

Learning Objectives for Cells, Human Systems, and Heredity

1. You should be able to distinguish among the terms fact, theory, and hypothesis.
2. Give an experimental design, you should be able to identify the control, the independent variable, and the dependent variable.
3. You should be able to explain how variables such as temperature affect the rate of diffusion of molecules in a solution.
4. When given information about the apparent size of an object, the actual size of an object, and the magnification of the object, you should be able to determine the third variable when provide with the other two.
5. Using specific examples, you should be able to explain why only some molecules pass through a dialysis membrane and how this can be demonstrated to students.
6. You should be able to explain why red blood cells remain the same size in a solution of normal saline (0.9%), shrink in a solution of high saline (e.g., 2%), and lyse (i.e., burst) in distilled water.
7. You should be able to explain how energy provided for photosynthesis.
8. You should be able to identify the source and fate of oxygen that is produced during photosynthesis.
9. You should be able to identify the source of carbon that is used to manufacture sugar in photosynthesis.
10. You should be able to compare and contrast photosynthesis and cellular respiration.
11. You should be able to describe how a culture of yeast cells can be used by students to investigate the factors that affect the rate of cellular respiration as measured by the production of carbon dioxide.
12. You should be able to list the structures that are found in 1) all living cells; and 2) only in eukaryotic cells.
13. You should be able to identify the major functions of common cell structures.
14. You should be able to distinguish among replication, transcription, and translation.
15. You should be able to compare and contrast mitosis and meiosis.
16. Given a sequence of the bases A, T, C, and G in a DNA molecule, you should be able to determine the base sequences of the complementary strand.

17. Given a sequence of bases A, T, C, and G in a DNA molecule, you should be able to determine base sequence of the mRNA molecule that would be transcribed from that strand.
18. You should be able to identify the role of the mRNA codon and the tRNA anticodon in translation.
19. You should understand the relationship between the number of bases and the number of amino acids for which these bases code.
20. You should be able to describe the function of a “stop” codon.
21. You should be able to explain what a point mutation is and be able to distinguish between nonsense mutations, missense mutations, and silent mutations in terms of their effect on protein structure.
22. Given the number of base pairs in a DNA molecule, you should be able to calculate the number of possible base sequences that the DNA molecule could have.
23. Given the number of amino acids in a protein, you should be able to calculate the number of possible sequences that the protein could have.
24. You should be able to explain why changes in the amino acid sequence of a protein can alter its function.
25. You should be able to explain how children can show phenotypes that are not observed in either of their biological parents.