BMD 334 **Name _____**
PRACTICE EXAM 1
SAMPLE 3 **Student ID # _____**

1. **What is the primary mechanism for maintaining homeostasis?**
   a) Teleological approach
   b) Mechanistic approach
   c) Positive feedback
   d) Negative feedback

2. **The internal compartment (lumen) of which of the following is considered outside the body?**
   a) Respiratory tract
   b) Circulatory system
   c) Gastrointestinal tract
   d) A and C
   e) All of the above

3. **Which of the following is an example of an intrinsic control system?**
   a) If the filtration rate of the kidneys increases, the kidneys release a chemical signal that decreases blood flow to the kidneys, which in turn reduces the filtration rate.
   b) If blood pressure increases above normal, baroreceptors in major arteries detect the change and send signals to the brain. Certain areas of the brain then send signals to the nerves that control the heart and blood vessel to make the heart beat slower and the blood vessels increase in diameter, which in turn reduces the blood pressure.
   c) Both A and B are intrinsic control systems
   d) Neither A nor B are intrinsic control systems

4. **Which of the following is the strongest chemical bond?**
   a) Covalent bond
   b) Hydrogen bond
   c) Ionic bond
   d) Van der Waals forces

5. **Which of the following is least likely to dissolve in water?**
   a) HCl
   b) NaCl
   c) Glucose ($C_6H_{12}O_6$)
   d) Cholesterol
   e) A strong acid

6. **Which of the following is a product of the Krebs cycle per acetyl CoA?**
   a) 1 ATP
   b) 12 ATP
   c) 3 NADH
   d) A and C
   e) B and C

7. Where inside a cell is glycogen stored?

a) Mitochondria
b) Inclusions
c) Cytosol
d) Golgi apparatus
e) Smooth endoplasmic reticulum

8. What type of protein filament supports the formation of microvilli?

a) Microfilaments
b) Intermediate filaments
c) Microtubules

9. In the liver, detoxifying enzymes are localized in what organelle?

a) Lysosomes
b) Peroxisomes
c) Smooth endoplasmic reticulum
d) Golgi apparatus
e) Mitochondria

10. How are the structures of DNA and RNA different?

a) Only DNA contains more than one nucleotide chain.
b) DNA contains 5 different bases associated with the nucleotides, whereas RNA contains only 4.
c) Only DNA follows the Law of Complementary Base Pairing.
d) A and C
e) All of the above

11. Which of the following statements correctly describes an exergonic reaction?

a) Energy is released by the forward reaction.
b) The reaction is thermodynamically favorable – that is, it will proceed in the forward direction.
c) The free energy of the reactants exceeds the free energy of the products.
d) A and C
e) All of the above

12. Enzymes are what class of molecule?

a) Nucleic acids
b) Proteins
c) Carbohydrates
d) Lipids

13. Some enzymes require trace metals to function as cofactors. Why?

a) Trace metals must be present in the enzyme in order for the enzyme to bind substrate.
b) Trace metals are necessary for the transfer of electrons between substrates.
c) Trace metals are necessary for the transfer of chemical groups between substrates.
d) A and C
e) All of the above

14. In allosteric modulation, the modulator molecule

a) binds to the catalytic site of the enzyme.
b) binds to the regulatory site of the enzyme.
c) binds to the enzyme by weak, reversible interactions.
d) A and C
e) B and C

15. The enzyme that converts glucose-6-P to glucose is found in which of the following organs/tissue?

a) Skeletal muscle
b) Cardiac muscle
c) Liver
d) Adipose tissue
e) All of the above

16. Which of the following is a mechanism to regulate enzyme-catalyzed reactions?

a) End-product inhibition
b) Covalent modulation
c) Compartmentation of enzymes within cells
d) Varying the concentration of enzyme
e) All of the above

17. Which of the following metabolic pathways synthesizes ATP by substrate phosphorylation?

a) Citric acid cycle (aka Krebs cycle or tricarboxylic acid cycle)
b) Electron transport system
c) Glycolysis
d) A and C
e) All of the above

18. Under anaerobic conditions, what is pyruvate (produced by glycolysis) converted to and where does this occur?

a) Acetyl coenzyme A in the mitochondria
b) Acetyl coenzyme A in the cytosol
c) Lactate in the mitochondria
d) Lactate in the cytosol
e) Fatty acid in the cytosol

19. Which of the following enzymes catabolizes proteins to amino acids?

a) Proteases
b) Protein kinases
c) Peptidases
d) A and C
e) All of the above

20. Where are triglycerides stored?

a) Skeletal muscle
b) Adipose tissue
c) Liver
d) Brain

21. How many acetyl coenzyme A molecules can be produced by beta oxidation of a 24 carbon fatty acid?

a) 4
b) 6
c) 8
d) 12
e) 24

22. The portion of DNA that codes for a particular protein is called a _____.

a) nucleotide
b) gene
c) triplet
d) codon
e) promoter sequence

23. The mRNA codon is complementary to the DNA

a) leader sequence
b) promoter sequence
c) triplet
d) gene
e) nucleotide

24. Which of the following molecules cannot readily cross the lipid bilayer of cell membranes?

a) Glucose
b) Fatty acids
c) Oxygen
d) Water

25. Which of the following molecules are amphipathic?

a) Phospholipids
b) Integral membrane proteins
c) Both A and B are amphipathic
d) Neither A nor B are amphipathic

26. The layer of carbohydrates on the external surface of a cell is call what?

a) Inclusion
b) Glycocalyx
c) Glycogen
d) Glycolipid
e) Desmosome

27. Which of the following properties is characteristic of all 3 of the following: enzyme, receptors, and carrier proteins?

a) Specificity to a given molecule or class of molecules
b) Competition between molecules
c) Saturation
d) A and C
e) All of the above

28. Which of the following statements about the Ca-ATPase is false?

a) Ca-ATPases on the plasma membrane transport calcium out of the cell.
b) Ca-ATPases on organelle membranes transport calcium out of the organelle.
c) The affinity of all Ca-ATPases is greater for calcium on the surface facing the cytosol.
d) ATP is the direct energy source for moving calcium by the Ca-ATPase.
e) The Ca-ATPase carrier is an example of an uniport carrier protein.

29. When a white blood cell engulfs a bacterium to protect the body, this is an example of ___.

a) Phagocytosis
b) Pinocytosis
c) Receptor-mediated endocytosis
d) Exocytosis
e) Transcytosis

30. Which of the following statements about osmosis is true?

a) Water will diffuse from high water concentration to low water concentration, just like solutes do.
b) Water will diffuse from high solute concentration to low solute concentration.
c) Permeating solutes do not exert an osmotic force for water movement.
d) A and C
e) All of the above

Short answer questions. Answer the following questions directly on the exam as indicated. Your answers must be legible to receive credit. PRINT if necessary.

31. (2 points) Name the 2 tissue types that are being described below. Put your answers in the appropriate blanks.

_____ This tissue is specialized for transport and exchange of material.

_____ This tissue is a major component of bone, ligaments, and blood.

32. (2 points) What is the driving force for diffusion of non-charged molecules?

33. (5 points) Fill in the blanks with the correct number and circle the correct word in brackets to complete the following phrase accurately.

The Na/K-ATPase is an example of [primary or secondary] active transport. This pump transports _____ sodium ions [into or out of] the cell and _____ potassium ions [into or out of] the cell per ATP.

34. (3 points) What chemical groups are transferred by the following coenzymes?

NAD _____

FAD _____

Coenzyme A _____

35. (8 points) Match the following metabolic pathways with the location of where it occurs in the cell. Put the letter that corresponds to the correct site in the blank in front of the metabolic pathway. An answer may be used more than once or not at all. There is only one answer per blank.

A) Nucleus B) Rough ER C) Smooth ER D) Free ribosomes
E) Golgi apparatus F) Lysosome G) Peroxisome H) Mitochondrial matrix
I) Mitochondrial intermembrane space J) Inner mitochondrial membrane
K)Cytosol

_____ Transcription

_____ Glycolysis

_____ Citric acid cycle (aka Krebs cycle or tricarboxylic acid cycle)

_____ Synthesis of proteins (polypeptide chain) to be subsequently packaged into vesicles

_____ Beta oxidation of fatty acids

_____ Lipolysis

_____ Electron transport system

_____ Triglyceride synthesis

36. (3 points) Match the type of cell junction to its description.

A. gap junctions B. tight junctions C. desmosomes

_____ These appear as plaques in electron micrographs, just inside the cell membrane where two cells join. Intermediate filaments penetrate the membranes in skin and lining tissues to resist stretching and twisting.

_____ These junctions are found in epithelial tissue where they help determine what substances can pass from lumen to extracellular fluid or extracellular fluid to lumen.

_____ These junctions allow molecules and ions to pass into adjacent cell's cytoplasms along channels. This is especially important for rapid signal transference in cardiac muscle, smooth muscle and certain nerves.

37. (3 points) Answer the following questions.

How many ATP are formed by oxidative phosphorylation per NADH supplying electrons to the electron transport system?

How many ATP are formed by oxidative phosphorylation per $FADH_2$ supplying electrons to the electron transport system?

Why is there a difference?

38. (3 points) Name or describe the three mechanisms for opening or closing gated ion channels.

39. (4 points) Match the enzymes to their functions. Put the letter corresponding to the correct enzyme in the appropriate blank.

A. RNA polymerase B. Protein kinase C. ATP synthase
D. Catalase

_____ Found in peroxisomes

_____ Catalyzes formation of bonds between nucleotides in mRNA

_____ Catalyzes synthesis of ATP by oxidative phorphorylation

_____ Catalyzes addition of a phosphate group to a protein

40. (7 points) A solution is made by mixing 20 gm NaCl with water for a final volume of 1 liter. The molecular weight of NaCl is 58. Answer the following questions.

What is the concentration of this solution in weight percent?

What is the osmolarity of this solution?

A cell that is impermeable to all ions is placed in this solution. Will the cell swell, shrink, or not change volume? Explain.