First Semester Biology Final:

1. The technique known as chromosome painting is the result of scientific research. Scientists use chromosome painting to mark the locations of genes on human chromosomes with fluorescent tags. It is also possible to apply this technique to the chromosomes of many different species. Chromosome painting allows for which of the following?

   F  A comparison of the genomes of different species
   G  The sequencing of proteins from many species
   H  An increase in mutations in many species
   J  The extraction of amino acids from different species

2. Which of these statements best explains the process of energy conversion that takes place in the mitochondria?

   F  Energy is required for carbon dioxide molecules to form six-carbon sugar molecules.
   G  Water molecules and radiant energy are necessary for anaerobic respiration to take place.
   H  Oxygen molecules release energy in the form of heat during combustion reactions.
   J  The energy in the bonds of glucose molecules is transferred to the phosphate bonds in ATP.

3. Enzymes are proteins that help increase the rate of chemical reactions inside cells. These proteins are composed of many simpler molecules called amino acids. Which of the following suggests that the shape of an enzyme determines the enzyme’s function?

   F  Enzymes are specific to a substrate.
   G  Enzymes can operate in a wide range of conditions.
   H  Enzymes are activated by neighboring molecules.
   J  Enzymes can be found in all life-forms.

4. Which of the following correctly describes how a diagram of cellular respiration would differ from a diagram of photosynthesis?

   F  The cellular-respiration diagram would show electromagnetic waves as the final product.
   G  The cellular-respiration diagram would show glucose as the main source of energy.
   H  The cellular-respiration diagram would show energy stored in large protein molecules.
   J  The cellular-respiration diagram would show water as the main source of chemical energy.
5 A photomicrograph of onion root tip cells during mitosis is shown below.

Which phase of mitosis is occurring in the cell indicated by the arrow?

F  Prophase  G  Metaphase  H  Anaphase  J  Telophase

6 A model of a DNA molecule is shown below.

The arrow indicates —

F  the bond between adjacent phosphate and deoxyribose molecules
G  the junction of introns and exons in the sense strand of DNA
H  the hydrogen bond between complementary nucleotides
J  the junction of a codon and a DNA triplet
7 Proteins and polysaccharides are polymers. These polymers are formed by dehydration synthesis. Which statement correctly identifies a difference in the structure of proteins and polysaccharides?

F Only polysaccharides are comprised of repeating units of cytosine, adenine, guanine, and thymine.

G Only proteins are formed from amino acids joined by peptide bonds.

H Only polysaccharides can be folded and twisted to very specific shapes.

J Only proteins can be large molecules with thousands of subunits

8 A codon chart is shown below.

<table>
<thead>
<tr>
<th>First Letter</th>
<th>Second Letter</th>
<th>Third Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>Phenylalanine</td>
<td>Serine</td>
</tr>
<tr>
<td>C</td>
<td>Leucine</td>
<td>Serine</td>
</tr>
<tr>
<td>A</td>
<td>Leucine</td>
<td>Proline</td>
</tr>
<tr>
<td>G</td>
<td>Isoleucine</td>
<td>Threonine</td>
</tr>
<tr>
<td>U</td>
<td>Methionine (START)</td>
<td>Threonine</td>
</tr>
<tr>
<td>C</td>
<td>Valine</td>
<td>Alanine</td>
</tr>
<tr>
<td>A</td>
<td>Valine</td>
<td>Alanine</td>
</tr>
<tr>
<td>G</td>
<td>Valine</td>
<td>Alanine</td>
</tr>
</tbody>
</table>

Which of these changes to the DNA triplet 3’ GCT 5’ will affect the protein produced?

A GTT

B TCT

C TCC

D GCA

9 Both euglena and cyanobacteria are photosynthetic unicellular organisms found in pond water. The feature that distinguishes euglena from cyanobacteria is the —

A ability to maintain homeostasis

B presence of ribosomes

C ability to reproduce

D presence of a nuclear membrane
The carbon cycle includes processes that release carbon into the atmosphere and places that act as carbon reservoirs. The diagram below shows both major processes that release carbon and major carbon reservoirs.

Carbon output to atmosphere

- Organism respiration
- Fuel combustion
- Cement production

Atmospheric carbon

Carbon reservoirs

- Soils and detritus
- Dissolved organic carbon
- Ocean sediments
- Terrestrial biota
- Marine biota
- Buried fossil fuels
- Ro
Which of these disruptions would cause an excess output in the carbon cycle?

A  The destruction of terrestrial biota
B  Increases in marine biota
C  A reduction in the use of fossil fuels
D  A thickening of ocean sediments

11 Characteristics such as a widow’s peak or attached earlobes are determined by the genetic code. Which components of DNA are referred to as the genetic code?

F  Phosphate groups
G  Nitrogenous bases
H  Deoxyribose sugars
J  Hydrogen bonds

12 Which of these must occur during S phase of the cell cycle so that two daughter cells can be produced during M phase?

A  The DNA must be replicated.
B  The chromosomes must be joined.
C  The cytoplasm must be separated.
D  The cell membrane must be expanded.

13 Which of these best represents a fatty-acid molecule?

E

F
A student sets up a compost bin outdoors. Inside the bin microorganisms convert the student’s vegetable and paper scraps into rich fertilizer. Which of the following best describes the role that these microorganisms play in natural habitats?

F  The microorganisms help balance the numbers of producers and consumers.
G  The microorganisms help keep nutrients cycling through the ecosystem.
H  The microorganisms turn solar energy into sugars.
J  The microorganisms function as autotrophs.

The diagram below represents the cell cycle.
When cells leave the cell cycle, they exit during G phase and then enter G phase, a resting period. Most normal cells can leave G₀ phase and reenter the cell cycle at G₁ phase before entering S phase. Cancer cells are different because they cannot enter G₀ phase and are likely to do which of the following?

A  Fail to complete S phase  
B  Mutate during G phase  
C  Repeat the cell cycle continuously  
D  Die after completing mitosis

16  How does DNA in cells determine an organism’s complex traits?

A  DNA contains codes for proteins, which are necessary for the growth and functioning of an organism.  
B  DNA separates into long single strands that make up each part of an organism.  
C  DNA produces the energy an organism needs in order to grow.  
D  DNA folds into the nucleus of each of the cells of an organism
Cell differentiation is critical during embryonic development. The process of cell differentiation results in the production of many types of cells, including germ, somatic, and stem cells. Cell differentiation is most directly regulated by —

A  ATP  
B  DNA  
C  lipids  
D  sugars

The human digestive system is approximately 900 cm long. Food is moved through the digestive tract primarily by —

F  bile produced by the pancreas  
G  the enzymes amylase and pepsin  
H  muscular contractions  
J  hydrochloric acid in the stomach

The fact that a strain of yeast with a certain defective gene can use the human version of the gene to repair itself is evidence that yeast and humans —

A  depend on the same food supply  
B  share a genetic code  
C  both have eukaryotic cells  
D  have identical genomes

Changes in water pressure within guard cells cause the cells to open or close the stoma. This response helps the plant maintain homeostasis by —

A  stabilizing the plant’s temperature through the evaporation of water  
B  regulating the amount of water the plant loses during transpiration  
C  allowing oxygen needed for photosynthesis to enter the plant  
D  enabling the plant to release more carbon dioxide at night for photosynthesis
The diagram shows taxonomic groups and a major distinguishing characteristic of all but two of them.

**Taxonomic Groups**

- All living organisms
  - Prokaryotic
    - Archaeabacteria
    - Eubacteria
  - Eukaryotic
    - Unicellular or multicellular
      - Kingdom Protista
    - Multicellular
      - Kingdom Plantae
      - Kingdom Fungi
      - Kingdom Animalia

**KEY**
- Distinguishing characteristic

Which characteristics will be used to complete the chart?

- **F** Motile
  - Nonmotile
- **G** Nonphotosynthetic
  - Photosynthetic
- **H** Autotrophic
  - Heterotrophic
- **J** No nucleus
  - Nucleus