1. Which of the following characteristics is not an important feature of this cell type?
   a. These cells are haploid
   b. The cells developed below 98.6°F
   c. The cells are motile after they leave the body
   d. Sympathetic innervation aids their exit
   e. Their forward movement is due to cilia

2. During a knife fight, a 32-year-old man received a stab wound just superior to his left clavicle. All of the following structures might be injured by a stab wound in this region except the
   a. Platysma muscle
   b. Left subclavian vein
   c. Left superior lobe of the lung
   d. Brachiocephalic trunk
   e. Phrenic nerve

3. All of the following are tributaries of the portal vein EXCEPT.
   a. Gastric veins
   b. Middle colic vein
   c. Superficial epigastric vein
   d. Superior rectal vein
   e. Ileocolic vein
4. Which of the following statements is true of the structure indicated by the arrow
   a. Blood from the orbit may drain into this structure.
   b. The oculomotor nerve passes between the endothelium and dura forming the lateral wall of this structure.
   c. Blood from this structure may drain into the internal jugular vein.
   d. This structure consists of a tunica intima, tunica media, and tunica adventitia.
   e. Two divisions of the trigeminal nerve pass between the endothelium and dura forming the lateral wall of this structure.

*(All correct except D)*

5. A child ruptures her liver in a bicycle accident. She complains of diffuse abdominal pain and refuses to sit up. Where will the clinician most likely discover an accumulation of free intraperitoneal hemorrhage with an ultrasound probe?
   a. Left paracolic gutter
   b. Rectouterine space (of Douglas)
   c. Gastroplenic ligament
   d. Lesser peritoneal sac (omenta bursa)
   e. Hepatorenal recess (of Morrison)

6. General sensation is conveyed by the maxillary division of the trigeminal nerve from all of the following structures except the
   a. Inferior concha of the nasal cavity
   b. Hard palate
   c. Anterior 2/3 of the tongue
   d. Maxillary sinus
   e. Lower eyelid
7. The structure indicated by the arrow is the
   a. **Median nerve**
   b. Lateral cord of the brachial plexus
   c. Superior cord of the brachial plexus
   d. Radial nerve
   e. Musculocutaneous nerve

8. Where would you find this tissue organization?
   a. Tongue
   b. Salivary gland
   c. **Colon**
   d. Testis
   e. Kidney

9. An acute coronary arterial occlusion results in a myocardial infarction of the left ventricular papillary muscles. Which of the following is least likely to result from this infarction?
   a. Mitral regurgitation
   b. Pulmonary edema
   c. Substernal pain
   d. **Aortic stenosis**
   e. Reduced cardiac output
10. On this lateral plane film of the head, the arrow is pointing to the
a. Sphenoid sinus
b. Anterior ethmoid sinus
c. Posterior ethmoid sinus
d. Frontal sinus
e. Maxillary sinus

11. The cartilaginous structure deep to the mucosa at the tip of the arrow is the
a. Palatine tonsil
b. Epiglottis
c. Cricoid cartilage
d. Arytenoid cartilage
e. Cricothyroid joint

12. The arrow is pointing to which of the following structures?
   a. Major calyx
   b. Minor calyx
   c. Renal pyramid
d. Renal papilla
e. Renal pelvis
13. Each of the following structures are lined with transitional epithelium EXCEPT
   a. Minor calyx
   b. Major calyx
   c. Renal pelvis
   d. Ureter
   e. Renal capsule

14. The red lines in the diagram represent the attachments and path of which of the following muscles?
   a. Sternocleidomastoid muscle
   b. Omohyoid muscle
   c. Sternohyoid muscle
   d. Anterior scalene muscle
   e. Middle scalene muscle

15. This axial CT demonstrates which of the following abnormalities?
   a. Subarachnoid hematoma
   b. Subdural hematoma
   c. Coronary sinus thrombosis
   d. Epidural hematoma
   e. Fracture of the petrous temporal bone
16. The structure indicated by the tip of the arrow is
   a. **Superior mesenteric artery**
   b. Inferior mesenteric artery
   c. Gastroduodenal artery
   d. Renal artery
   e. Inferior pancreaticoduodenal artery

17. This is a normal x-ray image of an upright patient. The tip of the arrow is within the
   a. **Right bronchus**
   b. Trachea
   c. Esophagus
   d. Pulmonary artery
   e. Pulmonary vein

18. The muscle indicated by the arrow is the
   a. Anterior scalene
   b. Sternohyoid
   c. Levator scapula
   d. Sternothyroid
   e. **Middle scalene**
19. A clot is dislodged from a deep vein in the lower limb. Instead of embolizing (traveling) to the lungs, as is normally the case, the clot reaches, and occludes, the middle cerebral branch of the circle of Willis. Which of the following congenital cardiac anomalies cannot account for the pathway taken by this ‘paradoxical embolus’.
   a. Transposition of the great vessels
   b. Patent foramen ovale
   c. Ventricular septal defect
   d. Aortic stenosis (narrowing)
   e. Atrial septal defect

20. All of the following structures are located near the arrow tips EXCEPT
   a. Portal vein
   b. Central vein
   c. Bile duct
   d. Hepatic artery
   e. Hepatocytes

21. The valve indicated by the arrow is the
   a. Right atrioventricular (tricuspid) valve
   b. Left atrioventricular (mitral) valve
   c. Pulmonary valve
   d. Aortic valve
   e. Opening to the coronary sinus
22. The artery at the tip of the pointer is the
   a. Right gastric artery
   b. **Right gastroepiploic artery**
   c. Left gastric artery
   d. Left gastroepiploic artery
   e. Gastroduodenal artery

23. This slide represents a cross section of which organ?
   a. Stomach
   b. Duodenum
   c. Ureter
   d. **Colon**
   e. Fallopian tube

24. The bony landmark indicated by the arrow is the
   a. **Ischial spine**
   b. Sacral spine
   c. Ischial tuberosity
   d. Ischiopubic ramus
   e. Sacral promontory
25. The organ shown in this slide is the
   a. Vas deferens
   b. Epididymis
   c. Esophagus
   d. Ureter
   e. Uterine tube

26. In this normal axial CT, the structure indicated by the arrow is the
   a. Stomach
   b. Spleen
   c. Liver
   d. Gallbladder
   e. Inferior vena cava

27. The structure indicated by the arrows is the
   a. Prostate gland
   b. Seminal vesicle
   c. Bulbourethral gland
   d. External urethral sphincter
   e. Corpus spongiosum
28. The structure indicated by the arrow is the
   a. Basilar artery
   b. Posterior cerebral artery
   c. **Vertebral artery**
   d. Posterior cerebellar artery
   e. Anterior spinal artery

29. In this sagittal MR image, the tip of the arrow is located within which of the following hollow organs.
   a. Bladder
   b. **Uterus**
   c. Rectum
   d. Vagina
   e. Sigmoid colon

30. This slide includes an example of which of the following?
   a. Primordial follicle
   b. Primary follicle
   c. **Antral (Graafian) follicle**
   d. Corpus luteum
   e. Prostatic concretion
31. This region of the gastrointestinal tract receives sympathetic visceral motor (GVE) innervation from the
   a. Greater splanchnic nerve (T5-T9)
   b. Sacral splanchnic nerves (L1-L2)
   c. Lesser splanchnic nerve (T10-T11)
   d. Lumbar splanchnic nerves (L1-L2)
   e. Pelvic splanchnic nerves (S2-S4)

32. The structure indicated by the tip of the arrow in this normal x-ray image is the
   a. Lunate
   b. Ulna
   c. Scaphoid
   d. Capitate
   e. Hamate

33. Which of the following statements is not true of the mediastinum?
   a. The mediastinum lies between the left and right pleural sacs.
   b. The esophagus runs through the mediastinum.
   c. The mediastinum is continuous with the retroperitoneum through the openings in the diaphragm.
   d. The mediastinum is continuous with the left and right pleural spaces.
   e. The azygos vein enters the superior vena cava within the mediastinum.
34. Which of the following statements is not true of the structure indicated by the arrow?

a. Contraction of this structure everts the foot at the intertarsal joint.

b. **The tibial nerve provides motor innervation to this structure.**

c. The fibular artery supplies blood to this structure.

d. Contraction of this structure plantarflexes the foot at the ankle joint.

e. The deep fascia of the lateral crural compartment covers this structure.

35. As the result of a cranial injury, a 35-year-old motorcycle rider suffers complete transection of the oculomotor nerve. Which of the following muscles would be unaffected by this injury?

a. Inferior oblique muscle

b. Sphincter pupillae muscle

c. Medial rectus muscle

d. Inferior rectus muscle

e. **Lateral rectus muscle**

36. A pathogenic bacterium enters the nasal cavity of a 92-year-old shepherd. The normal anatomy of the head and neck will NORMALLY prevent the bacterium from traveling between which of the following pairs of passages?

a. From the nasal cavity to the nasopharynx

b. From the oropharynx to the laryngopharynx

c. From the nasal cavity to the maxillary sinus

d. **From the maxillary sinus to the orbit**

e. From the nasopharynx to the oropharynx
37. Identify this tubular structure.
   a. Fallopian (uterine) tube
   b. Seminal vesicle
   c. Corpus luteum
   d. **Seminiferous tubule**
   e. Epididymis

38. The muscular tube shown in this slide is the
   a. Ureter
   b. **Vas Deferens**
   c. Uterine tube
   d. Urethra
   e. Epididymis

39. This slide includes a collection of glandular acini in the submucosa. This pattern is also found in which of the following locations?
   a. Ileum
   b. Uterus
   c. Rectum
   d. **Duodenum**
   e. Ilium
40. The organ in this slide includes all of the following features EXCEPT
   a. Plicae circulares
   b. Haustra
   c. Taenia coli
   d. Crypts of Lieberkühn
   e. Appendices epiploica

41. The cartilaginous structure deep to the mucosa at the tip of the arrow is the
   a. Palatine tonsil
   b. Epiglottis
   c. Cricoid cartilage
   d. Arytenoid cartilage
   e. Cricothyroid joint

42. The slide shows a change in epithelial cell type at which of the following junctions?
   a. Cervical canal – uterine junction
   b. Lip – oral mucosa junction
   c. Common bile duct - duodenum
d. Gastroesophageal junction
   e. Gastroduodenal junction
43. Identify the structure indicated by the arrow in this axial CT image of the chest
   a. Azygos vein
   b. Left crus of diaphragm
   c. **Descending aorta**
   d. Esophagus
   e. Inferior vena cava

44. The muscle indicated by the arrow is innervated by which of the following nerves?
   a. Sacral splanchnics
   b. Lumbar splanchnics
   c. **Pudendal nerve**
   d. Femoral nerve
   e. Obturator nerve

45. The structure indicated by the arrow is the
   a. Medial collateral ligament of the knee
   b. **Lateral collateral ligament of the knee**
   c. Tendon of the semimembranosus muscle
   d. Tendon of the sartorius muscle
   e. Iliotibial tract
46. All of the following structures enter the orbit through the superior orbital fissure EXCEPT the
   a. Trochlear nerve
   b. **Optic nerve**
   c. Abducens nerve
   d. Oculomotor nerve
   e. Ophthalmic division of Trigeminal

47. In this normal axial CT, the structure indicated by the arrow is the
   a. Stomach
   b. Spleen
   c. **Liver**
   d. Gallbladder
   e. Inferior vena cava

48. Identify this lymphoid organ.
   a. Lymph nodule
   b. Thymus
   c. Lymph node
   d. **Spleen**
   e. Peyers patch
49. All of the following statements are true of the artery indicated by the arrow except
   a. This artery is a branch of the celiac axis (trunk).
   b. The vein accompanying this artery is a tributary of the portal vein.
   c. Blood from this artery enters the marginal artery of Drummond.
   d. The artery passes through the transverse mesocolon to reach its destination.
   e. If the inferior mesenteric artery became occluded, blood from this artery could supply the descending colon.

50. This gland secretes all of the following compounds EXCEPT
   a. Enzymes
   b. Insulin
   c. Bicarbonate
   d. Mucus
   e. Glucagon

51. Where would you expect to find this type of epithelium?
   a. Lung
   b. Fallopian tube
   c. Large intestine
   d. Small intestine
   e. Efferent ductules
52. Which of the following structures is indicated by the arrow?
   a. Vagus nerve
   b. Glossopharyngeal nerve
   c. **Superior cervical ganglion**
   d. Spinal accessory nerve
   e. Hypoglossal nerve

53. The structure indicated by the arrow is a branch of which of the following vessels?
   a. Common iliac artery
   b. **Aorta**
   c. Internal iliac artery
   d. Pudendal artery
   e. External iliac artery

54. This low magnification view shows which of the following organs?
   a. **Kidney**
   b. Pancreas
   c. Ear
   d. Spleen
   e. Lymph node
55. The arrow is pointing to the
   a. Abductor pollicis brevis muscle
   b. Flexor pollicis brevis muscle
   c. Opponens pollicis muscle
   d. Lumbrical muscle
   e. Dorsal interosseous muscle

56. Which of the following statements is not true of the nervous system?
   a. The dorsal (posterior) ramus of a spinal nerve contains both somatic sensory and
      somatic motor nerve fibers.
   b. The median, ulnar, and musculocutaneous nerves are branches of the brachial plexus.
   c. Each cranial nerve contains at least two nerve fiber types.
   d. Special sensory fibers are found only in cranial nerves.
   e. The pudendal nerve contains both somatic motor and somatic sensory fibers.

57. A 26-year-old professional baseball player is hit on the side of the head by a wild pitch. An
    epidural hematoma most commonly results from bleeding of the
   a. Middle meningeal artery
   b. Superior sagittal sinus
   c. Bridging veins
   d. Internal carotid artery
   e. Vertebral artery

58. After a fall down stairs, an 8-year-old boy is unable to taste sugar at the tip of his tongue. This defect suggests injury to which of the following cranial nerves?
   a. Hypoglossal nerve (CN XII)
   b. Glossopharyngeal nerve (CN IX)
   c. Facial nerve (CN VII)
   d. Vagus nerve (CN X)
   e. Trigeminal nerve, maxillary division (CN V₂)
Please limit your answer to the space provided on this side of the page.

1. List FIVE ways the body prevents water loss and maintains water in the blood volume.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Keratinized skin</td>
</tr>
<tr>
<td>b.</td>
<td>Resorption of water in the colon</td>
</tr>
<tr>
<td>c.</td>
<td>Resorption of water in the kidney</td>
</tr>
<tr>
<td>d.</td>
<td>High resorption of water from the interstitial tissues of the lung (H diagram)</td>
</tr>
<tr>
<td>e.</td>
<td>Resorption of extracellular fluid in the venous side of the capillary bed by high osmotic pressure of protein in the serum</td>
</tr>
<tr>
<td>f.</td>
<td>Resorption of extracellular fluid by the lymphatic system.</td>
</tr>
</tbody>
</table>

2. Describe the boundaries between the foregut, midgut, and hindgut regions of the gastrointestinal tract. For each region, please list the main arterial supply and parasympathetic innervation?

The boundary between the foregut and hindgut lies between the first and second parts of the duodenum where the common bile duct enters the duodenum.

The boundary between the midgut and hindgut lies somewhere along the distal part of the transverse colon, anywhere between the midpoint of the transverse colon and the splenic flexure is an acceptable answer.

The celiac axis and vagus nerve supply the **foregut**.

The superior mesenteric artery and vagus nerve supply the **midgut**.

The inferior mesenteric artery and pelvic splanchnics (S2-S4) supply the **hindgut**.
Epithelium - 3 transitions
- Stratified squamous keratinizing to stratified squamous non-keratinizing to simple columnar with goblet cells.

**Lamina propria** loose irregular CT and **muscularis mucosa**
- smooth m beneath the simple columnar epithelium of the Crypts of Lieberkuhn

**Dense irregular connective tissue** (dermis) under the squamous epithelium. The interdigitation between the epidermal pegs and the dermal papilla increase as you move towards the most keratinized surface.

**Large veins** (hemmorhoidal)

**Muscularis** composed of *inner smooth m*, *outer robust layer* of smooth muscle until you reach the beginning of the keratinized area where **hair** and **sebaceous glands** may be, then large bundles of **skeletal muscle** are present (levator ani / externa anal sphincter)
Castle – E Upper esophagus /Pharynx Image is similar to the slide

**Epithelium** - Stratified squamous non-keratinizing with obvious nucleated cells on the surface.

**Lamina propria** - Fairly dense irregular connective tissue, Vessels

**Muscularis mucosa** is thin smooth muscle cut in cross section. They have central nuclei. Smooth muscle is also around a large number of arterioles subjacent to the muscularis layer.

**Submucosa**, very dense eosinophilic connective tissue. May see submucosal ganglion (Meissners) that contain large neuron cell bodies with large nuclei, prominent nucleolus; associated Schwann cells

**Muscularis externa** is all skeletal muscle. The arrangement is somewhat uneven, but generally there is an internal layer in longitudinal section where you can see striations. The outer layer is primarily skeletal muscle fibers cut in cross section. Filled with cytoskeleton and having nuclei located against the plasma membrane. May see myenteric ganglia (Auerbachs) that contain neuron cell bodies with large nuclei, prominent nucleolus; associated Schwann cells.

**Adventitia**
Holmes – G Kidney - Image is similar to the slide
Capsule of Dense connective tissue, a bit tattered
Shaped like a Pyramid

Darker staining outer region cortex
Contains glomeruli, proximal and distal convoluted tubules
- Proximal tubules are full of apical cell debris, Distal tubules have a clear lumen. Proximal and distal tubules have no distinct lateral plasma membranes (they are interdigitated).
- Medullary rays carry vessels and collecting tubules up into cortex. Collecting tubules have distinct lateral plasma membranes between adjacent cells. Bowmans space receives filtrate from capillary bed. You can see RBCs in the glomerular capillaries and in vessels.
Area of medium sized muscular arteries. Arcuate aa and vv that (branch from interlobular a and v.)

Lighter staining of medulla
- The juxtamedullary glomeruli have bundles of thin capillaries that extend into the medulla, the vasa recta. These stand out as they have RBCs within them. They are cut in cross section in some area.
- Tubules become straight as they descend into the medulla.
(Holmes continued)

The collecting tubule cells that began as cuboidal cells are increasing in height. The distal straight tubule is cuboidal epithelium and at 40x you can see striations in the basal cytoplasm (mitochondria and infoldings of the basal membrane). Centrally placed round nuclei. Vessels have endothelial cells with flattened nuclei and squamous shape. The loop of Henle is close to the size of the distal tubule, the cells have round nuclei that bulge into the lumen, but the cytoplasm is very thin between cells.

The medullary papilla stops abruptly against transitional epithelium (minor calyx). There are smooth muscle cell surrounding some of these areas followed by dense irregular connective tissue, looser connective tissue and adipose tissue is also surrounding this region Adventitia
Lumen
Epithelium (transitional) containing a number of individual lymphocytes
Eosinophilic Lamina propria that has a fibrous nature but has many more nuclei than the adventitia, There is no submucosa
Muscularis externa
Smooth muscle cut in cross section
Smooth muscle cut in longitudinal section arranged circularly around tube
Aventitia CT, adipocytes, muscular arteries, veins in very dense connective tissue, Eosinophilic staining collagen bundles with very few nuclei