

Biology 12 – Biologically Important Molecules - Study Guide

1. a) List 5 characteristics of living things. b) Using this list, is a Forest Fire is alive or non-living? What characteristics would indicate that it is alive? What characteristics would indicate that it is not alive?
 2. a) What do we mean when we say "**Scientific Method**"? b) What is the importance of the scientific method?
 3. a) What is the difference between a **hypothesis** and a **theory**? b) Give two examples.
 4. a) What is a **CONTROL**? b) Give one specific example. b) Explain the role of a control in an experiment.
 5. Your pharmaceutical company thinks it has a great new headache medicine called *PainDrain*[®]. **Design a proper scientific experiment** that would effectively test the efficacy of *PainDrain*[®]. This must be detailed, logical, specific, and use the scientific method.

 6. Define **homeostasis** and describe at least **three** examples.
 7. What is meant by **negative feedback** in biological systems?
 8. Using **words** and **diagrams**, give **two examples** of homeostatic control through negative feedback in human systems.
 9. a) What is meant by **positive feedback** in biological systems? b) Describe one example of homeostatic control through positive feedback in human systems.

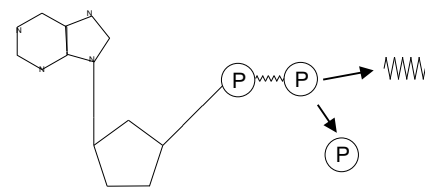
 10. Elements can combine using different types of **bonds**. Describe each bond and explain the differences between the following types of bonds: a) **ionic** b) **covalent** c) **hydrogen**. Give an example of **each type** of bond.
 11. Draw a labeled diagram of a **water molecule**. Why, and in what ways, is water such a unique molecule?
 12. In what specific ways does the **polar nature** of water promote the maintenance of life?
 13. Make a copy of the pH scale into your notes and fill in the following information.
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| 0 | | | | | | | | | | | | | | | | 14 |
| <div style="display: flex; justify-content: space-between; align-items: center; padding: 5px;"> < > </div> | | | | | | | | | | | | | | | | |
14. What is an acid? Give two examples. What pH range do acids have?
 15. What is a base? Give two examples. What pH range do bases have?
 16. Is pure water an acid or a base? Explain.
 17. Some acid rain has a pH of 2. How much more acidic is this than distilled water?
 18. **Why is the maintenance of pH crucial** to biological systems?
 19. What is a **buffer**? Why are buffers significant to biological systems?
 20. Two common buffer systems in biological systems are carbonic acid-bicarbonate ion (H_2CO_3 , HCO_3^-) in blood and acetic acid-acetate ion (CH_3COOH , CH_3COO^-) in some cells. Using the example of the carbonic acid-bicarbonate ion system, show what happens when this system encounters: a) H^+ ions b) OH^- ions

 21. a) What is a polymer? b) What is the relationship between polymers and synthesis & hydrolysis? c) Give **4 examples** of polymers.
 22. Describe the **5 major functions of proteins**.
 23. Which **elements** are found in **proteins**? Which **one** is most characteristic of proteins?
 24. a) Draw the generalized formula for an amino acid, and label the groups. b) How many amino acids are found in nature? c) In what way do these amino acids differ from each other?
 25. Using the formation of a bond between two amino acids as an example, explain what is meant by the following terms: a) **dehydrations synthesis** b) **hydrolysis** Use a labeled diagram and a **careful description** to assist your explanation.
 26. What do we call the type of **bond** that forms between amino acids?
 27. What is the difference between a polypeptide and a protein?
 28. Starting with primary structure, describe the **4 levels of organization** in proteins.
 29. What determines the **function** of a protein?
 30. What has happened to a protein that has become **denatured**? Using examples, list **3 things** that cause a protein to become denatured.

 31. a) Define **carbohydrate** and give the **general formula** for a carbohydrate. b) What elements are found in carbohydrates c) List the **main functions of carbohydrates** in living organisms.
 32. Draw diagrams of the pentose monosaccharide **ribose**, and the hexose monosaccharide **glucose**. b) What do I mean when I say "pentose" and "hexose"? c) What do monosaccharide names have in common?
 33. a) What is the formula for glucose? b) What is glucose used for in cells?

34. Differentiate between **monosaccharides**, **disaccharides**, and **polysaccharides** and give one example of a disaccharide, and 3 examples of polysaccharides.
35. What are the major differences in structure and function among the common polysaccharides **glycogen**, **starch**, and **cellulose**? Use a table format for your answer.
36. a) In vertebrates like humans, **where** do we find rich stores of **glycogen**? b) Why do you suppose we find glycogen here?
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37. a) What are **lipids**? b) What are their **functions** in the human body? c) Are they **soluble** or **insoluble** in water? d) List the **three major types** of lipids.
38. a) What is the difference between a **polar** molecule and a **non-polar** molecule? b) Give two examples of polar molecules and two examples of non-polar molecules.
39. What is the meant by **hydrophobic** and **hydrophilic**? Relate hydrophobic and hydrophilic to polar and non-polar molecules.
40. a) What are **Neutral Fats** formed from? b) What is another name for neutral fats? c) What is the primary function of neutral fats in the human body?
41. a) Draw a molecule of **glycerol** combining with **3 fatty acids** to form a **neutral fat**. b) What is the name for this type of reaction?
42. a) What are the difference between a **saturated fatty acid** and a **non-saturated fatty acid**? b) Which types of fats are liquid at room temperature? c) Which type of fat are solid at room temperature? d) Which types of fat are associated with high blood pressure, cancer and heart disease? d) draw a diagram of a saturated neutral fat and a monounsaturated neutral fat.
43. a) What are the **functions** of **Phospholipids**? b) Describe and sketch the **structure** of phospholipids. c) How do they differ from neutral fats? d) sketch a picture of a "phospholipids bilayer. d) What sorts of molecules would be able to easily pass through a lipid bilayer?
44. a) What are **steroids**? b) What are their **functions** in the human body? c) What is the name of the molecule from which steroids are derived? d) Draw a molecule of **cholesterol**. e) Is cholesterol inherently bad? Why or why not? f) What is the source of excess cholesterol in human beings?
45. Why do fat and oil molecules not normally not disperse in water?
46. Define **emulsification**.

47. a) List the major functions of **nucleic acids**. b) What are the two different types of nucleic acids?
48. Describe the structure and draw labeled diagrams of the two basic types nucleotides (purines & pyrimidines). Clearly label the constituent parts.
49. Draw a molecule of DNA to show how the nucleotides are connected. Your drawing should show both sides of the DNA molecule.



50. Draw and describe the general structure of **Adenosine Triphosphate**. b) What is the function of ATP? c) Where is the energy in ATP bonds stored? d) Explain the diagram on the right
51. Make a **review table** like the following table of the most important biological **polymers**, and the **unit molecules** which make them up.

Polymer	Summary of Functions	Unit Molecule	Sketch of Unit Molecule
Protein			
Starch			
Glycogen			Omit
Cellulose			Omit
DNA			Omit
Molecule	Summary of Functions	Constituent Molecules	Sketch of Molecule
Triglyceride			Omit
Phospholipid			
Steroid			
ATP			