

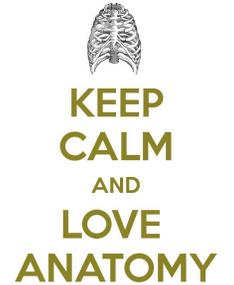


*Exploring the World of Science*

Anatomy & Physiology (Division B)

Gopher Invitational

January 6, 2018



Team \_\_\_\_\_

Team Number \_\_\_\_\_

Names \_\_\_\_\_

**Instructions:**

- 1 point will be awarded for each Multiple Choice question (unless otherwise noted) and the total point values are listed at each Free Response/Label question; no penalty will be given for incorrect answers, so answer as much as you can.
- Multiple answers may be correct for multiple choice and there will be no partial credit given, so you must answer ALL of the correct answers to receive credit.
- Any cheating and use of electronics other than a possible calculator will result in instant disqualification from the event.
- Keep cell phones silenced as any ringing of phones will result in disqualification as well.
- You may take the test apart but it MUST be reattached when turned in.
- The tiebreakers will ONLY be graded in the cases of ties between teams.
- Good luck and have fun!

## Section I: Multiple Choice ( 70 Pts)

- Which of the following can be absorbed without chemical digestion?
  - Carbohydrates
  - Cholesterol**
  - Nucleic Acids
  - Cookies
  - None of the above
- What is phagocytosis?
  - Process that expels harmful substances from cells
  - Process of communication between 2 immune cells
  - Process that gets rid of damaged cells
  - Process that ingests harmful substances**
  - Process where an immune cell communicates with other cells
- The Oropharynx is lined with
  - Pseudostratified ciliated columnar epithelium
  - Ciliated simple columnar epithelium
  - Nonkeratinized stratified squamous epithelium**
  - Nonciliated simple columnar epithelium
  - Simple squamous epithelium
- Which of the following allergic reactions is the most common?
  - Cell-Mediated
  - Cytotoxic
  - Anaphylactic**
  - Immune-Complex
  - Antigen-Oriented
- What anchors the teeth to its socket walls?
  - Root Canal
  - Gingivae
  - Gingival Sulcus
  - Periodontal Ligament**
  - Cementum
- Which of the following is a difference between B cells and T cells?
  - B cells are part of the nonspecific immune system while T cells are part of the specific immune system
  - B cells arise from the bloodstream while T cells arise from red bone marrows
  - B cells vanish in early childhood while T cells function through entire lifespan
  - B cells function through the entire lifespan while T cells vanish in early childhood
  - None of the above**
- What is the correct order of the veins in the path that blood from the liver to the heart goes on?
  - Central Vein, Hepatic Vein, Hepatic Sinusoids, Inferior Vena Cava
  - Hepatic Vein, Hepatic Sinusoids, Central Vein, Inferior Vena Cava
  - Hepatic Sinusoids, Hepatic Vein, Central Vein, Inferior Vena Cava
  - Hepatic Sinusoids, Central Vein, Hepatic Vein, Inferior Vena Cava**
  - None of the Above
- What is the principle bile pigment?
  - Stercobilin

- b. **Bilirubin**
  - c. Cholubin
  - d. Hepatubin
  - e. None of the Above
9. The appendix is attached to the... (Choose all that applies)
- a. **Cecum**
  - b. Rectum
  - c. Colon
  - d. Anal Canal
  - e. **Large Intestine**
  - f. Small Intestine
10. Place the following steps of Endogenous Antigens Processing in order:
- I. Synthesis of MHC-1 molecules
  - II. Insertion of antigen-MHC-1 into plasma membrane
  - III. Binding of peptide fragments to MHC-1
  - IV. Digestion of antigens into peptide fragments
  - V. Packaging of antigen-MHC-1 molecules
- a. III, II, V, I, IV
  - b. **IV, I, III, V, II**
  - c. I, V, II, IV, III
  - d. II, I, IV, III, V
  - e. II, III, V, I, IV
11. Which of the following enzymes is found in tears and is capable of breaking down the cell walls of certain bacteria?
- a. Dehydrogenase
  - b. **Lysozyme**
  - c. Lysosome
  - d. Reductase
  - e. Hydrozyme
12. The Epithelium in the Mucosa is composed of:
- a. Simple Squamous Epithelium
  - b. Simple Cuboidal Epithelium
  - c. Simple Columnar Epithelium
  - d. **Stratified Squamous Epithelium**
  - e. Stratified Cuboidal Epithelium
13. Rhinitis is an inflammation of what structure?
- a. **Mucosal membranes**
  - b. Sinuses
  - c. Nasal cavity
  - d. Pharynx
  - e. None of the above
14. Which of the following is NOT part of the bronchial tree?
- a. Primary bronchi
  - b. Terminal bronchioles
  - c. Alveolar sacs
  - d. Respiratory bronchioles
  - e. **Both C and D**
15. Which of the following is part of the Portal Triad? (Choose all that applies)

- a. Portal Vein
  - b. Portal Artery
  - c. Hepatic Vein**
  - d. Hepatic Artery**
  - e. Central Vein
  - f. Central Artery
  - g. None of the Above
16. Vaccination increases the number of
- a. different receptors that recognize a pathogen.
  - b. lymphocytes with receptors that can bind to the pathogen.**
  - c. epitopes that the immune system can recognize.
  - d. macrophages specific for a pathogen.
  - e. MHC molecules that can present an antigen.
17. Feces consists of... (Choose all that applies)
- a. Vitamins
  - b. Water**
  - c. Inorganic Salts**
  - d. Cells**
  - e. None of the Above
18. Which of the following is a respiratory control center in the brain?
- a. Pons
  - b. Medulla oblongata
  - c. Hypothalamus
  - d. Limbic system
  - e. Both A and B**
19. Which of the following is a term for a slippery, detergent-like fluid produced by cells in the alveoli that lowers the surface tension of alveolar fluid?
- a. Pleural fluid
  - b. Surfactant**
  - c. Plasma
  - d. Amniotic fluid
  - e. None of the above
20. Which of the following are enzymes in pancreatic juice? (Choose all that applies)
- a. Pancreatic Amylase**
  - b. Trypsin**
  - c. Chymotrypsin**
  - d. Carboxypeptidase**
  - e. Elastase**
21. Which of the following is a structure NOT in the lower respiratory system?
- a. Larynx
  - b. Pharynx**
  - c. Bronchi
  - d. Trachea
  - e. All of the structures above are in the lower respiratory system
22. How much is considered the vital capacity (VC) of the lungs?
- a. 3000-3300 mL
  - b. 1000-1200 mL
  - c. 4500-5000 mL**

- d. 5700-6200 mL
  - e. 2500-3500 mL
23. The Serosa is composed of:
- a. Simple Squamous Epithelium**
  - b. Simple Cuboidal Epithelium
  - c. Simple Columnar Epithelium
  - d. Stratified Squamous Epithelium
  - e. Stratified Cuboidal Epithelium
24. Which of the following is found in the Submucosa? (Choose all that applies)
- a. Enteric Nervous System**
  - b. Autonomic Nervous System
  - c. Myenteric Plexus
  - d. Submucosal Plexus**
  - e. None of the above
25. Which of the following is directly affected by HIV?
- a. Histamines
  - b. B cells
  - c. Bone marrows
  - d. Lymph nodes
  - e. CD4 cells**
26. Which of the following salivary glands are located in the tongue?
- a. Labial glands
  - b. Buccal glands
  - c. Palatal glands
  - d. Lingual glands**
  - e. Parotid glands
27. Cancer of the larynx is found almost exclusively in
- a. Individuals who smoke**
  - b. The mucous membrane
  - c. The ventricular folds
  - d. The vocal folds
  - e. None of these
28. In which layer of the parenchyma are lymphatic nodules found?
- a. Outer Cortex**
  - b. Inner Cortex
  - c. Medulla
  - d. Both B and C
  - e. All of the above
29. Which of the following is the space between the vocal folds of the glottis?
- a. Epiglottis
  - b. Arytenoid cartilages
  - c. Rima glottidis**
  - d. Thyroid cartilage
  - e. Mucous membrane
30. The word "hepatitis" is commonly referring to diseases of the
- a. Kidney
  - b. Liver**
  - c. Spleen

- d. Heart
  - e. Both b and c
31. The pharynx is composed of 3 parts. Which of these parts function in both the respiratory system and the digestive system? (Choose all that applies)
- a. Nasopharynx
  - b. Esopharynx
  - c. Oropharynx**
  - d. Laryngopharynx**
  - e. None of these
32. In which of the following stages of digestion does peristalsis occur? (Choose all that applies)
- a. Deglutition**
  - b. Voluntary Stage
  - c. Pharyngeal Stage
  - d. Esophageal Stage**
  - e. None of these
33. Which factors affect pulmonary ventilation? (Choose all that applies)
- a. Surface tension of alveolar fluid**
  - b. Surfactant
  - c. Compliance of the lungs**
  - d. Airway resistance**
  - e. Both A and C
34. Which of the following happens in response to injuries? (Choose all that applies)
- a. Vasodilation of arterioles**
  - b. The release of histamines by mast cells**
  - c. Formation of kinins from kininogens**
  - d. Increased permeability of capillaries**
  - e. Production of leukotrienes**
35. As you digest a cookie, portions of it pass through your alimentary canal. What is the correct order the cookie bolus will travel through between your esophagus and duodenum?
- a. Fundus, Cardia, Body, Pyloric Part
  - b. Cardia, Fundus, Body, Pyloric Part**
  - c. Body, Cardia, Fundus, Pyloric Part
  - d. Pyloric Part, Body, Fundus, Cardia
  - e. Pyloric Part, Cardia, Body, Fundus
  - f. None of the Above
36. Respiration includes which steps?
- a. Pulmonary ventilation (breathing)
  - b. External (pulmonary) respiration
  - c. Internal (tissue) respiration
  - d. Inhalation (inspiration)
  - e. Exhalation (expiration)
  - f. All of the above**
37. What is the correct order that cookie chyme will pass through in the Pyloric Part?
- a. Pyloric Antrum, Pyloric Sphincter, Pylorus**
  - b. Pyloric Antrum, Pylorus, Pyloric Sphincter
  - c. Pyloric Sphincter, Pyloric Antrum, Pylorus
  - d. Pyloric Sphincter, Pylorus, Pyloric Antrum
  - e. Pylorus, Pyloric Antrum, Pyloric Sphincter

- f. Pylorus, Pyloric Sphincter, Pyloric Antrum
  - g. None of the Above
38. Which of the following statements is *not* true?
- a. An antibody has more than one antigen-binding site.
  - b. An antigen can have different epitopes.
  - c. A pathogen makes more than one antigen.
  - d. A lymphocyte has receptors for multiple different antigens.**
  - e. A liver cell makes one class of MHC molecule.
39. Approximately how many alveoli is in the lungs of an average adult?
- a. 100 million
  - b. 200 million
  - c. 300 million**
  - d. 400 million
  - e. 500 million
40. What is the correct order that cookie bolus will pass through the Colon?
- a. Ascending Colon, Sigmoid Colon, Descending Colon, Transverse Colon
  - b. Descending Colon, Sigmoid Colon, Ascending Colon, Transverse Colon
  - c. Ascending Colon, Transverse Colon, Sigmoid Colon, Descending Colon
  - d. Descending Colon, Transverse Colon, Ascending Colon, Sigmoid Colon
  - e. None of the Above**
41. Which of the following is true of IgG?
- a. It's the least common type of macrophages
  - b. It deactivates during fetal development
  - c. It originates from the bone marrows
  - d. It enhances phagocytosis**
  - e. Both C and D
42. How much gastric juice is secreted per day?
- a. 20-30 mL
  - b. 200-300 mL
  - c. 2000-3000 mL**
  - d. 20000-30000 mL
  - e. None of the Above
43. What is the name of the substance that induces fever?
- a. Carcinogens
  - b. Antibodies
  - c. Pyrogens**
  - d. Zymogens
  - e. None of the above
44. What are the major functional cells of the liver?
- a. Canaliculi
  - b. Stellate Reticuloendothelial Cells
  - c. Hepatocytes**
  - d. Bile Cells
  - e. None of the Above
45. Which of the following immune organs is also an endocrine organ?
- a. Spleen
  - b. Intestine
  - c. Thymus**

- d. Thyroid
  - e. Lungs
46. These major functional cells of the liver form three-dimensional units called
- a. Canaliculi laminae
  - b. Stellate Reticuloendothelial laminae
  - c. Hepatic laminae**
  - d. Bile laminae
  - e. None of the Above
47. What is the partial pressure of oxygen in the air?
- a. 760 mmHg
  - b. 560 mmHg
  - c. 360 mmHg
  - d. 260 mmHg
  - e. 160 mmHg**
48. What is the correct order of the path bile takes as it leaves the liver?
- a. Bile canaliculi, Bile ductules, Bile ducts, Right/Left Hepatic Ducts, Common Hepatic Duct**
  - b. Bile ductules, Bile ducts, Bile canaliculi, Right/Left Hepatic Ducts, Common Hepatic Duct
  - c. Bile ducts, Bile ductules, Bile canaliculi, Common Hepatic Duct, Right/Left Hepatic Ducts
  - d. Bile canaliculi, Bile ducts, Bile ductules, Common Hepatic Duct, Right/Left Hepatic Ducts
  - e. None of the Above
49. Respiratory Epithelium is composed of
- a. Olfactory receptors, supporting cells, and basal cells
  - b. Pseudostratified ciliated columnar epithelium with goblet cells**
  - c. Nonkeratinized stratified squamous epithelium with cilia
  - d. Pseudostratified ciliated columnar epithelium with ciliated columnar cells, goblet cells, and basal cells
  - e. None of the above
50. Using the "N" in the TNM system for colorectal cancer, in which stage would the tumor have invaded 4-6 regional lymph nodes?
- a. N0
  - b. N1a
  - c. N1b
  - d. N1c
  - e. N2a**
  - f. N2b
51. What is another name for antibodies?
- a. Immunoglobulins**
  - b. Glycobulins
  - c. Immunoglycoprotein
  - d. Macrophages
  - e. Glycydicolin
52. Patient Cookie presents with symptoms of fatigue, abdominal discomfort, and joint pain. Which of the following conditions is most likely?
- a. Hepatitis A
  - b. Hepatitis B
  - c. Hepatitis C
  - d. Hepatitis D
  - e. Hepatitis E

- f. **Autoimmune Hepatitis**
  - g. Alcoholic Hepatitis
  - h. None of the Above
53. Patient Cookie has lied to you. She/He now presents with symptoms of yellowing of the eyes, abdominal pain, and dark urine. Which of the following conditions is most likely?
- a. Hepatitis A
  - b. **Hepatitis B**
  - c. Hepatitis C
  - d. Hepatitis D
  - e. Hepatitis E
  - f. Autoimmune Hepatitis
  - g. Alcoholic Hepatitis
  - h. None of the Above
54. Patient Cookie has lied to you again. She/He now presents with symptoms of pain near the belly button, nausea, vomiting, poor appetite, fever, and chills. Which of the following conditions is most likely?
- a. **Appendicitis**
  - b. Lactose Intolerance
  - c. Stomach Ulcers
  - d. Duodenal Ulcers
  - e. Hepatitis
55. If Patient Cookie has Stomach Ulcers, what can be a cause? (Choose all that applies)
- a. Lack of vitamins and/or minerals
  - b. Stress
  - c. **A bacterial infection**
  - d. A viral infection
  - e. **Long-term use of certain drugs**
56. Which of the following structures contains cilia? (Choose all that applies)
- a. **Nasopharynx**
  - b. **Trachea**
  - c. Alveoli
  - d. Oropharynx
  - e. All of the above
57. Which of the following is NOT an autoimmune disease?
- a. Psoriasis
  - b. Multiple Sclerosis
  - c. Grave's Disease
  - d. **Type II Diabetes**
  - e. All are autoimmune diseases
58. Using the "T" in the TNM system for colorectal cancer, in which stage would the tumor have grown into the muscularis propria?
- a. T0
  - b. T1
  - c. **T2**
  - d. T3
  - e. T4a
  - f. T4b
59. Which of the following structures contains goblet cells? (Choose all that applies)
- a. Nasal vestibule

- b. **Nasopharynx**
  - c. **Primary bronchi**
  - d. Alveolar ducts
  - e. **Trachea**
60. What makes isograft different from allograft?
- a. **It does not cause immune responses**
  - b. It transplants tissues/organs to the same person rather than someone else
  - c. It involves taking tissues from another animal
  - d. It only works on generable organs such as liver
  - e. It's the specific term for kidney transplant
61. H1N1 Influenza (flu) is also known as
- a. **Swine flu**
  - b. Seasonal influenza
  - c. Coryza
  - d. H3N2 flu
  - e. None of the above
62. In what does the pancreatic juices travel in to get from the pancreas to the small intestine? (Choose all that applies)
- a. **Pancreatic Duct**
  - b. Common Bile Duct
  - c. **Accessory Duct**
  - d. **Hepatopancreatic Ampulla**
  - e. It doesn't travel through anything, it diffuses.
63. The rate of pulmonary and systemic gas exchange depends on which factors?
- a. Partial pressure difference of the gases
  - b. Surface area available for gas exchange
  - c. Diffusion distance
  - d. Molecular weight and solubility of the gases
  - e. **All of the above**
64. What is the name of the cells that make up lymphatic tissues?
- a. L Cells
  - b. White Blood Cells
  - c. Lythommunocytes
  - d. **Lymphocytes**
  - e. Lytocytes
65. Collapse of a part of a lung (or rarely an entire lung) is called
- a. Pneumothorax
  - b. **Atelectasis**
  - c. Hemothorax
  - d. Pleurisy
  - e. None of the above
66. What is the correct order that cookie bolus will pass through the Small Intestine?
- a. Ileum, Duodenum, Jejunum
  - b. Ileum, Jejunum, Duodenum
  - c. Jejunum, Duodenum, Ileum
  - d. Jejunum, Ileum, Duodenum
  - e. Duodenum, Ileum, Jejunum
  - f. **Duodenum, Jejunum, Ileum**

- g. None of the Above
67. The Alveolar Wall contains: (Choose all that applies)
- a. Capillary endothelium
  - b. Type I alveolar cells**
  - c. Type II alveolar cells**
  - d. Epithelial basement membrane
  - e. Alveolar macrophages**
68. What is an inflammation?
- a. The damage to specific defense system
  - b. Tissue damages caused by allergic reactions
  - c. Nonspecific defense response to tissue damage**
  - d. Both A and B
  - e. None of the above
69. Which of the following is an exocrine gland cell that secretes its products into the stomach lumen? (Choose all that applies)
- a. Mucous Neck Cells**
  - b. Chief Cells**
  - c. Gastric Cells
  - d. Parietal Cells**
  - e. None of the Above
70. What do tumor antigens often indicate?
- a. The invasion of a carcinogen
  - b. The degradation of the nonspecific defense system
  - c. The transition of a normal cell to a cancerous cell**
  - d. The start of inflammation of an internal tissue
  - e. The body's invasion to a tumor

## Section II: Free Response (60 Pts)

1. List each of the different areas of the respiratory control centers and their location in the brain. (6 pts)

**Medullary rhythmicity area - Medulla oblongata**

**Pneumotaxic area - Pons**

**Apneustic area - Pons**

2. Chemically, saliva is 99.5% water and 0.5% solutes. List at least 5 of these solutes. (5 pts)

**Possible Correct Answers: Sodium, Potassium, Chloride, Bicarbonate, Phosphate, Urea and Uric acid, mucus, immunoglobulin, lysozyme, and Salivary Amylase.**

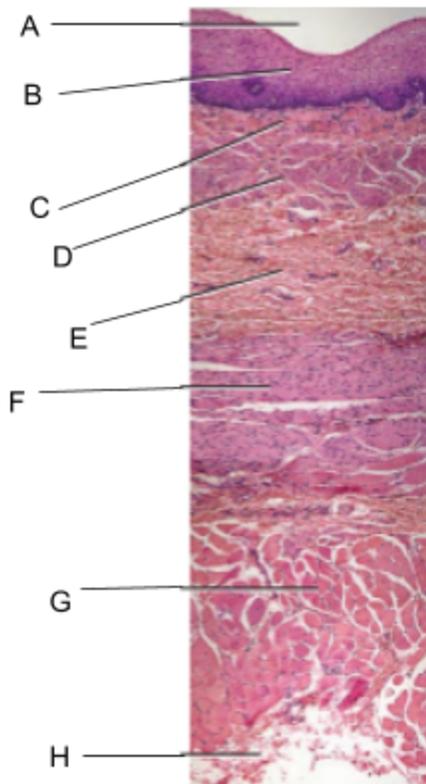
3. List the Extrinsic Muscles of the Tongue: (3 pts)

**Hyoglossus muscles, genioglossus muscles, and styloglossus muscles**

4. What is unique about the layers of the esophagus? (1 pt)

**The superficial layer is known as the adventitia rather than the serosa.**

5. Use the Following Diagram to answer the questions below. (8 pts)



Write what each letter is referring to in the diagram:

A: \_\_\_\_\_

B: \_\_\_\_\_

C: \_\_\_\_\_

D: \_\_\_\_\_

E: \_\_\_\_\_

F: \_\_\_\_\_

G: \_\_\_\_\_

H: \_\_\_\_\_

**A- Lumen of esophagus**

**B- Nonkeratinized Stratified Squamous Epithelium**

**C- Lamina Propria**

**D- Muscularis Mucosae**

**E- Submucosa**

**F- Muscularis**

**G- Muscularis**

**H- Adventitia**

6. Complete this table: (9 pts)

Enzyme	Source	Substrates	Products
Lingual Lipase	Salivary Glands	Starches	Maltose, maltotriose, and $\alpha$ -dextrins
Pepsin	Stomach Chief Cells	Triglycerides	Fatty Acids and Diglycerides
Pancreatic Amylase	Pancreatic acinar cells	Starches	Maltose, maltotriose, and $\alpha$ -dextrins
Carboxypeptidase	Pancreatic acinar cells	Amino acid at carboxyl end of peptides	Amino acids and peptides
Ribonuclease	Pancreatic acinar cells	Ribonucleic Acid	Nucleotides
Maltase	Small Intestine	Maltose	Glucose
Enterokinase	Small intestine	Trypsinogen	Trypsin
Aminopeptidase	Small intestine	Amino acid at amino end of peptides	Amino acids and peptides
Nucleosidases and Phosphatases	Small intestine	Nucleotides	Nitrogenous bases, pentoses, and phosphates

7. List the 3 types of White Blood Cells. Then, explain at least 2 functions of each IN DETAIL. (6 pts) (Proctor Note: do NOT score if answer to all 3 is "attack pathogen" or something like this)

- Neutrophils:** engulf bacteria and release chemicals that kill both the chemical and themselves; Phagocytosis; squeeze between cells in between walls of capillaries to attack pathogens; marks acute inflammation within moments of occurrence, etc.
- Macrophages:** ingest/kill pathogens, phagocytosis, clear dead cells/debris from body, release Cytokines to decrease immune reactions, etc.
- Natural Killer Cells:** attack cells infected with pathogens by puncturing cell membrane causing extracellular water to get into the cell (hypotonicity); detect/kill cancer cells, etc.

8. What is unique about the muscularis layer of the stomach? (1 pt)

**It is composed of 3 layers of smooth muscle rather than 2.**

9. Contrast Propulsion, Retropulsion, and Gastric Emptying. (3 pts)

**Propulsion is a process where each peristaltic wave moves contents from the body of the stomach into the antrum. Retropulsion is the process where food particles in the stomach that are too large to fit through the pyloric sphincter are forced back into the stomach. Gastric Emptying is when food particles pass through the pyloric sphincter as they are finally small enough to.**

10. Why doesn't Pepsinogen digest the stomach? (2 pts)

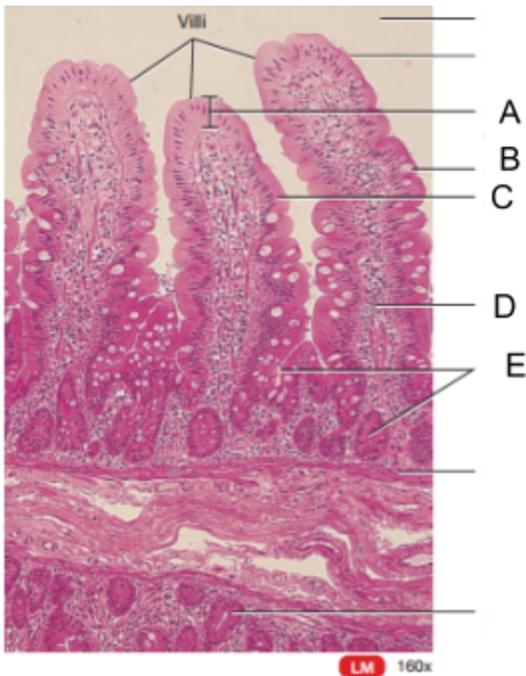
**Pepsin is in its inactive form until it is contact with hydrochloric acid. Also, stomach epithelial cells are protected by a layer of alkaline mucus.**

11. Define Hypoxia and describe its 4 types. (5 pts)

**Hypoxia - a deficiency of oxygen at the tissue level**

- 1. Hypoxic hypoxia: caused by a low partial pressure of carbon dioxide in arterial blood**
- 2. Anemic hypoxia: too little functioning hemoglobin is present in the blood, which reduces oxygen transport to tissue cells**
- 3. Ischemic hypoxia: blood flow to a tissue is so reduced that too little oxygen is delivered to it, even though partial pressure of oxygen and oxyhemoglobin levels are normal**
- 4. Histotoxic hypoxia: the blood delivers adequate oxygen to tissues, but the tissues are unable to use it properly because of the action of some toxic agent**

12. Use the Following Diagram to help you answer the Questions Below. (5 pts)



Write what each letter is referring to in the diagram:

A: \_\_\_\_\_

B: \_\_\_\_\_

C: \_\_\_\_\_

D: \_\_\_\_\_

E: \_\_\_\_\_

13. List and explain the 2 types of adaptive immunity (Specific Defense System). (4 pts)

**1. Cell-Mediated Immunity:** cytotoxic T cells directly attack invading antigens; particularly effective against (1) intracellular pathogens, which include any viruses, bacteria, or fungi that are inside cells; (2) some cancer cells; and (3) foreign tissue transplants, etc.

- 1. In a cellular infection, antigens are broken down by the cell and presented at the cell surface by class I MHC proteins.
- 2. T cells bind to the MHC detect antigens and undergo clonal selection, initiating the production of cytotoxic T cells and helper T cells.
- 3. Helper T cells bind to macrophages which are displaying marker combinations which signal with marks that they have engulfed a pathogen.
- 4. Helper T cells produce interleukins, communication chemicals, to stimulate T cell and B cell proliferation. This initiates a positive-feedback cycle, increasing the concentration of leukocytes in the area.

**2. Antibody-Mediated Immunity (accept *humoral immunity*):** B cells turn into plasma cells to synthesize antibodies; mainly work against extracellular pathogens, etc.

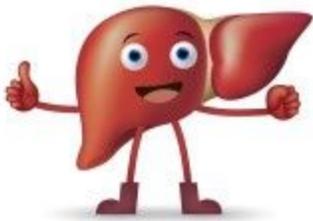
- 1. An antigen is engulfed by a phagocyte. It displays the antigen on its surface using a class II MHC protein.
- 2. B cells recognize the antigen and produce plasma cells, which release antibodies that bind with antigens or antigen-carrying pathogens.
- 3. B cells produce memory cells, providing future immunity.
- 4. Macrophages and helper T cells stimulate B cell production through cell-mediated response.

14. Patient Cookie now exhibit sketchy symptoms such as skin and joints inflammations that are distributed unevenly throughout the body. Many of its joints have turned red and started to swell. What disease do you think is displayed this time by Patient Cookie? What could possibly have caused it? And what should Patient Cookie do for treatment? (4 pts)

**It's Psoriatic Arthritis; It's most likely caused by genetic factors that cause decline in helper T cells, or possibly caused by stress; treated with nonsteroidal anti-inflammatory drugs, disease-modifying antirheumatic drugs, etc.**

Bonus Trivia for Finishing the Test:

The liver is the heaviest gland in the body and is the second only to the skin in size. It is also my favorite organ.



P.S. You will also kill your liver if you drink alcohol. Don't drink, kids.