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Part I: [69 pts]: Choose the one BEST answer. Circle its letter, write it in the blank, or fill in the blank, as indicated. Read each question and **all the choices** carefully because more than one answer might seem correct at first glance. For the non-standard questions, **read instructions carefully!** *1 pt each*

1. Medulla and cortex refer to
  - a. the inner portion and outer portion of an organ, respectively
  - b. the outer portion and inner portion of an organ, respectively
  - c. regions of the kidney, specifically
  - d. no generalization is possible - it depends on context
  - e. specific parts of the brain, only
  
2. This structure covers the nasopharynx when swallowing
  - a. epiglottis
  - b. tongue
  - c. uvula
  - d. frenulum
  - e. tonsils
  
3. Between the 2 muscular layers of the of the muscularis externa is/are found
  - a. myenteric plexus
  - b. Auerbach's plexus
  - c. Meissner's plexus
  - d. submucosal plexus
  - e. a and b
  - f. c and d
  - g. all of the above
  
4. Efferent lymphatic vessels of a lymph node are located in the
  - a. germinal center
  - b. hilum
  - c. capsule
  - d. lymphatic nodule
  - e. cortex
  
5. Functions of the lymphatic system include
  - a. carrying oxygen to tissues and organs
  - b. removing CO<sub>2</sub> and waste from tissues and organs
  - c. carrying interstitial fluid back to the blood stream and transport lipids
  - d. housing and develop lymphocytes
  - e. a and b
  - f. c and d
  
6. What structure stores sperm until they are fully mature and capable of being motile?
  - a. ampulla
  - b. ductus deferens
  - c. bulbourethral gland
  - d. epididymis
  - e. corpus spongiosum
  
7. The organ that produces bile, detoxifies drugs (including many pharmaceuticals) and poisons, and processes and stores metabolites is the
  - a. gallbladder
  - b. pancreas
  - c. liver
  - d. jejunum
  - e. duodenum

8. The visceral layer of the serous pericardium is (also called) the
  - a. epicardium
  - b. endocardium
  - c. myocardium
  - d. pericardial cavity
  - e. epimysium
  
9. The hepatic portal system drains venous blood from
  - a. capillaries in the intestines, spleen, pancreas, stomach and gallbladder into sinusoids in the liver
  - b. the lower extremities and stomach into the spleen, from there into the inferior vena cava
  - c. the stomach and kidneys into the liver and then on into the inferior vena cava
  - d. the brachia into the liver, then into the inferior vena cava
  - e. liver into the inferior vena cava
  
10. Backflow from the stomach to the esophagus is prevented by the
  - a. pyloric sphincter
  - b. ileocecal sphincter
  - c. sphincter of Oddi
  - d. upper esophageal sphincter
  - e. cardiac sphincter
  
11. The most abundant cell in blood is the
  - a. nurse cell
  - b. dendritic cell
  - c. macrophage
  - d. lymphocyte
  - e. red blood cell
  
12. All of the following are components of a portal triad EXCEPT
  - a. branch of the bile duct
  - b. branch of the hepatic portal vein
  - c. branch of the hepatic artery
  - d. hepatic sinusoid
  - e. none of the above; all of the above ARE parts of a portal triad
  
13. The main branches of the human aortic arch include all of the following EXCEPT
  - a. right brachiocephalic artery
  - b. right subclavian artery
  - c. left subclavian artery
  - d. left common carotid artery
  - e. all of the above are direct branches of the aortic arch in humans (cats differ)
  
14. Lymph is drained from the thoracic duct into the
  - a. cisterna chyli
  - b. right jugular or subclavian vein
  - c. left lymphatic duct
  - d. right lymphatic duct
  - e. left jugular or subclavian vein
  
15. Where two or more arteries (or veins) converge or intertwine to supply the same body region is called a(n)
  - a. companion vessels
  - b. vasa vasorum
  - c. vasomotion
  - d. anastomosis
  - e. vasodilation
  
16. The body is protected against blood loss by
  - a. clots formed by clusters of leukocytes
  - b. clots formed by platelets and blood proteins
  - c. masses of erythrocytes and erythrocyte fragments
  - d. constriction of capillaries in the damaged area
  - e. only by medical intervention

17. The openings at the proximal end of the pharynx are the
- Eustachian tube and internal nares
  - larynx and esophagus
  - vena cava and aorta
  - small and large intestines
  - esophagus and Eustachian tube
18. Valves are found in
- heart
  - veins
  - arteries
  - GI tract
  - a and b
  - a, b, d
  - all of the above
19. Muscles that participate in inhalation include
- external intercostal muscles
  - internal intercostal muscles
  - internal oblique, external oblique, and rectus abdominis
  - diaphragm
  - a and d
  - b and d
  - all of the above
20. Nasal conchae
- warm inhaled air
  - humidify inhaled air
  - participate in vocalization
  - a and b
  - all of the above
21. Brunner glands can be found in the
- stomach
  - duodenum
  - jejunum
  - ilium
  - colon
22. The structure between the uterus and the vagina is the
- uterine tube
  - labia
  - vulva
  - cervix
  - frenulum
23. Which of the following is NOT a function of the digestive tract?
- digestion
  - absorption
  - excretion
  - ingestion
  - secretion
  - none of the above - all are functions of the digestive system
24. A double fold of peritoneum called \_\_\_\_\_, attaches each ovary at its hilum, which is the anterior surface of the ovary where its blood vessels and nerves enter.
- broad ligament
  - mesovarium
  - infundibulum
  - fimbriae
  - suspensory ligament of the ovary

25. Nutrients and oxygen are supplied to the heart via
- the left and right coronary arteries
  - directly into the wall from blood in the heart chambers themselves
  - the coronary sinus
  - the heart is full of blood and does not need a special supply
  - the great cardiac artery
26. Organs of the lymphatic system include
- spleen, thymus, thyroid, and tonsils
  - spleen, lymph nodes, thymus, and pancreas
  - spleen, lymph nodes, thymus, and appendix
  - spleen, pancreas, tonsils, and appendix
  - spleen, lymph nodes, tonsils, and thyroid
27. The majority of lymph fluid in the body returns to the venous circulation via the
- intestinal tract
  - right lymphatic duct
  - thoracic duct
  - cisterna chyli.
  - hormones
28. Which is **not** part of the male reproductive system?
- epididymis
  - ureter
  - prostate
  - urethra
  - testes
29. Organs which have a hilum or hilus include
- lung
  - kidney
  - lymph node
  - a and b
  - all of the above
30. The embryonic structure that regresses in females but not males is the
- pronephric duct
  - pronephros
  - Mullerian duct
  - Wolffian duct
  - prostate gland
31. Special lymphatic capillaries draining lipid and nutrient rich lymph from intestinal villi are
- efferent capillaries
  - afferent capillaries
  - cysterni chyli
  - lacteals
  - intestinal lymphatic ducts
32. The lymphatic organ that removes damaged erythrocytes from circulation is the
- thymus
  - spleen
  - tonsils
  - axillary lymph nodes
  - cervical lymph nodes
33. Which one of the following features is shared by both the small and large intestines?
- crypts
  - Peyer's patches (aggregated nodules)
  - taenia coli
  - haustra
  - circular folds

34. The functional filtration unit of the kidney is the
- nephron loop
  - renal corpuscle
  - nephron
  - proximal convoluted tubule
  - distal convoluted tubule
35. The \_\_\_\_\_ has two bodies of erectile tissue, the \_\_\_\_\_
- bulb of the vestibule ... corpora spongiosum
  - clitoris ... corpora cavernosa
  - bulb of the vestibule ... corpora cavernosa
  - clitoris ... labia majora
  - penis ... labia majora
36. A vein that does NOT drain directly into inferior vena cava is the
- renal vein
  - hepatic portal vein
  - right gonadal vein
  - common iliac vein
  - all of the above drain directly into inferior vena cava
37. The structure that controls forward flow of material from the stomach into the small intestine is the
- pyloric sphincter
  - cardiac sphincter
  - ileocecal sphincter
  - duodenal sphincter
  - forward sphincter
38. Blood vessels are anchored to surrounding structures by the areolar connective tissue of their
- tunica intima
  - tunica media
  - tunica externa
  - adventia
  - serosa
39. Tar inhaled into the lungs, such as from smoking cigarettes, mostly
- clogs alveoli, reducing the functional surface area available for gas exchange
  - passes readily into capillaries, and clogs them
  - passes readily into capillaries, and is thus circulated through the body to exert widespread toxic effects
  - can never be removed
  - all of the above
40. Uterine cramps during the menstrual cycle are particularly uncomfortable because they result from
- the cervix contracting
  - the uterus contracting and pulling on the peritoneum
  - the vagina contracting
  - the ovary passing an ovum to the Fallopian tube
  - imagination; hypochondria
41. Alveolar type II cells
- secrete pulmonary surfactant, which prevents collapse of the lungs
  - secrete mucus to keep the alveoli lubricated
  - enclose the alveolar space
  - to hold oxygen during exhalation
  - form the structure of the alveoli
42. Structures in the small intestine that provide an increased surface area include
- villi
  - microvilli
  - intestinal glands
  - plicae circularis or circular folds
  - all of the above

43. Liver is supplied by
- hepatic portal vein
  - hepatic artery
  - hepatic vein
  - a and b
  - all of the above
44. The alveolar type II cell
- promotes rapid gas diffusion
  - secretes mucous
  - secretes pulmonary surfactant
  - a and b
  - a and c
45. The parietal peritoneum is continuous with all of the following EXCEPT the
- mesocolon
  - mesentery
  - mesovarium
  - mesorchium
  - all of the above form a continuous sheet
46. Secondary oocytes, ova, fertilized eggs, zygotes, and embryos move to the uterus in the
- uterine tubes
  - Fallopian tubes
  - oviducts
  - a and b
  - all of the above
47. Two primary components of whole blood are
- serum and formed elements
  - plasma and formed elements
  - formed elements and dissolved proteins
  - blood cells and fragments
  - serum and plasma
48. Blood leaving the glomerulus exits through the
- renal vein
  - efferent arteriole
  - hepatic portal vein
  - inferior mesenteric vein
  - arcuate vein
49. Lungs inflate because
- there is negative pressure (a vacuum) in the thoracic cavity
  - the volume of pleural fluid is small
  - serous fluid seals the visceral and parietal plurae so that they slide easily but do not peel apart
  - a and b
  - all of the above
50. The primary lymphoid tissues involved in the production and early selection of lymphocytes are
- thymus, bone marrow
  - fatty acids, chyle
  - lymph, blood
  - parenchymal cells, interstitial fluids
  - all of the above
51. A vasectomy is
- removal of a segment of the vas (ductus) deferens
  - a sterilization procedure
  - removal of skin at the tip of the penis
  - a and b
  - all of the above

52. The organs of the alimentary tract are innervated by
- sympathetic nerve fibers
  - parasympathetic nerve fibers
  - sympathetic nerve fibers and parasympathetic nerve fibers
  - somatic nerve fibers, not the autonomic nervous system
  - these organs do not need innervation - they work by themselves
53. The vermiform appendix
- is an outpocketing of the cecum
  - has no known function
  - is found in the lower right quadrant
  - a and b
  - all of the above
54. The following contribute to movement of fluid through the low pressure lymphatic system
- raising the legs above the head
  - breathing
  - resting; lying inert for long periods of time
  - a and b
  - all of the above
55. The cardia, fundus, body, and pylorus are all part of the
- stomach
  - duodenum
  - small intestine
  - large intestine
  - all of the above
56. The respiratory membrane (air-blood barrier) consists of
- alveolar type I cell, basal laminae, endothelial cell
  - air, connective tissue, lung
  - type II cell, dust cell, type I cell
  - pseudostratified epithelium, lamina propria, capillaries
  - nasal epithelium, nasal conchae, nasal septum
57. Which is part of the renal hilum?
- ureter
  - renal artery
  - renal vein
  - a and b
  - all of the above
58. Sperm are produced in (and by) the
- epididymis
  - seminiferous tubules
  - spermatic cord
  - ductus deferens
  - prepuce
59. Nicotine inhaled into the lungs, such as from smoking cigarettes mostly
- clogs alveoli, reducing the functional surface area available for gas exchange
  - passes readily into capillaries, and clogs them
  - passes readily into capillaries, and is thus circulated through the body to exert widespread toxic effects
  - can never be removed
  - all of the above
60. The cecum is the entrance into what organ or portion of organ?
- rectum
  - anus
  - colon
  - duodenum
  - ileum

61. Which of the following is NOT part of the urinary system?
- kidney
  - ureter
  - uterus
  - urethra
  - urinary bladder
62. Structures found only in arteries include
- tunica intima and tunica media
  - internal and external elastic laminae (membranes)
  - endothelium, smooth muscle, and connective tissues
  - tunica externa or adventitia
  - tunica intima, tunica media, tunica externa
63. The male urethra passes through the
- prostate gland
  - seminal vesicles
  - corpus cavernosum of the penis
  - vas deferens
  - all of the above
64. Both air and food (solid and liquid) are expected to be found in the
- laryngopharynx
  - oropharynx
  - nasopharynx
  - a and b
  - all of the above
65. Hyaline cartilage is found in the
- trachea
  - bronchi
  - respiratory alveoli
  - a and b
  - all of the above
66. The brachiocephalic veins merge to form the
- inferior vena cava
  - internal thoracic vein
  - superior vena cava
  - azygos vein
  - basilic vein
67. The opening through the diaphragm that enables the esophagus to pass through is the
- cardiac sphincter
  - hiatal hernia
  - esophageal hiatus
  - fundus
  - cardia
68. The main pancreatic duct merges with the \_\_\_\_\_, and their contents empty together into the duodenum through the major duodenal papilla.
- cystic duct
  - left hepatic duct
  - right hepatic duct
  - common bile duct
  - common hepatic duct



Part II: [7 points]: Fill in the blanks *1 pt each*

- \_\_\_\_\_ 1. Name an organ in the peritoneal cavity that is NOT in the digestive system
- \_\_\_\_\_ 2. Specific name of tissue lining the heart and blood vessels
- \_\_\_\_\_ 3. Name the four layers of the alimentary tube
- \_\_\_\_\_ 4. "
- \_\_\_\_\_ 5. "
- \_\_\_\_\_ 6. "
- \_\_\_\_\_ 7. Name an organ of the GI tract with skeletal muscle in its wall

Part III: [10 points]: Use the key to describe the location of the following:

- |                          |  |
|--------------------------|--|
| _____ 1. ovary           | a. anteropitoneal                            |
| _____ 2. kidney          | b. peritoneal                                |
| _____ 3. duodenum        | c. retroperitoneal                           |
| _____ 4. urinary bladder | d. pleural (associated with pleura)          |
| _____ 5. stomach         | e. pericardial (associated with pericardium) |
| _____ 6. thymus          | f. mediastinal                               |
| _____ 7. testis          | g. none of the above                         |
| _____ 8. esophagus       |  |
| _____ 9. spleen          |  |
| _____ 10. lung           |  |

Part IV: [7 points]: Fill in the blanks: what organ is associated with

- \_\_\_\_\_ 1. pericardium
- \_\_\_\_\_ 2. mesorchium
- \_\_\_\_\_ 3. mesocolon
- \_\_\_\_\_ 4. peritoneum
- \_\_\_\_\_ 5. pleura
- \_\_\_\_\_ 6. mesentery
- \_\_\_\_\_ 7. mediastinum

**BONUS: WRITE A QUESTION THAT YOU STUDIED FOR, AND FORGETFUL ME, I NEGLECTED TO ASK. ANSWER YOUR QUESTION. PLEASE ASK YOURSELF SOMETHING YOU CAN ANSWER WELL! PLEASE ANSWER THE QUESTION YOU ACTUALLY ASK. YOU MAY CHOOSE TO ANSWER A FIFTH QUESTION IN PART VI, IF YOU PREFER (MAX 5 POINTS - SO BE SURE TO INDICATE WHICH ONE!) [UP TO 5 POINTS AWARDED BASED ON QUESTION & ANSWER]**

Part V. [6 points] For each of the following structures, write the structure that is homologous to it in the male or female, respectively. If none, explain (e.g. "the same in male & female"; "no counterpart or homologous structure in the other sex", etc.)

<u>MALE</u>	<u>FEMALE</u>
1. urethra	_____
2. testes	_____
3. _____	labia majora
4. ureter	_____
5. _____	clitoris
6. _____	ovum

Part VI. [ 12 pts] Match organ/ structure with its epithelial lining. You may use a choice as many times as necessary.

- |                                |   |
|--------------------------------|---|
| _____ heart                    | a. simple squamous epithelium                     |
| _____ trachea                  | b. keratinized stratified squamous epithelium     |
| _____ ureter                   | c. non-keratinized stratified squamous epithelium |
| _____ skin                     | d. simple columnar epithelium                     |
| _____ jejunum                  | e. simple cuboidal epithelium                     |
| _____ stomach                  | f. non-ciliated pseudostratified epithelium       |
| _____ medium vein              | g. ciliated pseudostratified epithelium           |
| _____ alveolar sac             | h. transitional epithelium                        |
| _____ anus                     | x. other -- <i>specify what tissue it is</i>      |
| _____ distal convoluted tubule |   |
| _____ esophagus                |   |
| _____ aorta                    |   |

Part VII. [40 pts] Choose 4 questions. Use paper provided *10 points each*. Choose at least one question from each group. (If a particular portion of a route has been listed for one question, it is not necessary to rewrite; just indicate *clearly* where the route is described.)

Group A:

1. **List** the route of "Sally" sugar molecule from the pasta on a fork to its providing nutrition to the cardiac muscle. This is JUST a list of structures [from the mouth to where the food is absorbed into the blood to the muscle]. Be complete.
2. **List** the route of "Oliver" oxygen molecule from the oxygen mask on the airplane (OH! NO!!!!) to your ever so grateful brain. This is JUST a list of structures. Be complete. *One extra point for each different route (not just L/R)*
3. **List** the route of "Indiana" insulin from the site of its production to some of its major targets: (a) liver, (b) specific appendicular skeletal muscle of your choice, (c) kidney. This is JUST a list of structures [from where the hormone is produced to the muscle]. Be complete.

Group B:

5. Draw a liver lobule and label the following parts. Be sure to draw and label (at least): central vein; sinusoid; hepatocyte; hepatic portal vein; hepatic artery; bile duct; bile canaliculus
6. Describe the structure of the digestive system wall, focusing on the common features, as well as the regional distinctions. Be sure to include all the layers and sublayers, what they are made of and any special features likely to be found there. State where skeletal muscle and where smooth muscle would be found. Be sure to mention each region and its distinctive characteristics.
7.
  - a. Describe the structure of blood vessel walls. Be sure to include all classes of blood vessels, showing how they are similar and how they differ among themselves. For major components, briefly (a few words) state the function.
  - b. Describe the distinct types of valves found in the heart, veins, and digestive system (sphincters), and how their structure relates to their function.

Group C:

8. **List** the route of "Joe" sperm and "Sue" egg from their respective sites of "birth" to their meeting place. Assuming they hit it off on their first date, where do they spend the next several months "getting it together"? Finish by tracing the route of the final product to "out". This is JUST a list of structures. Be complete. Include important glands or other relevant organs that contribute to the reproductive process along the way.
9.
  - a. Trace the route of blood through the kidney from its entry point to its exit. This is just a list.
  - b. Trace the route of urine (as it is formed) through the kidney from its origin to its exit. This is just a list.
10. Describe the routing of blood through the heart. Describe the specific function of each chamber, individually, and explain **why it is important** that we have a four chambered heart. Be sure that you have distinguished all four chambers, and the distinctive characteristics of each, including the wall, valves, and functions.