

A & P Placement Exam Learning Outcomes

Science as a Way of Learning: A Guide to the Natural World

1. Why is it important to have a basic knowledge of biology?
2. List the features that differentiate living things from nonliving matter.
3. List the levels of hierarchical organization and understand the relationship of one level to the next.

Basic Math Skills

1. Understand the units of the metric system, be able to recognize the basic units of measure (meter, gram and liter) and know how to convert a measurement expressed in one unit of measurement to a different unit.
2. Create and know how to interpret charts and graphs.
3. Learn the proper step-by-step process in how to set up dimensional analysis problems.
4. Compute simple concentrations and dosage calculation problems.

Fundamental Building Blocks: Chemistry, Water and pH

1. Define: matter, atoms and elements.
2. Describe the characteristics and location of subatomic particles: protons, neutrons, electrons.
3. Use atomic number and mass to diagram atoms.
4. Define and recognize isotope.
5. Recognize the relationship between the location of an element in the periodic table and its valence electrons.
6. Describe how gaining or losing electrons leads to the formation of ions.
7. Describe the formation of ionic, polar covalent and non-polar covalent bonds.
8. Describe the structure of water and how it leads to hydrogen bonds.
9. Describe the properties of water including: adhesion, cohesion, surface tension, specific heat, heat of vaporization and solvency.
10. Define dissociate and list the three categories of electrolytes.
11. Define acidic, basic, and neutral solutions based on hydrogen ion concentrations.
12. Describe the relationship between hydrogen ions and pH.
13. Describe salts and give examples.
14. Define buffer.

Life's Components: Biological Molecules

1. Recognize the importance of the nature of carbon skeleton.
2. Recognize the six most common elements in living things.
3. Understand the relationship between hydrocarbons and non-polarity.
4. Recognize the general characteristics and polarity of major functional groups.
5. Understand processes of dehydration synthesis and hydrolysis.
6. Describe the relationship between polymers and monomers.
7. Differentiate polymers and composite molecules.
8. Know basic organic building blocks – amino acids, monosaccharides, fatty acids, glycerol and nitrogenous bases.
9. Recognize the chemical make-up of carbohydrates including the various monosaccharides. Also, understand the formation of disaccharides and polysaccharides and know specific examples.
10. Recognize the similarities and differences between the major groups of polysaccharides including: cellulose, starch, and glycogen.

11. Identify the hydrophobic nature of lipids and the differences between saturated and unsaturated fatty acids, triglycerides, phospholipids, and steroids.
12. Describe the chemical make-up of amino acids, the general properties of R groups and the formation of peptide linkages.
13. Differentiate among the primary, secondary, tertiary, and quaternary structure of proteins and the types of bonds that contribute to their 3-dimensional structure.
14. Recognize the chemical components of nucleic acids.
15. Describe how individual nucleotides are linked to form RNA and DNA.
16. Distinguish between carbohydrates, lipids, proteins, and nucleic acids with respect to chemical structure.
17. Understand the nature and functions of modified biomolecules such as glycoproteins and proteoglycans.

Life's Home: The Cell

1. Compare and contrast the general features of eukaryotic and prokaryotic cells.
2. What are the differences between plant and animal cells.
3. Each student will identify the location and structure of cell organelles including: nucleus, endoplasmic reticulum, ribosomes, mitochondria, golgi, lysosomes, peroxisomes, cytoskeleton, centrioles, cilia, and flagella.
4. Each student will describe the function of cell organelles including: nucleus, endoplasmic reticulum, ribosomes, mitochondria, golgi, lysosomes, peroxisomes, cytoskeleton, centrioles, cilia, and flagella.

Life's Border: The Plasma Membrane

1. Describe the structure and function of the fluid-mosaic membrane model and apply knowledge of organic molecules to explain the characteristics of proteins, phospholipids, cholesterol, and combination molecules
2. Explain why the cell membrane is described as "selectively permeable" and explain how size and polarity of molecules effect their ability to cross the membrane.
3. Explain factors that affect the rate of diffusion across a cell membrane
4. Compare and contrast the different types of passive transport: diffusion, facilitated transport, osmosis.
5. Predict the effects of hypertonic, isotonic, and hypotonic environments on animal cells.
6. Compare and contrast the different types of active transport including molecular pumps, and different types of bulk transport (endocytosis, phagocytosis, pinocytosis, and exocytosis).
7. Students will be able to define and explain: diffusion, osmosis, facilitated diffusion, and active transport.

Life's Mainspring: An Introduction to Energy

1. Define the following terms: metabolism, enzyme, substrate, coenzyme, activation energy.
2. Explain the induced fit model of enzymatic action.
3. Identify the role of coenzymes and cofactors in biochemical reactions.
4. Explain the role of the following on enzyme activity: pH, temperature, substrate concentration, enzyme concentration, and competitive inhibitors.
5. How to name enzymes.
6. Understand the structure and role of ATP in living organisms.
7. Define kinetic and potential energy.

8. List and describe the different types of energy.
9. Understand the Laws of Thermodynamics.

Vital Harvest: Deriving Energy from Food

1. Discuss the background principle of oxidation-reduction.
2. Define cell respiration.
3. Explain the four major stages of cell respiration.
4. Understand the differences between anaerobic and aerobic respiration, including the # of ATP produced and the products.
5. Describe how oxidation and reduction reactions are used to transfer electrons from food molecules to NADH, FADH₂, the electron transport system, and oxygen.
6. Write and explain the overall balanced equation for cellular respiration ($C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$).

Cell Division

1. Describe the stages of the cell cycle.
2. Describe where mitosis fits into the cell cycle and what happens to cells that don't undergo mitosis.
3. Describe why cells go through mitosis.
4. Name the stages of mitosis and describe what takes place in each stage.

Passing on Life's Information: DNA Structure and Function

1. Name the four bases in DNA and describe the structure of DNA using the following terms:
 - nucleotide (sugar, phosphate, base)
 - complementary base pairing
 - double helix
 - hydrogen bonding
2. Describe DNA replication including unwinding of DNA, role of DNA polymerase, complementary base pairing, and joining of adjacent nucleotides.
3. Compare and contrast the general structural composition of DNA and RNA

How Proteins are Made: Genetic Transcription, Translation, and Regulation

1. Compare and contrast the structure and function of DNA, mRNA, tRNA, and ribosomes.
2. Explain the process of transcription including where it occurs in the cell.
3. Explain the process of translation including where it occurs in the cell.
4. Describe how the genetic code determines the amino acid sequence in polypeptides.
5. Use examples to explain how mutations in DNA affect protein synthesis and may lead to genetic disorders.

Introduction to Homeostasis

1. Define homeostasis and explain why it is important in the body
2. Be able to define the components of a homeostatic system and recognize each of the components in representative systems: stimulus, receptor, control center, effector, and result).
3. Be able to apply the concepts of a homeostatic system to examples in the human body.
4. Explain negative feedback and recognize examples.
5. Explain positive feedback and recognize examples.