Section 1
Answer questions 1 – 40 on the scan sheet.

1. Which of the following is **NOT** considered to be a solute of the body?
   a. sodium (Na⁺)
   b. water
   c. glucose
   d. guanine
   e. triglycerides

2. Which of the following cell membrane transport mechanisms requires integral membrane proteins to occur?
   a. Exocytosis
   b. Phagocytosis
   c. Simple diffusion
   d. Receptor-mediated endocytosis
   e. all of the above

3. The movement of substances out of the cell by way of vesicular transport is called ____________.
   a. phagocytosis
   b. bulk-phase endocytosis
   c. replication
   d. osmosis
   e. exocytosis

4. The movement of extracellular fluid into the cell by the process of vesicular transport is called ____________.
   a. exocytosis
   b. receptor mediated endocytosis
   c. pinocytosis
   d. phagocytosis
   e. transcytosis

5. Symport:
   a. describes the movement of water against its concentration gradient.
   b. describes the movement of two molecules in the same direction.
   c. across the cell membrane does not require integral proteins.
   d. is demonstrated by the simultaneous movement of calcium out of the cell and sodium into the cell.
   e. is necessary for the movement of lipids into the cell.

6. Passive transport:
   a. describes a molecule that moves from a region of high concentration to low concentration.
   b. generates potential energy because the concentration gradient for a particular molecule will increase.
   c. is an energy requiring process.
   d. is the only way molecules can enter or exit the cell.
   e. a and d
7. Which of the following will cause an increase in the rate of diffusion of a molecule?
   a. a decrease in the concentration gradient of the molecule
   b. a decrease in the size of the molecule
   c. a decrease in the temperature of the environment of the molecules
   d. a and b
   e. b and c

8. The diffusion of a substance will stop when _______________ is reached.
   a. homeostasis
   b. equilibrium
   c. a concentration gradient
   d. a steady state
   e. body temperature

9. Which of the following terms best describes the passive movement of a non-polar (lipophilic) molecule across a cell membrane?
   a. primary active transport
   b. secondary active transport
   c. osmosis
   d. simple diffusion
   e. facilitated diffusion

10. Which of the following substances requires a transporting protein to move through the plasma membrane?
    a. a monosaccharide
    b. Na+
    c. water
    d. an amino acid
    e. all of the above

11. Which of the following is a result of a cell that is submerged into a hypertonic solution?
    a. The shape and size of the cell will not change.
    b. The cell will swell.
    c. The cell will shrink.
    d. Water will diffuse into the cell.
    e. None of the above

12. Active transport
    a. establishes a gradient of a substance across the cell membrane.
    b. requires the expenditure of energy.
    c. requires an integral membrane protein.
    d. opposes the tendency of a substance to reach equilibrium.
    e. all of the above.

13. What type of energy is used in the process of primary active transport?
    a. Heat
    b. Electric
    c. Chemical
    d. Light
    e. Nuclear
14. Which of the following molecules is hydrolyzed in the primary active transport of a molecule across the cell membrane?
   a. Glucose  
   b. Alanine  
   c. Adenine  
   d. Adenosine triphosphate  
   e. H₂O

15. In the process of secondary active transport:
   a. one molecule is moved up (against) its concentration gradient as another molecule moves down (with) its concentration gradient.  
   b. two molecules are moved up (against) their concentration gradients.  
   c. ATP hydrolysis is directly involved in the movement of the molecules.  
   d. two molecules are moved down (with) their concentration gradients.  
   e. the molecules that are transported must move in the same direction.

16. Which of the following terms correctly describes the Na⁺,K⁺-ATPase?
   a. integral membrane protein  
   b. channel  
   c. uniport  
   d. secondary active transport  
   e. all of the above

17. Which enzyme is directly responsible for the synthesis of a molecule of mRNA?
   a. DNA polymerase  
   b. helicase  
   c. RNA polymerase  
   d. histones  
   e. RNA synthase

18. A molecule of tRNA:
   a. instructs the nucleus to make a protein.  
   b. has an amino acid attached at one end.  
   c. is used to make a molecule of DNA.  
   d. converts glucose into ATP.  
   e. contains the nucleotide thymine.

19. The synthesis of a protein by a ribosome:
   a. takes place in the nucleus of a cell.  
   b. requires 2 types of RNA, messenger and transfer.  
   c. links monosaccharides together through peptide bonds.  
   d. is called transcription  
   e. c and d

20. A _______ is a portion of a DNA molecule which provides the complete instructions to build one single protein.
   a. triplet  
   b. codon  
   c. anticodon  
   d. gene  
   e. polypeptide
21. Which of the following is NOT required or produced during transcription?
   a. DNA
   b. tRNA
   c. RNA polymerase
   d. mRNA
   e. codons

22. If one of the 2 strands of DNA had a sequence of TAGGATAACCA, what would be the sequence of a complementary strand of mRNA?
   a. UAGGAUACGA
   b. AGGATAACCAT
   c. AUCCUAUGGU
   d. ACCAUAGGAU
   e. ATCCTATGGT

23. How many nucleotides are “read” at a time to determine the sequence of amino acids in a protein?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5

24. Which of the following is NOT required or produced during translation?
   a. DNA
   b. tRNA
   c. ribosome
   d. mRNA
   e. codons

25. The process of translation refers to:
   a. the synthesis of a molecule of DNA from a molecule of RNA.
   b. the synthesis of a molecule of RNA from a protein.
   c. the synthesis of a molecule of RNA from a molecule of DNA.
   d. the synthesis of a molecule of DNA from another molecule of DNA.
   e. the synthesis of a protein from a molecule of RNA.

26. During the cell cycle, the process of nuclear division is called:
   a. meiosis.
   b. mitosis.
   c. hydrolysis.
   d. the G1 phase.
   e. the interphase.

27. When during the cell cycle does the process of DNA replication occur?
   a. Interphase
   b. Prophase
   c. Cytokinesis
   d. Mitosis
   e. Metaphase
28. Which of the following occurs during the Interphase?
   a. The chromosomes align along the equator (center) of the cell.
   b. The centrioles move toward opposite poles of the cell.
   c. The cell increases in size.
   d. The chromosomes are pulled toward opposite poles of the cell.
   e. The process of cytokinesis.

29. Which of the following statements is correct regarding the process of DNA replication?
   a. The enzyme DNA polymerase accomplishes the process.
   b. It is considered to be semiconservative.
   c. The process creates an exact copy of a double-stranded molecule of DNA.
   d. The 2 complementary strands of DNA must be separated from one another.
   e. All of the above are true.

30. Which of the following is the correct sequence of stages during the division of the nucleus?
   a. prophase → anaphase → metaphase → telophase
   b. metaphase → anaphase → prophase → telophase
   c. prophase → telophase → metaphase → anaphase
   d. anaphase → metaphase → prophase → telophase
   e. prophase → metaphase → anaphase → telophase

31. Which of the following represents the complete catabolism of glucose during cellular respiration?
   
   \[ A + B → C + D \]
   a. \( A = 6 \text{ H}_2\text{O}, B = \text{C}_6\text{H}_12\text{O}_6, C = 6 \text{ O}_2, D = 6 \text{ CO}_2 \)
   b. \( A = 6 \text{ CO}_2, B = 6 \text{ H}_2\text{O}, C = 6 \text{ O}_2, D = \text{C}_6\text{H}_12\text{O}_6 \)
   c. \( A = 6 \text{ O}_2, B = \text{C}_6\text{H}_12\text{O}_6, C = 6 \text{ H}_2\text{O}, D = 6 \text{ CO}_2 \)
   d. \( A = \text{C}_6\text{H}_12\text{O}_6, B = 6 \text{ CO}_2, C = 6 \text{ O}_2, D = 6 \text{ H}_2\text{O} \)
   e. \( A = \text{C}_6\text{H}_12\text{O}_6, B = 6 \text{ H}_2\text{O}, C = 6 \text{ O}_2, D = 6 \text{ CO}_2 \)

32. During the phase of glycolysis how many molecules of ATP are used (hydrolyzed)?
   a. 0
   b. 1
   c. 2
   d. 3
   e. 4

33. During glycolysis:
   a. 2 molecules of ATP are hydrolyzed.
   b. 2 molecules of CO\(_2\) are produced.
   c. Hydrogen and oxygen atoms are combined to form water.
   d. a and b
   e. a, b and c

34. The ability of a cell to convert pyruvic acid to Acetyl-CoA depends upon the presence of __________.
   a. ATP
   b. oxygen
   c. sunlight
   d. lactic acid
   e. carbon dioxide
35. During the conversion of a molecule of pyruvic acid to acetyl CoA, a decarboxylation reaction occurs releasing carbon in the form of __________.
   a. H₂CO₃ (carbonic acid)
   b. CO₂ (carbon dioxide)
   c. CO (carbon monoxide)
   d. C₆H₁₂O₆ (acetic acid)
   e. HCO₃ (bicarbonate)

36. How many molecules of ATP are produced from a single molecule of acetyl CoA that is used in the reactions of the Krebs cycle?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5

37. The process of oxidative phosphorylation alone is responsible for synthesizing _____ of _____ molecules ATP for the complete catabolism of a single molecule of glucose.
   a. 2 of 34
   b. 4 of 34
   c. 19 of 38
   d. 34 of 38
   e. 30 of 34

38. The first enzyme complex of the electron transport chain converts hydrogen atoms into ______ and ______.
   a. a proton, an electron
   b. a proton, a neutron
   c. an electron, water
   d. a proton, water
   e. an electron, oxygen

39. The activity of the enzyme ATP synthase uses the energy stored in __________ to create a molecule of ATP.
   a. a sodium ion gradient
   b. a potassium ion gradient
   c. a proton gradient
   d. an oxygen gradient
   e. an osmotic gradient

40. Which of the following is the function of oxygen during cellular respiration?
   a. It binds carbon atoms during glycolysis to make CO₂.
   b. It is used to transport pyruvic acid into the matrix of the mitochondria.
   c. It is used as an enzyme to convert glucose into fructose.
   d. It is used to accept electrons from the last enzyme complex of the electron transport chain to make molecules of water.
   e. None of the above.
Section 2
Answer the true/false questions 41 – 55 on the scan sheet (A = True, B = False).

41. “Gated” channels are always open allowing a constant movement of a substance across a cellular membrane down its concentration gradient.

42. Proteins are secreted out of a cell by osmosis.

43. If the intracellular solute concentration is greater than the extracellular solute concentration, the cell will shrink.

44. The Na+, K+-ATPase functions as a symporter.

45. Pinocytosis literally translates to “cell eating”.

46. Carriers change shape when moving substances across the cell membrane.

47. Osmosis is a form of passive transport.

48. Either (both) of the strands in a molecule of DNA can be used for the process of protein synthesis.

49. TAG and GTC are examples of codons.

50. A cell’s mitochondria is responsible for creating the mitotic spindle fibers during mitosis.

51. At the end of cellular respiration 6 molecules of water are synthesized for each molecule of glucose used.

52. Most of the carbon dioxide produced during cellular respiration occurs during glycolysis.

53. During anaerobic fermentation, pyruvic acid is converted to glucose.

54. A molecule of acetyl Co A contains 4 atoms of carbon.

55. During anaerobic fermentation, pyruvic acid is converted to glucose.