Biology
Unit 1 – Introduction to Biology
STUDY GUIDE

Essential Skills Questions:
1-1. Be able to identify and explain the 5 characteristics of living things.
1-2. Be able to identify the hierarchical levels of organization of life from molecules and atoms to organisms.
1-3. Be able to identify the monomers, polymers, and functions of each of the 4 macromolecules.

Review Questions
1. List and describe the 5 characteristics of life?
   Cells – the basic unit of life
   Homeostasis – ability to maintain a relatively stable internal environment
   Reproduction – ability to produce offspring
   Metabolism – ability to obtain and use energy for growth and movement
   DNA/Heredity – genetic material passed on during reproduction

2. Give 3 examples of homeostasis in a human?
   Homeostasis examples – body temperature, water level, blood sugar, etc.

3. How does metabolism relate to growth and movement?
   Metabolism provides the organism with the energy needed to grow and move.

4. List and briefly describe the organization of life starting with the smallest unit of matter.
   Atoms are the smallest unit of matter. Atoms make up molecules. Molecules make up organelles.
   Cells are made up of organelles. Groups of cells working together form tissues. Multiple types of tissues interact to form organs.
   Multiple organs work together to form organ systems. Organisms are made up of interacting organ systems.
   A group of organisms of the same species in the same location make up a population.
   A community is made up of all of the populations of different species in an area.
   An ecosystem is made up of the community and all of the nonliving components in an area.
   A biosphere includes all of the ecosystems on the planet.

5. What is the difference between a monomer and a polymer? Draw a picture to explain.
   A monomer is a single unit of a larger molecule. A polymer is many monomers bound together.

6. Explain the process of Dehydration Synthesis and Hydrolysis. Use the terms water, monomer and polymer in both explanations.
   In dehydration synthesis a water molecule is formed when 2 monomers are joined together to form a polymer.
7. Complete the summary chart below:

<table>
<thead>
<tr>
<th>Macromolecule</th>
<th>Monomer(s)</th>
<th>Polymer(s)</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Carbohydrate</td>
<td>Monosaccharide</td>
<td>Disaccharide &amp; polysaccharide</td>
</tr>
<tr>
<td>L</td>
<td>Lipids (fats)</td>
<td>Glycerol &amp; fatty acids</td>
<td>Triglyceride</td>
</tr>
<tr>
<td>P</td>
<td>Protein</td>
<td>Amino acids</td>
<td>Polypeptide</td>
</tr>
<tr>
<td>N</td>
<td>Nucleic acid</td>
<td>Nucleotide</td>
<td>DNA &amp; RNA</td>
</tr>
</tbody>
</table>

8. What are 3 health risks associated with eating a diet high in sugars? What is the recommended amount of sugar a person should have in a day?

Diets high in sugar can lead to obesity, type II diabetes, tooth decay, hyperactivity, depression, mood swings, etc (see “Spoonful of Carbohydrates Activity).

9. Explain how each of these carbohydrates differs in function, food source and structure? Glucose, Glycogen, Cellulose
   a. Glucose – a monosaccharide that is directly used by cells during cellular respiration
   b. Glycogen - a polysaccharide that is stored in animals cells
   c. Cellulose – a polysaccharide that makes up the cell wall in plant cells

10. What are the differences between saturated and unsaturated fat? (Structures, appearance, and food source). What are 3 reasons a person needs a “healthy” level of fat in their diet or on their body?

   It is important to consume a healthy level of fat to maintain fatty tissue for insulation, provide protection for your internal organs and make up much of your brain tissue.

11. In the chart list 3 healthy food sources for each macromolecule:

<table>
<thead>
<tr>
<th>Carbohydrates</th>
<th>Lipids</th>
<th>Proteins</th>
</tr>
</thead>
<tbody>
<tr>
<td>* fruits</td>
<td>* fish</td>
<td>* fish</td>
</tr>
<tr>
<td>* vegetables</td>
<td>* nuts</td>
<td>* lean meats</td>
</tr>
<tr>
<td>* whole grains</td>
<td>* plant sources (ex olives)</td>
<td>* dairy</td>
</tr>
</tbody>
</table>

12. Based on the Macromolecule Diet Lab, which two macromolecules are most important for energy in our cells? Which of these contains the greatest amount of energy? Explain how you know this.

Carbohydrates and Lipids are the most important macromolecules for energy in our cells. Lipids contain more energy, because they released more energy when we burned them in lab.

13. How many amino acid monomers are there? What is the name of a protein polymer? List at least 3 functions of proteins in living things.

   There are 20 amino acids monomers. A protein polymer is a polypeptide. Proteins provide structure & support, control chemical reactions and are the building blocks for cells in living things.

14. How are proteins and nucleic acids related? Explain how DNA codes for amino acids, using the term codon.

   DNA (a nucleic acid) carries the instructions for making an amino acid sequence (protein). RNA (also a nucleic acid) is transcribed from DNA and is translated into an amino acid sequence. Each group of 3 nucleotides in a nucleic acid chain make up a codon. Each codon “codes” for a specific amino acid. The sequence of codons determines the sequence of amino acids in a polypeptide chain (“protein”).
15. Explain the significance of the following in your diet:
   i. trans fat – the most unhealthy fat (linked to an increased risk of heart disease)
   ii. essential amino acids – amino acids that human cells cannot make on their own & must be acquired through diet
   iii. dietary fiber - helps to regulate cholesterol & triglyceride levels in the blood, reduces the risk of heart disease

16. What are the two other types of lipids that we need to know? Describe their functions.
   a. **Phospholipids** – these make up the cell membrane
   b. **Steroids** – these provide structure in the cell membrane and are used as hormones (chemical messengers between cells)

17. List at least two differences between DNA and RNA.
   The 5-carbon sugars are different (DNA = deoxyribose sugar, RNA = ribose sugar)
   DNA is double stranded. RNA is single stranded.
   DNA has the nucleotide thymine. RNA has the nucleotide uracil instead of thymine.

18. Describe the dehydration synthesis of a polypeptide. Be sure to include the names of the bonds that are formed.
   In dehydration synthesis a water molecule is formed when 2 monomers are joined together to form a polymer.

19. Draw a picture of a monomer of Nucleic Acids and label the three parts.

![Image of a monomer of Nucleic Acids](image.png)

   (a) Atomic structure  
   (b) Symbol used in this book

20. What are enzymes? What is their function? What are 4 factors that can affect enzyme action?
    Enzymes are biological catalyst and are also proteins. They control chemical reactions in living things by lowering the activation energy needed for the reaction to occur