

Biology 351 - Human Anatomy

Abdominal and Pelvic Cavities

You must answer *all* questions on this exam. Because statistics demonstrate that, on average, between 2-5 questions on every 100-point exam are ambiguous enough to come out "aberrant" on an item analysis, the total number of points possible on this exam is 104. However, grades will be calculated out of a possible 100 points.

Section 1: True-False Questions. If the following statements about the abdominal musculature are true place a (+) in the space provided; if the statement is false place a (O) in the space. 2 points each.

- _____ 1. The external oblique muscles insert onto the linea alba and the ilium (iliac crest)
- _____ 2. A mesentery is a piece of connective tissue that connects the visceral and parietal layers of the peritoneum.
- _____ 3. The greater omentum is a piece of the peritoneum that is connected to the stomach.
- _____ 4. The lesser omentum connects the lesser curvature of the stomach to the esophagus, duodenum and the liver.
- _____ 5. The mucosa of the stomach demonstrates folds termed gastric folds (also termed rugae). These gastric folds (rugae) increase the surface area of the stomach for absorption and secretion. In addition, these gastric folds disappear when the stomach is stretched as it is filled.
- _____ 6. The glands of the stomach have parietal cells, chief cells and mucous cells. The mucous cells produce mucous, which protects the mucosa of the stomach from the hydrochloric acid produced by the parietal cells and the pepsinogen and pepsin produced by the chief cells.
- _____ 7. Except for the pylorus, (which is retroperitoneal) the stomach is intraperitoneal.
- _____ 8. The spleen and the kidneys are retroperitoneal.
- _____ 9. The internal anatomy of the small intestine is specialized to maximize absorption and secretion. These mucosal specializations are termed haustra, microvilli, plica circularis, and villi, may be found.
- _____ 10. The various regions of the small intestine have differing relationships to the peritoneum. The duodenum starts out being intraperitoneal and then the terminal 2/3 of the duodenum is secondarily retroperitoneal. The jejunum and all but the last 10 cm. of the ileum, which is secondarily retroperitoneal, are intraperitoneal.

- _____ 11. Like the small intestine, the regions of the large intestine (also termed the colon) have differing relationships with the peritoneum. The cecum is intraperitoneal; the ascending colon is intraperitoneal; the first segment of the transverse colon is intraperitoneal; the terminal segment of the transverse colon is secondarily retroperitoneal; the descending colon is retroperitoneal; the initial segment of the sigmoid colon is intraperitoneal; the terminal segment of the sigmoid colon is secondarily retroperitoneal.
- _____ 12. The colon exhibits the same specializations of the mucosa that increase surface area for absorption and secretion as does the small intestine.
- _____ 13. The clitoris is the erectile organ of the female. When cut into cross section the clitoris would demonstrate two erectile bodies that fill with blood during preparation for sexual activity. These structures are called corpora spongiosa.
- _____ 14. When cut into a cross section the male penis exhibits the two erectile bodies (termed the corpora cavernosa) and one structure that contains the penile urethra. The structure containing the urethra is termed the corpus spongiosum.
- _____ 15. The pelvic floor (in both males and females) is composed of two pieces of smooth muscle: the levator ani and the coccygeus. These muscles function to contain the organs of the pelvis and also as the involuntary sphincters of the urethra and rectum.
- _____ 16. The male urethra is composed of three segments: prostatic urethra, membranous urethra, and penile urethra. The prostatic urethra is the site of the involuntary sphincter, while the membranous urethra is the site of the voluntary sphincter.
- _____ 17. The medial surfaces of the labia minora and the labia majora lack pigmentation.
- _____ 18. *Some* of the actions of the anterolateral muscles of the abdominal and pelvic cavities are to support the abdominal viscera and compress the abdomen and play an important role in expiration, defecation, urination, vomiting, and giving birth.
- _____ 19. The internal oblique originates on the iliac crest and inguinal ligament, and inserts onto the ribs, costal cartilages, linea alba and pubic crest.
- _____ 20. The transverse abdominis muscle is the innermost and thinnest of the abdominal muscles. Its fibers run transversely, and may be absent in a large number of individuals.
- _____ 21. The rectus abdominis muscle is a long strap-like muscle extending the length of the anterior abdominal wall on each side of the linea alba. When you are standing or sitting (also termed weight-bearing positions) the rectus abdominis has its origin on the xiphoid process and costal cartilages 5 to 7, and inserts onto the pubic tubercle, pubic crest and pubic symphysis. When you are in the supine position and doing a sit up or a “crunch” the origins and insertions are reversed: insertions on the xiphoid process and costal cartilages 5 to 7, and origins onto the pubic tubercle, pubic crest and pubic symphysis.

Section 2: Short answer

22. Draw and label the hepatic portal system. (7 points)

23. In words and a diagram explain what a “portal system” is. (7 points)

Section 3: If the following statements about the vasculature of the abdominal and pelvic cavities are true place a (+) in the space provided; if the statement is false place a (O) in the space provided.

- _____ 24. The abdominal aorta would be found to lie to the right of the vertebral column within the abdominal cavity.
- _____ 24. The inferior vena cava would be found to lie superficially and to the right of the abdominal aorta within the abdominal cavity.
- _____ 26. The abdominal aorta ends by the bifurcation into the common iliac arteries.
- _____ 27. The celiac trunk is the first vessel to branch off of the abdominal aorta. The celiac trunk subdivides into the common hepatic artery, splenic artery and right gastric artery.
- _____ 28. The hepatic artery proper supplies the liver, gallbladder and stomach (along the greater curvature) with blood. The hepatic artery proper is formed after the common hepatic artery divides into the gastroduodenal artery and the hepatic artery proper.
- _____ 29. The splenic artery supplies the stomach (along the lesser curvature) and pancreas with blood.
- _____ 30. The superior mesenteric artery branches off of the abdominal aorta inferiorly to the celiac trunk. This vessel supplies the following areas of the G.I. tract with blood: duodenum, jejunum, cecum, ascending colon, appendix, ileum and the first one half to two thirds of the transverse colon.
- _____ 31. The inferior mesenteric artery branches off of the abdominal aorta superior to the formation of the common iliac arteries. The inferior mesenteric artery supplies the cecum, appendix, ascending colon, transverse colon, descending colon, sigmoid colon and rectum with blood.
- _____ 32. The gonadal arteries (especially in women) are found to lie very close to the ureters as they (the gonadal arteries and the ureters) pass inferiorly through the abdominal and pelvic cavities.
- _____ 33. The renal arteries and adrenal (suprarenal) arteries supply the kidneys and adrenal glands (suprarenal glands) with blood, respectively.
- _____ 34. No organ of the gastrointestinal tract drains into the inferior vena cava directly.
- _____ 35. The stomach, small intestine, large intestine, pancreas and gall bladder drain into the inferior vena cava via the hepatic portal vein.
- _____ 36. The third artery that branches off of the celiac trunk (left gastric artery) supplies the cardia of the stomach and the adjacent portion of the esophagus with blood.

Go on to the next three pages for the last four questions of the test.

Section 4: First think question. Answer the question in the space provided on the next page.

Two first-year medical residents are doing a rotation in gastroenterology. They have been called into a patient's room by the head resident. The particulars about the patient they have been called in to see are listed below.

- The patient is suspected of having a tear in the wall of the most distal part of the duodenum.
- If there is a tear in the most distal part of the duodenum chyme and bacteria would be leaking out of the duodenum and causing an infection.
- The patient has a fever of 103° and has a high white blood cell count. Both are indicative of an infection.
- Because of complicating factors the head resident doesn't want to introduce an x-ray opaque dye into the patient in order to do a GI tract contrast x-ray and determine if a leakage/tear is indeed present.
- The patient is very intolerant of anesthesia and, therefore, they cannot do an endoscopic investigation of the patient's upper G.I. tract. (This test involves threading a camera into the patient's mouth and down into the stomach and small intestine. This test is generally done under general anesthesia.)

The head resident asks the first-year residents to sit down and, remembering the anatomy that they were taught in medical school, design a test that could be done under local anesthetic in order to determine whether or not the patient does indeed have a tear in the most distal portion of the duodenum.

One of the residents says the following procedure should be conducted:

- An incision should be made in the anterior wall of the abdominal cavity.
- Sterile saline should be introduced into the abdominal cavity through a sterile tube that is inserted through the incision in the body wall.
- A second incision should then be made in the anterior wall of the abdominal cavity and a second sterile tube should be inserted. The water that was introduced into the abdominal cavity by the first sterile tube would be removed via this second tube.
- The water that is removed via the second tube will then be examined for bacteria and chyme. If one or both are present then it can be assumed that there is indeed a tear in the most distal portion of the duodenum. If no chyme and/or bacteria are present it can be assumed there is no tear in any portion of the wall of the distal portion of the duodenum.

The second resident states that this test will not yield the correct results. This is because of the following: (1) If no chyme and/or bacteria are present in the water that is removed from the patient's abdominal cavity the result may be a false negative (result on a laboratory test that is not accurate, resulting in a negative result when, in actuality, bacteria and chyme should have been detected if another procedure had been used) and (2) that bacterial and/or chyme might still be leaking from a tear in the duodenum but isn't detected by this test.

In the space provided on the next page answer the following two questions utilizing sound anatomical logic, reasoning and knowledge:

37. Which resident is correct? Resident #1 or Resident #2 (2 points)

38. Using *solid anatomical reasoning* state why resident #1 or resident #2 is correct. (10 points)

Go to the next page for the next set of questions.

Another think question: For both genders a physical exam involving some portion of the reproductive tract can be an uncomfortable experience — both physically and emotionally. Current statistics state that 1 in 7 males will be diagnosed with prostate cancer, and of those men only 1 in 39 will die from prostate cancer.

In addition, BPH (benign prostate hypertrophy) is another problem that many men encounter. Approximately 50% of all males between the ages of 51 and 60 will develop BPH. With BPH the prostate hypertrophies (enlarges significantly) but does not develop cancer. BPH can cause problems with urine flow and sexual performance (inability to obtain and maintain an erection).

Because of the above statistics, a regular prostate exam should be part of every physical examination for any male above the age of 40. A prostate exam is performed by the following procedure:

- The prostate is examined by a digital rectal examination.
- The male bends over at the waist and places his hands on his knees.
- The physician inserts his/her index finger into the patient's rectum and palpates the patient's prostate for firmness and regularity of contour. A cancerous prostate feels hard and irregular to palpation.
- It is easier for the physician to exam and palpate the patient's prostate if the bladder is full.

In the space provided answer the following two questions utilizing sound anatomical logic, reasoning and knowledge:

39. How is it anatomically possible to explain how a physician may examine the prostate by inserting his/her finger into the patient's rectum? (10 points)
40. Why does a full bladder make it easier to examine the patient's prostate? (2 points)