Name: _____ Student I.D. _____

Bio 200 Fundamentals of Human Biology
Mid-term Exam
Wednesday, Mar. 8, 2017
Time Allotted: 70 minutes

Read the following questions very carefully. For each question, choose the correct answer. If more than one answer seems correct, choose the best possible answer. Only 1 answer will be accepted. (1 point per question)

1. The 4 biological macromolecules present in all living systems are:
   (a) nucleic acids, proteins, amino acids and lipids
   (b) carbohydrates, proteins, amino acids and lipids
   (c) nucleic acids, proteins, carbohydrates and lipids
   (d) triglycerides, proteins, amino acids and lipids

2. Deductive arguments:
   (a) assert that the conclusion follows necessarily from the truth of the premises
   (b) assert that if the premises are true, then the conclusion is usually true
   (c) assert that if the premises are true, then the conclusion must not be true
   (d) assert that the conclusion follows not necessarily, but only probably from the truth of the premises

3. In pharmaceutical drug testing, Phase 1 trials refer to:
   (a) testing the effect of the drug on rodents
   (b) testing to determine whether the drug is effective in curing the disease in question
   (c) testing how the drug compares to other drugs currently available for the disease
   (d) testing to determine whether the drug is safe for use in humans with the disease
   (e) testing to determine whether the drug is safe for use in healthy humans

4. Epidemiological studies refer to:
   (a) studies carried out in a laboratory
   (b) studies with both an experimental group and a control group
   (c) studies that involve looking at patterns that occur within large populations
   (d) none of the above

5. An atom that has 6 electrons:
   (a) can bind with 6 other atoms
   (b) can bind with 4 other atoms
   (c) can bind with 8 other atoms
   (d) none of the above

6. The number of elements on the planet earth are:
   (a) 20
   (b) 103
   (c) 1000
   (d) 203

7. Isotopes:
   (a) are atoms of a particular element that have different numbers of protons
   (b) are atoms of a particular element that have different numbers of neutrons
   (c) are atoms of a particular element that have different numbers of electrons
   (d) are atoms of a particular element that have no neutrons

8. Covalent bonds:
   (a) can be polar or nonpolar
   (b) occur when atoms share electrons in their outer shell
   (c) can be single, double or triple bonds
   (d) all of the above
   (e) none of the above

9. Ionic bonds:
   (a) are stronger than covalent bonds
   (b) are weaker than hydrogen bonds
   (c) can be single, double or triple bonds
   (d) form because of the tendency of atoms to form a complete outermost electron shell
   (e) all of the above

10. Single covalent bonds:
   (a) are stronger than double covalent bonds
   (b) are weaker than double covalent bonds
   (c) are stronger than triple covalent bonds
   (d) are weaker than triple covalent bonds
   (e) 2 of the above

11. The bonds within a water molecules are _____ and the bonds between water molecules are _____:
   (a) single covalent bonds; double covalent bonds
   (b) hydrogen bonds; single covalent bonds
   (c) triple covalent bonds; hydrogen bonds
   (d) hydrogen bonds; hydrogen bonds
   (e) single covalent bonds; hydrogen bonds

12. The following is true of an acid:
   (a) it has a higher pH than a base
   (b) it releases hydroxide ions (OH^-) when placed in water
   (c) it has a pH of greater than 7
   (d) it releases hydrogen ions (H^+) when placed in water
   (e) none of the above

13. Each reduction of pH by one unit represents:
(a) a ten-fold increase in the amount of H^+
(b) a ten-fold decrease in the amount of H^+
(c) a hundred-fold increase in the amount of H^+
(d) a hundred-fold decrease in the amount of H^+
(e) none of the above

14. The following statement is **NOT** true:
(a) a protein is a polymer of amino acid monomers linked together
(b) a carbohydrate is a polymer of glucose monomers linked together
(c) a protein is a polymer of glucose monomers linked together
(d) polymers are macromolecules consisting of repeating subunits called monomers
(e) DNA is a polymer of nucleic acid monomers linked together

15. When amino acid monomer subunits come together to form a peptide:
(a) water is incorporated in a condensation reaction
(b) water is released in a condensation reaction
(c) water is incorporated in a hydrolysis reaction
(d) water is released in a hydrolysis reaction

16. The following statement(s) is (are) false about saturated triglycerides:
(a) some of their carbon atoms share double bonds
(b) they are solids at room temperature
(c) they are composed of one molecule of glycerol and 3 fatty acids
(d) all of the above
(e) none of the above statements are false

17. The following statement about phospholipids is **NOT** true:
(a) They are the major components of cell membranes
(b) They are composed of a hydrophilic head and a hydrophobic tail
(c) Their heads are composed of a variable group, a phosphate group and glycerol
(d) Their tails are composed of 2 fatty acids
(e) They are composed of a hydrophobic head and a hydrophilic tail
~~(f) all of the above statements are not true~~

18. The following statement(s) is (are) **NOT** true:
(a) Human proteins contain 20 different amino acids
(b) Amino acids differ in their amino group
(c) Amino acids differ in their carboxyl group
(d) Amino acids have different side chains
(e) b and c
~~(f) all of the above~~

19. The following statement is **NOT** true:
(a) Enzymes speed up the rates of reactions
(b) Enzymes are highly specific
(c) Enzyme specificity is due to the unique shape of its active site, which is specific for its substrate
(d) Enzyme deficiencies can result in human diseases
(e) none of the above

20. The following statement is **NOT** true:
(a) DNA inside the cell contains the blueprint for the proteins that are formed inside that cell
(b) The genetic code is **universal**: the same genetic code exists in all organisms
(c) The order of DNA bases directs the order of amino acids in the protein
(d) DNA codes for RNA which codes for protein
(e) none of the above

21. The following statement about plasma membranes is **NOT** true:
(a) The lipid bilayer is interspersed with proteins, carbohydrates & cholesterol
(b) plasma membranes regulate the movement of substances into and out of the cell
(c) Receptors in the plasma membranes may bind to hormones secreted by other cells
(d) RNA is the nucleic acid found in plasma membranes
(e) Membrane glycoproteins are recognition molecules, allowing cells to recognize foreign invaders
~~(f) plasma membranes are selectively permeable~~

22. Net movement of water down a concentration gradient with assistance from a membrane protein through a selectively permeable membrane is:
(a) active transport
(b) simple diffusion
(c) facilitated diffusion
(d) pinocytosis
(e) exocytosis
~~(f) endocytosis~~

23. The organelle responsible for the synthesis of ATP is:
(a) the nucleus
(b) the rough endoplasmic reticulum
(c) the golgi apparatus
(d) the lysosome
(e) the mitochondrion

24. The nucleus is the organelle where:
(a) proteins are produced
(b) proteins are packaged
(c) ATP is synthesized
(d) most of the cells' DNA is located

25. The greatest amount of ATP is formed during which stage in the functioning of a cell?
(a) citric acid cycle
(b) transition reaction
(c) electron transport chain
(d) glycolysis
(e) none of the above

26. Glucose is broken down into two 3-carbon molecules during the _____ and this process takes place in the _____.
(a) glycolysis reaction; mitochondrion
(b) citric acid cycle; mitochondrion
(c) glycolysis reaction; cytosol
(d) electron transport chain reaction; cytosol
(e) electron transport chain reaction; mitochondrion

27. Mitochondria are the organelles where the following reactions take place:
(a) glycolysis, transition reaction, citric acid cycle, electron transport chain
(b) glycolysis, transition reaction, citric acid cycle
(c) transition reaction, citric acid cycle, electron transport chain
(d) none of the above

28. Human tissues come in 4 primary types:
(a) epithelial, connective, skeletal, muscular
(b) epithelial, connective, muscular, nervous
(c) epithelial, connective, reproductive, muscular
(d) epithelial, connective, skeletal, cartilage
(e) none of the above

29. The tissue that comes in 3 forms (squamous, cuboidal and columnar) is:
(a) epithelial tissue
(b) nervous tissue
(c) skeletal tissue
(d) muscular tissue
(e) reproductive tissue

30. Connective tissue consists primarily of:
(a) connective cells
(b) epithelial cells
(c) cells embedded in an extracellular matrix consisting of ground substance & protein fibers
(d) epithelial, muscle & nerve cells
(e) none of the above

31. Protein fibers are produced by _____.
(a) fibroblasts
(b) epithelial cells
(c) collagen
(d) keratin cells
(e) none of the above

32. The 3 types of protein fibers are: _____.
(a) collagen, cartilage and elastic
(b) collagen, elastic and reticular
(c) epithelial, elastic and reticular
(d) elastic, reticular and keratin
(e) none of the above

33. Muscle tissue comes in the following forms: _____.
(a) cardiac
(b) smooth
(c) skeletal
(d) all of the above
(e) none of the above

34. Smooth muscle cells are found:
(a) in muscles attached to bones
(b) in the walls of the heart
(c) in blood vessels
(d) in blood vessels and walls of the heart
(e) in muscles and walls of the heart
~~(f) none of the above~~

35. Neurons are _____ that consist of _____.
(a) neuroglia; 1 cell body, 1 dendrite and several axons
(b) dendrites; 1 cell body, 1 nerve cell and several axons
(c) nerve cells; 2 axons and 2 dendrites
(d) neuroglia; 1 cell body, 1 axon and several dendrites
(e) nerve cells; 1 cell body, 1 axon and several dendrites

36. The thoracic and abdominal cavities are separated by:
(a) the pericardium
(b) the diaphragm
(c) the pleural cavity
(d) the dorsal cavity
(e) none of the above

37. Membranes that line passageways that open to the exterior of the body are:
(a) serous membranes
(b) synovial membranes
(c) cutaneous membranes
(d) mucous membranes
(e) none of the above

38. The protective properties of the epidermis are due to:
(a) the presence of fibrin
(b) the presence of collagen
(c) the presence of keratin
(d) the presence of sweat glands
(e) the presence of wax glands

39. Nails are:
(a) living cells hardened by keratin
(b) dead cells hardened by keratin
(c) living cells hardened by collagen
(d) dead cells hardened by collagen
(e) none of the above

40. Oil glands:
(a) produce sweat to regulate body temperature
(b) secrete sebum, made up of lipids, cholesterol, proteins & salts
(c) are found all over the body except the palms of the hands and soles of the feet
(d) protect the nose and ears
(d) a and c
(e) b and c

41. Acne:
(a) is caused by poor hygeine
(b) is caused by poor diet
(c) occurs when a hair follicle is clogged with sebum
(d) occurs when a hair follicle is clogged with keratin
(e) all of the above

42. Skin cancers can be attributed to:
(a) exposure to the sun and UV radiation
(b) heredity
(c) poor diet
(d) there is no known cause
(e) a and b
~~(f) a and b and c~~

43. Homeostasis:
(a) is maintained primarily through positive feedback mechanisms
(b) is the ability to maintain absolute internal constancy despite changes in the surroundings
(c) is the ability to maintain a relatively stable internal environment despite changes in the surroundings
(d) none of the above

44. The body's temperature control center is located _____ called the _____.
(a) in a region of the brain; sensory effector
(b) in a region of the skin; hypodermis
(c) in a region of the skin; dermis
(d) in a region of the brain; hypothalamus
(e) none of the above

45. Negative feedback is a mechanism that serves to
(a) turn off effector signals once the normal state is reached
(b) turn on effector signals once the normal state is reached
(c) turn on effector signals despite the presence of the normal state
(d) none of the above

46. Intervertebral discs are smooth, lubricated pads of _____ that help cushion the bones of the vertebral column.
(a) keratin
(b) fibrokeratin
(c) fibrocartilage
(d) sacrum
(e) bone tissue

47. The bone in the upper portion of the arm is the:
(a) ulna
(b) radius
(c) femur
(d) tibia
(e) humerus

48. The thighbone is the:
(a) ulna
(b) radius
(c) femur
(d) tibia
(e) humerus

49. Osteoclasts are
(a) cells involved in the deposition of calcium & phosphorus into compact bone
(b) cells that break down bone when blood calcium levels are in excess
(c) cells that break down bone when blood calcium levels are below normal
(d) osteoblasts with multiple nuclei
(e) none of the above

50. Bone remodeling:
(a) is a life-long process that involves osteoclasts which break down bone and osteoblasts which build new bone
(b) is a lifelong process that involves osteoblasts which break down bone and osteoclasts which build new bone
(c) occurs only when bones are broken
(d) none of the above

51. Osteoporosis occurs when:
(a) the thyroid hormone calcitonin is overproduced
(b) the bone deposition process occurs faster than the breakdown of old bone
(c) the bone breakdown process occurs faster than the deposition of new bone
(d) none of the above

52: Joints that are freely moveable are:
(a) fibrous joints
(b) cartilaginous joints
(c) synovial joints
(d) all of the above

53: Damage to ligaments:
(a) can be called a sprain
(b) heal slowly due to the low supply of blood vessels
(c) occurs when someone gets osteoporosis
(d) a and b

54: Rheumatoid arthritis:
(a) is an autoimmune disease
(b) is characterized by inflammation of the synovial membrane with accumulation of synovial fluid in the joint causing swelling, pain, and stiffness
(c) can destroy cartilage and be replaced by fibrous connective tissue
(d) all of the above
(e) none of the above

55. Which of the following is NOT a characteristic of cardiac muscles?
(a) they are striated
(b) they are found only in the heart
(c) involuntary muscle contractions
(d) never fatigue
(e) all of the above are characteristics of cardiac muscles

56. Smooth muscles are found in the:
(a) digestive system
(b) respiratory system
(c) circulatory system
(d) a and b
(e) all of the above

57. Word association. For each of the 28 words below, put an x in the box corresponding to the category best corresponds to the meaning of the word. Only 1 x per word. (10 points)

		DNA	Protein	Carbohydrate	Lipid
1	active site		x		
2	adenine	x			
3	amino acid		x		
4	bilayer				x
5	cholesterol				x
6	cytosine	x			
7	disaccharide			x	
8	double helix	x			
9	enzyme		x		
10	fatty acid				x
11	gene	x			
12	glucose			x	
13	glycerol				x
14	glycogen			x	

		DNA	Protein	Carbohydrate	Lipid
15	guanine	x			
16	heredity	x			
17	hydrophobic				x
18	nucleic acid	x			
19	nucleotide	x			
20	oil				x
21	peptide bond		x		
22	polypeptide		x		
23	steroid				x
24	starch			x	
25	substrate		x		
26	sugar-phosphate	x			
27	thymine	x			
28	unsaturated				x

58. Word classification: For each of the 18 words listed below, they can be classified by placing an x in the box corresponding to as group A, group B, or both Group A & Group B. (5 points)

		prokaryote only	eukaryote only	BOTH
1	bacterial cell	x		
2	blood cell		x	
3	bone cell		x	
4	citric acid cycle		x	
5	DNA			x
6	electron transport chain		x	
7	human cell		x	
8	internal membranes		x	
9	mitochondria		x	
10	muscle cell		x	
11	nucleus		x	
12	organelle		x	
13	plant cell		x	
14	plasma membrane			x
15	proteins			x
16	sperm		x	
17	osteon		x	
18	*Homo sapiens*		x	

59. Short answer questions

a. Describe the Sliding Filament Model of muscle contractions. Be sure to use key terms including: actin, myosin, thick and thin filaments, ATP, sarcomere. Use of a diagram is also acceptable. (4 points)

The sliding filament model is a mechanism of muscle contraction in which the myofilaments – actin or thin filaments and myosin or thick filaments – slide across one another, causing the sarcomere to shorten. When enough sarcomeres shorten, the entire muscle will contract. First, myosin heads hydrolyze ATP into ADP and Pi to become energized. The myosin heads then bind to actin, forming a crossbridge. The myosin heads then rotate toward the center of the sarcomere pulling actin toward the midline of the sarcomere. A new ATP molecule then binds myosin, detaching the crossbridge and allowing the cycle to being again.

b. Explain how nerve impulses and calcium ions influence muscle contractions. (3 points)

A nerve impulse (stimulus) leads to the release of calcium ions. A nerve impulse reaches the neuromuscular junction (between the motor neuron and the muscle cell). Acetylcholine (a neurotransmitter) is released from the motor neuron and diffuses across the synaptic cleft and binds to receptors on the muscle cell creating an electrochemical message. This message travels along the muscle cell's plasma membrane, into T-tubules and then to the sarcoplasmic reticulum causing the release of calcium ions. The calcium ions then bind to troponin-tropomyosin on the actin filament, exposing the myosin-biding site and allowing for the myosin heads to bind to actin leading to the sliding filament model and a muscle contraction.

c. _____ muscles are those that must contract at the same time to accomplish the same body movement, while _____ are muscle pairs that when one contracts the other relaxes. (2 points)

Synergistic; antagonistic pairs