periodontium.
- b) The gingiva is attached to the surrounding structures throughout its entire extent.
- c) Sharpey's fibers are collagen fibers present in the periodontal ligament.
- d) The alveolar bone has a limited capacity for remodelling.

**19. Decide whether the following statements about the periodontium are true T or false F:**

- a) The alveolar bone is covered by a thick layer of the periosteum.
- b) Periodontium contains many elastic fibers.
- c) Collagen fibers of the periodontium attach to the tooth socket on one side and to the cementum on the other side.
- d) The junction between the gingiva and the oral mucosa is smooth.

**20. Which tooth tissue is the most mineralized?**

- a) alveolar bone
- b) cement
- c) enamel
- d) dentin

**21. Which of the following statements about tooth are true?**

- a) the organ of enamel is active throughout life
- b) adult dentition contains a total of 32 teeth
- c) the cementum covers the dental crown
- d) the dental pulp contains nerves
- e) dentin is of neuroectodermal origin

**22. Where are ameloblasts found in an adult human?**

- a) in one line on the boundary between pulp and dentin
- b) in one line on the border between dentin and enamel
- c) freely dispersed in the dental pulp



d) adult human does not have ameloblasts

**23. Which of the following statements about the dentin are true?**

- a) is produced by odontoblasts
- b) it consists of 94 to 98 % calcium hydroxyapatite
- c) destroyed during preparation of tooth paraffin blocks
- d) made of loose connective tissue
- e) can be reactively renewed

**24. Which of the following statements about the dentin are true?**

- a) contains Tomes fibers
- b) is produced by ameloblasts
- c) contains type I collagen fibrils
- d) contains hydroxyapatite crystals

**25. How many incisors are present in deciduous dentition?**

- a) 2
- b) 4
- c) 8
- d) 12

**26. Which of the following statements about the enamel are true?**

- a) is the hardest tissue in the body
- b) covers the crown of the tooth

- c) is composed of enamel rods
- d) striae of Retzius are evidence of rhythmic growth of the enamel
- e) is primarily composed of soft tissues, making it less resistant to wear and tear compared to other dental structures
- f) can regenerate after damage, including the treatment of dental caries

**27. Which of the following statements about the gingivodental cap (attachment epithelium) are true?**

- a) changes and shifts apically over the course of a lifetime
- b) is a firm connection between the epithelium of the gingiva and the hard tissues of the tooth
- c) the cells of the junctional epithelium have a high regenerative capacity
- d) there are numerous leukocytes in the connective tissue under the epithelium
- e) is primarily composed of enamel-forming ameloblasts, actively involved in the secretion of enamel matrix during tooth development

**28. In the following statement, correct the word to make this statement correct: The dental pulp cavity is a richly vascularized and innervated dense connective tissue compartment bounded by the tooth dentin**

- a) pulp → matrix
- b) richly → poorly
- c) dense → loose
- d) dentin → enamel

**29. Which of the following statements about the histological processing of the tooth are true?**

- a) ground section preserves living tissues
- b) ground section can be much thinner than paraffin-embedded sections
- c) decalcification is needed for paraffin-embedded processing
- d) enamel is lost in ground sections
- e) the entire histology of the crown can be seen after the decalcification process

**30. Which of the following statements about the cementum are true?**

- a) its histology is similar to woven bone
- b) is richly vascularized
- c) is loose connective tissue
- d) Sharpey's fibers are embedded in it
- e) covers the crown of the tooth
- f) contains cementocytes in lacunae

**31. What are the functions of periodontal ligament?**

- a) triggers the formation of the Hertwig epithelial root sheath
- b) tooth attachment
- c) proprioception
- d) provide structural support and nourishment to the enamel

**32. Which tissues of the tooth are avascular?**

- a) cementum
- b) enamel

- c) dentin
- d) pulp

**33. Which of the pairs are correct?**

- a) hydroxyapatite - dental pulp
- b) Tomes's processes - ameloblasts
- c) Tomes's fibers - odontoblasts
- d) Sharpey's fibers - odontoblasts
- e) striae of Retzius - enamel

**34. Which of the following statements about the tertiary dentin are true?**

- a) it is formed before the tooth is erupted
- b) also referred to as reactive, reparative
- c) the number of its dentin tubules is reduced and their course is irregular
- d) is an immature, non-mineralized dentin

**35. What also belongs to the structures of the periodontium?**

- a) cement of the tooth root
- b) junctional epithelium
- c) dental pulp
- d) dentin of the crown
- e) supraalveolar system of ligaments

**36. Which of the following statements about the periodontal ligaments are true?**

- a) they consist mainly of bundles of collagen fibres (collagen I)
- b) they consist mainly of thick elastic fibres
- c) are arranged in a clockwise and anticlockwise direction
- d) develop from the ectomesenchyme of the dental sac

**37. Which of the following statements about the supraalveolar system of ligaments are true?**

- a) strengthen the gingiva and bone alveolus with the tooth
- b) attach the root area of the tooth in the bone alveolus
- c) are made up of both collagen and elastic fibers
- d) are part of the periodontal ligaments

**38. Which of the following statements about the junctional epithelium of the gingiva are true?**

- a) forms cells with high mitotic activity and regenerative capacity
- b) formed by the fusion of the oral epithelium and part of the enamel epithelium during tooth eruption
- c) is firmly attached to the dentin of the tooth
- d) a pathological gingival pouch is formed when its connection with the tooth is broken

**39. Into what tissues do periodontal ligaments insert?**

- a) enamel
- b) dentin

- c) junctional epithelium
- d) alveolar bone
- e) dental lamina
- f) cementum

**40. Decide whether the following statements about the development of the tooth are true T or false F:**

- a) Root development occurs earlier than crown development of a tooth.
- b) Cementoblasts develop from the enamel organ.
- c) During tooth root development, the epithelial root sheath (Hertwig's sheath) induces the differentiation of odontoblasts in the tooth papilla to form the root dentin.
- d) Malassez epithelial bodies in the periodontium represent the remnants of the epithelial root sheath.

**41. Decide whether the following statements about the development of the tooth are true T or false F:**

- a) Mesenchymal cells of the tooth socket that come into contact with the dentin of the root initiate the formation of cementum and periodontium.
- b) The epithelial root sheath (Hertwig's sheath) is formed by the outer and inner enamel epithelium without the enamel pulp (stellate reticulum) in between.
- c) Root development begins after crown development.
- d) The enamel pulp (stellate reticulum) differentiates into the definitive pulp during development.

**42. Decide whether the following statements about the development of the tooth are true T or false F:**

- a) The dental pulp develops from the ectomesenchyme of the dental papilla.
- b) The dental pulp develops from the inner epithelial layer of the enamel organ.
- c) The dental sac is the embryonic structure from which the dental pulp develops.
- d) The dental pulp develops from tissue derived from neural crest cells.

**43. Decide whether the following statements about the development of the bones of the skull are true T or false F:**

- e) Bones of the skull develop from mesenchyme derived from both the mesoderm and ectomesenchyme of neural crest cells origin.
- f) Bones of the chondrocranium ossify by a process called desmogenic ossification.
- g) Most viscerocranial bones ossify via desmogenic ossification from tissue of pharyngeal arches.
- h) All cranial bones ossify by the same mechanism.

**44. Decide whether the following statements about the development of the bones of the skull are true T or false F:**

- a) Bones of the cranial vault ossify in a desmogenic manner.
- b) Most bones of the facial skeleton ossify by desmogenic ossification.
- c) Bones of the viscerocranium grow much faster than bones of the neurocranium during fetal development.
- d) Bones of the newborn's skull fuse definitively shortly after birth.

**45. Which of the following general statements about the tooth development are true?**

- a) dental papilla is of endodermal origin
- b) production of dentin precedes enamel production and appears in bell stage
- c) preodontoblasts first appear in the stellate reticulum of developing tooth
- d) the root of the deciduous tooth begins to form after the tooth erupts

**46. Which of the following statements about the enamel development are true?**

- a) secretory ameloblasts differentiate from outer enamel epithelium of enamel organ
- b) ameloblasts differentiate from inner enamel epithelium of enamel organ
- c) enamel originates from the ectodermal epithelium of the primitive oral cavity
- d) ameloblasts, producing the enamel, arise from ectomesenchyme of dental papilla

**47. What is the embryonic origin of dentin?**

- a) ectoderm
- b) mesenchyme
- c) endoderm
- d) mesoderm

**48. Which of the following statements about the secretory ameloblasts ultrastructure are true?**

- a) are columnar cells
- b) junctional complexes are present on both apical and basal parts of the cell



- c) their apex neighbors stratum intermedium
- d) possess Tomes's process

**49. What are the structures of the bell stage?**

- a) stellate reticulum in the dental papilla
- b) outer enamel epithelium
- c) preodontoblasts
- d) stratum intermedium

**50. Which of the following statements about the Hertwig epithelial root sheath are true?**

- a) is derived from the inner and outer enamel epithelium
- b) may be involved in cementogenesis
- c) is located at the cervical loop of the enamel organ
- d) is a temporary structure found in deciduous teeth but is absent in permanent teeth

## Chapter Six answers:

- |         |          |          |         |
|---------|----------|----------|---------|
| 1) cd   | 14) ac   | 27) abcd | 40) cd  |
| 2) abd  | 15) ac   | 28) c    | 41) abc |
| 3) a    | 16) ab   | 29) c    | 42) ad  |
| 4) ad   | 17) cd   | 30) adf  | 43) ac  |
| 5) ab   | 18) ac   | 31) bc   | 44) ab  |
| 6) a    | 19) c    | 32) abc  | 45) b   |
| 7) cd   | 20) c    | 33) bce  | 46) bc  |
| 8) b    | 21) bde  | 34) bc   | 47) a   |
| 9) ad   | 22) d    | 35) abe  | 48) bd  |
| 10) ac  | 23) ae   | 36) acd  | 49) bcd |
| 11) ab  | 24) acd  | 37) ac   | 50) abc |
| 12) acd | 25) c    | 38) abd  |         |
| 13) cd  | 26) abcd | 39) df   |         |

## Chapter Seven: Respiratory system

**1. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) The epiglottis is reinforced by elastic cartilage.
- b) The lingual surface of the epiglottis is covered by a stratified squamous non-keratinized epithelium.
- c) Reinke's space is a loose connective tissue beneath false vocal cords.
- d) The false vocal cords contain seromucous glands in the connective tissue.

**2. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) The epiglottis is reinforced by hyaline cartilage.
- b) The laryngeal surface of the epiglottis is covered by a pseudostratified columnar epithelium with cilia and goblet cells.
- c) The epiglottis contains seromucous glands in the connective tissue.
- d) Tonsilla laryngea is an accumulation of a lymphatic tissue in the epiglottis.

**3. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) Plicae vocales contain mainly seromucous glands in the connective tissue.
- b) The larynx is reinforced exclusively by hyaline cartilage.
- c) Plicae vocales are covered by a stratified squamous non-keratinized epithelium due to intense mechanical stress of voice production.

- d) Reinke's space is a layer of a loose connective tissue beneath the plicae vocales.

**4. Decide whether the following statements about the respiratory system are true T or false F:**

- a) The cartilage reinforcing the epiglottis can be selectively stained for example with orcein.
- b) The laryngeal surface of the epiglottis is covered entirely by a stratified squamous non-keratinized epithelium.
- c) Tonsilla laryngea is an accumulation of a lymphatic tissue in the region of the ventriculus laryngis.
- d) The larynx is entirely lined by a pseudostratified columnar epithelium with cilia and goblet cells.

**5. Decide whether the following statements about the respiratory system are true T or false F:**

- a) The lingual surface of the epiglottis is covered by a pseudostratified columnar epithelium with cilia and goblet cells.
- b) The epiglottis is reinforced by fibrous cartilage.
- c) Plicae vocales contain an elastic ligament referred to as ligamentum vocale.
- d) Stratified squamous non-keratinized epithelium is present on the lingual as well as part of the laryngeal surface of the epiglottis.

**6. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) The trachea is reinforced by elastic cartilage.
- b) Lymphatic follicles can be found within lamina propria of the trachea as a part of the BALT system.
- c) Cartilages that reinforce the trachea are C-shaped with open ends facing dorsally.
- d) Lamina propria of the trachea mucosa contains mixed seromucous glands.

**7. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) The trachea is reinforced by hyaline cartilage.
- b) Lamina epithelialis of the trachea is formed by a stratified squamous non-keratinized epithelium.
- c) The wall of a trachea contains striated skeletal muscle called musculus trachealis.
- d) The basement membrane of the trachea epithelium is only visible when using a selective staining.

**8. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) The basement membrane of the trachea epithelium is 2-4 micrometers thick which enables it to be well visible even with hematoxylin and eosin staining.
- b) Glands of the tracheal wall are purely mucous.
- c) The superficial layer of the trachea wall is tunica adventitia.
- d) Ligamenta anularia connect the adjacent cartilages of the trachea to each other.

**9. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) Ligamenta annularia connect the free ends of the individual cartilages in the trachea.
- b) Paries membranaceus is the designation for the musculo-vascular part of the wall of the trachea.
- c) The trachea is reinforced by fibrous cartilage.
- d) The trachea is covered with serosa, which connects it to the surrounding tissue.

**10. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) The trachea is lined by a pseudostratified columnar epithelium with cilia and goblet cells.
- b) Free ends of the rings of hyaline cartilage in the wall of the trachea are ventrally directed.
- c) Like the larynx, both hyaline and elastic cartilages reinforce the trachea wall.
- d) Musculus trachealis is a smooth muscle in the wall of the trachea.

**11. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) Clara cells are part of the lining of large bronchi.
- b) Bronchioles contain hyaline cartilage in the wall.
- c) Bronchioles have relatively more elastic fibers in relation to wall thickness than bronchi.
- d) Bronchioles do not contain glands.

**12. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) Bronchioles, unlike bronchi, contain lymphatic follicles in the connective tissue.
- b) The terminal bronchioles form the boundary between the conducting and respiratory parts of the respiratory system.
- c) Bronchioles usually have a round lumen at the cross section.
- d) Clara cells normally produce surfactant in the alveoli of the lungs.

**13. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) All compartments of the bronchial tree are lined by a pseudostratified columnar epithelium with cilia and goblet cells.
- b) The small bronchi, like the trachea, contain C-shaped hyaline cartilage in the wall.
- c) The bronchi are reinforced by hyaline cartilage, while the bronchioles contain elastic cartilage.
- d) The epithelium of the respiratory tract decreases in height towards the periphery.

**14. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) Respiratory bronchioles contain glands in the wall, but not cartilage and lymphatic tissue.
- b) The hyaline cartilage in the bronchial wall ensures that postmortem bronchi have a rather regular lumen on section.

- c) The exchange of respiratory gases can take place from the level of the respiratory bronchioles.
- d) Postmortem contraction of the smooth muscle of the bronchiole wall causes them to have an irregular lumen at histological slides.

**15. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) Most compartments of the respiratory system contain a layer in the wall where we find a combination of smooth muscle, connective tissue fibers, and cartilage.
- b) Tunica fibromusculocartilaginea is part of the tracheal wall only.
- c) The surface of bronchi is covered by tunica adventitia.
- d) Terminal bronchioles are part of the respiratory portion of the respiratory system.

**16. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) The blood-air barrier is formed by type I pneumocytes, capillaries in the interalveolar septa, and their fused basal laminae.
- b) Macrophages in the alveoli of lungs are called dust cells or coniphages.
- c) Alveoli like the rest of the respiratory system are lined by a pseudostratified epithelium with cilia.
- d) Kohn's pores interconnect and thus equalise pressure in adjacent alveoli.



**17. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) The blood-air barrier consists of type I pneumocytes and type II pneumocytes.
- b) Inter-alveolar septa contain capillaries with a continuous lining.
- c) Pulmonary alveoli are lined by a stratified squamous epithelium.
- d) Type II pneumocytes produce surfactant.

**18. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) Inter-alveolar septa contain capillaries with fenestrations.
- b) Kohn's pores are part of the blood-air barrier.
- c) All parts of the bronchial and alveolar tree are covered with pleura.
- d) The blood-air barrier is about 6 micrometers thick.

**19. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) The respiratory part of the respiratory system includes respiratory bronchioles, alveolar ducts, alveolar sacs, and alveoli.
- b) Inter-alveolar septa contain capillaries with pores.
- c) The simple squamous epithelium of alveoli consists exclusively of type II pneumocytes.
- d) Clara cells produce a secretion that is similar in composition to the surfactant produced by type II pneumocytes.

**20. Decide whether the following statements about the respiratory system are true**

**T or false F:**

- a) Clara cells have cilia on their surface.
- b) The blood-air barrier is formed exclusively by plasma membranes of type I pneumocytes and endothelial cells of capillaries.
- c) The blood-air barrier is about 5-6 micrometers thick.
- d) Although the entire lung is covered by a pleura, individual sections of the bronchial tree are attached to the surrounding area by adventitia.

**21. Which components of the respiratory system belong to its respiratory part?**

- a) alveolar ducts
- b) terminal bronchioles
- c) respiratory bronchioles
- d) alveoli

**22. Which structures are involved in the conditioning of the air?**

- a) vibrissae
- b) Club cells
- c) plexus cavernosus conchae
- d) Bowman's gland

**23. Which cell populations can be found in the pseudostratified epithelium of the conducting portion of the respiratory system?**

- a) basal (stem) cells
- b) club cells

- c) dust cells
- d) goblet cells
- e) brush cells

**24. Which cell populations can be found in the olfactory epithelium?**

- a) receptor cells
- b) goblet cells
- c) sustentacular cells
- d) brush cells

**25. Which of the following statements about the respiratory tract histology are true?**

- a) the lamina propria of the bronchi contains abundant seromucous glands
- b) all epithelial cells of the trachea have the same shape
- c) tracheal epithelium is composed of cells that are all located on the basal lamina
- d) type II alveolar cells are flat cells and together with the capillary endothelium form the blood-air barrier

**26. Where in the respiratory tract can we physiologically find stratified squamous epithelium?**

- a) carina tracheae
- b) ventricular folds
- c) lingual surface of epiglottis
- d) vestibulum nasi
- e) bronchioli

- f) olfactory region of the nasal cavity

**27. Which of the following statements about the trachealis muscle are true?**

- a) is bridging the craniocaudal gap between two C-shaped cartilages
- b) is a cross-striated muscle
- c) connects the free ends of C-shaped cartilage in the posterior aspect
- d) together with the cartilage and connective tissue, form the tunica fibromusculocartilaginea

**28. Which of the following larynx-related pairs are correct?**

- a) ventriculus Morgagni - vocalis muscle
- b) ventricular folds - mucosal glands
- c) vocal cords - elastic cone
- d) vocal cords - Reinke's space

**29. Which of the following statements about the epiglottis are true?**

- a) contains hyaline cartilage
- b) glands are only in its laryngeal aspect
- c) contains cross-striated muscle
- d) contains elastic cartilage

**30. What is missing in the wall of the bronchioles and found in the wall of the bronchi?**

- a) hyaline cartilage

- b) goblet cells
- c) club (Clara) cells
- d) smooth muscle

**31. What is the role of type II pneumocyte?**

- a) to produce surfactant
- b) are progenitor cells for type I pneumocytes
- c) serve as a receptors
- d) to produce anti-atelectasis factor
- e) to form an effective barrier between the air and blood

**32. What is the morphology of type II pneumocytes?**

- a) contain the lamellar bodies
- b) are extremely thin squamous cells
- c) tend to bulge into alveolar space
- d) contain microvilli on their apical surface

**33. Where in the respiratory system is simple cuboidal epithelium found?**

- a) olfactory region of the nasal cavity
- b) bronchi
- c) respiratory bronchioles
- d) terminal bronchioles
- e) false vocal cords
- f) alveolar ducts

**34. What are the components of blood-air barrier?**

- a) surfactant
- b) type I pneumocyte
- c) basal membrane of tracheal type
- d) alveolar pores of Kohn
- e) fused laminae basales
- f) type II pneumocyte
- g) endothelial cell

**35. What are some histological characteristics of the lungs?**

- a) most of nerves are not visible at the light microscope
- b) have two parallel blood circulations (nutritive and functional) that partially anastomose
- c) their external surface is the adventitia
- d) pulmonal lobules are separated by connective tissue septa
- e) its fenestrated capillaries facilitate diffusion of respiratory gases

**36. Which components of the wall of the airways relatively increase with progressive branching of the tracheobronchial tree?**

- a) ciliated cells
- b) goblet cells
- c) cartilage
- d) smooth muscle
- e) elastic fibers
- f) glands

**37. Which of the following statements about the surfactant are true?**

- a) prevents alveolar collapse by increasing surface tension
- b) its function relates with blood capillaries
- c) is product of type I pneumocytes
- d) consist of proteins and phospholipids
- e) its excess production can cause respiratory distress syndrome

**38. What is part of the interalveolar septum?**

- a) reticular fibers
- b) elastic fibers
- c) cartilage
- d) endothelial cells of lung capillaries
- e) surfactant
- f) dust cells in blood capillaries

**39. Which statements about the dust cells are true?**

- a) are specialized lung neutrophils
- b) are derived from monocytes originating in the bone marrow
- c) are also called alveolar macrophages
- d) are also called Clara cells
- e) are squamous alveolar cells

**40. Which of the following statements about the pleura are true?**

- a) epithelial cells on its surface contains kinocilia
- b) it is covered by simple squamous epithelium - mesothelium

- c) visceral pleura lines the inner surfaces of the thoracic cavity on each side of the mediastinum
- d) between two pleurae is a potential space called the pleural cavity

**41. Decide whether the following statements about the development of the respiratory system are true T or false F:**

- a) All components of the tracheobronchial tree develop from the endoderm.
- b) The development of the respiratory system is related to the development of the foregut.
- c) The final stage of lung maturation is the pseudoglandular stage.
- d) Cartilages of the larynx develop from the mesenchyme, which is of neural crest cells origin.

**42. Decide whether the following statements about the development of the respiratory system are true T or false F:**

- a) The maturation of lungs occurs in four histological stages.
- b) The tracheoesophageal septum divides part of the foregut into the base of the respiratory system ventrally and parts of the digestive tube dorsally.
- c) The first stage in the development of the respiratory system is the laryngotracheal sulcus.
- d) The epithelium of the respiratory system develops from the mesenchyme, which originates from the mesoderm of the splanchnopleura.



**43. Decide whether the following statements about the development of the respiratory system are true T or false F:**

- a) Mesenchyme originating from the mesoderm of the splanchnopleura gives rise to cartilage, muscle, and connective tissue in the organs of the respiratory system.
- b) Various types of tracheoesophageal fistulae can arise when the bases of the trachea and esophagus are incompletely separated.
- c) The first histological stage of lung maturation is the canalicular stage.
- d) The bronchial tree arises from the cranial end of the laryngotracheal diverticulum.

**44. Decide whether the following statements about the development of the respiratory system are true T or false F:**

- a) Giving birth to a fetus whose lungs are in the pseudoglandular stage is not compatible with life.
- b) The last stage of lung maturation is the alveolar stage.
- c) The respiratory system begins to develop in the 8th week after fertilization.
- d) The base of the respiratory system develops in the midgut region.

**45. Decide whether the following statements about the development of the respiratory system are true T or false F:**

- a) The pseudoglandular stage of lung maturation histologically resembles the exocrine glands.
- b) Severe and chronic oligohydramnios leads to impaired lung development resulting in pulmonary hypoplasia.
- c) Cartilages of the larynx develop from the material of the first and second pharyngeal arches.

d) The respiratory system begins to develop in the 4th week after fertilization.

**46. Which components of the trachea are of endodermal origin?**

- a) hyaline cartilage C-shaped rings
- b) ligamenta annularia
- c) goblet cell
- d) tracheal glands
- e) endocrine cell of DES
- f) tracheal muscle

**47. How would you explain the relatively frequent occurrence of tracheoesophageal fistulas from an embryological point of view?**

- a) the protruding trachea grew into a primitive esophagus
- b) wrong pattern of separation of the lung bud from the esophagus
- c) pleuropericardial folds failed to meet and create pleural cavities
- d) they have no embryological explanation, it is not a developmental defect but an acquired defect (e.g. after infection)
- e) failure of the foregut to separate completely into trachea and esophagus

**48. Approximately how many divisions of the primary bronchial bud occurs by 28 weeks?**

- a) 3
- b) 28
- c) 16
- d) division does not begin until after the 28th week

**49. Which components of the respiratory system are of ectodermal origin?**

- a) vocalis muscle
- b) endocrine cell of DES in bronchi
- c) tracheal autonomic innervation
- d) olfactory organ
- e) parietal pleura

**50. Premature children do not produce adequate amounts of pulmonary surfactant. What would you expect to see on a histological preparation of lung tissue from such an infant?**

- a) collapsed alveoli
- b) bronchiectasis (widened airways)
- c) thickened blood-air barrier
- d) emphysema (enlarged air-filled spaces with alveolar destruction)

## Chapter Seven answers:

- |        |         |          |         |
|--------|---------|----------|---------|
| 1) abd | 13) d   | 26) acd  | 39) bc  |
| 2) bc  | 14) bcd | 27) cd   | 40) bd  |
| 3) cd  | 15) ac  | 28) bcd  | 41) bd  |
| 4) ac  | 16) abd | 29) d    | 42) abc |
| 5) cd  | 17) bd  | 30) ab   | 43) ab  |
| 6) bcd | 18) d   | 31) abd  | 44) ab  |
| 7) a   | 19) ad  | 32) ac   | 45) abd |
| 8) acd | 20) d   | 33) cd   | 46) cde |
| 9) b   | 21) acd | 34) abeg | 47) be  |
| 10) ad | 22) ac  | 35) abd  | 48) c   |
| 11) cd | 23) ade | 36) de   | 49) cd  |
| 12) b  | 24) acd | 37) d    | 50) a   |
|        | 25) ac  | 38) abd  |         |

## Chapter Eight: Urinary system

**1. Decide whether the following statements about the urinary system are true T or false F:**

- a) The renal corpuscle is always located in the cortex of the kidney.
- b) The urinary (Bowman's) space contains definitive urine.
- c) The urinary pole of the renal corpuscle directly continues into the distal tubule.
- d) The renal corpuscle is synonymous with glomerulus.

**2. Decide whether the following statements about the urinary system are true T or false F:**

- a) Pedicles of podocytes form the visceral sheet of Bowman's capsule.
- b) The glomerulus is formed by capillaries with a continuous epithelial lining.
- c) Renal corpuscles are found in both the cortex and medulla of the kidney.
- d) The nephron is formed exclusively by the renal corpuscle.

**3. Decide whether the following statements about the urinary system are true T or false F:**

- a) The proximal tubule is lined by epithelial cells with many microvilli that form a brush border.
- b) The lumen of the proximal tubules is round with smooth edges.
- c) The proximal tubule is part of the juxtaglomerular apparatus.
- d) Macula densa is a set of specialized cells within the distal tubules.

**4. Decide whether the following statements about the urinary system are true T or false F:**

- a) The thin arm of Henle's loop (tubulus intermedius) is lined by a single layer of cuboidal epithelial cells.
- b) The collecting duct is part of the intrarenal ureters.
- c) The distal tubule has a round lumen with smooth edges.
- d) The parietal sheath of Bowman's capsule is formed by a simple squamous epithelium.

**5. Decide whether the following statements about the urinary system are true T or false F:**

- a) The intraglomerular mesangium is part of the juxtaglomerular apparatus.
- b) The glomerular filtration barrier is formed by primary processes of podocytes.
- c) The distal tubule is lined by a simple columnar epithelium with a brush border.
- d) The vascular pole of the renal corpuscle contains the afferent and efferent arteriole.

**6. Decide whether the following statements about the urinary system are true T or false F:**

- a) In the proximal tubule, not all epithelial cell nuclei can be seen in a histological slide.
- b) Juxtaglomerular cells are modified renin-producing smooth muscle cells.
- c) Macula densa is seen as a bright area of the distal tubules close to the glomerulus.
- d) The glomerulus of the kidney is formed by capillaries with pores.

**7. Decide whether the following statements about the urinary system are true T or false F:**

- a) The glomerular filtration barrier consists of the glomerular capillaries with pores, secondary processes (pedicles) of podocytes and their fused laminae.
- b) The proximal tubule has a narrow star-shaped lumen.
- c) Extraglomerular mesangial cells are part of the juxtaglomerular apparatus.
- d) Macula densa is formed by modified smooth muscle cells of the afferent arteriole.

**8. Decide whether the following statements about the urinary system are true T or false F:**

- a) The boundary between the tubules of the nephron and the intrarenal urinary duct is formed by tubulus reuniens.
- b) The renal papilla contains renal corpuscles.
- c) The blood-urine barrier (filtration membrane) is formed by endothelial cells of the glomerular capillaries, pedicles of podocytes, and their fused basal laminae.
- d) The urinary space contains primary urine which enters the proximal tubule at the urinary pole.

**9. Decide whether the following statements about the urinary system are true T or false F:**

- a) Juxtaglomerular cells contain eosinophilic granules with renin in their cytoplasm.
- b) The collecting duct is lined by a simple columnar epithelium.
- c) The thin arm of Henle's loop is lined by a single layer of squamous epithelial cells.

- d) The parietal sheath of Bowman's capsule is also part of the blood-urine barrier.

**10. Decide whether the following statements about the urinary system are true T or false F:**

- a) Macula densa contains cells with nuclei closely adjacent to each other and is therefore distinguishable as a dark area on histological slides.
- b) Tubulus reuniens is part of the nephron.
- c) The mesangium is formed by the mesangial matrix and mesangial cells around the glomerulus of the renal corpuscle.
- d) All ducts of the nephron are lined by a single layer of epithelial cells of varying height.

**11. Decide whether the following statements about the urinary system are true T or false F:**

- a) The ureter is lined by a simple columnar epithelium.
- b) Adventitia connects the ureter to its environment.
- c) Mucosa of the ureter forms numerous long folds.
- d) The musculature of the ureter has the same arrangement as in the digestive tract - the inner layer is circular, and the outer layer is longitudinal.

**12. Decide whether the following statements about the urinary system are true T or false F:**

- a) The ureter is lined with urothelium - a simple squamous epithelium.
- b) The musculature of the ureter is arranged opposite to that of the digestive tube - the inner layer is longitudinal, and the outer is circular.



- c) The terminal third of the ureter additionally contains a third superficial longitudinal layer of musculature.
- d) The superficial layer of the ureter is referred to as tunica serosa.

**13. Decide whether the following statements about the urinary system are true T or false F:**

- a) The ureter is lined with urothelium - a pseudostratified transitional epithelium.
- b) The surface cells of the urothelium are called umbrella cells.
- c) The ureter has a round, regular lumen.
- d) The musculature of the ureter is arranged in three layers along its entire course.

**14. Decide whether the following statements about the urinary system are true T or false F:**

- a) Pars spongiosa of the male urethra is lined by a stratified columnar epithelium.
- b) The female urethra is lined by two types of epithelia - urothelium and stratified squamous non-keratinized epithelium.
- c) The male urethra is lined by a total of four different types of epithelia in different anatomical locations.
- d) The entire female urethra is lined by the urothelium.

**15. Decide whether the following statements about the urinary system are true T or false F:**

- a) Fossa navicularis of the male urethra is lined by a stratified squamous non-keratinized epithelium.
- b) The male urethra has musculature arranged in an inner longitudinal and outer circular layer.
- c) Different anatomical parts of the female urethra are lined by four different types of epithelia.
- d) Both the male and female urethra are connected to the surrounding area by adventitia.

**16. Decide whether the following statements about the urinary system are true T or false F:**

- a) The bladder is lined with urothelium.
- b) The entire surface of the bladder is covered by serosa.
- c) The muscles of the bladder are arranged in three layers.
- d) The inner layer of the bladder musculature is longitudinal.

**17. Decide whether the following statements about the urinary system are true T or false F:**

- a) The musculature of the bladder is made up of by the inner plexiform, middle circular, and outer longitudinal layers.
- b) The bladder is lined in different parts by different types of epithelia.
- c) Most of the surface of the bladder is covered with serosa.
- d) The bladder is lined by a simple columnar epithelium.

**18. Decide whether the following statements about the urinary system are true T or false F:**

- a) Most of the surface of the bladder is covered with adventitia.
- b) Muscles of the bladder are arranged in the same way as in the ureter.
- c) Nuclei of epithelial cells of the bladder mucosa are always at the same level, regardless of the functional state.
- d) The bladder mucosa is arranged in folds.

**19. Decide whether the following statements about the urinary system are true T or false F:**

- a) The female urethra contains paraurethral glands of Skene in lamina propria.
- b) Stratified squamous non-keratinized epithelium lines the part of the female urethra closer to the bladder.
- c) The part of the male urethra that directly follows the bladder is lined by urothelium.
- d) Lamina propria of the male urethra contains paraurethral Littre's glands.

**20. Decide whether the following statements about the urinary system are true T or false F:**

- a) We distinguish the bladder from the ureter based on different types of epithelia.
- b) Unlike the ureter, part of the bladder is covered with adventitia and part with serosa.
- c) The ureter is recognized on the slide from the bladder mainly by the arrangement of the musculature.
- d) Both the male and female urethra contain intraepithelial Morgagni's glands formed by mucous cells.

**21. What epithelium lines the distal portion of the female urethra at, or near, its termination?**

- a) transitional
- b) simple columnar
- c) non-keratinized stratified squamous
- d) the same as in the fossa navicularis of the glans penis
- e) stratified cuboidal
- f) pseudostratified columnar

**22. What is the specialized erectile tissue that surrounds the penile urethra called?**

- a) corpus albicans
- b) tunica albuginea
- c) corpora cavernosa
- d) corpora arenacea
- e) corpus spongiosum

**23. Urethra is initially lined with \$ epithelium until the ejaculatory ducts join the prostatic urethra. Replace \$ with the correct word!**

- a) transitional zones
- b) transitional
- c) simple columnar
- d) stratified columnar

**24. Which of the following general statements about the urinary system are true?**

- a) urothelium lines the parietal sheet of glomerular Bowman's capsule of kidney

- b) external layer of the urinary bladder may be covered by both adventitia and serosa
- c) the thickest layer of the ureter consists of smooth muscle
- d) the portion of the urethra leaving the urinary bladder is the prostatic urethra

**25. Which of the following statements about the Bowman's capsule sheaths are true?**

- a) its visceral sheath comprises podocytes
- b) its parietal sheath comprises podocytes
- c) its visceral sheath comprises simple squamous epithelium
- d) its parietal sheath comprises simple squamous epithelium

**26. What is the vas efferens that drains blood from the glomerulus?**

- a) sinusoid
- b) venule
- c) arteriole
- d) continuous capillary

**27. Which of the following statements about the umbrella cells are true?**

- a) often are binucleated
- b) at the apical pole contain the transmembrane protein uroplakin
- c) their mitotic activity is high
- d) have massive connecting complexes between them
- e) are basic cells of collecting ducts

**28. Which cells does the urothelium consist of?**

- a) umbrella cells
- b) DES cells (diffuse endocrine)
- c) intermediate (tennis racket-shaped) cells
- d) cells with cilia
- e) basal cells

**29. What is proper arrangement of muscle layers in tunica muscularis of the ureter?**

- a) an third layer, internal longitudinal, less distinct than the other two is found only in the neighborhood of the bladder
- b) mostly inner longitudinal - outer circular layers are formed
- c) consists of several oblique layers of smooth muscle
- d) mostly inner circular - outer longitudinal layers are formed

**30. What distinguishes the proximal tubule from the distal tubule of the nephron?**

- a) absence of microvilli in the proximal tubule
- b) cuboidal shape of its epithelial cells
- c) the proximal tubule is longer and therefore more numerous in cross-section
- d) reabsorption of molecules takes place only in the proximal tubule
- e) the proximal tubule is responsible for the reabsorption of about two-thirds of the filtered sodium and water

**31. Which of the following statements about the glomerulus are true?**

- a) is a tuft of capillaries
- b) is supplied by an afferent arteriole

- c) consists of the proximal convoluted and straight tubule
- d) together with Bowman's capsule constitutes the renal (Malpighian) corpuscle
- e) contains intraglomerular mesangial cells

**32. Which of the following statements about the renal corpuscle are true?**

- a) the filtration slit diaphragm between podocyte's pedicles acts as a size-selective filter
- b) visceral sheath of Bowman's capsule is made of mesangial cells
- c) through the urinary pole enter and exit the vessels of the glomerulus
- d) the glomerular basement membrane and endothelial glycocalyx act as a charge-selective filter

**33. What are the functions of the juxtaglomerular apparatus?**

- a) hydroxylation of vitamin D<sub>3</sub> to produce highly active calcitriol
- b) renin, as a part of renin-angiotensin-aldosterone system, is being produced by cells of macula densa
- c) cells of macula densa serve as a sensor of tubular fluid composition
- d) regulation of blood filtration rate by podocytes
- e) does not participate in the secretion of erythropoietin

**34. Which structures can be found in the medulla of the kidney?**

- a) extensive vascular supply
- b) convoluted tubules
- c) vasa recta
- d) collecting ducts

- e) straight tubules
- f) major calyces

**35. What does the filtration apparatus of the kidney consist of?**

- a) intraglomerular mesangial cells
- b) endothelial glycocalyx
- c) parietal sheath of Bowman's capsule
- d) glomerular basement membrane
- e) filtration slit diaphragm

**36. What can be said about the morphology and function of juxtaglomerular cells?**

- a) are part of the juxtaglomerular apparatus
- b) are modified smooth muscle cells in the wall of afferent arteriole
- c) they contain secretory vesicles with renin
- d) their nuclei are spindle-shaped and elongated

**37. In which structures of the kidney can simple cuboidal epithelium be found?**

- a) vasa recta
- b) glomerulus
- c) proximal convoluted tubule
- d) medullary collecting duct
- e) Bowman's capsule



**38. Which of the following statements about the loop of Henle are true?**

- a) runs in the cortex
- b) is part of the nephron and is lined with a simple cuboidal to squamous epithelium
- c) consists of ascending and descending segments
- d) contains e.g. macula densa and also renin-producing cells
- e) its function is the formation of an osmolar concentration gradient in the medullary interstitium

**39. What is part of a nephron?**

- a) interstitial connective tissue
- b) descending limb of the Henle loop
- c) papillary duct
- d) glomerulus

**40. Which of the pairs are correct?**

- a) basal labyrinth - distal tubule
- b) aquaporin 1 - proximal tubule
- c) brush border - proximal tubule
- d) macula densa - loop of Henle
- e) intercalated cells - collecting tubule

**41. Decide whether the following statements about the development of the urinary system are true T or false F:**

- a) The pronephros gives rise to the definitive kidney.

- b) All components of the kidney develop from the metanephrogenic blastema.
- c) Trigonum vesicae is formed by incorporation of the mesodermal Wolffian ducts into the base of the bladder from the endodermal part of the cloaca.
- d) Epithelial components of the kidney develop from the intermediate mesoderm.

**42. Decide whether the following statements about the development of the urinary system are true T or false F:**

- a) The first stage in the development of the kidney is the rudimentary pronephros, which forms in the cervical region of the embryo.
- b) The pronephros develops early in the 4th week after fertilization.
- c) The metanephros, the basis of the permanent kidney, develops from the 5th week after fertilization.
- d) Nephrons of the kidney develop from the ureteric bud.

**43. Decide whether the following statements about the development of the urinary system are true T or false F:**

- a) The basis of the intrarenal urinary tract is the metanephrogenic blastema.
- b) The ureter develops from the ureteric bud, which grows out of the mesonephric (Wolffian) duct.
- c) The bladder is entirely derived from part of the endodermal urogenital sinus.
- d) Both large and small calyces develop from the ureteric bud.

**44. Decide whether the following statements about the development of the urinary system are true T or false F:**

- a) Both the pronephros and mesonephros are rudimentary primordia that completely cease to exist - they form no definite derivatives.
- b) The urethra has the origin in the metanephrogenic blastema.
- c) Although trigonum vesicae has a distinct origin, the epithelium that secondarily covers it in the definitive bladder is from the endoderm of the urogenital sinus.
- d) Nephrons and intrarenal excretory ducts have distinct embryonic origins.

**45. Decide whether the following statements about the development of the urinary system are true T or false F:**

- a) The development of the urinary bladder is related to the allantois, which normally transforms into the urachus.
- b) Metanephrogenic blastema develops from paraxial mesoderm.
- c) The epithelium of trigonum vesicae and its associated connective tissue structures are derived from the mesonephric (Wolffian) duct.
- d) The ureteric bud and the metanephrogenic blastema induce each other, which we refer to as reciprocal induction.

**46. Which tissue gives the foundation to three successive nephric structures?**

- a) lateral plate mesoderm
- b) ectomesenchyme
- c) nephrotome
- d) intermediate mesoderm

**47. Which of the following statements about the pronephros development are true?**

- a) the mesenchymal-to-epithelial transition process had to take place in order to achieve the hollow tube system
- b) starts at 4th week of development
- c) primitive nephrons are temporarily functional between the 6th and 10th week
- d) it begins with the appearance of mesonephric ducts

**48. What structure induces the transformation of the metanephric blastema into the metanephros?**

- a) wolffian ducts
- b) urogenital sinus
- c) ureteric buds
- d) mesonephric nephrons

**49. What are ureteric bud derivatives?**

- a) major calyces
- b) renal pelvis
- c) collecting tubules
- d) juxtaglomerular apparatus
- e) urinary bladder

**50. Which parts of the urinary system are of endodermal origin?**

- a) penile urethra
- b) collecting ducts

- c) trigone of the urinary bladder
- d) greater part of the urinary bladder

## Chapter Eight answers:

- |         |         |          |          |
|---------|---------|----------|----------|
| 1) a    | 13) ab  | 26) c    | 39) bd   |
| 2) a    | 14) abc | 27) abd  | 40) abce |
| 3) ad   | 15) abd | 28) ace  | 41) cd   |
| 4) bcd  | 16) ac  | 29) b    | 42) abc  |
| 5) d    | 17) a   | 30) ce   | 43) bd   |
| 6) abd  | 18) ad  | 31) abde | 44) cd   |
| 7) abc  | 19) acd | 32) ad   | 45) ad   |
| 8) acd  | 20) bcd | 33) ce   | 46) cd   |
| 9) abc  | 21) cd  | 34) cde  | 47) abd  |
| 10) acd | 22) e   | 35) bde  | 48) c    |
| 11) bc  | 23) b   | 36) abc  | 49) abc  |
| 12) bc  | 24) bcd | 37) cd   | 50) ad   |
|         | 25) ad  | 38) bce  |          |

## Chapter Nine: Male reproductive system

**1. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The germinal epithelium of the seminiferous tubules is divided into two compartments.
- b) Spermatids are localized in the basal compartment of the seminiferous tubules.
- c) Sertoli cells are essential for the proper progression of spermatogenesis.
- d) Testosterone is produced by Leydig cells in the interstitium of the testis.

**2. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Reinke's crystalloids are found in androgen-producing interstitial cells of the testis.
- b) Intercellular junctions between Sertoli cells form a hematotesticular barrier.
- c) The acrosome is a modified lysosome that is essential for fertilization.
- d) Spermatids differentiate from type B spermatogonia.

**3. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The largest cells in the spermatogenic epithelium are primary spermatocytes.
- b) Secondary spermatocytes are more numerous than primary spermatocytes in the spermatogenic epithelium.
- c) Spermatohistogenesis occurs earlier than spermatocytogenesis.

- d) Type A light spermatogonia continue to differentiate into primary spermatocytes during spermatocytogenesis.

**4. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Tunica albuginea is formed by a dense connective tissue.
- b) Cells that the immune system considers to be self are found in the adluminal compartment of the spermatogenic epithelium.
- c) The nucleus of primary spermatocytes often contains meiotic figures.
- d) Spermatids are the smallest cells in the spermatogenic epithelium.

**5. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Convoluted seminiferous tubules connect via tubuli recti to rete testis, which are located in the mediastinum testis.
- b) Normal spermatogenesis depends on the transition of spermatids from the basal to the adluminal compartment.
- c) Light type A spermatogonia have a heterochromatic nucleus.
- d) Differentiation of primary spermatocytes into secondary spermatocytes is part of spermatohistogenesis.

**6. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Ductus epididymidis is lined by a pseudostratified columnar epithelium with stereocilia.



- b) Ductuli efferentes form the head of the epididymis and are lined by a pseudostratified epithelium.
- c) Ductuli efferentes contain columnar cells with cilia.
- d) The epithelium of the ductus epididymidis, unlike that of the testis, does not form a barrier between the blood and the epididymis.

**7. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The thickest layer of the wall of the ductus deferens is the muscle layer.
- b) Ductus deferens is lined by a pseudostratified columnar epithelium with cilia.
- c) Muscles of the ductus deferens wall are arranged in three layers.
- d) Ductus deferens has a star-shaped lumen because its mucosa forms longitudinal folds.

**8. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The ductus epididymidis is lined by a simple columnar epithelium.
- b) Halo cells are basal cells of the ductus epididymidis epithelium responsible for regeneration.
- c) Ductus epididymidis is covered with serosa on the surface.
- d) The hematoepididymal barrier provides protection of sperm from unwanted immune response.

**9. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Tubuli recti testis are partially lined with Sertoli cells.
- b) Ductuli efferentes are exclusively part of the extratesticular genital tract.
- c) Ductus epididymidis is covered with adventitia, which connects it to its surroundings.
- d) Ductuli efferentes have an irregular "sawtooth" lumen because of the alternation of low cubic and high columnar cells.

**10. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Ductus deferens has a wider lumen compared to the lumen of ductus epididymidis.
- b) Ductus deferens is covered with adventitia.
- c) Muscles of the ductus deferens are arranged in two layers.
- d) All epithelial cells of ductuli efferentes have cilia on their surface.

**11. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Glandula vesiculosa is lined with a simple to double row of columnar epithelium.
- b) Up to 60-70% of the ejaculate volume is produced by the glandula vesiculosa.
- c) Columnar secretory cells of the glandula vesiculosa epithelium have stereocilia on their surface.
- d) Columnar secretory epithelial cells of the glandula vesiculosa accumulate lipofuscin during puberty.

**12. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The fibromuscular stroma of the prostate is made up of collagen and elastic fibers with a lot of smooth muscle.
- b) The prostate contains simple tubular glands.
- c) Corpora amylacea are embedded in the fibromuscular stroma of the prostate.
- d) Part of the urethra passes through the prostate.

**13. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The peripheral zone of the prostate contains main glands and accounts for about 70% of the gland's volume.
- b) Corpora amylacea are found in the lumen of the prostate.
- c) Prostatic secretion accounts for most of the ejaculate volume.
- d) The fibromuscular stroma of the prostate contains striated muscle.

**14. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The prostate is the largest male accessory sex gland.
- b) The periurethral zone of the prostate contains the main glands.
- c) The height of epithelial cells of the prostate gland depends on its secretory activity, but usually the epithelium is a two-rowed columnar.
- d) Mucosal glands of the prostate are firmly attached to the urethra.

**15. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Corpora amylacea are found in the lumen of glandula vesiculosa.
- b) Glandula vesiculosa is covered with adventitia.
- c) The musculature of the glandula vesiculosa is made up of an inner circular and outer longitudinal layer.
- d) The prostate contains 30-50 branched tubulo-alveolar glands.

**16. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The penis contains two corpora cavernosa and one corpus spongiosum.
- b) Cavens of corpora cavernosa are lined by a fenestrated endothelium.
- c) The urethra passes through the center of the corpus cavernosum.
- d) Trabeculae of corpora cavernosa contain striated muscle fibers.

**17. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The urethra passes through the center of the corpus spongiosum.
- b) Trabeculae divide corpora cavernosa into cavities (caverns) lined by an unfenestrated endothelium.
- c) Tunica albuginea of the penis is composed of a mixture of collagen, elastic fibers, and smooth muscle cells.
- d) Tunica albuginea is found in the penis only around the corpus spongiosum.

**18. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) The penis contains two corpora spongiosa and one corpus cavernosum.
- b) Tunica albuginea around the corpus spongiosum is thinner compared to the corpora cavernosa.
- c) Cavens of corpora cavernosa are lined by sinusoidal capillaries.
- d) Trabeculae of corpora cavernosa protrude from tunica albuginea.

**19. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Von Ebner's pads are found in the subendothelial layer of arterioles of the corpora cavernosa.
- b) The urethra passing through the corpus spongiosum is lined with single type of epithelium.
- c) Tunica albuginea is found in the penis only around the corpora cavernosa.
- d) Corpora cavernosa are lined by a stratified squamous epithelium.

**20. Decide whether the following statements about the male reproductive system are true T or false F:**

- a) Spermatohistogenesis takes place closest to the lumen of the coiled seminiferous tubules.
- b) Contact with Sertoli cells is not required for spermatohistogenesis to proceed normally.
- c) Leydig cells are involved in the formation of the hematotesticular barrier.
- d) Type A dark spermatogonia serve as a supply of stem cells for spermatogenesis.

**21. Which cells can be found in the seminiferous tubules?**

- a) Sertoli cells
- b) Leydig cells
- c) spermatogonia
- d) spermatids
- e) ciliated cells

**22. What are the functions of Sertoli cells?**

- a) creation of hematotesticular barrier
- b) production of androgens
- c) production of androgen-binding protein
- d) phagocytosis of excess cytoplasm in the form of residual bodies of Regaud
- e) movement of morphologically mature spermatozoa towards the rete testis by means of kinocilia
- f) physical support for developing cells

**23. What are the ultrastructural morphological specificities of Leydig cells?**

- a) contain a lot of rough ER
- b) possess mitochondria of tubular type
- c) have basophilic cytoplasm
- d) their cytoplasm contains membrane-bound lipid droplets
- e) contain rod-shaped crystal-like structures called corpora amylacea

**24. What structures are found in the testes?**

- a) tunica albuginea

- b) tunica dartos
- c) pampiniform plexus
- d) tubuli recti (straight tubules)
- e) Littre's glands

**25. Which events take place in the process of sperm cytodifferentiation, called spermiogenesis?**

- a) phagocytosis of acrosome by sertoli cells
- b) development of axonemal complex
- c) formation of midpiece with mitochondria
- d) condensation of nucleus
- e) completion of the 2nd meiotic division

**26. Which cells of the seminiferous tubules are found in their adluminal compartment?**

- a) primary spermatocytes
- b) secondary spermatocytes
- c) spermatogonia type A
- d) spermatogonia type B

**27. In which structures can Sertoli cells be found?**

- a) tubuli recti (straight tubules)
- b) rete testis
- c) ductuli efferentes
- d) tubuli seminiferi contorti

**28. In which organs of the male genital system is pseudostratified columnar epithelium with stereocilia found?**

- a) ductuli efferentes
- b) ductus epididymidis
- c) ductus deferens
- d) rete testis

**29. Which of the following statements about the ductus deferens are true?**

- a) this is where sperm mature and are stored
- b) union of the ductus deferens with the duct of the seminal vesicle creates the ejaculatory duct
- c) forms part of the spermatic cord
- d) its middle layer in the tunica muscularis externa is oriented longitudinally

**30. Which of the following statements about the ductus deferens are true?**

- a) enter the abdominal cavity through the inguinal canal
- b) its outermost layer is tunica serosa
- c) in its tunica muscularis, a circular muscle layer is interposed between two longitudinal ones
- d) is lined with pseudostratified columnar epithelium with stereocilia

**31. Which of the following statements about the seminal vesicles are true?**

- a) produces up to 30% of ejaculate volume
- b) their epithelial cells can contain lipofuscin granules
- c) are paired convoluted tubular glands



- d) their mucosa forms elaborate folds
- e) concretions - corpora amylacea, can be found inside

**32. What can be found as part of the prostate gland?**

- a) dense fibromuscular stroma
- b) tubuloalveolar glands
- c) corpora amylacea
- d) corpus cavernosum

**33. Which of the following statements about the penis are true?**

- a) the glans penis is a distal continuation of the corpora cavernosa
- b) its skin is very thin and mostly loosely attached to the underlying connective tissue
- c) its erectile bodies are all covered by tunica albuginea
- d) Skene's glands are present near navicular fossa

**34. Which cells of the germinal epithelium of the seminiferous tubules are the largest?**

- a) spermatogonia
- b) spermatids
- c) primary spermatocytes
- d) secondary spermatocytes

**35. What structures are found in the penis?**

- a) 3 erectile bodies
- b) serous glands
- c) unfenestrated endothelium
- d) Littre's glands

**36. Which of the following statements about the bulbourethral glands (Cowper's glands) are true?**

- a) their secretory portion is lined by squamous epithelium
- b) belong to the accessory sex glands
- c) are located proximal to the membranous section of the urethra
- d) produce mucus
- e) are responsible for producing a pre-ejaculate fluid

**37. Where in the male reproductive system can syncytium be observed?**

- a) in the spermiogenic germinal epithelium
- b) in the prostate glands
- c) in the corpus cavernosum of the penis
- d) in the Littre's glands

**38. Which of the following statements about the prostate are true?**

- a) it is a convoluted tubular gland
- b) its stroma is fibromuscular
- c) produces testosterone
- d) creates major portion of semen (ejaculate)

- e) its major products are fructose and citric acid

**39. Which of the following statements about the Leydig cells are true?**

- a) are located in the interstitial tissue between the seminiferous tubules
- b) synthesize and secrete male sex hormones
- c) synthesize androgen binding protein
- d) are found in the rete testis and the tubules recti

**40. Decide whether the following statements about the development of the male reproductive system are true T or false F:**

- a) Morphological features of the male embryo begin to appear as early as the 4th week after fertilization.
- b) Chromosomal sex is determined at the time of fertilization, which is determined by the karyotype of the sperm.
- c) The paramesonephric (Müllerian) duct is largely involved in the development of the internal male genitalia.
- d) Until the 7th week after fertilization, the sex cannot be determined from the morphological features of the gonads - this is the indifferent gonad stage.

**41. Decide whether the following statements about the development of the male reproductive system are true T or false F:**

- a) The primordial germ cells differentiate directly in the mesenchyme of the genital ridge.
- b) Normal sexual differentiation in the male depends on dihydrotestosterone and antimüllerian hormone signalling.

- c) Tubuli seminiferi contorti, tubuli recti, rete testis, and ductuli efferentes all have a common embryonic origin.
- d) Ductus epididymidis develops from the paramesonephric duct.

**42. Decide whether the following statements about the development of the male reproductive system are true T or false F:**

- a) Ductus deferens develops from the distal part of the mesonephric (Wolffian) duct.
- b) Ducts forming the head, body, and tail of the epididymis develop from the mesonephric (Wolffian) duct.
- c) The genital tubercle at the cranial end of the cloacal membrane is the basis for the penis.
- d) Extension of the genital tubercle gives rise to the primordial phallus.

**43. Decide whether the following statements about the development of the male reproductive system are true T or false F:**

- a) Spermatic cords are the basis for the tubuli seminiferi contorti, tubuli recti, and rete testis.
- b) Labioscrotal folds are the basis for the glans penis and glans clitoridis.
- c) Primordial cells migrate to the genital ridge from the yolk sac via the dorsal mesentery of the hindgut.
- d) Interstitial Leydig cells develop from the mesenchyme of the genital ridge.

**44. Decide whether the following statements about the development of the male reproductive system are true T or false F:**

- a) Prostate glands are of endodermal origin because they grow from the base of pars prostatica uretrae which develops from part of the urogenital sinus.
- b) Seminiferous cords develop in the region of the original cortex of the indifferent gonad.
- c) Epispadias is a congenital developmental defect in which the external opening of the urethra is located on the ventral side of the penis.
- d) Hypospadias is the most common congenital defect of the penis.

**45. What is the embryonic origin of fetal Leydig cells?**

- a) paramesonephric duct
- b) testis cords
- c) neural crest cells
- d) mesonephric mesenchymal cells

**46. From what tissue does the primordium of the future prostate arise at the 10th week of development?**

- a) endoderm
- b) intermediate mesoderm
- c) lateral plate mesoderm
- d) ectoderm

**47. The urinary and genital systems both develop from which of the following types of early mesoderm?**

- a) intermediate
- b) lateral plate somatic
- c) lateral plate splanchnic
- d) paraxial

**48. Which of the following statements about the development of the male external genitals are true?**

- a) the phallus forms the penis
- b) the urogenital folds form the ventral aspect of the penis (i.e., penile raphe)
- c) the labioscrotal swellings form the scrotum
- d) their early development varies considerably from development in females

**49. Where do primordial germ cells (PGCs), the future spermatogonia, originate?**

- a) gonadal ridge
- b) dorsal endoderm of the yolk sac
- c) Mullerian ducts
- d) cloaca

## Chapter Nine answers:

- |         |          |          |         |
|---------|----------|----------|---------|
| 1) acd  | 14) acd  | 27) ad   | 40) bd  |
| 2) abc  | 15) bcd  | 28) bc   | 41) b   |
| 3) a    | 16) a    | 29) bc   | 42) acd |
| 4) acd  | 17) abc  | 30) acd  | 43) acd |
| 5) a    | 18) bd   | 31) bcd  | 44) ad  |
| 6) abc  | 19) ab   | 32) abc  | 45) d   |
| 7) acd  | 20) ad   | 33) bc   | 46) a   |
| 8) d    | 21) acd  | 34) c    | 47) a   |
| 9) acd  | 22) acdf | 35) acd  | 48) abc |
| 10) b   | 23) bd   | 36) bcde | 49) b   |
| 11) abd | 24) ad   | 37) a    |         |
| 12) ad  | 25) bcd  | 38) b    |         |
| 13) ab  | 26) ab   | 39) ab   |         |

## Chapter Ten: Female reproductive system

**1. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) The ovary is covered with a superficial epithelium (germinal in older literature) from which gametes develop.
- b) The developmental stages of ovarian follicles are in the medulla of the ovary.
- c) The secondary ovarian follicle contains a secondary oocyte.
- d) The primordial ovarian follicle consists of a primary oocyte and a single layer of squamous follicular cells.

**2. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) All stages of ovarian follicles, except for the Graafian follicle just before ovulation, contain a primary oocyte.
- b) The ovarian stroma contains specialized fibroblasts and, in the hilus region, interstitial hilus cells.
- c) All primordial follicles contain primary oocytes that are in prophase 1 of meiosis.
- d) The oocyte has the same size in all types of ovarian follicles.

**3. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) Theca folliculi, the fibrous layer of the ovarian follicle, begins to form at the stage of the primary multilaminar follicle.



- b) The Graaffian follicle is the mature form of the dominant tertiary ovarian follicle at the time of ovulation.
- c) All tertiary follicles contain secondary oocytes.
- d) From the primordial follicle stage, the oocyte is covered by the zona pellucida.

**4. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) Tunica albuginea is a connective tissue ovarian sheath located beneath the superficial epithelium.
- b) The development of a cohort of follicles from the primordial follicle stage to the mature Graafian follicle takes place during the luteal phase of the ovarian cycle.
- c) The ovarian medulla does not contain any developmental stages of ovarian follicles.
- d) Follicular atresia is a pathological process that is not observed under normal conditions.

**5. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) The follicular cells surrounding the oocyte are called granulosa cells from the stage of the primary multilaminar follicle.
- b) The primary oocyte in the primordial follicle is about 130 micrometers in size.
- c) The Graafian follicle contains a mature egg (ovum) that has completed the 2nd meiotic division.
- d) The follicular antrum is fully developed at the tertiary follicular stage.

**6. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) In the secondary ovarian follicle, cavities begin to form which later fuse to form the follicular antrum.
- b) The primary oocyte in the primordial follicle is about 25-30 micrometers in size.
- c) Cumulus oophorus is a typical structure of the primary unilaminar follicle.
- d) Primordial follicles are the most numerous follicles of the ovarian cortex.

**7. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) Corona radiata is a set of granulosa cells that directly surround the oocyte.
- b) In each cycle, only one primordial follicle continues to develop under the influence of FSH.
- c) Follicular atresia is a physiological process in which more than 99.9% of all ovarian follicles are lost by apoptosis.
- d) The development of a cohort of ovarian follicles is under the control of the same pituitary hormone that influences the activity of Sertoli cells in seminiferous tubules.

**8. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) A mature egg (ovum) is formed only in the case of fertilization.
- b) The primary unilaminar follicle contains a primary oocyte surrounded by a single layer of cuboidal follicular cells.
- c) A follicular cohort is a group of 6-12 follicles that mature together each cycle.
- d) The cumulus oophorus is an elevation inside the secondary follicle.

**9. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) The oviduct is lined by a simple columnar epithelium with cilia.
- b) The isthmus of the uterine tube represents locus fecundationis (place of fertilization).
- c) The musculature of the uterine tube is arranged into an inner circular and outer longitudinal layer.
- d) All epithelial cells of the uterine tube have cilia on their surface.

**10. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) The epithelium of the uterine tube contains two main populations of cells which reach the lumen - ciliated cells and secretory cells with microvilli.
- b) The surface of the uterine tube is covered with serosa.
- c) Cilia of the oviduct epithelium only move towards the uterus.
- d) The tubal ampulla is called locus fecundationis because this is where fertilization most commonly occurs.

**11. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) Mucosa of the oviduct forms anastomosing folds, which are most prominently developed in the ampulla.
- b) The uterine tube is covered by adventitia.
- c) The cilia of the uterine tube epithelial cells oscillate in both directions, helping to move the oocyte and early embryo towards the uterus and the sperm in the opposite direction.

- d) The musculature of the uterine tube is thickest in the ampulla and thins towards the uterus.

**12. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) The endometrium is the mucosa of the uterus, which is lined with a simple columnar epithelium.
- b) The thickest layer of the uterine wall is the endometrium.
- c) Smooth muscle cells of the myometrium hypertrophy during pregnancy - they can increase in size by up to 10 times.
- d) The proliferative phase of the menstrual cycle corresponds to the follicular phase of the ovarian cycle.

**13. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) Endometrial glands in the proliferative phase have a saw-like appearance.
- b) The myometrium is the thickest layer of the uterine wall and consists of smooth muscle.
- c) Stratum basale of the endometrium undergoes significant morphological and functional changes during the menstrual cycle.
- d) The secretory phase of the menstrual cycle corresponds to the luteal phase of the ovarian cycle.

**14. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) Endometrial glands in the proliferative phase are straight.
- b) Stratum functionale of the endometrium undergoes the most significant morphological and functional changes during the menstrual cycle.
- c) The cervix, like the rest of the uterus, is lined by a single type of epithelium.
- d) Zona basalis ensures the regeneration of the endometrium during the following menstrual cycle.

**15. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) The entire surface of the uterus is covered with perimetrium or serosa.
- b) The first phase of the menstrual cycle is the secretory phase.
- c) During pregnancy, smooth muscle cells of the myometrium undergo both hypertrophy and hyperplasia.
- d) The endometrium also contains special Hamperl cells that have important immune functions.

**16. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) The endometrium contains both secretory cells and ciliated cells, similar to the oviduct epithelium.
- b) The endometrium contains simple tubular glands that undergo significant changes during the menstrual cycle.
- c) Smooth muscle cells of the myometrium do not undergo significant changes during pregnancy.
- d) The exocervix is lined by a stratified squamous non-keratinized epithelium.

**17. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) Mucosa of the endocervix does not contain glands.
- b) The endocervix is lined by a simple columnar epithelium.
- c) During the menstrual cycle, the cervix goes through the same significant morphological and functional changes as the endometrium of the uterus.
- d) During the secretory phase of the menstrual cycle, stromal cells undergo a predecidual reaction.

**18. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) In the secretory phase of the menstrual cycle, two layers are morphologically distinguished - stratum compactum and stratum spongiosum of the endometrium.
- b) Mucosa of the exocervix does not contain glands.
- c) The menstrual phase of the endometrial cycle begins due to a decrease in progesterone levels.
- d) Both endocervix and exocervix are lined with the same type of epithelium.

**19. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) The vaginal mucosa contains numerous tubulo-alveolar glands.
- b) The epithelium of the vagina is simple columnar.
- c) The superficial layers of the vaginal epithelium contain numerous structures which can be visualized by the PAS reaction.
- d) The surface of the vagina is covered with adventitia.

**20. Decide whether the following statements about the female reproductive system are true T or false F:**

- a) Tunica spongiosa of the vaginal wall contains many elastic fibers and several thin-walled veins.
- b) The musculature of the vaginal wall is divided into an inner circular layer and outer longitudinal layer.
- c) The epithelium of the vagina is a mechanically resistant, stratified squamous non-keratinized.
- d) The surface of vagina is covered by serosa.

**21. Which of the following statements about the ovarian follicles are true?**

- a) both the ovarian cortex and medulla contain ovarian follicles
- b) are multicellular structures containing primary or secondary oocyte – according to the stage of follicle maturation
- c) secondary ovarian follicle contains a secondary oocyte
- d) primordial follicles contain columnar follicular cells

**22. Which of the following statements about the ovarian medulla are true?**

- a) consists of loose connective tissue rich in vessels and nerves
- b) consists of more layers of smooth muscles
- c) with the exception of primordial follicles, all stages of follicles are present in it
- d) can contain hilus cells with endocrine functions

**23. Which of the following structures are part of the tertiary, Graafian follicle?**

- a) cumulus oophorus
- b) zona pellucida

- c) antrum folliculi
- d) theca-lutein cells
- e) tertiary oocyte
- f) granulosa cells

**24. Which of the following statements about the uterus are true?**

- a) endometrial lamina propria contains many fibroblasts
- b) myometrium, which consists of more layers of smooth muscles, is the thickest layer of the uterine wall
- c) simple alveolar glands are localized in the lamina propria of the endometrium
- d) mucosa of the uterus is lined by a pseudostratified columnar epithelium

**25. Which of the following statements about the uterine cervix are true?**

- a) the epithelium of the exocervix (external os) is the same as the epithelium of vagina
- b) mucus produced by the epithelial cells the uterine cervix is involved in moisturizing the vagina
- c) the epithelium of the endocervix (internal os) is the same as the epithelium of the uterine fundus and body
- d) the exocervix (external os) is lined by a simple columnar epithelium
- e) mucosa of the uterine cervix does not contain any glands

**26. Which of the following statements about the vagina are true?**

- a) numerous vaginal mucosal glands are active during sexual arousal
- b) its wall contains rich networks of thin-walled veins



- c) its epithelial cells synthesize and accumulate glycogen
- d) its muscularis contains striated muscle
- e) its lamina epithelialis consists of stratified squamous nonkeratinized epithelium

**27. Which of the following statements about the uterine tubes are true?**

- a) ampullary oviduct mucosa forms high longitudinal folds
- b) their outermost layer is called adventitia
- c) the longest mucosal folds are situated in the isthmus
- d) their lamina epithelialis contains also columnar cells with kinocilia

**28. Which of the following statements about the ovarian follicles are true?**

- a) the rupture of a mature Graafian follicle in the ovary is called luteolysis
- b) the zona pellucida is the extracellular mass between the follicular/granulosa cells and the thecal cells within the follicles
- c) the programmed physiological cessation of follicles is referred to as follicular atresia
- d) ovulation happens together with the menstrual bleeding

**29. In what parts of the female genital system are cilia found?**

- a) oviducts
- b) uterus
- c) vagina
- d) Bartholin's gland

**30. What role does glycogen production play in vaginal epithelium?**

- a) nourishment of sperm
- b) activation of sperm motility
- c) is metabolized into lactic acid, which increases the acidity of the vagina
- d) since the vagina is glandless, it lubricates the surface of the vagina in this way

**31. Which one of the following statements best describes a histological difference between the esophagus and vagina?**

- a) vagina possesses submucosal glands, while the esophagus does not
- b) vagina possesses keratinized stratified squamous epithelium; esophagus possesses non-keratinized stratified squamous epithelium
- c) esophagus possesses submucosal glands, while the vagina does not
- d) esophagus possesses more extensive vascular sinuses than the vagina

**32. What is the structure within the female external genitalia possessing paired corpora cavernosa?**

- a) mons pubis
- b) labia majora
- c) labia minora
- d) clitoris

**33. Which of the following statements about the endometrial basal layer are true?**

- a) is supplied by the straight arteries
- b) contains the bases of the endometrial glands
- c) during menstruation is preserved

- d) it becomes ischemic after rapid decline of corpus luteum hormones
- e) is adjacent to the myometrium

**34. In the following statement, correct the word to make this statement correct: The primary oocyte is arrested for up to 50 years in the zygotene stage of prophase of the first meiotic division.**

- a) primary → primordial
- b) zygotene → diplotene
- c) prophase → metaphase
- d) first → second

**35. Which of the following aptly describes the biological function of the zona pellucida?**

- a) hormone secretion
- b) selective protein uptake
- c) polyspermy prevention
- d) sperm capacitation
- e) sperm adhesion
- f) prevention of early embryo implantation

**36. Which of the following findings is expected on gross and microscopic examination of an ovary obtained from a healthy woman during her reproductive life?**

- a) primordial follicles
- b) implants of endometrial tissue

- c) collagen scar tissue
- d) rich capillary bed
- e) surface simple cuboidal epithelium
- f) secondary lymphatic nodules

**37. What arteries are found in the uterus?**

- a) arcuate
- b) radial
- c) spiral
- d) central
- e) afferent

**38. Which of the following statements about the vagina are true?**

- a) is lined with stratified squamous keratinized epithelium
- b) is richly populated with *Lactobacillus acidophilus*
- c) has abundant serous and mucinous glands in its wall
- d) has numerous elastic fibres in the wall

**39. Which of the following statements about the corpus luteum are true?**

- a) is present in the ovaries at the time of the secretory phase of the endometrium
- b) is formed in the ovary after ovulation
- c) is a remnant of corpus albicans
- d) produces progesterone
- e) if fertilization does not occur, it ceases at the end of the menstrual cycle

**40. How is the proliferative phase of the endometrium aligned with the ovarian cycle?**

- a) follows after ovulation
- b) follows the luteal phase
- c) approximately overlaps with the follicular phase
- d) occurs during the formation of the corpus albicans

**41. Decide whether the following statements about the development of the female reproductive system are true T or false F:**

- a) Follicular cells of the ovarian follicle develop from the mesenchyme.
- b) The SRY gene is essential for proper development of the female embryo.
- c) The paramesonephric (Müllerian) duct is largely involved in the development of the internal female genitalia.
- d) The mesonephric (Wolffian) duct is essential for the development of the ovarian tubes and uterus.

**42. Decide whether the following statements about the development of the female reproductive system are true T or false F:**

- a) The entire vagina originates from the mesonephric (Müllerian) duct.
- b) Cells of theca folliculi originate from the mesenchyme of the genital ridge.
- c) The paramesonephric (Müllerian) duct is the basis of the oviduct, uterus, and cranial part of the vagina.
- d) Follicular cells of the ovarian follicles develop from epithelial cords derived from the celomic epithelium.

**43. Decide whether the following statements about the development of the female reproductive system are true T or false F:**

- a) Primordial cells develop in the same way as follicular cells from the celomic epithelium.
- b) Müllerian tubercle is formed at the junction of the uterovaginal canal and the pelvic part of the urogenital sinus.
- c) The vagina develops from two bases - one from the fused Müllerian ducts and one from the urogenital sinus.
- d) The vaginal vestibulum originates from the urogenital sinus.

**44. Decide whether the following statements about the development of the female reproductive system are true T or false F:**

- a) Labioscrotal folds are the basis for labia minora.
- b) Uterus bicornis is a congenital malformation that results from incomplete union of mesonephric (Wolffian) ducts.
- c) Pelvic and phallic parts of the urogenital sinus give rise to the cranial part of the vagina.
- d) The ovary develops from the indifferent gonad which begins to differentiate towards the female phenotype from the 7th week after fertilization.

**45. Decide whether the following statements about the development of the female reproductive system are true T or false F:**

- a) The entire vagina develops from the urogenital sinus.
- b) A disorder in the development of the paramesonephric (Müllerian) ducts can result in a rare agenesis of the ovarian tubes, uterus, and cranial part of the vagina, known as Mayer-Rokitansky-Küster-Hauser syndrome.
- c) Primordial cells differentiate directly in the genital ridge.

- d) The ovary develops from three embryologic origins - primordial germ cells, epithelial cords from the celomic epithelium, and mesenchyme of the genital ridge.

**46. During the development of the female reproductive system, the mesonephric ducts disappear. However, their remnant may persist in the female in the form of what structure?**

- a) Bartholin's cyst
- b) Nabothian cyst
- c) Gartner's cyst
- d) ovarian cyst
- e) epoöphoron

**47. Which organs originate from the Müllerian ducts?**

- a) ovaries
- b) oviducts
- c) uterus
- d) cranial portion of vagina
- e) caudal portion of vagina

**48. Which of the following statements about the urethral folds in female are true?**

- a) develops on either side of the urethral plate
- b) meet at the genital tubercle
- c) develop into labia majora
- d) develop into clitoris

**49. What structures or tissues give rise to the ovaries?**

- a) intermediate mesoderm of the posterior body wall
- b) cells from the wall of the yolk sac
- c) urogenital sinus
- d) coelomic epithelium

**50. Which organs originate from the urogenital sinus?**

- a) epoöphoron
- b) thecal cells
- c) Bartholin's glands
- d) caudal portion of vagina



## Chapter Ten answers:

- |         |          |          |         |
|---------|----------|----------|---------|
| 1) d    | 14) abd  | 27) ad   | 40) c   |
| 2) abc  | 15) cd   | 28) c    | 41) c   |
| 3) ab   | 16) abd  | 29) ab   | 42) bcd |
| 4) ac   | 17) bd   | 30) c    | 43) bcd |
| 5) ad   | 18) abc  | 31) c    | 44) d   |
| 6) abd  | 19) cd   | 32) d    | 45) bd  |
| 7) acd  | 20) abc  | 33) abce | 46) ce  |
| 8) abc  | 21) b    | 34) b    | 47) bcd |
| 9) ac   | 22) ad   | 35) cef  | 48) ab  |
| 10) abd | 23) abcf | 36) acde | 49) abd |
| 11) ac  | 24) ab   | 37) abc  | 50) cd  |
| 12) acd | 25) abc  | 38) bd   |         |
| 13) bd  | 26) bce  | 39) abde |         |

## Chapter Eleven: Skin

**1. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) All cells of the epidermis are known as keratinocytes.
- b) Stratum basale and stratum spinosum are collectively referred to as stratum germinativum seu Malpighi.
- c) Stratum lucidum is present only in thick type of skin.
- d) Stratum corneum consists of several layers of keratinocytes with pale spherical nucleus.

**2. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Melanocytes use cytokrine secretion - melanin is directly "injected" into the cytoplasm of keratinocytes.
- b) Merkel cells are antigen-presenting cells of the epidermis.
- c) Spines visible between the keratinocytes of the stratum spinosum represent communicating junctions.
- d) Keratinocytes of the stratum basale are flat cells because the epidermis is a stratified squamous epithelium.

**3. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Stratum lucidum is a highly eosinophilic layer because of its eleidine content.

- b) Merkel cells, as part of tactile corpuscles, act as mechanoreceptors in the epidermis.
- c) Keratinocytes of the stratum basale contain basophilic keratohyalin granules.
- d) Langerhans cells are a population of keratinocytes.

**4. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Pheomelanin produced by melanocytes forms a more effective protection against UV rays than eumelanin.
- b) Langerhans cells are dendritic, antigen-presenting cells of the epidermis.
- c) Stratum corneum contains only dead elements filled with keratin and devoid of cell organelles.
- d) All epidermal cell populations have the same embryonic origin.

**5. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Stratum basale of the epidermis is formed by a single layer of cuboidal to columnar cells.
- b) The spines of stratum corneum keratinocytes connect neighbouring cells via hemidesmosomes.
- c) Keratohyalin granules are basophilic structures in the cytoplasm of stratum granulosum keratinocytes.
- d) The epidermis is made up of four cell types - keratinocytes, melanocytes, Langerhans cells, and Merkel cells.

**6. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) The dermis consists of two sublayers - stratum papillare and stratum reticulare.
- b) Both layers of the dermis are made up of the same type of connective tissue.
- c) Stratum reticulare contains sebaceous glands.
- d) The boundary between the stratum papillare dermis and the epidermis is a straight line.

**7. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) The hypodermis contains all types of skin appendages.
- b) Stratum papillare of the dermis extends opposite the epidermis into papillae, which have an important mechanical and nutritive function.
- c) Stratum papillare of the dermis is formed by a dense connective tissue.
- d) Stratum reticulare of the dermis consists of a loose connective.

**8. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Stratum reticulare of the dermis is formed by a dense irregular connective tissue.
- b) Stratum papillare dermis is made up of a loose connective tissue.
- c) The hypodermis consists mainly of elastic connective tissue.
- d) Stratum reticulare dermis contains only sebaceous glands from skin appendages.

**9. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) The hypodermis contains varying amounts of adipose tissue in different parts of the body.
- b) Panculus adiposus is the name given to the stratum reticulare of the dermis.
- c) The hypodermis is formed by a single type of connective tissue in all parts of the human body.
- d) Stratum reticulare of the dermis is a dense connective tissue containing only collagen fibers.

**10. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Stratum reticulare of the dermis also contains many elastic fibers, which can be seen for example by staining with orcein.
- b) Stratum reticulare of the dermis is where most of the muscoli arrectores pillorum run.
- c) Vater-Pacini and Ruffini corpuscles are found in the stratum papillare dermis at the border with the epidermis.
- d) In most areas of the human body, the adipose tissue is the dominant type of connective tissue in the hypodermis.

**11. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Eccrine sweat glands have ducts composed of two layers of cuboidal epithelium.
- b) Ducts of eccrine sweat glands open into the hair follicle.

- c) Apocrine aromatic glands and eccrine sweat glands are always found together.
- d) Sebaceous gland and a hair follicle usually form the pilosebaceous.

**12. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Sebaceous glands have a single duct lined by a stratified squamous non-keratinized epithelium.
- b) Eccrine sweat glands use primarily the apocrine mechanism of secretion.
- c) Scapus is the part of the hair that protrudes above the skin.
- d) The hair papilla is histologically an epithelial tissue.

**13. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) The hair bulb (bulus pili) contains keratinocytes, their precursors, and melanocytes and has a high mitotic activity.
- b) The inner epithelial sheath of the hair follicle consists of three layers - the cuticle, Huxley's layer, and Henle's layer.
- c) The root is the part of the hair shaft that protrudes above the skin.
- d) Sebaceous glands open into the hair follicle above the exit of aromatic glands.

**14. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Eccrine sweat glands are simple glands with a coiled secretory part.

- b) The holocrine type of secretion predominates in sweat and aromatic glands.
- c) In aromatic glands, the merocrine mechanism of secretion predominates.
- d) Keratinocytes in nails undergo a hard type of keratinization.

**15. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Musculi arrectores pilorum are striated muscles attaching to the hair follicle.
- b) Aromatic glands open into the hair follicle, usually above the sebaceous gland.
- c) Ducts of eccrine sweat glands are lined by a simple squamous epithelium.
- d) The mammary gland is an example of skin appendage.

**16. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) The thick skin type does not contain any skin appendages.
- b) There is no stratum lucidum in the thick skin type.
- c) Typical examples of the thick skin type are palms and soles.
- d) The division of skin into thick and thin types is based on the thickness of the entire skin, including the hypodermis.

**17. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Thin skin covers most of the body.
- b) The thin skin type does not contain eccrine sweat glands.
- c) Stratum lucidum is usually not visible in the thin skin type.

- d) The thick skin type contains hair and sebaceous and aromatic glands.

**18. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) The division of skin into thick and thin types is mainly based on the thickness of the epidermis.
- b) The thick type of skin has no hair, sebaceous, or aromatic glands.
- c) Stratum corneum of the thick skin can be thicker than all the other layers of the epidermis put together.
- d) The difference between thick and thin skin types is the presence/absence of the stratum spinosum.

**19. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) The thick skin contains the stratum corneum, whereas the thin skin does not have this epidermal layer.
- b) Most of the body is covered by thick skin.
- c) Eccrine sweat glands are found in both thin and thick skin.
- d) The eyelids have thin skin, and the back has thick skin.

**20. Decide whether the following statements about the skin and skin appendages are true T or false F:**

- a) Langerhans cells of the epidermis are important part of the immune system.
- b) Melanocytes have a different embryonic origin than skin keratinocytes.
- c) Sebaceous glands always open into the hair follicle.
- d) The entire skin is made up of epithelial tissue.



**21. What is the expansion of a growing hair follicle formed by different cellular components at its base?**

- a) terminal
- b) papilla
- c) bulb
- d) club

**22. What tissues can be found in the skin?**

- a) epithelial lining in the epidermis
- b) loose connective tissue in the epidermis
- c) dense connective tissue in the reticular layer of epidermis
- d) white adipose tissue in the hypodermis

**23. Which of the following statements about the spinous layer of the epidermis are true?**

- a) is composed of several layers of keratinocytes connected by desmosomes
- b) is translucent thin layer of extremely flattened basophilic cells
- c) is the source of new keratinocytes
- d) is composed of columnar keratinocytes
- e) shrinking of the microfilaments between desmosomes is responsible for its spiny appearance

**24. Which of the following statements about the skin glands are true?**

- a) sweat glands of skin are the simple branched alveolar glands
- b) eccrine sweat glands are tubular coiled glands

- c) sweat glands of skin are the exocrine glands with holocrine secretion
- d) sebaceous glands are the exocrine glands with holocrine secretion

**25. Which of the following general statements about the skin are true?**

- a) stratum lucidum of the epidermis is absent in the thin skin type
- b) melanocytes are pigment cells with long, irregular processes that protect the mitotically active cells of the stratum basale of the skin from the damaging effects of sunlight
- c) the layer of skin beneath the epidermis is called the hypodermis and is composed of connective tissue
- d) reticular layer of the dermis is composed of the reticular connective tissue

**26. What are the layers of the epidermis in a skin of thin type?**

- a) stratum basale
- b) stratum granulosum
- c) stratum papillare
- d) stratum lucidum
- e) stratum corneum

**27. What are the typical histologic characteristics of the cells of the basal layer of the epidermis?**

- a) striking eosinophilia of their cytoplasm
- b) contain various amounts of melanin
- c) are low columnar to cuboidal
- d) connected to the underlying lamina basalis by desmosomes

e) contain numerous keratohyalin granules

**28. What are the typical cells of the epidermis?**

- a) Merkel cells
- b) melanocytes
- c) Langerhans cells
- d) fibroblasts

**29. What ultrastructural component of the cell fills 85% of the volume of a differentiated keratinocyte?**

- a) microtubules
- b) intermediate filaments
- c) actin filaments
- d) lamins

**30. What amino acid is the basic building block of melanin?**

- a) leucine
- b) valine
- c) proline
- d) tyrosine

**31. Which of the following statements about the sebaceous glands of the skin are true?**

- a) are found in the skin of the external genitalia

- b) form glandulae tarsales Meibomi in eyelid
- c) are holocrine glands
- d) are not found in the skin of the hands or feet
- e) form glandulae ceruminosae of the external auditory canal

**32. Which of the following statements about the mammary gland are true?**

- a) myoepithelial cells cause the milk to be ejected through the ducts
- b) estrogen promotes its branching differentiation
- c) the fat component of milk is secreted by the holocrine secretion
- d) is absent in males

**33. What are the functions of Vater-Paccini corpuscles?**

- a) pressure changes detection
- b) phagocytosis of harmful particles
- c) detection of vibration
- d) heat detection (high temperature)
- e) cold detection (low temperature)

**34. Which of the following statements about the Huxley's layer of the internal root sheath of the hair follicle are true?**

- a) form its middle plate
- b) is made of flattened epithelial cells
- c) is in direct contact with the outermost part of the hair follicle
- d) consists of cuboidal cells that produce keratin

**35. Which of the following statements about the eccrine sweat glands are true?**

- a) are distributed almost over the entire body
- b) are simple coiled glands
- c) their secretory portion contains myoepithelial cells
- d) despite the name, their mode of secretion is apocrine

**36. Which of the following statements about the Meissner's corpuscles are true?**

- a) are also formed by Schwann cells
- b) respond to stretch and torque
- c) belongs to the encapsulated nerve endings
- d) are housed in the papillae of the corium
- e) are receptors for pain

**37. Which skin structures are nociceptors (pain receptors)?**

- a) free nerve endings
- b) Krause's corpuscles
- c) Merkel discs
- d) Ruffini's corpuscles

**38. Which of the following epidermal cells is closely associated with terminal nerve fibers and serves as a mechanoreceptor in the skin?**

- a) Langerhans cell
- b) melanocyte

- c) Merkel cell
- d) spinous keratinocyte

**39. Which structure are generally absent in thick skin but is present in thin skin?**

- a) dermatoglyphics
- b) arrector pili muscle
- c) sebaceous glands
- d) stratum lucidum

**40. Which of the following statements about the keratohyalin granules are true?**

- a) are basophilic
- b) they are found in the stratum granulosum cells of the skin
- c) contain a protein called profilaggrin
- d) are eosinophilic

**41. What distinguishes the stratum papillare from the stratum reticulare of the dermis?**

- a) different type of connective tissue proper (loose vs. dense)
- b) only stratum reticulare is innervated
- c) their location within the dermis
- d) stratum papillare is thinner

**42. Decide whether the following statements about the development of the skin and skin appendages are true T or false F:**

- a) The periderm is the base of the future epidermis.
- b) All epidermal cells have a common embryonic origin.
- c) All skin layers are derived from the superficial ectoderm.
- d) The epithelial portions of skin derivatives are of ectodermal origin.

**43. Decide whether the following statements about the development of the skin and skin appendages are true T or false F:**

- a) The connective tissue of the dermis originates from the dermatomes and somatopleura of the lateral plate mesoderm.
- b) Melanocytes are derived from the neuroectoderm of the neural crest.
- c) The epidermis arises from the basal cuboidal cells of the primitive epidermis.
- d) The periderm is involved in the development of the future dermis.

**44. Decide whether the following statements about the development of the skin and skin appendages are true T or false F:**

- a) Merkel cells of the epidermis have a neuroectodermal origin.
- b) At the end of the 3rd month after fertilization, melanoblasts of neuroectodermal origin migrate into the skin.
- c) The mammary ridge is involved in the development of the mammary gland throughout its entire course.
- d) The glandular epithelium of the mammary gland originates from the dermatomes of the somites.

**45. Decide whether the following statements about the development of the skin and skin appendages are true T or false F:**

- a) If the mammary ridge does not disappear completely, polythelia or polymastia develops.
- b) The keratinocytes of the epidermis develop from the surface ectoderm.
- c) Sebaceous glands, unlike eccrine sweat glands, have a mesodermal origin.
- d) The periderm gives rise to the subcutaneous connective tissue.

**46. Decide whether the following statements about the development of the skin and skin appendages are true T or false F:**

- a) Hair begins to develop in the 3rd month after fertilization as primary hair (lanugo).
- b) Sebaceous glands develop as outgrowths of the primitive hair follicle; thus they are of ectodermal origin.
- c) The epidermis develops from the dermatomes of the somites.
- d) Merkel cells develop from the surface ectoderm.

**47. What is the origin of the dermis?**

- a) intermediate mesoderm
- b) dermatomes of somites
- c) placodes
- d) lateral plate mesoderm
- e) ectomesenchyme



**48. What is the future fate of periderm?**

- a) differentiates into cells of epidermal basal layer
- b) is gradually sloughed into the amniotic cavity
- c) participates in the formation of vernix caseosa
- d) give rise to germinal basal layer of epidermis

**49. The keratinocytes of the epidermis are embryologically derived from which germ layer?**

- a) neural crest cells
- b) surface ectoderm
- c) endoderm
- d) somatic mesoderm
- e) splanchnic mesoderm

**50. Which cells of human epidermis originate from the ectoderm?**

- a) keratinocytes
- b) Langerhans cells
- c) melanocytes
- d) Merkel cells

**51. The breast develops along the mammary line/ridge or milk line. Which of the following is a possible location for the accessory nipple or breast?**

- a) armpits
- b) groin
- c) cubital fossa or anterior elbow

- d) popliteal fossa or behind the knee
- e) lower lateral neck above clavicle

## Chapter Eleven answers:

- |         |         |          |         |
|---------|---------|----------|---------|
| 1) bc   | 14) ad  | 27) bc   | 40) abc |
| 2) a    | 15) bd  | 28) ab   | 41) acd |
| 3) ab   | 16) c   | 29) b    | 42) d   |
| 4) bc   | 17) ac  | 30) d    | 43) abc |
| 5) acd  | 18) abc | 31) abcd | 44) ab  |
| 6) ac   | 19) c   | 32) ab   | 45) ab  |
| 7) b    | 20) ab  | 33) ac   | 46) ab  |
| 8) ab   | 21) c   | 34) ab   | 47) bd  |
| 9) a    | 22) acd | 35) abc  | 48) bc  |
| 10) abd | 23) ace | 36) acd  | 49) b   |
| 11) ad  | 24) bd  | 37) a    | 50) acd |
| 12) ac  | 25) ab  | 38) c    | 51) ab  |
| 13) ab  | 26) abe | 39) bc   |         |

## Chapter Twelve: Central and peripheral nervous system

**1. Decide whether the following statements about the nervous system are true T or false F:**

- a) The spinal cord contains alpha-motoneurons in the anterior horns of the gray matter.
- b) The spinal cord has the same arrangement of gray and white matter as the brain.
- c) When stained with hematoxylin, Nissl substance is shown in the cytoplasm of alpha-motoneurons.
- d) The central canal of the spinal cord is lined by ependymal cells.

**2. Decide whether the following statements about the nervous system are true T or false F:**

- a) Ependymal cells are epithelial cells that lie on the basement membrane.
- b) Ependymal cells have microvilli and/or cilia on their surface.
- c) The gray matter of the spinal cord contains predominantly myelinated axons.
- d) Alpha-motoneurons of the anterior horns of the spinal gray matter send out somatomotor fibers that innervate skeletal muscles.

**3. Decide whether the following statements about the nervous system are true T or false F:**

- a) The white matter of the spinal cord is present on its surface below sheaths.
- b) The white matter of the spinal cord contains predominantly myelinated axons, glial cells, and continuous capillaries.

- c) The central canal of the spinal cord is lined by different types of neurons.
- d) Ependymal cells are glial cells arranged in epithelioid manner.

**4. Decide whether the following statements about the nervous system are true T or false F:**

- a) Lateral horns of the spinal cord contain somatomotor fibers of alpha-motoneurons.
- b) Posterior horns of the spinal cord contain axons of somatosensitive neurons bodies of which are in the dorsal root ganglia.
- c) The nerve fibers are stained pink with hematoxylin and eosin.
- d) The white matter of the spinal cord surrounds the central canal.

**5. Decide whether the following statements about the nervous system are true T or false F:**

- a) The central canal of the spinal cord is lined by cells with processes that aid in the circulation of cerebrospinal fluid.
- b) The white matter of the spinal cord is divided into anterior, lateral, and posterior roots.
- c) Alpha-motoneurons in the anterior horns of the gray matter of the spinal cord send axons through anterior roots of spinal nerves.
- d) Motor and sensory fibers are equally present in all corners of the gray matter of the spinal cord.

**6. Decide whether the following statements about the nervous system are true T or false F:**

- a) Betz cells are found in the most superficial layer of the cerebral cortex.
- b) The neocortex of the hindbrain is divided into three typical layers.
- c) Lamina molecularis is the most superficial layer of the hindbrain neocortex.
- d) Lamina multiformis of the hindbrain neocortex is located at the boundary with the white matter.

**7. Decide whether the following statements about the nervous system are true T or false F:**

- a) Lamina pyramidalis interna of certain regions of the hindbrain may contain large Betz cells.
- b) Betz cells are multipolar pyramidal neurons with their tips always facing the surface of the great brain.
- c) Betz cells are part of the white matter of the hindbrain.
- d) The neocortex of the hindbrain consists of six layers.

**8. Decide whether the following statements about the nervous system are true T or false F:**

- a) The white matter of the hindbrain contains mainly myelinated nerve cell processes, glial cells, and continuous capillaries.
- b) Lamina molecularis of the hindbrain neocortex contains few cells and many fibers.
- c) Lamina pyramidalis externa of the hindbrain neocortex is the fifth layer from the surface.
- d) Most pyramidal cells in the hindbrain neocortex are found in granular layers.

**9. Decide whether the following statements about the nervous system are true T or false F:**

- a) All parts of the cerebral cortex are arranged in six layers.
- b) Lamina multiformis of the hindbrain neocortex contains neurons of different shapes.
- c) The paleocortex consists of three layers.
- d) The fourth layer of the hindbrain neocortex from the surface is lamina granularis interna.

**10. Decide whether the following statements about the nervous system are true T or false F:**

- a) Dura mater is a layer of dense connective tissue that covers both the brain and the spinal cord.
- b) The arachnoid is a layer of loose connective tissue that directly covers the brain tissue.
- c) Dura mater of the brain fuses with the periosteum of skull bones.
- d) The arachnoid is formed by a loose connective tissue arranged in trabeculae, between which the cerebrospinal fluid flows.

**11. Decide whether the following statements about the nervous system are true T or false F:**

- a) Purkinje cells of the cerebellar cortex send dendrites into the stratum moleculare, which we refer to as Purkinje fibers.
- b) Purkinje cell bodies are in the middle layer of the cerebellar cortex.
- c) The cerebellar cortex is divided into three layers.
- d) The dendritic tree of Purkinje cells branches out in the stratum granulosum of the cerebellar cortex.

**12. Decide whether the following statements about the nervous system are true T or false F:**

- a) Purkinje cells are large multipolar neurons with dendritic tree branching out in the stratum moleculare of the cerebellar cortex.
- b) Stratum granulosum of the cerebellar cortex lies at the boundary between the gray and white matter.
- c) Stratum purkinjese is the thickest layer of the cerebellar cortex.
- d) Granular neurons are the main type of neurons in the stratum granulosum of the cerebellar cortex and are one of the smallest cells in the human body.

**13. Decide whether the following statements about the nervous system are true T or false F:**

- a) Mossy fibers are the most numerous afferent fibers of the cerebellar cortex.
- b) The cerebellar cortex contains five main types of neurons - granule, Purkinje, Golgi, rod, and basket cells.
- c) Purkinje cells are pear-shaped, and their bodies form the stratum purkinjese of the cerebellar cortex.
- d) The cerebellum has the same arrangement of gray and white matter as the spinal cord.

**14. Decide whether the following statements about the nervous system are true T or false F:**

- a) Lamina multiformis is part of the cerebellar cortex.
- b) Granular neurons are mainly found in the stratum moleculare of the cerebellar cortex.
- c) Stratum moleculare of the cerebellar cortex contains the axonal tree of Purkinje cells.



- d) The white matter of the cerebellum is predominantly composed of myelinated axons, glial cells, and continuous capillaries.

**15. Decide whether the following statements about the nervous system are true T or false F:**

- a) We can best observe Nissl substance in the bodies of Purkinje cells in Holmes impregnation.
- b) Purkinje cells are among the smallest cells in the human body.
- c) Purkinje cell bodies are found predominantly in the white matter of the cerebellum.
- d) Granule cells are small excitatory neurons in the cerebellar cortex.

**16. Decide whether the following statements about the nervous system are true T or false F:**

- a) The spinal ganglion contains pseudounipolar neurons.
- b) Neurons of spinal ganglia send an efferent axon towards peripheral organs.
- c) The spinal ganglion contains supporting satellite cells that have their own basal lamina.
- d) All sensory ganglia contain pseudounipolar neurons.

**17. Decide whether the following statements about the nervous system are true T or false F:**

- a) The choroid plexus is covered by modified ependymocytes.
- b) The choroid plexus is the site of cerebrospinal fluid production.
- c) Processes of the dura mater form the choroid plexus.

- d) The choroid plexus consists of a loose connective tissue and fenestrated capillaries.

**18. Decide whether the following statements about the nervous system are true T or false F:**

- a) The surface of a peripheral nerve is covered by the endoneurium.
- b) Vasa nervorum and nervi nervorum are also part of peripheral nerves.
- c) The perineurium envelops each individual nerve fiber.
- d) Axons and dendrites of peripheral nerves can be distinguished from each other by different impregnation methods.

**19. Decide whether the following statements about the nervous system are true T or false F:**

- a) The endoneurium is a connective tissue layer around individual nerve fiber.
- b) Each peripheral nerve contains only one type of nerve fiber.
- c) The perineurium surrounds bundles of nerve fibers.
- d) The epineurium is a dense irregular connective tissue.

**20. Decide whether the following statements about the nervous system are true T or false F:**

- a) Peripheral nerves do not have their own vascular supply.
- b) All peripheral nerve fibers are myelinated.
- c) The endoneurium is a reticular connective tissue found around the axons of individual nerve fibers of the peripheral nerve.

- d) The peripheral nerve contains somatomotor, somatosensitive, visceromotor, and viscerosensitive nerve fibers in various combinations.

**21. Which ganglia contain cell bodies of sensory neurons?**

- a) trigeminal ganglion
- b) prevertebral ganglia
- c) paravertebral ganglia
- d) dorsal root ganglia

**22. Which of the following statements about peripheral nerve connective tissue sheaths are true?**

- a) individual nerve fibers are surrounded by epineurium made of dense connective tissue
- b) delicate layer of loose connective tissue with reticular fibers, the endoneurium, surrounds each nerve fiber
- c) epineurium is a peripheral nerve outermost covering made of dense connective tissue
- d) perineurium is composed of modified fibroblasts that are connected to form concentric cylindrical sheaths separated by fibrous collagen

**23. Which of the following describes the function of neurons that are located in dorsal root ganglia of the nervous system?**

- a) autonomic motor
- b) interneuron communicating
- c) somatic motor

- d) somatic sensory
- e) visceral sensory

**24. Which of the following cells contributes to the formation of the blood–brain barrier in the central nervous system?**

- a) endothelial cells
- b) pericytes
- c) ependymal cells
- d) oligodendrocytes
- e) astrocytes

**25. In which organs is the plexus myentericus Auerbachii located?**

- a) urethra
- b) trachea
- c) colon
- d) urether

**26. In which layer of the neuronal cortex can Purkinje neurons be found?**

- a) lamina pyramidalis interna
- b) stratum granulosum
- c) lamina multiforme
- d) stratum ganglionare

**27. Which structures are creating hematoneural barrier in the peripheral nerve?**

- a) myelin sheath
- b) epitheloid-arranged fibroblasts of the perineurium
- c) dense connective tissue of the epineurium
- d) reticular tissue of the endoneurium

**28. What histological structures can be found in the peripheral nerve?**

- a) satellite cell processes
- b) axons (central processes) of pseudounipolar neurons
- c) dendrites of alpha-motoneurons
- d) vasa nervorum
- e) endoneurium

**29. Which of the following statements about the Purkinje neurons (cells) are true?**

- a) are excitatory neurons
- b) have a particularly rich dendritic tree
- c) their perikarya have a pyramidal shape
- d) belong to the neurons with the largest perikarya
- e) their axons form synapses with granular neurons

**30. The bodies of which neurons can be found in the cerebellar cortex?**

- a) basket cells
- b) granular neurons
- c) Betz pyramidal neurons
- d) dopaminergic neurons

- e) stellate cells

**31. Which of the following statements about the motoric neocortex are true?**

- a) consists of 6 different layers
- b) consists of 7 different layers
- c) its molecular layer contains an abundance of neuronal bodies
- d) axons of its neurons create pyramidal tract

**32. Which of the following statements about the spinal dorsal root ganglia are true?**

- a) comprise of pseudounipolar neurons and satellite cells
- b) after insult, astrocytes form a glial scar here
- c) comprise bipolar neurons and satellite cells
- d) is involved in the sensitive pathway

**33. Which of the following statements about the choroid plexus are true?**

- a) is responsible for cerebrospinal fluid production
- b) is almost avascular to prevent subarachnoidal hemorrhage
- c) is covered by cuboidal ependymal cells
- d) is rich in blood vessels in loose connective tissue
- e) lines central canal of the spinal cord
- f) is lined by tanocytes

**34. Where do we find bodies of Betz's motoneurons?**

- a) in cerebellar deep nuclei

- b) in spinal ventral horns
- c) in motoric cortex of the girus praecentralis
- d) in basal ganglia and pars compacta of substantia nigra

**35. In which organs can satellite cells be seen?**

- a) coeliac ganglia of coeliac plexus
- b) dorsal root ganglia
- c) nervus ischiadicus
- d) nervus vagus
- e) cornu posterior of the spinal cord
- f) prevertebral symphatetic ganglia

**36. The bodies of which neurons can be found in the cerebral cortex?**

- a) Cajal-Retzius cells
- b) Martinotti cells
- c) Purkinje cells
- d) Betz pyramidal neurons

**37. In which CNS structures are neuronal bodies found in large numbers?**

- a) substantia nigra
- b) anterior commissure
- c) pyramidal tract
- d) nucleus paraventricularis
- e) intermediolateral cell column
- f) dorsal column

**38. Which structures are part of the proprioceptive monosynaptic reflex arc?**

- a) intrafusal fibers of muscle spindle
- b) dendrite (peripheral process) of pseudounipolar neuron
- c) inhibitory interneuron
- d) axon of alpha-motoneuron

**39. Which of the following statements about the myelinated nerve fibers are true?**

- a) myelin sheath of one axon is formed by many Schwann cells
- b) one Schwann cell forms a myelin sheath around many axons
- c) myelin insulates axons and increases the rate at which electrical impulses are passed along the axon
- d) axons are embedded in a cytoplasm of Schwann cells

**40. Which cells can we find in white matter tracts?**

- a) interneurons
- b) astrocytes
- c) oligodendrocytes
- d) microglia

**41. Decide whether the following statements about the development of the nervous system are true T or false F:**

- a) Notochord together with paraxial mesoderm induce differentiation of ectoderm to neuroectoderm.
- b) The neural plate is the basis for the neural tube.
- c) The anterior and posterior neuropores close simultaneously.



- d) Anencephaly is the result of failure of the posterior neuropore to close.

**42. Decide whether the following statements about the development of the nervous system are true T or false F:**

- a) Only genetic factors are involved in the development of congenital neural tube defects.
- b) Neural crest cells are derived from the neuroectoderm of the neural tube.
- c) Since only the bones of the neurocranium are derived from cells of the neural tube, their differentiation potential is limited.
- d) Neuroepithelial cells differentiate into neuroblasts, glioblasts, and ependymoblasts.

**43. Decide whether the following statements about the development of the nervous system are true T or false F:**

- a) Two brain vesicles develop from the mesencephalon, the telencephalon and diencephalon.
- b) A fifth cerebral vesicle (myelencephalon) develops from the rhombencephalon.
- c) The thalamus and hypothalamus are derivatives of the prosencephalon.
- d) The cerebellum develops from the metencephalon.

**44. Decide whether the following statements about the development of the nervous system are true T or false F:**

- a) Motor neurons of the ventral horns of the spinal cord develop from the basal plate of the neural tube.

- b) By the 2nd month of embryonic development, the spinal cord and spine are of equal length.
- c) Groups of motor nuclei (n. oculomotorius, n. trochlearis, n. ruber) arise from the alar plates of the mesencephalon.
- d) Motor nuclei of the cranial nerves arise from the basal plates of the metencephalon.

**45. Decide whether the following statements about the development of the nervous system are true T or false F:**

- a) The autonomic nervous system develops from neural crest cells.
- b) Myelination of nerve fibers begins in the 4th month and is completed just before birth.
- c) The ventricular system and the central canal of the spinal cord develop from the lumen of the neural tube.
- d) Failure of the anterior neuropore to close can lead to the development of spina bifida.

**46. To what brain vesicles does the rhombencephalon further differentiate?**

- a) metencephalon
- b) mesencephalon
- c) diencephalon
- d) myelencephalon

**47. Which of the flexions of neural tube are ventrally directed?**

- a) pontine flexure
- b) cranial (mesencephalic) flexure
- c) cervical flexure

d) sacral spinal flexure

**48. Which zone of the neural tube neuroepithelium is the place, where neurons are created?**

- a) mantle zone
- b) ventricular zone
- c) marginal zone
- d) zone, which surrounds the central lumen

**49. Which structures of the CNS originate in the basal plates?**

- a) nucleus of the trochlear nerve
- b) vestibular nuclei of n. vestibulocochlearis
- c) ventral horns of the spinal cord
- d) dorsal horns of the spinal cord

**50. Which of the following statements about the spina bifida are true?**

- a) it is sought at screening by measuring maternal blood alpha-fetoprotein levels at 15-17 weeks of gestation
- b) arises when rhombomeres do not disappear
- c) has a multifactorial aetiology
- d) is a malformation that occurs when the closure of the neural tube in the posterior neuropore fails

## Chapter Twelve answers:

- |         |         |         |         |
|---------|---------|---------|---------|
| 1) acd  | 14) d   | 27) b   | 40) bcd |
| 2) bd   | 15) d   | 28) de  | 41) ab  |
| 3) abd  | 16) ac  | 29) bd  | 42) bd  |
| 4) bc   | 17) abd | 30) abe | 43) bcd |
| 5) ac   | 18) b   | 31) ad  | 44) abd |
| 6) cd   | 19) acd | 32) ad  | 45) ac  |
| 7) abd  | 20) cd  | 33) acd | 46) ad  |
| 8) ab   | 21) ad  | 34) c   | 47) bc  |
| 9) bcd  | 22) bcd | 35) abf | 48) bd  |
| 10) acd | 23) de  | 36) abd | 49) ac  |
| 11) bc  | 24) abe | 37) ade | 50) acd |
| 12) abd | 25) c   | 38) abd |         |
| 13) abc | 26) d   | 39) ac  |         |

## Chapter Thirteen: Eye and ear

### 1. Decide whether the following statements about the eye are true T or false F:

- a) Tunica fibrosa bulbi is the innermost layer of the eyeball.
- b) Amacrine cells in the retina are the only neurons in the human body that do not have an axon.
- c) The posterior corneal epithelium attaches to Bowman's membrane.
- d) The cornea has a rich vascular supply.

### 2. Decide whether the following statements about the eye are true T or false F:

- a) The anterior corneal epithelium is a stratified squamous non-keratinized epithelium.
- b) The epithelium of the ciliary body and iris is part of the uvea.
- c) The optical part of the retina consists of ten typical layers.
- d) Rods and cones are first neurons of the visual pathway.

### 3. Decide whether the following statements about the eye are true T or false F:

- a) Rods and cones are part of the pars caeca retinae.
- b) Suspensory ligaments attach the lens to the ciliary body which is important for accommodation.
- c) The posterior corneal epithelium is stratified squamous non-keratinized.
- d) The sclera is composed predominantly of dense irregular connective tissue.

**4. Decide whether the following statements about the eye are true T or false F:**

- a) The iris contains two smooth muscles - m. sphincter and m. dilatator pupillae.
- b) Schlemm's canal is an endothelium-lined drainage system for aqueous humour.
- c) Descemet's membrane is the basement membrane of the posterior corneal epithelium.
- d) The ciliary body has posteriorly a simple epithelium which is part of the blind spot of the retina.

**5. Decide whether the following statements about the eye are true T or false F:**

- a) The lens is covered anteriorly by a simple cuboidal epithelium, which is the source of the lens fibers.
- b) Müller cells are glial cells that run along the entire width of the retina.
- c) Bipolar cells represent third neurons of the visual pathway.
- d) Amacrine cells of the retina have like other multipolar neurons usually one axon and many dendrites.

**6. Decide whether the following statements about the eye are true T or false F:**

- a) The boundary between the pars caeca and the pars optica retinae is formed by the anterior chamber of the eye.
- b) The pigment epithelium is the innermost layer of the optical part of the retina.
- c) Lens fibers are present only on the surface of the lens.
- d) The choroid contains Bruch's membrane, which lies between the choroid and optical part of the retina.

**7. Decide whether the following statements about the eye are true T or false F:**

- a) Both the anterior and posterior corneal epithelium are simple squamous.
- b) The stroma (substantia propria) is the thickest layer of the cornea.
- c) The anterior border layer of the iris contains fibroblasts and melanocytes.
- d) The iris has anteriorly an epithelium like the cornea.

**8. Decide whether the following statements about the eye are true T or false F:**

- a) The iris has anteriorly the anterior border layer instead of the epithelium.
- b) Corpus vitreum is part of the eyeball wall.
- c) Musculus dilatator pupillae is formed by myoepithelial cells.
- d) The boundary between the non-photosensitive and photosensitive area of the retina is the ora serrata.

**9. Decide whether the following statements about the eye are true T or false F:**

- a) Nerve fiber layer of the photosensitive part of the retina is located just below the pigment epithelium.
- b) External plexiform layer of the photosensitive part of the retina is formed by synapses between processes of photoreceptor cells and bipolar cells.
- c) The vitreous humour is formed in the pars plana of the ciliary body.
- d) Inner limiting membrane of the photosensitive part of the retina is formed by synapses between ganglion cells and bipolar cells.

**10. Decide whether the following statements about the eye are true T or false F:**

- a) Rods are responsible for black and white vision.
- b) Cones are responsible for seeing colours and small details.

- c) The conjunctiva of the eyeball extends into the adjacent corneal epithelium.
- d) Loose connective tissue of the iris does not contain any blood vessel.

**11. Decide whether the following statements about the ear are true T or false F:**

- a) The base of the auricle is elastic cartilage.
- b) The entire external acoustic meatus consists of hyaline cartilage.
- c) Stratum cutaneum of the tympanic membrane is formed by a stratified squamous keratinized epithelium.
- d) All layers of the tympanic membrane have a common embryonic origin.

**12. Decide whether the following statements about the ear are true T or false F:**

- a) The middle ear cavity contains three auditory ossicles and two muscles.
- b) The middle ear is connected to the outer ear by the Eustachian tube.
- c) Stapes is attached to the oval window.
- d) The middle ear cavity is lined by a simple squamous to low cuboidal epithelium.

**13. Decide whether the following statements about the ear are true T or false F:**

- a) The membranous labyrinth contains only the organ of Corti and the vestibular system consists only of the bony part.
- b) All sensory structures of the membranous labyrinth contain hair cells.
- c) Stria vascularis is the only epithelium in the human body that contains blood vessels.
- d) The vestibular system is in the scala media.



**14. Decide whether the following statements about the ear are true T or false F:**

- a) The organ of Corti contains two types of hair cells - outer and inner.
- b) Cristae ampullares are part of the organ of Corti.
- c) The organ of Corti is positioned on the basilar membrane.
- d) The bony labyrinth is located inside the membranous labyrinth.

**15. Decide whether the following statements about the ear are true T or false F:**

- a) Scala media is part of the bony labyrinth.
- b) The boundary between the scala media and scala vestibuli is the basilar membrane.
- c) Stria vascularis is a pseudostratified epithelium that is involved in the formation of the endolymph.
- d) The three semicircular canals of the bony labyrinth contain the three semicircular ducts of the membranous labyrinth.

**16. Decide whether the following statements about the ear are true T or false F:**

- a) Helicotrema is a place at the apex of the cochlear labyrinth where the scala tympani and scala vestibuli meet.
- b) Hairs of outer hair cells extend into the membrana tectoria.
- c) Phalangeal cells are a type of hair cell in the organ of Corti.
- d) All hair cells have many motile cilia on their surface.

**17. Decide whether the following statements about the ear are true T or false F:**

- a) Cristae ampullares contain hair cells covered by the cupula.
- b) Macula sacculi et utriculi are found in the organ of Corti.

- c) The otolithic membrane is part of the membrana tectoria of the organ of Corti.
- d) The entire membranous labyrinth of the inner ear is responsible for hearing and movement.

**18. Decide whether the following statements about the ear are true T or false F:**

- a) Membrana vestibularis separates the scala media from the scala vestibuli.
- b) Endolymph flows through the bony labyrinth.
- c) Perilymph flows in the membranous labyrinth.
- d) Scala media has triangular shape in cross-section.

**19. Decide whether the following statements about the ear are true T or false F:**

- a) Hair cells of cristae ampullares have a cilium on their surface in addition to stereocilia.
- b) Inner hair cells of the organ of Corti have stereocilia on their surface, whereas outer hair cells have cilia.
- c) The endolymph flows in the membranous labyrinth.
- d) The bony labyrinth contains the perilymph.

**20. Decide whether the following statements about the ear are true T or false F:**

- a) Stria vascularis is part of the vestibular system.
- b) Ligamentum spirale is a modified periosteum of the bony labyrinth and is the site of absorption of the endolymph.
- c) In addition to phalangeal and hair cells, the organ of Corti contains many other cells, for example pillar cells, Claudius cells, etc.

d) The outer, middle, and inner ear share a common embryonic origin.

**21. Which of the following statements about the membranous labyrinth are true?**

- a) maculae are composed of hair cells that have motile kinocilia
- b) otoliths are mainly composed of calcium carbonate
- c) the saccule and utricle are lined by a single layer of flat epithelium
- d) the epithelium of the labyrinth is of endodermal origin

**22. Which of the following statements about the middle ear are true?**

- a) It is filled with endolymph, the composition of which is similar to intercellular fluid
- b) it communicates with the cavities in the processus mastoideus of the temporal bone
- c) communicates via the Eustachian tube (tuba pharyngotympanica) with the pharynx
- d) is a space covered by a multilayered flat epithelium, which also passes to the three middle ear ossicles

**23. Which of the following statements about Corti's organ are true?**

- a) fluid flows through it - called cortilymph
- b) it contains the macula utriculi and macula sacculi
- c) contains special receptor cells - called hair cells
- d) lies on the basilar membrane

**24. Which of the following statements the corpus choroidea of the eye are true?**

- a) It contains m. sphincter pupillae and thus participates in miosis
- b) is rich in melanocytes
- c) consists of vascularised sparse collagen fibrils
- d) forms the middle layer in the posterior 5/6 of the eyeball

**25. Where in the structures of the eye and inner ear can we find cilia?**

- a) in Eustachian tube
- b) in the epithelium of the external auditory canal
- c) in the retina as part of the cone
- d) on the hair cells of the inner ear

**26. Which of the following statements about retinal cones are true?**

- a) most of them are concentrated in the macula lutea
- b) it consists of an inner and an outer segment
- c) they are specialised dendrites of bipolar neurons
- d) they are responsible for scotopic vision (twilight)

**27. What are the glial cells of the retina of the eye called?**

- a) amacrine cells
- b) Müller cells
- c) Bergmann's glia
- d) pinealocytes

**28. Where would you find hyalocytes?**

- a) in the anterior chamber of the eye
- b) in the sclera
- c) in the pars plana of the corpus ciliare
- d) in the arteria hyaloidea

**29. What is Bruch's membrane?**

- a) innermost layer of the choroid of the eye
- b) pentalaminar structure located between the retinal pigment epithelium and the fenestrated choroidal capillaries of the eye
- c) basement membrane of the inner epithelium (endothelium) of the cornea
- d) basement membrane of lens fibres

**30. Which of the following are histological components of the cornea?**

- a) zonular fibres
- b) musculus ciliaris
- c) Descemet's membrane
- d) Bowman's membrane

**31. What are the functions of the corpus ciliare?**

- a) production of ventricular fluid
- b) mydriasis
- c) miosis
- d) accommodation

**32. What is the truth about ganglion neurons of the retina?**

- a) they are the third neuron of the optical pathway
- b) are the second neuron of the optical pathway
- c) their axons form the fibres of the nervus opticus
- d) are bipolar
- e) arise from the optic placode

**33. Which of the following statements about the lens are true?**

- a) its back surface is covered with epithelium
- b) its lens capsule is made up of a particularly thick basement membrane of lens epithelial cells
- c) the lens fibres of its matrix are made up of fine collagen fibres
- d) can vary its optical power due to its elasticity

**34. Decide whether the following statements about the development of the eye are true T or false F:**

- a) The retina has the origin in the neuroectodermal lens placode.
- b) The ectomesenchyme together with neural crest cells is strongly involved in the development of the fibrous components of the eye.
- c) Both pars caeca and pars optica retinae share a common embryonic origin.
- d) The optic cup is the basis for the lens.

**35. Decide whether the following statements about the development of the eye are true T or false F:**

- a) The choroidal fissure is a slit that opens into the optic vesicle.

- b) The lens develops from the lens placode which originates from the surface ectoderm.
- c) The eye begins to develop from the 7th week after fertilization.
- d) The sphincter and dilator pupillae arise from the ectomesenchyme.

**36. Decide whether the following statements about the development of the eye are true T or false F:**

- a) The optic stalk, which connects the eye sac to the prosencephalic cavity at the beginning of eye development, is the basis of the optic nerve.
- b) The vitreous body (corpus vitreum) develops from the mesenchyme in the cavity of the optic cup.
- c) The entire cornea develops from the surface ectoderm.
- d) Only the optic cup and its derivatives are of neuroectodermal origin.

**37. Decide whether the following statements about the development of the eye are true T or false F:**

- a) The base of the eye begins to develop from the 4th week after fertilization.
- b) The anterior epithelium is the only part of the cornea that develops from the surface ectoderm.
- c) The pupil arises as a constricted circular entrance to the optic cup.
- d) The lens develops from two different bases.

**38. Decide whether the following statements about the development of the eye are true T or false F:**

- a) The lens placode develops from the neuroectoderm of the optic cup.

- b) The cavity of the eye sac gradually becomes the cavity of the optic cup.
- c) The central retinal artery develops from the hyaloid artery.
- d) Both the entire iris and ciliary body arise from the neuroectoderm of the optic cup.

**39. Decide whether the following statements about the development of the ear are true T or false F:**

- a) The outer, middle, and inner ear all originate from the neural crest.
- b) The tympanic membrane develops at the point where the 1st pharyngeal cleft and the 1st pharyngeal pouch meet.
- c) The auricle arises from six hillocks around the edge of the 1st pharyngeal cleft.
- d) The otic placode is the basis for the external ear canal.

**40. Decide whether the following statements about the development of the ear are true T or false F:**

- a) The otic placode is the basis for the membranous labyrinth of the inner ear.
- b) The tympanic cavity and the auditory (Eustachian) tube develop from the tubotympanic recess.
- c) Structures of the middle ear develop from the otocyst.
- d) Structures of the middle ear arise from the pharyngeal region.



**41. Decide whether the following statements about the development of the ear are true T or false F:**

- a) Hair cells of both the auditory and vestibular systems are derived from the ectodermal otocyst.
- b) The membranous labyrinth of the inner ear starts to develop from the 4th week after fertilization.
- c) The tympanic cavity is derived from the 1st endodermal pharyngeal pouch.
- d) During the development of the external and middle ear, membrana obturans between the 1st pharyngeal cleft and the 1st pharyngeal pouch is perforated.

**42. Decide whether the following statements about the development of the ear are true T or false F:**

- a) The ear starts to develop at 8 weeks after fertilization.
- b) Both the bony and membranous labyrinth develop from the ectodermal otocyst.
- c) Membrana obturans between the 1st pharyngeal pouch and the 1st pharyngeal cleft forms the basis of the tympanic membrane.
- d) The vestibulocochlear ganglion as well as hair cells arise from the otocyst.

**43. Decide whether the following statements about the development of the ear are true T or false F:**

- a) The malleus, incus, and stapes are all derived from the cartilage of the 1st pharyngeal arch.
- b) The development of the entire external auditory canal is completed during the embryonic period.
- c) Atresia of the external auditory canal may occur if the 1st pharyngeal arch fails to develop.

- d) The vestibulocochleare ganglion arises from the neuroectoderm of the neural crest.

**44. What is the thickening of the ectoderm induced in response to proliferation of the eyestalk from the diencephalon at week 4 called?**

- a) eyecup
- b) lens placode
- c) otic placode
- d) eye sac

**45. Which parts of the eye are of mesenchymal origin?**

- a) retina
- b) lens
- c) corneal epithelium
- d) choroidea
- e) corneal fibrous stroma
- f) vitreous

**46. What components remain in the eye as remnants of the arteria hyaloidea?**

- a) nervus opticus
- b) blind spot
- c) canalis hyaloideus
- d) arteria centralis retinae

**47. From what does the ductus endolymphaticus arise?**

- a) from the condensed mesenchyme of the 1st pharyngeal arch
- b) from the otic placode
- c) from the recessus tubotympanicus
- d) from the otocyst (auditory sac)
- e) from the first pharyngeal groove

**48. What does the external ear canal develop from?**

- a) its epithelium from the superficial ectoderm
- b) from the first pharyngeal groove
- c) from the recessus tubotympanicus
- d) from the first pharyngeal pouch

## Chapter Thirteen answers:

- |         |         |         |         |
|---------|---------|---------|---------|
| 1) b    | 13) bc  | 25) acd | 37) abc |
| 2) acd  | 14) ac  | 26) abc | 38) c   |
| 3) bd   | 15) cd  | 27) b   | 39) bc  |
| 4) abc  | 16) ab  | 28) b   | 40) abd |
| 5) ab   | 17) a   | 29) ab  | 41) abc |
| 6) d    | 18) ad  | 30) cd  | 42) c   |
| 7) bc   | 19) acd | 31) ad  | 43) cd  |
| 8) acd  | 20) bc  | 32) ac  | 44) b   |
| 9) b    | 21) bc  | 33) bd  | 45) def |
| 10) abc | 22) bc  | 34) bc  | 46) cd  |
| 11) ac  | 23) acd | 35) b   | 47) bd  |
| 12) acd | 24) bcd | 36) ab  | 48) ab  |

## Chapter Fourteen: General embryology

**1. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The development of the corpus luteum corresponds to the follicular phase of the menstrual cycle.
- b) Theca-lutein cells are more numerous compared to granulosa-lutein cells.
- c) Corpus luteum graviditatis grows to a size of 2-5 cm.
- d) Theca-lutein cells are localized at the periphery of the corpus luteum.

**2. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Theca-lutein cells are larger than granulosa-lutein cells.
- b) Corpus luteum graviditatis produces mainly progesterone and is essential for maintaining pregnancy.
- c) The final stage of corpus luteum degeneration is the fibrous corpus albicans.
- d) Theca-lutein cells are about 15 micrometers in size and synthesise mainly androgens.

**3. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Granulosa-lutein cells secrete progesterone under the influence of luteinising hormone.
- b) The entire corpus luteum is surrounded by the outer fibrous layer of the theca folliculi externa.

- c) Luteolysis of the corpus luteum is induced by high levels of hCG.
- d) Granulosa-lutein cells are round with diameter of about 30 micrometers.

**4. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Decidua is the name given to the myometrium of the uterine wall during pregnancy.
- b) Decidual reaction involves the transformation of endometrial stromal cells into decidual cells.
- c) Decidua parietalis is involved in the formation of the placenta.
- d) Chorion frondosum develops in the area of the decidua basalis.

**5. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Decidual transformation of the endometrium ensures the histiotrophic nutrition during early development of the embryo.
- b) Decidual reaction involves the proliferation of endometrial blood vessels and the formation of thin-walled sinusoidal capillaries.
- c) The future placenta is formed in the region of decidua capsularis.
- d) Decidual cells have an euchromatic nucleus and contain abundant lipids and glycogen in the cytoplasm.

**6. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The part of the decidua that lies just below the nested blastocyst is called decidua marginalis.
- b) Decidua basalis plays an important role in the development of the maternal part of the placenta.
- c) Decidual reaction involves increased activity of the glands of the endometrium.
- d) Arias-Stella reactio refers to changes in the nucleus of endometrial epithelial cells during decidual transformation.

**7. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Decidual cells develop from epithelial cells of endometrial glands.
- b) Decidual cells have a heterochromatic nucleus and are smaller than stromal cells from which they are derived.
- c) Decidual transformation is essential during the hemotrophic nutrition of developing embryo.
- d) Decidua is the name for the endometrium during pregnancy.

**8. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Chorion laeve develops in the region of decidua capsularis.
- b) Decidual cells arise from endothelial cells of endometrial capillaries.
- c) Arias-Stella reaction represents changes in the nucleus of decidual cells.
- d) Decidual reaction involves all layers of the uterine wall.

**9. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Glandula mammaria lactans is a tubuloalveolar gland.
- b) During lactation, the parenchyma of the mammary gland increases, and the stroma is reduced.
- c) Ductus lactiferi are intralobular ducts of the mammary gland.
- d) The mammary gland is specific in that it also contains myoepithelial cells around ducts.

**10. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The transformation of an inactive mammary gland into a lactating mammary gland is under the influence of prolactin, estrogen, and placental progesterone.
- b) Glandula mammaria lactans contains only ducts without developed secretory units.
- c) Secretory alveoli of the mammary gland are formed by galactocytes and myoepithelial cells.
- d) Stimulation of milk secretion and ejection during lactation is under the influence of oxytocin.

**11. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Primary chorionic villi contain blood vessels.
- b) All types of chorionic villi are covered with syncytiotrophoblast.
- c) Stem chorionic villi grow from the chorionic plate.
- d) Secondary chorionic villi contain mesenchyme.



**12. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The fetal part of the placenta forms septa that divide it into cotyledons.
- b) The fetal part of the placenta is covered by the amnion.
- c) Chorionic villi contain specialized macrophages called Hofbauer cells.
- d) Stem chorionic villi arise from free chorionic villi.

**13. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The intervillous space contains under normal conditions fetal blood.
- b) The placental barrier is formed by the endothelium of fetal blood vessels, trophoblast cells, their basal laminae, and the mesenchymal layer.
- c) The cytotrophoblast is part of the placental barrier throughout whole pregnancy.
- d) The basal plate of the placenta grows from the chorionic plate.

**14. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The intervillous space normally contains only maternal blood.
- b) The placental septa, which divide the placenta into cotyledons, grow from the basal plate.
- c) Tertiary chorionic villi contain fetal blood vessels in the mesenchyme.
- d) Secondary chorionic villi are composed exclusively of cytotrophoblast and syncytiotrophoblast.

**15. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Fully mature chorionic villi contain a minimum of mesenchyme, with fetal capillaries in close contact with the syncytiotrophoblast.
- b) The umbilical cord attaches to the basal plate.
- c) The mesenchyme of chorionic villi is derived from the embryonic mesoderm.
- d) The syncytiotrophoblast is part of the placental barrier throughout whole pregnancy.

**16. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The umbilical cord contains two veins and one artery.
- b) The connective tissue of the umbilical cord contains large amounts of hyaluronic acid and is known as Wharton's jelly.
- c) The mature umbilical cord always contains ductus omphaloentericus under normal circumstances.
- d) The presence of intestinal hernia in the umbilical cord is always considered a pathological phenomenon.

**17. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The umbilical cord is covered with amniotic epithelium.
- b) The umbilical cord contains an intestinal hernia until the 3rd trimester.
- c) The two umbilical arteries contain deoxygenated blood, and the umbilical vein contains oxygenated blood.
- d) Umbilical vessels develop from allantoic vessels.

**18. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The development of the umbilical cord is closely related to the bending of the trilaminar germ disc.
- b) An extraembryonic coelom can be seen in the mature umbilical cord.
- c) The biomechanical properties of Wharton's jelly protect umbilical vessels from strangulation.
- d) As the embryo flexes and the umbilical cord develops, the yolk sac becomes a narrow duct - ductus omphaloentericus.

**19. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) The umbilical cord attaches to the chorionic plate.
- b) Wharton's jelly develops from the extraembryonic mesenchyme.
- c) Most of the mesenchyme in the developing umbilical cord is derived from the material of the connecting stalk.
- d) The mature umbilical cord is similar in length to a full-term fetus - about 50 cm.

**20. Decide whether the following statements about the structures during pregnancy are true T or false F:**

- a) Wharton's jelly is made up of a dense connective tissue.
- b) The chorion is located on the surface of the umbilical cord.
- c) A variable part of the umbilical cord, seen especially in the early stages of development, is ductus allantoicus (allantois).
- d) The presence of an intestinal hernia in the umbilical cord during the 6th to 10th week of development is called physiological gut herniation.

**21. Which of the following statements about the trilaminar germ disc are true?**

- a) is formed by trophoblast, epiblast and hypoblast
- b) is formed in the fourth week
- c) all its germ layers originate from the epiblast
- d) consists of ectoderm, mesoderm and endoderm

**22. What are the physiological roles of the yolk sac?**

- a) in weeks 4-12, provide nutrition for the developing embryo
- b) its extraembryonic mesoderm is a major site of hematopoiesis
- c) primordial germ cells are formed in its wall
- d) is a repository of waste products of fetal metabolism

**23. Which of the following statements about the extraembryonic spaces are true?**

- a) an exocoelomic cyst arises during the formation of a definitive yolk sac
- b) amniotic cavity disappears during the fetal period of development
- c) the yolk sac is the basis for the placenta and part of the fetal membranes
- d) the chorionic cavity forms by splitting of the extraembryonic mesoderm into two layers

**24. Which of the following statements about the multiple pregnancy are true?**

- a) under normal circumstances, about 10% of human pregnancies are multiple (usually twins)
- b) siamese (conjoined) twins are fraternal (dizygotic), so they can be of different sexes
- c) monozygotic twins are created by postzygotic division of an early embryo

- d) monozygotic twins can have both a common placenta (monochorionic) and a common amniotic cavity (monoamniotic)

**25. What is the first axial organ of the embryo?**

- a) the notochord
- b) the Heuser's membrane
- c) the neural tube
- d) the primitive node

**26. What happens around the 22nd day of development?**

- a) notochordal plate separates from endoderm to form a solid notochord
- b) embryonic folding comences
- c) posterior neuropore closes
- d) the septum transversum forms
- e) the exocoelomic cyst is formed
- f) cranial neural crest cells migration starts
- g) tertiary bronchial buds appear

**27. What is the structure that has never been directly associated with the primitive gut during its evolution?**

- a) neural tube
- b) allantois
- c) ductus vitellinus
- d) pronephros

**28. Around day 20, the yolk sac cavity temporarily communicates with the amniotic cavity. What is this opening called?**

- a) oropharyngeal membrane
- b) ductus omphaloentericus
- c) neurenteric canal
- d) primitive pit

**29. Which of the following statements about the placental barrier are true?**

- a) mesenchyme can be located between trophoblast and endothelium of branches of umbilical vessels
- b) trophoblast in mature placenta consists of syncytiotrophoblast and incomplete cytotrophoblast
- c) it is a semipermeable layer of fetal tissue separating the maternal from the fetal blood in the placenta
- d) continuous type of endothelium of maternal vessels prevents HIV infection of the fetus

**30. What structures are derivatives of the surface ectoderm?**

- a) hair follicle
- b) enteroendocrine cell
- c) canal of Hering
- d) retina

**31. Which of the following statements about the embryo implantation are true?**

- a) in two-thirds of cases it implants on the dorsal surface of the uterus
- b) it precedes hatching of the embryo

- c) abnormal implantation in oviducts consequently causes the formation of placenta praevia
- d) it occurs approximately ten days after fertilization
- e) just after its begins, the trophoblast starts to produce human chorionic gonadotropin

**32. Which events need to happen just before fertilization itself?**

- a) sperm capacitation
- b) cleaving of blastomeres
- c) hatching
- d) cortical reaction
- e) acrosome reaction

**33. Which of the following pairs: typical anatomical site - event, are correct?**

- a) ampulla of the oviduct - fecundation place
- b) uterine cervix - formation of placenta praevia
- c) isthmus of the oviduct - hatching
- d) lower anterior wall of the uterus - implantation

**34. What is the origin of the mesenchyme in the head region?**

- a) the mesodermal cells of cardiogenic zone
- b) neural crest cells
- c) the cervical somites
- d) somatopleuric mesenchyme

**35. Replace "\$" with the correct word in the following sentence: The intraembryonic coelom first appears during the \$ week.**

- a) second
- b) fourth
- c) fifth
- d) seventh

**36. What can be said about the sperm capacitation?**

- a) is another term for the cortical reaction
- b) during this process, acrosomal enzymes are released
- c) is a process which takes place in the epididymis and ejaculatory ducts
- d) physiological changes spermatozoa must undergo in order to have the ability to penetrate and fertilize an oocyte
- e) includes removal of cholesterol from sperm plasma membrane

**37. What is it hatching?**

- a) another term for delivery
- b) cleavage of zygote
- c) reaction of endometrium after implantation
- d) stripping of zona pellucida

**38. Which of the following statements about the corpus luteum are true?**

- a) granulosa-lutein cells are located predominantly in the central part of corpus luteum near the blood clot



- b) corpus luteum graviditatis is a major source of progesterone in early pregnancy
- c) granulosa-lutein cells are darker and smaller than theca-lutein cells
- d) is composed of two types of cells with endocrine function - theca-lutein and granulosa-lutein cells

**39. What are the components of the tertiary chorionic villi?**

- a) the extraembryonic mesenchyme
- b) maternal capillaries
- c) syncytiotrophoblast
- d) cytotrophoblast
- e) decidual cells
- f) Hofbauer cells

**40. Which events are part of the decidual reaction?**

- a) differentiation of fibroblasts into glycogen-containing decidual cells
- b) increase in secretory functions of the endometrium
- c) formation of primary chorionic villi
- d) maternal spiral arteries remodeling
- e) presence of large numbers of leukocytes

## Chapter Fourteen answers:

- |         |          |          |          |
|---------|----------|----------|----------|
| 1) cd   | 11) bcd  | 21) cd   | 31) ae   |
| 2) bcd  | 12) bc   | 22) bc   | 32) ade  |
| 3) abd  | 13) b    | 23) ad   | 33) ab   |
| 4) bd   | 14) abc  | 24) cd   | 34) b    |
| 5) abd  | 15) ad   | 25) a    | 35) b    |
| 6) bcd  | 16) b    | 26) abdf | 36) de   |
| 7) d    | 17) acd  | 27) ad   | 37) d    |
| 8) a    | 18) acd  | 28) c    | 38) abd  |
| 9) abd  | 19) abcd | 29) abc  | 39) acdf |
| 10) acd | 20) cd   | 30) a    | 40) abde |

## Table of Contents

<b>Winter Semester: Special Histology (Microscopic Anatomy of the Organ Systems)</b> .....	3
<b>Chapter One: Cardiovascular system</b> .....	4
<b>Chapter One answers:</b> .....	20
<b>Chapter Two: Lymphatic tissue</b> .....	21
<b>Chapter Two answers:</b> .....	36
<b>Chapter Three: Endocrine system</b> .....	37
<b>Chapter Three answers:</b> .....	54
<b>Chapter Four: Gastrointestinal system 1 (digestive tract)</b> .....	55
<b>Chapter Four answers:</b> .....	72
<b>Chapter Five: Gastrointestinal system 2 (GIT associated glands)</b> .....	73
<b>Chapter Five answers:</b> .....	89
<b>Chapter Six: Tooth</b> .....	90
<b>Chapter Six answers:</b> .....	106
<b>Chapter Seven: Respiratory system</b> .....	107
<b>Chapter Seven answers:</b> .....	124
<b>Chapter Eight: Urinary system</b> .....	125
<b>Chapter Eight answers:</b> .....	142
<b>Chapter Nine: Male reproductive system</b> .....	143

Chapter Nine answers: .....	159
Chapter Ten: Female reproductive system .....	160
Chapter Ten answers:.....	177
Chapter Eleven: Skin .....	178
Chapter Eleven answers:.....	195
Chapter Twelve: Central and peripheral nervous system .....	196
Chapter Twelve answers:.....	212
Chapter Thirteen: Eye and ear .....	213
Chapter Fourteen: General embryology .....	229
Chapter Fourteen answers: .....	242

