1. What is a similarity between all bacteria and plants?
   A) They both have a nucleus
   B) **They are both composed of cells**
   C) They both have chloroplasts
   D) They both lack a cell wall

2. Which sequence of terms is in the correct order from simplest to most complex?
   A) cells → tissues → organs → organ systems
   B) tissues → organisms → cells → organ systems
   C) cells → tissues → organisms → organs
   D) organs → organisms → organ systems → cells

3. The cell theory states that
   A) all cells have nuclei that contain genetic information
   B) **living organisms are composed of cells that arise from preexisting cells**
   C) all cells regenerate and contain the same basic structures
   D) organisms that lack certain organelles reproduce by binary fission

4. Which structure is best observed using a compound light microscope?
   A) a cell
   B) a virus
   C) a DNA sequence
   D) the inner surface of a mitochondrion

5. Which cell structures are correctly paired with their functions?
   A) The mitochondria produce enzymes, and ribosomes transport them.
   B) **The ribosomes make proteins, and the nucleus stores genetic information.**
   C) The cell membrane make enzymes, and cytoplasm transports them.
   D) The vacuole stores genetic information, and chloroplasts make proteins.

6. The diagram below represents changes in the sizes of openings present in leaves as a result of the actions of cells X and Y.

   The actions of cells X and Y help the plant to
   A) maintain homeostasis by controlling water loss
   B) store excess heat during the day and remove the heat at night
   C) absorb light energy necessary for cellular respiration
   D) detect changes in the biotic factors present in the environment

7. The letters in the diagram below indicate some parts of a cell.

   The function of which cell part is most similar to that of the human excretory system?
   A) A    B) B    C) C    D) D
8. Which row in the chart below contains a cell structure paired with its primary function?

<table>
<thead>
<tr>
<th>Row</th>
<th>Cell Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>ribosome</td>
<td>protein synthesis</td>
</tr>
<tr>
<td>(2)</td>
<td>vacuole</td>
<td>production of genetic information</td>
</tr>
<tr>
<td>(3)</td>
<td>nucleus</td>
<td>carbohydrate synthesis</td>
</tr>
<tr>
<td>(4)</td>
<td>mitochondrion</td>
<td>waste disposal</td>
</tr>
</tbody>
</table>

A) 1  B) 2  C) 3  D) 4

9. Within which structure shown in the diagram below are energy-rich organic compounds used to produce ATP?

A) 1  B) 2  C) 3  D) 4

10. The diagram below represents a cell.

Which statement concerning ATP and activity within the cell is correct?

A) The absorption of ATP occurs at structure A.
B) The synthesis of ATP occurs within structure B.
C) ATP is produced most efficiently by structure C.
D) The template for ATP is found in structure D.

11. Which organelle is the site of cellular respiration?

A) endoplasmic reticulum  B) mitochondria  C) ribosomes  D) chloroplast function

12. Which organelle is correctly paired with its function?

A) nucleus — provides carbohydrates for fermentation
B) chloroplast — serves as a site for photosynthesis
C) centriole — synthesizes digestive enzymes
D) lysosome — packages cellular products

13. Which organelles must be present within a cell of a geranium leaf for respiration and photosynthesis to occur?

A) cell wall and lysosome
B) mitochondrion and chloroplast
C) centrosome and nucleus
D) endoplasmic reticulum and ribosome

14. Base your answer to the following question on the diagram below which represents a typical green plant cell and on your knowledge of biology.

Which structure is chiefly composed of a nonliving material known as cellulose?

A) A  B) B  C) C  D) D
15. Base your answer to the following question on Which metabolic process is most closely associated with the organelle represented in the diagram below?

A) intracellular digestion  B) aerobic respiration  
C) synthesis of glycogen  D) hydrolysis of lipids

16. Base your answer to the following question on Which cellular organelle is represented by the diagram below?

A) cell wall  B) molecules  
C) plasma membrane  D) protein

17. Base your answer to the following question on Which structures in the diagram below enable the observer to identify it as a plant cell?

A) A and B  B) B and C  
C) A and C  D) B and D

18. Which sequence represents the levels of biological organization from smallest to largest?

A) organism → cell → tissue → organelle → organ system → organ  
B) organ system → organ → organism → cell → tissue → organelle  
C) organelle → organ system → cell → organism → tissue → organ  
D) organelle → cell → tissue → organ → organ system → organism

19. Which statement describes starches, fats, proteins, and DNA?

A) They are used to store genetic information.  
B) They are complex molecules made from smaller molecules.  
C) They are used to assemble larger inorganic materials.  
D) They are simple molecules used as energy sources.

20. Base your answer to the following question on The diagram below represents a biological process

Which set of molecules is best represented by letters A and B?

A) A: oxygen and water  B: glucose  
B) A: glucose  B: carbon dioxide and water  
C) A: carbon dioxide and water  B: glucose  
D) A: glucose  B: oxygen and water

21. In a chemical analysis of a sample of animal tissue, which element would most likely be found in the smallest quantity?

A) glucose (C₆H₁₂O₆)  B) carbon dioxide (CO₂)  
C) ethane (C₂H₆)  D) stearic acid (C₁₈H₃₆O₂)

22. Which compound is inorganic?

A) hydrogen and oxygen  B) nitrogen and oxygen  
C) nitrogen and carbon  D) hydrogen and carbon

23. Which elements are present in all organic compounds?

A) hydrogen and oxygen  B) nitrogen and oxygen  
C) nitrogen and carbon  D) hydrogen and carbon

24. Which statement best describes enzymes?

A) Every enzyme controls many different reactions.  
B) The rate of activity of an enzyme might change as pH changes.  
C) Temperature changes do not affect enzymes.  
D) Enzymes are produced from the building blocks of carbohydrates.
25. Which class of molecules is responsible for speeding up chemical reactions?
   A) Sugars  B) Fats  C) Genetic material  D) Enzymes

26. Base your answer to the following question on Experiments revealed the following information about a certain molecule:
   — It can be broken down into amino acids.
   — It can break down proteins into amino acids.
   — It is found in high concentrations in the small intestine of humans.
   This molecule is most likely
   A) an enzyme  B) an inorganic compound  C) a hormone  D) an antigen

27. Base your answer to the following question on Hydrogen peroxide (H₂O₂) is a toxic by-product of cellular metabolism in aerobic organisms. The reaction below occurs within the cells to prevent the accumulation of hydrogen peroxide.

   \[
   2\text{H}_2\text{O}_2 \xrightarrow{\text{catalase}} 2\text{H}_2\text{O} + \text{O}_2
   \]

   In this reaction, catalase functions as an
   A) enzyme in the breakdown of hydrogen peroxide  B) enzyme in the synthesis of hydrogen peroxide  C) emulsifier in the digestion of hydrogen peroxide  D) indicator in the detection of hydrogen peroxide

28. Neither enzyme works at a pH of
   A) 1  B) 5  C) 3  D) 13

29. Pepsin works best in which type of environment?
   A) acidic, only  B) basic, only  C) neutral  D) sometimes acidic, sometimes basic
30. Base your answer to the following question on the table below and on your knowledge of biology.

<table>
<thead>
<tr>
<th>Enzyme</th>
<th>Effective Temperature Range (°C)</th>
<th>Optimum pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>60–80</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>30–40</td>
<td>3.5</td>
</tr>
<tr>
<td>C</td>
<td>20–38</td>
<td>9</td>
</tr>
<tr>
<td>D</td>
<td>20–27</td>
<td>7</td>
</tr>
</tbody>
</table>

At what temperature would enzyme D most likely be denatured?
A) 15°C  B) 20°C  C) 25°C  D) 39°C

31. One effect of uncontrolled diabetes is that the blood might develop an acidic pH. As a result, cells may not be able to regulate their internal pH. Within these cells, this could cause a disruption of the function of biological catalysts known as
A) enzymes  B) toxins  C) antibodies  D) antigens

32. Base your answer to the following question on the diagram below, which represents stages in the digestion of a starch, and on your knowledge of biology.

The structure labeled X most likely represents
A) an antibody  B) a receptor molecule  C) an enzyme  D) a hormone
33. Base your answer to the following question on the diagram below. For each of the following phrases, select the molecule, chosen from those shown below, which is best described by that phrase.

A) 1  B) 2  C) 3  D) 4  E) 5

An example of a carbohydrate

34. Which compound is a polysaccharide?
   A) glucose  B) maltase  C) ribose  D) starch

35. Which group of organic molecules includes glycogen and glucose?
   A) carbohydrates  B) lipids  C) nucleic acids  D) proteins

36. What are the end products of the hydrolysis of a polysaccharide?
   A) simple sugars  B) amino acids  C) fatty acids  D) nucleotides
Base your answers to questions 37 and 38 on the chart below and your knowledge of Biology.

<table>
<thead>
<tr>
<th>Class of Substance</th>
<th>Basic Unit of Structure</th>
<th>One Possible Function</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><img src="#" alt="Chemical Structure" /></td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>D</td>
<td>Structural component of cell walls</td>
<td>E</td>
</tr>
<tr>
<td>F</td>
<td>G</td>
<td>Structural component of cell membranes</td>
<td>Fats, waxes</td>
</tr>
<tr>
<td>H</td>
<td><img src="#" alt="Protein Structure" /></td>
<td>Protein synthesis</td>
<td>I</td>
</tr>
</tbody>
</table>

37. In which section of the chart do the substances starch and glycogen belong?
   - A) A  
   - B) E  
   - C) C  
   - D) I

38. Which belongs in section G?
   - A) ![O=C=O](#)  
   - B) ![Chemical Structure](#)  
   - C) ![H-C-H](#)  
   - D) ![H-O-H](#)

39. Which organic compound is produced when three fatty acid molecules bond to one glycerol molecule?
   - A) glycosgen  
   - B) ATP  
   - C) PGAL  
   - D) a lipid

40. Enzymes are a type of
   - A) Carbohydrate  
   - B) Protein  
   - C) Nucleotide  
   - D) Fatty acid
41. Base your answer to the following question on the diagram and graph below and on your knowledge of biology. The diagram represents the human digestive system. Pepsin and trypsin are human digestive enzymes.

Pepsin and trypsin are classified as

A) sugars  
B) carbohydrates  
C) lipids  
D) proteins

42. What are proteins ingested by animals immediate sources of?

A) glucose  
B) cellulose  
C) fatty acids  
D) amino acids

43. How many different kinds of amino acids are there?

A) 10  
B) 20  
C) 1  
D) 100

44. Autotrophs might survive when heterotrophs cannot, because autotrophs are able to

A) reproduce asexually  
B) become dormant  
C) exist without respiration  
D) make their own food

45. Maple trees and tulips are classified as autotrophs because they both

A) produce gametes by the process of mitosis  
B) produce carbon dioxide and water as metabolic wastes  
C) are able to obtain complex organic materials from the environment  
D) are able to synthesize organic molecules from inorganic raw materials
46. Base your answer to the following question on the information and diagram below and on your knowledge of biology.

A small water plant (elodea) was placed in bright sunlight for five hours as indicated below. Bubbles of oxygen gas were observed being released from the plant.

The bubbles of oxygen indicate that the plant is

A) producing sugar  B) making protein
C) releasing energy from water  D) carrying on active transport

47. Base your answer to the following question on The green aquatic plant represented in the diagram below was exposed to light for several hours.

Which gas would most likely be found in the greatest amount in the bubbles?

A) oxygen  B) nitrogen
C) ozone  D) carbon dioxide

48. Plants in areas with short growing seasons often have more chloroplasts in their cells than plants in areas with longer growing seasons. Compared to plants in areas with longer growing seasons, plants in areas with shorter growing seasons most likely

A) make and store food more quickly  B) have a higher rate of protein metabolism
C) grow taller  D) have a different method of respiration

49. Which process is directly used by autotrophs to store energy in glucose?

A) diffusion  B) photosynthesis
C) respiration  D) active transport

50. The energy used to obtain, transfer, and transport materials within an organism comes directly from

A) ATP  B) DNA  C) sunlight  D) starch

51. Which two organ systems provide materials required for the human body to produce ATP?

A) reproductive and excretory  B) digestive and respiratory
C) respiratory and immune  D) digestive and reproductive

52. In what way are photosynthesis and cellular respiration similar?

A) They both occur in chloroplasts.
B) They both require sunlight.
C) They both involve organic and inorganic molecules.
D) They both require oxygen and carbon dioxide. Inorganic produce

53. What are possible products of certain types of anaerobic respiration?

A) water and oxygen
B) pyruvic acid and glycerol
C) nitrogen gas and ammonia
D) alcohol and carbon dioxide
54. In a laboratory culture of yeast, it may be concluded that fermentation has occurred if chemical tests indicate the production of:

A) carbon dioxide and water
B) PGAL and nitrates
C) oxygen and ATP
D) ethyl alcohol and carbon dioxide

55. Which metabolic process is responsible for the muscle fatigue and cramping an athlete may experience after running a race?

A) alcoholic fermentation  B) dehydration synthesis
C) lactic acid fermentation  D) aerobic respiration

56. The production of alcohol by yeast cells is the result of:

A) fermentation  B) aerobic respiration
C) budding  D) dehydration synthesis

57. Teeth chewing food into smaller digestible pieces is known as:

A) chemical digestion  B) circulation
C) mechanical digestion  D) regulation

58. In humans, villi that absorb monosaccharides and amino acids are found within the:

A) stomach  B) small intestine
C) pancreas  D) esophagus

59. In the human body, hydrochloric acid is responsible for the low pH of the contents of the:

A) lungs  B) kidney
C) liver  D) stomach

60. Which statement most accurately describes the human heart?

A) It has two atria and one ventricle, and it pumps blood directly into veins.
B) It has one atrium and one ventricle, and it is composed of cardiac muscle.
C) It has one atrium and two ventricles, and it is composed of visceral muscle.
D) It has two atria and two ventricles, and it pumps blood directly into arteries.

61. Base your answer to the following question on the diagram below which represents the pathway of the blood throughout the body.

Which structure pumps oxygenated blood throughout the body?

A) 1  B) 8  C) 9  D) 10

62. Which chamber of the human heart receives most of the blood returning from the brain?

A) left ventricle  B) right ventricle
C) left atrium  D) right atrium

63. Which transport vessel is correctly paired with its usual function?

A) lymph vessels – add blood toward the heart
B) capillary – provides a site for the exchange of materials between the blood and body tissues
C) artery – filters bacteria and dead cells from the lymph and the blood
D) vein – produces white blood cells

64. Humans breathe more rapidly during exercise than before it because during exercise the blood contains:

A) an increased level of oxygen
B) a decreased number of red blood cells
C) an increased level of carbon dioxide
D) a decreased amount of hemoglobin

65. In humans, the thin, moist membranes of the alveoli are surrounded by:

A) bronchi  B) the epiglottis
C) capillaries  D) lymph vessels
Base your answers to questions 66 through 70 on the information below, and on your knowledge of biology.

A student has a sandwich for lunch. The bread contains starch molecules and various other molecules. After chewing and swallowing some of the sandwich, the starch moves along the digestive system and is digested. The sequence below represents what takes place next.

digested starch → bloodstream → cell → cell structure → ATP

Explain what occurs, beginning with the digestion of starch and ending with ATP production.

66. State why ATP is important to cells.

67. Identify the structure in the cell that will produce ATP from the starch building blocks.

68. Explain why starch must be digested before its building block molecules can enter the bloodstream.

69. Identify the molecules produced when starch is digested.

70. Identify the molecules that are used to digest the starch.

71. Systems in the human body interact to maintain homeostasis. Four of these systems are listed below.

   Body Systems
   Circulatory
   Digestive
   Respiratory
   Excretory

a Select two of the systems listed. Identify each system selected and state its function in helping to maintain homeostasis in the body.

b Explain how a malfunction of one of the four systems listed disrupts homeostasis and how that malfunction could be prevented or treated. In your answer be sure to:
   • name the system and state one possible malfunction of that system
   • explain how the malfunction disrupts homeostasis
   • describe one way the malfunction could be prevented or treated
72. Base your answer to question on the diagram below and on your knowledge of biology.

In a cell, a variety of structures perform specific functions and interact to maintain homeostasis. The diagram below represents a typical cell with three cell structures labeled 1, 2, and 3.

![Cell Diagram]

Select one cell structure labeled in the diagram and write its number in the space below. Explain how the cell structure you selected helps maintain homeostasis in a cell.

In your answer, be sure to:
• identify the cell structure you selected
• state one function of this cell structure
• identify one substance that is often associated with the cell structure you selected and state how that substance is associated with the cell structure
• identify one other cell structure and explain how it interacts with the cell structure you selected to maintain homeostasis in the cell

73. Base your answer to the following question on the diagram of a cell below.

Choose either structure 3 or structure 4, write the number of the structure on the line below, and describe how it aids the process of protein synthesis.

Structure: _______

74. Identify a specific structure in a single-celled organism. State how that structure is involved in the survival of the organism.
Some poinsettia plants have green leaves that turn red. A garden club decided to study the color change of poinsettia plants. Knowing that poinsettias change color during the short daylight periods of winter, they decided to investigate the effect of different daylight lengths on color change.

Design a controlled experiment using three experimental groups that could be used to determine if the number of hours of daylight has an effect on the color change of poinsettias.

75. Describe experimental results that would support your hypothesis.

76. Identify the dependent variable in the experiment.

77. Identify two factors that must be kept the same in all three groups.

78. State one way the three experimental groups would differ.

79. State one hypothesis the experiment would test.
1. B
2. A
3. B
4. A
5. B
6. A
7. A
8. A
9. A
10. C
11. B
12. B
13. B
14. D
15. B
16. B
17. C
18. D
19. B
20. C
21. C
22. B
23. D
24. B
25. D
26. A
27. A
28. D
29. A
30. D
31. A
32. C
33. B
34. D
35. A
36. A
37. B
38. B
39. D
40. B
41. D

42. D
43. B
44. D
45. D
46. A
47. A
48. A
49. B
50. A
51. B
52. C
53. D
54. D
55. C
56. A
57. C
58. B
59. D
60. D
61. D
62. D
63. B
64. C
65. C
66. D
67. B
68. B
69. glucose molecules, – simple sugars, – monosaccharides, – sugars
70. enzymes, – biological catalysts, – amylase molecules
71. (essay)
72. (essay)
73. Structure 3 provides the energy needed for protein synthesis. — Structure 4 allows the movement of substances into the cell for the process of protein synthesis.
74. Examples:
   – mitochondrion: site of respiration or releases energy
   – cell membrane: regulates what enters (or leaves) the cell
75. The hypothesis would be supported if only the plants exposed to less than 10 hours of daylight change color and those exposed to more hours of daylight do not change color. – All of the plants changed color
76. – leaf color, – whether or not color changes
77. – temperature, – amount of water/fertilizer, – soil condition, – age/size of plants
78. One group gets less than 10 hours of daylight, one more than 12 hours of daylight, and one 11 hours of daylight. – exposure to different lengths of daylight
79. If plants are exposed to fewer than 11 hours of daylight, then they will change color. – The number of hours of daylight will have no effect on color change.

---

6. ATP is the molecule that supplies usable energy for all the activities of a cell. – ATP molecules provide energy for cells.
13. Mitochondria
14. Starch molecules are too large. – They are too big to get from the digestive tract into the blood. – Large molecules cannot diffuse through cell membrane.

71. **Examples:** 
   a — circulatory: carries nutrients to cells  
   — digestive: breaks down substances *or* makes nutrients available  
   — respiratory: exchange of gases  
   — excretory: eliminates metabolic wastes  
   
   b  
   • — circulatory: heart attack, hardening of arteries, disruption of blood flow  
   — digestive: constipation, diarrhea  
   — respiratory: asthma, bronchitis, emphysema  
   — excretory: kidney disease, gout  
   • — hardening of arteries: raises blood pressure  
   — diarrhea: results in dehydration  
   — emphysema: reduced oxygen supply to cells  
   — kidney disease: interferes with excretion of some wastes  
   • — hardening of arteries: exercise  
   — emphysema: do not smoke

72. **Structure 1**  
   • ribosome • site of protein synthesis • amino acid — used to make proteins • nucleus — the ribosome gets instructions from the nucleus determining which proteins are produced by the cell  

**Structure 2**  
   • nucleus • control of cell processes • DNA — makes up the chromosomes in the nucleus  
   • ribosome — nucleus sends instructions to ribosomes for protein synthesis

**Structure 3**  
   • mitochondrion • site of energy release/cell respiration • ATP — produced in the mitochondrion  
   • cell membrane — allows glucose to enter cell and be used by the mitochondrion for energy release