Histology review supplement

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Histology Review Supplement The slides in this section are designed to provide a basic histology review related to topics introduced in the PhysioEx lab simulations and in your anatomy and physiology textbook. From the PhysioEx main menu, select Histology Tutorial. The opening screen should appear after a few seconds. The Sort by menu is located at the top left. Click on the white drop-down menu and select “ Histology Review” from the list.

You will note that the slides in the histology module are grouped in the following folders: Skeletal muscle slides Nervous tissue slides Endocrine tissue slides Cardiovascular tissue slides Respiratory tissue slides Digestive tissue slides Renal tissue slides Select the group of slides you wish to view, and then refer to the relevant worksheet in this section for a step-by-step tutorial. For example, if you would like to review the skeletal muscle slides, click on the Skeletal muscle slides folder, and then turn to the next page of this lab manual for the worksheet entitled Skeletal Muscle Tissue Review to begin your review.

You will have the option of viewing slides with or without labels by clicking the On/Off buttons at the bottom left of the viewer. Since the slides in this module have been selected for their relevance to topics covered in the PhysioEx lab simulation, it is recommended that you complete the worksheets along with a related PhysioEx lab. For example, you might complete the Skeletal Muscle Tissue worksheet right before or after your instructor assigns you Exercise 2, the PhysioEx lab simulation on Skeletal Muscle Physiology. For additional histology review, turn to page 121. 23 Skeletal Muscle Tissue Review From the PhysioEx main menu, select Histology Review Supplement. When the screen comes up, click Select an

Image Group. From Group Listing, click Skeletal muscle slides. To view slides without labels, click the Labels Off button at the bottom right of the monitor. Click slide 1. Skeletal muscle is composed of extremely large, cylindrical multinucleated cells called myofibers. The nuclei of the skeletal muscle cell (myonuclei) are located peripherally just subjacent to the muscle cell plasmalemma (sarcolemma).

The interior of the cell is literally filled with an assembly of contractile proteins (myofilaments) arranged in a specific overlapping pattern oriented parallel to the long axis of the cell. Click slides 2, 3. Sarcomeres are the functional units of skeletal muscle. The organization of contractile proteins into a regular end-to-end repeating pattern of sarcomeres along the length of each cell accounts for the striated, or striped, appearance of skeletal muscle in longitudinal section. Click slide 4.

The smooth endoplasmic reticulum (sarcoplasmic reticulum), modified into an extensive network of membranous channels that store, release, and take up the calcium necessary for contraction, also functions to further organize the myofilaments inside the cell into cylindrical bundles called myofibrils. The stippled appearance of the cytoplasm in cells cut in cross section represents the internal organization of myofilaments bundled into myofibrils by the membranous sarcoplasmic reticulum. What is the functional unit of contraction in skeletal muscle?

Click slide 5. The neural stimulus for contraction arises from the axon of a motor neuron whose axon terminal comes into close apposition to the muscle cell sarcolemma. Would you characterize skeletal muscle as

voluntary or involuntary? Name the site of close juxtaposition of an axon terminal with the muscle cell plasmalemma. Skeletal muscle also has an extensive connective tissue component that, in addition to conducting blood vessels and nerves, becomes continuous with the connective tissue of its tendon.

The tendon in turn is directly continuous with the connective tissue covering (the periosteum) of the adjacent bone. This connective tissue continuity from muscle to tendon to bone is the basis for movement of the musculoskeletal system. What is the name of the loose areolar connective tissue covering of an individual muscle fiber? endomysium The perimysium is a collagenous connective tissue layer that groups several muscle fibers together into bundles called fascicles . the sacromeres What are the two principal contractile proteins that compose the functional unit of contraction?

Which connective tissue layer surrounds the entire muscle and merges with the connective tissue of tendons and aponeuroses? epimysium actin and myosin What is the specific relationship of the functional unit of contraction to the striated appearance of a skeletal muscle fiber? the repeating pattern of the sacromeres organized end to end 124 Histology Review Supplement Nervous Tissue Review From the PhysioEx main menu, select Histology Review Supplement. When the screen comes up, click Select an Image Group. From Group Listing, click Nervous tissue slides.

To view slides without labels, click the Labels Off button at the bottom right of the monitor. Nervous tissue is composed of nerve cells (neurons) and a variety of support cells. Click slide 1. Each nerve cell consists of a cell body

(perikaryon) and one or more cellular processes (axon and dendrites) extending from it. The cell body contains the nucleus, which is typically pale-staining and round or spherical in shape, and the usual assortment of cytoplasmic organelles. Characteristically, the nucleus features a prominent nucleolus often described as resembling the upil of a bird's eye (" bird's eye," or " owl's eye," nucleolus). Click slide 2. The cytoplasm of the cell body is most often granular in appearance due to the presence of darkly stained clumps of ribosomes and rough endoplasmic reticulum (Nissl bodies/ Nissl substance). Generally, a single axon arises from the cell body at a pale-staining region (axon hillock), devoid of Nissl bodies. The location and number of dendrites arising from the cell body varies greatly. Axons and dendrites are grouped together in the peripheral nervous system (PNS) to form peripheral nerves.

What is the primary unit of function in nervous tissue? Click slide 5. Because Schwann cells are aligned in series and myelinate only a small segment of a single axon, small gaps occur between the myelin sheaths of adjacent contiguous Schwann cells. The gaps, called nodes of Ranvier, together with the insulating properties of myelin, enhance the speed of conduction of electrical impulses along the length of the axon. Different support cells and myelinating cells are present in the central nervous system (CNS). What is the general name for all support cells within the CNS? neuroglial cells

Name the specific myelinating cell of the CNS. Oligodendrocyte In the PNS, connective tissue also plays a role in providing support and organization. In fact, the composition and organization of the connective tissue investments of peripheral nerves are similar to those of skeletal muscle. Click slide 3.

Each individual axon or dendrite is surrounded by a thin and delicate layer of loose connective tissue called the endoneurium (not shown.) The perineurium, a slightly thicker layer of loose connective tissue, groups many axons and dendrites together into bundles (fascicles).

The outermost epineurium surrounds the entire nerve with a thick layer of dense irregular connective tissue, often infiltrated with adipose tissue, that conveys blood and lymphatic vessels to the nerve. There is no connective tissue component within the nervous tissue of the CNS. What is the relationship of the endoneurium to the myelin sheath? neuron Name the pale-staining region of the cell body from which the axon arises. nucleus The support cells of the nervous system perform extremely important functions including support, protection, insulation, and maintenance and regulation of the microenvironment that surrounds the nerve cells.

Click slides 3, 4. In the PNS, support cells surround cell bodies (satellite cells) and individual axons and dendrites (Schwann cells). Schwann cells, in particular, are responsible for wrapping their cell membrane jelly-roll style around axons and dendrites to form an insulating sleeve called the myelin sheath. enclosed and protects Histology Review Supplement 125 Endocrine Tissue Review From the PhysioEx main menu, select Histology Review Supplement. When the screen comes up, click Select an Image Group.

From Group Listing, click Endocrine tissue slides. To view slides without labels, click the Labels Off button at the bottom right of the monitor. antrum, except for a thin rim of granulosa cells (corona radiata) that encircles the oocyte and a pedestal of granulosa cells (cumulus oophorus) that attaches

the oocyte to the inner wall of the antrum. Which cells of the ovarian follicle secrete estrogen? Thyroid Gland The thyroid gland regulates metabolism by regulating the secretion of the hormones T3 (triiodothyronine) and T4 (thyroxine) into the blood.

Click slide 1. The gland is composed of fluid-filled (colloid) spheres, called follicles, formed by a simple epithelium that can be squamous to columnar depending upon the gland's activity. The colloid stored in the follicles is primarily composed of a glycoprotein (thyroglobulin) that is synthesized and secreted by the follicular cells. Under the influence of the pituitary gland, the follicular cells take up the colloid, convert it into T3 and T4, and secrete the T3 and T4 into an extensive capillary network.

A second population of cells, parafollicular (C) cells (not shown), may be found scattered through the follicular epithelium but often are present in the connective tissue between follicles. The pale-staining parafollicular cells secrete the protein hormone calcitonin. Why is the thyroid gland considered to be an endocrine organ? Uterus Click slides 4, 5, 6. The uterus is a hollow muscular organ with three major layers: the endometrium, myometrium, and either an adventitia or a serosa. The middle, myometrial layer of the uterine wall is composed of several layers of smooth muscle oriented in different planes.

Click slide 6. The innermost (nearest the lumen) endometrial layer is further divided functionally into a superficial functional layer (stratum functionalis) and a deep basal layer (stratum basalis). Click slide 4. A simple columnar epithelium with both ciliated and nonciliated cells lines the surface of the

endometrium. The endometrial connective tissue features an abundance of tubular endometrial glands that extend from the base to the surface of the layer. During the proliferative phase of the menstrual cycle, shown here, the endometrium becomes thicker as the glands and blood vessels proliferate.

Click slide 5. In the secretory phase, the endometrium and its glands and blood vessels are fully expanded. Click slide 6. In the menstrual phase, the glands and blood vessels degenerate as the functional layer of the endometrium sloughs away. The deep basal layer (stratum basalis) is not sloughed and will regenerate the endometrium during the next proliferative phase. Which layer of the endometrium is shed during the menstrual phase of the menstrual cycle? it secrets a horomone What hormone secreted by the pituitary gland controls the synthesis and secretion of T3 and T4? TSH - thyroid stimulating hormone

What is the function of calcitonin? causes CA to be released into blood Ovary The ovary is an organ that serves both an exocrine function in producing eggs (ova) and an endocrine function in secreting the hormones estrogen and progesterone. Click slide 2. Grossly, the ovary is divided into a peripherally located cortex in which the oocytes (precursors to the ovulated egg) develop and a central medulla in which connective tissue surrounds blood vessels, lymphatic vessels and nerves. The oocytes, together with supporting cells (granulosa cells), form the ovarian follicles seen in the cortex at various stages of development.

Click slide 3. As an individual oocyte grows, granulosa cells proliferate from a single layer of cuboidal cells that surround the oocyte to a multicellular layer

that defines a fluid-filled spherical follicle. In a mature follicle (Graafian follicle), the granulosa cells are displaced to the periphery of the fluid-filled 126 Histology Review Supplement endometrium What is the function of the deep basal layer (stratum basalis) of the endometrium? regenerate new superficial layer What composes a serosa? perimetrium

How does the serosa of the uterus, where present, differ from visceral peritoneum? location Pancreas The pancreas is both an endocrine and an exocrine gland. Click slide 7. The exocrine portion is characterized by glandular secretory units (acini) formed by a simple epithelium of triangular or pyramidal cells that encircle a small central lumen. The central lumen is the direct connection to the duct system that conveys the exocrine secretions out of the gland. Scattered among the exocrine secretory units are the pale-staining clusters of cells that compose the endocrine portion of the gland.

The cells that form these clusters, called pancreatic islet cells (islets of Langerhans), secrete a number of hormones, including insulin and glucagon. Do the pancreatic islets secrete their hormones into the same duct system used by the exocrine secretory cells? no, but directly into blood stream Histology Review Supplement 127 Cardiovascular Tissue Review From the PhysioEx main menu, select Histology Review Supplement. When the screen comes up, click Select an Image Group. From Group Listing, click Cardiovascular Tissue Slides. To view slides without labels, click the Labels Off button at the bottom right of the monitor.

Which component of the intercalated disc is a junction that provides the intercellularcommunicationrequired for the myocardium to perform as a functional syncytium? gap juntions Blood Vessels Blood vessels form a system of conduits through which lifesustaining blood is conveyed from the heart to all parts of the body and back to the heart again. Click slide 3. Generally, the wall of every vessel is described as being composed of three layers, or tunics. The tunica intima, or tunica interna, a simple squamous endothelium and a small amount of subjacent loose connective tissue, is the innermost layer adjacent to the vessel lumen.

Smooth muscle and elastin are the predominant constituents of the middle tunica media, and the outermost tunica adventitia, or tunica externa, is a connective tissue layer of variable thickness that provides support and transmits smaller blood and lymphatic vessels and nerves. The thickness of each tunic varies widely with location and function of the vessel. Arteries, subjected to considerable pressure fluctuations, have thicker walls overall, with the tunica media being thicker than the tunica adventitia.

Veins, in contrast, are subjected to much lower pressures and have thinner walls overall, with the tunica adventitia often outsizing the tunica media. Because thin-walled veins conduct blood back to the heart against gravity, valves (not present in arteries) also are present at intervals to prevent backflow. In capillaries, where exchange occurs between the blood and tissues, the tunica intima alone composes the vessel wall. The tunica media of the aorta would have a much greater proportion of what type of tissue than a small artery? Heart The heart is a four-chambered muscular pump.

Although its wall can be divided into three distinct histological layers (endocardium, myocardium, and epicardium), the cardiac muscle of the myocardium composes the bulk of the heart wall. Click slide 1. Contractile cardiac muscle cells (myocytes, myofibers) have the same striated appearance as skeletal muscle, but are branched rather than cylindrical in shape and have one (occasionally two) nucleus (myonucleus) rather than many. The cytoplasmic striations represent the same organization of myofilaments (sarcomeres) and alignment of sarcomeres as in skeletal muscle, and the mechanism of contraction is the same.

The intercalated disc, however, is a feature unique to cardiac muscle. The densely stained structure is a complex of intercellular junctions (desmosomes, gap junctions, fasciae adherens) that structurally and functionally link cardiac muscle cells end to end. A second population of cells in the myocardium composes the noncontractile intrinsic conduction system (nodal system). Although cardiac muscle is autorhythmic, meaning it has the ability to contract involuntarily in the absence of extrinsic innervation provided by the nervous system, it is the intrinsic conduction system that prescribes the rate and orderly sequence of contraction.

Extrinsic innervation only modulates the inherent activity. Click slide 2. Of the various components of the noncontractile intrinsic conduction system, Purkinje fibers are the most readily observed histologically. They are particularly abundant in the ventricular myocardium and are recognized by their very pale-staining cytoplasm and larger diameter. The connective tissue component of cardiac muscle is relatively sparse and lacks the organization present in skeletal muscle. Which component of the

intercalated disc is a strong intercellular junction that functions to keep cells from being pulled apart during contraction? lastic fiber In general, which vessel would have a larger lumen, an artery or its corresponding vein? vein Why would the tunica media and tunica adventitia not be present in a capillary? to allow material exchange between blood and tissue desmosomes What is a functional syncytium? Because the cardiac muscle cells are mechanically, chemically, and electrically connected to one another, the entire tissue resembles a single, enormous muscle cell. 128 Histology Review Supplement Respiratory Tissue Review From the PhysioEx main menu, select Histology Review Supplement.

When the screen comes up, click Select an Image Group. From Group Listing, click Respiratory Tissue Slides. To view slides without labels, click the Labels Off button at the bottom right of the monitor. The respiratory system serves both to conduct oxygenated air deep into the lungs and to exchange oxygen and carbon dioxide between the air and the blood. The trachea, bronchi, and bronchioles are the part of the system of airways that conduct air into the lungs. Click slide 2. The trachea and bronchi are similar in morphology.

Their lumens are lined by pseudostratified columnar ciliated epithelium with goblet cells (respiratory epithelium), underlain by a connective tissue lamina propria and a deeper connective tissue submucosa with coiled sero-mucous glands that open onto the surface lining of the airway lumen. Click slide 1. Deep to the submucosa are the hyaline cartilage rings that add structure to the wall of the airway and prevent its collapse. Peripheral to the cartilage is a connective tissue adventitia. The sero-mucous glands are also visible in this slide. Click slide 3.

The bronchioles, in contrast, are much smaller in diameter with a continuous layer of smooth muscle in place of the cartilaginous reinforcements. A gradual decrease in the height of the epithelium to simple columnar also occurs as the bronchioles decrease in diameter. Distally the bronchioles give way to the respiratory bronchioles, alveolar ducts, alveolar sacs, and alveoli in which gas exchange occurs. In the respiratory bronchiole, the epithelium becomes simple cuboidal and the continuous smooth muscle layer is interrupted at intervals by the presence of alveoli inserted into the bronchiolar wall.

Click slide 4. Although some exchange occurs in the respiratory bronchiole, it is within the alveoli of the alveolar ducts and sacs that the preponderance of gas exchange transpires. Here the walls of the alveoli, devoid of smooth muscle, are reduced in thickness to the thinnest possible juxtaposition of simple squamous alveolar cell to simple squamous capillary endothelial cell. What are the primary functions of the respiratory epithelium? What is the primary functional unit of the lung? alveoli The alveolar wall is very delicate and subject to collapse.

Why is there no smooth muscle present in its wall for support? smooth muscle would hinder the gas exchange What are the three basic components of the air-blood barrier? alveolar, capillary walls and basal laminae humidfy, filter and warm incoming air Why doesn’t gas exchange occur in bronchi? bronchi have no alveoli Histology Review Supplement 129 Digestive Tissue Review From the PhysioEx main menu, select Histology Review Supplement. When the screen comes up, click Select an Image Group. From Group Listing, click Digestive Tissue Slides.

To view slides without labels, click the Labels Off button at the bottom right of the monitor. smooth muscle nearest the stomach, and a mix of both skeletal and smooth muscle in between. 4. The outermost layer of the esophagus is an adventitia for the portion of the esophagus in the thorax, and a serosa after the esophagus penetrates the diaphragm and enters the abdominal cavity. Click slide 3. Here we can see the abrupt change in epithelium at the gastroesophageal junction, where the esophagus becomes continuous with the stomach. Briefly explain the difference between an adventitia and a serosa. Salivary Gland

The digestive process begins in the mouth with the physical breakdown offoodby mastication. At the same time salivary gland secretions moisten the food and begin to hydrolyze carbohydrates. The saliva that enters the mouth is a mix of serous secretions and mucus (mucin) produced by the three major pairs of salivary glands. Click slide 1. The secretory units of the salivary tissue shown here are composed predominantly of clusters of pale-staining mucussecreting cells. More darkly stained serous cells cluster to form a demilune (half moon) adjacent to the lumen and contribute a clear fluid to the salivary secretion.

Salivary secretions flow to the mouth from the respective glands through a well-developed duct system. Are salivary glands endocrine or exocrine glands? serosa secret serous fluid, and adventitia don't. Stomach The wall of the stomach has the same basic four-layered organization as that of the esophagus. Click slide 4. The mucosa of the stomach consists of a simple columnar epithelium, a thin connective tissue lamina propria, and a thin muscularis mucosa. The most significant feature of the stomach mucosa is

that the epithelium invaginates deeply into the lamina propria to form superficial gastric pits and deeper gastric glands.

Although the epithelium of the stomach is composed of a variety of cell types, each with a unique and important function, only three are mentioned here (see slide 5). Click slide 5. The surface mucous cells are simple columnar cells that line the gastric pits and secrete mucus continuously onto the surface of the epithelium. The large round pink- to red-stained parietal cells that secrete hydrochloric acid (HCl) line the upper half of the gastric glands; more abundant in the lower half of the gastric glands are the chief cells (not shown), usually stained blue, that secrete pepsinogen (a precursor to pepsin).

Click slide 4. The submucosa is similar to that of the esophagus but without glands. The muscularis externa has the two typical circumferential and longitudinal layers of smooth muscle, plus an extra layer of smooth muscle oriented obliquely. The stomach’s outermost layer is a serosa. What is the function of the mucus secreted by surface mucous cells? exocrine Which salivary secretion, mucous or serous, is more thin and watery in consistency? serous Esophagus

Through contractions of its muscular wall (peristalsis), the esophagus propels food from the mouth to the stomach. Four major layers are apparent when the wall of the esophagus is cut in transverse section: Click slide 2. 1. The mucosa adjacent to the lumen consists of a nonkeratinized stratified squamous epithelium, its immediately subjacent connective tissue (lamina propria) containing blood vessels, nerves, lymphatic vessels, and cells of the

immune system, and a thin smooth muscle layer (muscularis mucosa) forms the boundary between the mucosa and the submucosa.

Because this slide is a low magnification view, it is not possible to discern all parts of the mucosa nor the boundary between it and the submucosa. 2. The submucosa is a layer of connective tissue of variable density, traversed by larger caliber vessels and nerves, that houses the mucus-secreting esophageal glands whose secretions protect the epithelium and further lubricate the passing food bolus. 3. Much of the substance of the esophageal wall consists of both circumferentially and longitudinally oriented layers of muscle called the muscularis externa.

The muscularis externa is composed of skeletal muscle nearest the mouth, 130 Histology Review Supplement protects the epithelium Small Intestine The key to understanding the histology of the small intestine lies in knowing that its major function is absorption. To that end, its absorptive surface area has been amplified greatly in the following ways: 1. The mucosa and submucosa are thrown into permanent folds (plicae circulares). 2. Fingerlike extensions of the lamina propria form villi (singular: villus) that protrude into the intestinal lumen (click slide 7). 3.

The individual simple columnar epithelial cells (enterocytes) that cover the villi have microvilli (a brush border), tiny projections of apical plasma membrane to increase their absorptive surface area (click slide 6). Click slide 7. Although all three segments of the small intestine (duodenum, jejunum, and ileum) possess villi and tubular crypts of Lieberkuhn that project deep into the mucosa between villi, some unique features are present in particular

segments. For example, large mucous glands (duodenal glands, Brunner’s glands) are present in the submucosa of the duodenum.

In addition, permanent aggregates of lymphatic tissue (Peyer’s patches) are a unique characteristic of the ileum (click slide 8). Aside from these specific features and the fact that the height of the villi vary from quite tall in the duodenum to fairly short in the terminal ileum, the overall morphology of mucosa, submucosa, muscularis externa, and serosa is quite similar in all three segments. Why is it important for the duodenum to add large quantities of mucus (from the duodenal glands) to the partially digested food entering it from the stomach?

Click slide 10. Located in the surrounding connective tissue, roughly at the points of the hexagon where three lobules meet, is the portal triad (portal canal). Click slide 12. The three constituents of the portal triad include a branch of the hepatic artery, a branch of the hepatic portal vein, and a bile duct. Both the hepatic artery and portal vein empty their oxygen-rich blood and nutrient-rich blood, respectively, into the sinusoids. This blood mixes in the sinusoids and flows centrally in between and around the hepatocytes toward the central vein.

Bile, produced by hepatocytes, is secreted into very small channels (bile canaliculi) and flows peripherally (away from the central vein) to the bile duct. Thus, the flow of blood is from peripheral to central in a hepatic lobule, while the bile flow is from central to peripheral. What general type of cell is the phagocytic Kupffer cell? immune Blood in the portal vein flows directly from what organs? liver What is the function of bile in the digestive process?

protects intestinal walls raises alkalinity to create ideal pH Colon Click slide 9.

The four-layered organization is maintained in the wall of the colon, but the colon has no villi, only crypts of Lieberkuhn. Simple columnar epithelial cells (enterocytes with microvilli) are present to absorb water from the digested food mass, and the numbers of mucous goblet cells are increased substantially, especially toward the distal end of the colon. Why is it important to have an abundance of mucous goblet cells in the colon? because they secrete mucous, which is important to fascilitate degestion Pancreas Click slide 13. The exocrine portion of the pancreas synthesizes and secretes pancreatic enzymes.

The individual exocrine secretory unit, or acinus, is formed by a group of pyramidal-shaped pancreatic acinar cells clustered around a central lumen into which they secrete their products. A system of pancreatic ducts then transports the enzymes to the duodenum where they are added to the lumen contents to further aid digestion. The groups of pale-staining cells are the endocrine pancreatic islet (islets of Langerhans) cells. Liver The functional tissue of the liver is organized into hexagonally shaped cylindrical lobules, each delineated by connective tissue.

Click slide 11. Within the lobule, large rounded hepatocytes form linear cords that radiate peripherally from the center of the lobule at the central vein to the surrounding connective tissue. Blood sinusoids lined by simple squamous endothelial cells and darkly stained phagocytic Kupffer cells are interposed between cords of hepatocytes in the same radiating pattern. Histology

Review Supplement 131 Renal Tissue Review From the PhysioEx main menu, select Histology Review Supplement. When the screen comes up, click Select an Image Group.

From Group Listing, click Renal Tissue Slides. To view slides without labels, click the Labels Off button at the bottom right of the monitor. The many functions of the kidney include filtration, absorption, and secretion. The kidney filters the blood of metabolic wastes, water, and electrolytes and reabsorbs most of the water and sodium ions filtered to regulate and maintain the body’s fluid volume and electrolyte balance. The kidney also plays an endocrine role in secreting compounds that increase blood pressure and stimulate red blood cell production.

The uriniferous tubule is the functional unit of the kidney. It consists of two components: the nephron to filter and the collecting tubules and ducts to carry away the filtrate. Click slide 1. The nephron itself consists of the renal corpuscle, an intimate association of the glomerular capillaries (glomerulus) with the cup-shaped Bowman’s capsule, and a single elongated renal tubule consisting of segments regionally and sequentially named the proximal convoluted tubule (PCT), the descending and ascending segments of the loop of Henle, and the distal convoluted tubule (DCT).

Click slide 2. A closer look at the renal corpuscle shows both the simple squamous epithelium of the outer layer (parietal layer) of the glomerular capsule (Bowman’s capsule) and the specialized inner layer (visceral layer) of podocytes that extend footlike processes to completely envelop the capillaries of the renal glomerulus. Processes of adjacent podocytes

interdigitate with one another, leaving only small slits (filtration slits) between the processes through which fluid from the blood is filtered.

The filtrate then flows into the urinary space that is directly continuous with the first segment of the renal tubule, the PCT. The PCT is lined by robust cuboidal cells equipped with microvilli to greatly increase the surface area of the side of the cell facing the lumen. Click slide 3. In the loop of Henle, lining cells are simple squamous to simple cuboidal. The DCT cells are also simple cuboidal but are usually much smaller than those of the PCT. The sparse distribution of microvilli, if present at all, on the cells of the DCT relates to their lesser role in absorption.

The DCT is continuous directly with the collecting tubules and collecting ducts that drain the filtrate out of the kidney. The large renal artery and its many subdivisions provide an abundant blood supply to the kidney. The smallest distal branches of the renal artery become the afferent arterioles that directly supply the capillaries of the glomerulus. In a unique situation, blood from the glomerular capillaries passes into the efferent arteriole rather than into a venule.

The efferent arteriole then perfuses two more capillary beds, the peritubular capillary bed and vasa recta that provide nutrient blood to the kidney tissue itself, before ultimately draining into the renal venous system. In which segment of the renal tubule does roughly 75–80% of reabsorption occur? proximal convoluted tubules How are proximal convoluted tubule (PCT) cells similar to enterocytes of the small intestine? both absorb water, salts, vitamins, phosphates

Starting from inside the glomerular capillary through to the urinary space, what are the three layers through which the filtrate must pass? glomerular capillary enothelium, glomrular basement membrane visceral layer of bowman's capsule Under normal circumstances in a healthy individual, would red blood cells or any other cells be present in the renal filtrate? no In addition to providing nutrients to the kidney tubules, what is one other function of the capillaries in the peritubular capillary bed? they deliver blood to tubular sites 132 Histology Review Supplement