GROSS ANATOMY EXAMINATION
February 18, 2000

For the following questions, indicate the letter that corresponds to the SINGLE MOST APPROPRIATE ANSWER.

1. Dr. Nussbaum used a laparoscopic procedure to remove the gallbladder of a 53-year-old woman. He knew that all of the following statements concerning the gallbladder are correct EXCEPT that it
   A. is located between the right and quadrate lobes of the liver.
   B. is commonly supplied by visceral afferent fibers that traverse the superior mesenteric plexus.
   C. has a duct that joins the common hepatic duct.
   D. receives arterial supply via a vessel that usually branches from the right hepatic artery.
   E. has a surface that may contact the anterior body wall.

2. During vaginal delivery, an episiotomy is performed by incising the perineal body to prevent uncontrolled tearing of the perineum. All of the following muscles are attached to the perineal body EXCEPT the
   A. bulbospongiousus.
   B. deep transverse perineal.
   C. external anal sphincter.
   D. superficial transverse perineal.
   E. ischiocavernosus.

3. A 57-year-old woman has a tumor involving the labia majora and minora. Surgery is recommended to remove not only the tumor, but also any affected lymph nodes. To which lymph nodes would tumor cells most likely initially metastasize?
   A. Common iliac
   B. Inferior mesenteric
   C. Lumbar
   D. Sacral
   E. Superficial inguinal
4. A 67-year-old man is jaundiced and has severe abdominal pain. He is diagnosed with cancer of the head of the pancreas. What spinal cord segment(s) receive the visceral afferent fibers from the head of the pancreas?
   A. T1 to T4
   B. T5 to T9
   C. T10 and T11
   D. T12
   E. L1 and L2

5. During an emergency hysterectomy in a 45-year-old woman, the surgeon exposes a uterine artery prior to its ligation. What structure passing inferior to this vessel and lateral to the cervix must be protected from accidental ligation during this procedure?
   A. Fallopian tube
   B. Ovarian artery
   C. Ureter
   D. Pudendal nerve
   E. Ovarian ligament

6. A 26-year-old woman complains of abdominal pain in the umbilical region. A problem with her appendix is suspected. Through which of the following nerves would visceral afferent fibers from the appendix travel?
   A. Vagus
   B. Greater splanchnic
   C. Lesser splanchnic
   D. Least splanchnic
   E. Lumbar splanchnic

7. A 12-year-old boy is undergoing liver transplant surgery. During the procedure the structure immediately posterior to the epiploic foramen of Winslow is damaged causing a significant amount of bleeding into the operative field. What vessel has most likely been injured?
   A. Aorta
   B. Common hepatic artery
   C. Inferior vena cava
   D. Portal vein
   E. Right renal vein
8. A 63-year-old man had a tumor adjacent to the celiac ganglion and plexus. This tumor would probably compress all of the following EXCEPT
   A. sympathetic preganglionic fibers.
   B. parasympathetic postganglionic fibers.
   C. visceral afferents from the stomach.
   D. parasympathetic preganglionic fibers.
   E. sympathetic postganglionic fibers.

9. A 63-year-old woman has an ulcer in the posterior wall of the first part of the duodenum. Which of the following structures is most likely to be directly damaged if a perforation occurred at the site of the ulcer?
   A. Right suprarenal gland
   B. Ascending colon
   C. Aorta
   D. Gastroduodenal artery
   E. Superior mesenteric vein

10. An aortic aneurysm in the aortic hiatus of the diaphragm could directly compress the
    A. vagal trunks.
    B. lesser splanchnic nerves.
    C. azygos vein.
    D. right phrenic nerve.
    E. sympathetic chains.

11. A 55-year-old man has cancer of the stomach requiring a total gastrectomy. Which group of lymph nodes should be examined as a possible site of initial metastasis?
    A. Superior mesenteric
    B. Lumbar
    C. Internal iliac
    D. Inferior mesenteric
    E. Celiac
12. During the examination of a 45-year-old woman, a large pelvic mass is discovered. After determining that it is an ovarian tumor, surgery is scheduled. During the surgical procedure, the primary vascular supply to the ovary must be ligated. Clamping and cutting which of the following ligaments will accomplish this task?
   A. Suspensory
   B. Round
   C. Ovarian
   D. Cardinal
   E. Broad

13. The T8 spinal nerve is compressed by a tumor in the intervertebral foramen. This compression could result in decrease or loss of innervation to all of the following structures EXCEPT
   A. a portion of the transversus abdominis muscle.
   B. a portion of the rectus abdominis muscle.
   C. postganglionic cell bodies in the celiac ganglion.
   D. skin of the anterior abdominal wall above the umbilicus.
   E. the cremaster muscle.

14. A 23-year-old motorcycle accident victim was rushed to the operating room, where a large volume of blood was aspirated (removed) from his abdominal cavity. The bleeding resulted from tearing of the ileocolic artery near its origin. This vessel was ligated to prevent further blood loss. The cecum in this patient continued to receive adequate blood flow by way of direct communication of branches of the ileocolic with those of the
   A. jejunal arteries.
   B. cecal arteries.
   C. right colic artery.
   D. left colic artery.
   E. appendicular artery
15. In a patient with severe portal venous obstruction secondary to cirrhosis of the liver, blood containing nutrients absorbed from the jejunum would most likely reach which of the following organs first?

A. Pancreas  
B. Spleen  
C. Lung  
D. Ileum  
E. Heart

16. A 45-year-old man arrived at the emergency room with a severe pain on his right side. He said the pain first started just below his ribs. Now, five hours later, the pain has moved to his groin. Suspecting that the patient is passing a ureteric calculus (stone), the physician ordered an intravenous pyelogram (IVP). In interpreting the pyelogram, she recalled that all of the following statements about the ureter are correct EXCEPT that

A. at the hilus of the kidney, the pelvis of the ureter is the most anterior structure.  
B. the ureter has several constrictions along its course where a calculus may pass with difficulty.  
C. it runs vertically downward posterior to the parietal peritoneum and lies on the psoas muscle.  
D. it enters the pelvic cavity by crossing anterior to the bifurcation of the common iliac artery.  
E. pain from the pelvic portion of the ureter is attributed to afferent fibers which travel in the lumbar splanchnic nerves.

17. A 37-year-old male was diagnosed with testicular cancer. Cells in a tumor arising in the testes would directly metastasize to the

A. superficial inguinal lymph nodes.  
B. lumbar lymph nodes.  
C. external iliac lymph nodes.  
D. internal iliac lymph nodes.  
E. intestinal lymph nodes.
18. A fourth-year medical student assists the surgeon in a direct inguinal hernia repair of a 60-year-old man. This type of hernia
   A. is due to a congenital defect.
   B. can pass through the superficial inguinal ring.
   C. is not surrounded by peritoneum.
   D. courses through the deep inguinal ring.
   E. passes posterior to the inguinal ligament.

19. Hemorrhoids bother a 23-year-old woman who is seven months pregnant. These have developed due to the enlargement of the normal anastomotic connections between branches of the inferior mesenteric vein and branches of which of the following veins?
   A. Internal pudendal
   B. Obturator
   C. Esophageal
   D. Paraumbilical
   E. Uterine

20. The urologist palpated the patient's spermatic cord while performing a vasectomy. He knew that all of the following structures were within at least two of the coverings of the spermatic cord EXCEPT the
   A. ductus deferens.
   B. testicular artery.
   C. pampiniform plexus of veins.
   D. ilioinguinal nerve.
   E. testicular lymphatics.

21. A 46-year-old man is having an inguinal hernia repaired. During the procedure the superficial inguinal ring must be enlarged to reduce the hernia and retract the intestinal loop. Which of the following structures is being incised to accomplish this task?
   A. Conjoined tendon
   B. Rectus sheath
   C. Transversalis fascia
   D. Internal oblique muscle
   E. External oblique aponeurosis
22. During abdominal surgery, the surgeon examined several structures that are primarily (not secondarily) retroperitoneal. These structures included all of the following EXCEPT the
   A. kidneys.
   B. pancreas.
   C. obliterated allantois.
   D. bladder.
   E. suprarenal glands.

23. A 22-year-old man is shot in a bar fight. The bullet passes through the midline of the anterior abdominal wall immediately superior to the pubic symphysis. If the bullet continued in a horizontal direction, in the mid-sagittal plane, which of the following structures would most likely be penetrated?
   A. Abdominal aorta
   B. Internal iliac artery
   C. Ureter
   D. Spinal cord
   E. Urinary bladder

24. In preparation for removal of an inflamed gallbladder, the surgeon laparoscopically examined the cystic duct and the common bile duct and confirmed that the common bile duct usually lies
   A. anterior to the portal vein.
   B. posterior to the inferior vena cava.
   C. lateral to the descending portion of the duodenum.
   D. to the left of the proper hepatic artery.
   E. posterior to the pancreas.

25. A 52-year-old man complains of pain in the epigastric region. This is most likely referred pain resulting from which of the following?
   A. Rectal polyps
   B. Renal calculus
   C. Testicular tumor
   D. Transverse colon obstruction
   E. Duodenal ulcer
26. A patient with a massive carcinoma of the stomach had most of his stomach removed surgically (subtotal gastrectomy). In that procedure, vessels that may be ligated USUALLY include branches or tributaries of all of the following EXCEPT the
   A. splenic artery.
   B. superior mesenteric artery.
   C. proper hepatic artery.
   D. gastroduodenal artery.
   E. portal vein.

27. A 68-year-old woman has a recently diagnosed occlusion of her inferior mesenteric artery near its origin. If significant collateral circulation fails to develop, she will have an increased risk for ischemia in which of the following parts of her gastrointestinal tract?
   A. Stomach
   B. Ileum
   C. Transverse colon
   D. Sigmoid colon
   E. Anal canal

28. In discussing the problems linked with alcoholism to a patient who has begun drinking three glasses of wine per day to avoid heart disease, you remind him that alcohol absorbed from the jejunum goes directly to the liver, by a short route involving the
   A. splenic vein.
   B. left gastric vein.
   C. right gastric vein.
   D. superior mesenteric vein.
   E. left gastroepiploic vein.

29. A 56-year-old man is having surgery to repair a direct inguinal hernia. The surgeon is using an open procedure during which a nerve is damaged. The man awakens after surgery and finds that he has lost sensation in the anterior part of the scrotum and the medial part of the adjacent thigh. What nerve has most likely been injured?
   A. Iliohypogastric
   B. Ilioinguinal
   C. Lateral femoral cutaneous
   D. Pudendal
   E. Subcostal
30. A 63-year-old man has his rectum removed after a diagnosis of rectal cancer. Following this procedure he is unable to have an erection. Along with this deficit, what portion of the gastrointestinal system would most likely lose its parasympathetic innervation?
   A. Stomach
   B. Duodenum
   C. Ileum
   D. Ascending colon
   E. Descending colon

31. A 67-year-old woman is having reconstructive surgery to correct prolapse of the uterus. During this procedure, manipulation of which of the following ligaments could cause injury to the uterine vessels?
   A. Cardinal (transverse cervical)
   B. Ovarian
   C. Round
   D. Suspensory
   E. Uterosacral

32. A 36-year-old man is passing blood in his urine. A pyelogram reveals an abnormality in the portion of the collecting system immediately following the major calyces. Where is the abnormality located?
   A. Renal cortex
   B. Renal medulla
   C. Minor calyx
   D. Renal pelvis
   E. Ureter

33. An obese, 45-year-old woman has severe upper abdominal pain after eating a meal at a fast food restaurant. She is diagnosed as having a large number of stones in her gallbladder. What nerves carry the visceral afferent fibers involved in the transmission of "pain" from the gallbladder?
   A. Greater splanchnic
   B. Lesser splanchnic
   C. Lumbar splanchnic
   D. Pelvic splanchnic
   E. Vagus
34. A 42-year-old man is brought to the emergency department with a severe laceration of the anus. Branches of which of the following structures carry pain fibers from this region?
   A. Pelvic splanchnic nerves
   B. Sacral splanchnic nerves
   C. Pudendal nerves
   D. Inferior hypogastric plexus
   E. Sympathetic chains

35. During repair of an inguinal hernia, the inferior epigastric artery was cut as it passed close to the deep inguinal ring. If this vessel were ligated, there would be a compensatory increase in blood flow through the superior epigastric artery, which is located
   A. between the internal oblique and transversus abdominis muscles.
   B. in the subserous fascia deep to the rectus sheath.
   C. between the rectus abdominis muscle and the posterior layer of the rectus sheath.
   D. deep to the body of the sternum.
   E. in the fatty layer of the abdominal superficial fascia.

36. A 47-year-old man is diagnosed with a hiatal hernia. During the surgical repair of this hernia, the vagus nerves are damaged and determined to be non-functional. Which of the following abdominal organs would still have their parasympathetic nerve supply intact?
   A. Stomach
   B. Jejunum
   C. Ileum
   D. Ascending colon
   E. Sigmoid colon

37. As part of a weight therapy program, a 35-year-old man underwent resection of portions of his greater omentum. During the procedure, his surgeon recalled that the greater omentum
   A. contains the left gastric artery.
   B. is made up of two peritoneal layers.
   C. is attached to the lesser curvature of the stomach.
   D. is attached to the lower border of the pancreas.
   E. contains the left gastroepiploic artery.
38. A 47-year-old man with abdominal pain has an abdominal CT scan. It reveals an obstruction of the third part of the duodenum due to an arterial aneurysm. In what vessel is the aneurysm most likely located?
   A. Celiac artery
   B. Gastroduodenal artery
   C. Inferior mesenteric artery
   D. Right renal artery
   E. Superior mesenteric artery

39. After birth, the vessel(s) that bring blood from the placenta to the heart of the embryo close off. A postnatal remnant of this system is the
   A. urachus.
   B. median umbilical ligament.
   C. medial umbilical ligament.
   D. lateral umbilical ligament.
   E. ligamentum teres (round ligament of the liver).

40. While exploring the posterior abdominal wall you recall that all of the following relations of the lumbar spinal nerves are correct EXCEPT that the
   A. lateral femoral cutaneous nerve passes deep to the inguinal ligament.
   B. lumbosacral trunk is located lateral to the psoas major muscle.
   C. genitofemoral nerve is usually located on the anterior surface of the psoas major muscle.
   D. obturator nerve is located medial to the psoas major muscle.
   E. ilioinguinal nerve passes through the superficial inguinal ring.

41. An infant arrives in the emergency department with symptoms of gastrointestinal obstruction including abdominal distention and tenderness. Ultrasound reveals that part of the intestine is twisted around a ligament connecting the ileum to the umbilicus. This omphalomesenteric ligament is a rudiment of which of the following structures?
   A. Allantois
   B. Median umbilical ligament
   C. Vitelline duct
   D. Gubernaculum
   E. Hepatoduodenal ligament
42. Each of the following structures is involved in the development of the diaphragm EXCEPT the

A. septum transversum.
B. pleuropertoneal membrane.
C. body wall.
D. esophageal mesenchyme.
E. pleuropericardial folds.

43. Ligaments derived from the ventral mesentery include all of the following EXCEPT the

A. coronary.
B. falciform.
C. gastrosplenic.
D. hepatoduodenal.
E. hepatogastric.

44. An infant is born with a rare defect at the umbilicus which expresses urine. It is probably a(n)

A. omphalocele.
B. Meckel's diverticulum.
C. omphalomesenteric fistula.
D. patent vitelline duct.
E. urachal fistula.

45. An infant in your care is diagnosed with a malformation of the GI tract. MRI and barium radiography indicate that the gut is organized in such a way that the midgut viscera are in their normal locations in the peritoneal cavity but the duodenum lies anterior to the transverse colon. You conclude that abnormal rotations of the gut must have occurred resulting in a total rotation of the intestines of

A. 90 degrees clockwise.
B. 270 degrees counterclockwise.
C. 270 degrees clockwise.
D. 90 degrees counterclockwise.
E. 180 degrees clockwise.
46. The former location of the membrane separating the endodermal and ectodermal portions of the anorectal canal is marked in the adult by an irregular folding of mucosa called the
   A. cloaca.
   B. urogenital sinus.
   C. pectinate line.
   D. proctodeum.
   E. urorectal septum.

47. An infant has a 46,XY karyotype but exhibits a normal female phenotype (ovaries, female genital ducts and external genitalia). During development there was the disruption of expression of
   A. androgen receptors.
   B. 5-(-reductase.
   C. TDF.
   D. anti-Mullerian hormone.
   E. a hormone produced by the Leydig cells.

48. Both mesonephric ducts sprout two ureteric buds which bifurcate but fail to penetrate the metanephric blastema. This would result in
   A. oligohydramnios.
   B. polycystic kidney disease.
   C. formation of nephric (renal vesicles).
   D. a bifid ureter.
   E. hydronephrosis.

49. An infant is born with female external genitalia and undescended testes within the inguinal canals. It is subsequently determined that this baby has a disabling mutation of the enzyme 5-(-reductase. All of the following internal genital structures are most likely missing or undifferentiated in this infant EXCEPT the
   A. prostate gland.
   B. superior end of the vagina.
   C. uterus.
   D. epididymis.
   E. testis cords.
50. Decreased amniotic fluid volume in the absence of causative factors (such as the rupture of fetal membranes) should alert the sonographer (ultrasound technician) to all of the following abnormalities EXCEPT
   A. pulmonary hypoplasia.
   B. bilateral renal agenesis.
   C. Potter's syndrome.
   D. limb deformities.
   E. a rectourethral fistula.
1. B 36. E
2. E 37. E
3. E 38. E
5. C 40. B
6. C 41. C
7. C 42. E
8. B 43. C
9. D 44. E
10. C 45. A
11. E 46. C
12. A 47. C
13. E 48. A
14. C 49. D
15. E 50. E
16. A
17. B
18. B
19. A
20. D
21. E
22. B
23. E
24. A
25. E
26. B
27. D
28. D
29. B
30. E
31. A
32. D
33. A
34. C
35. C