Name: _____

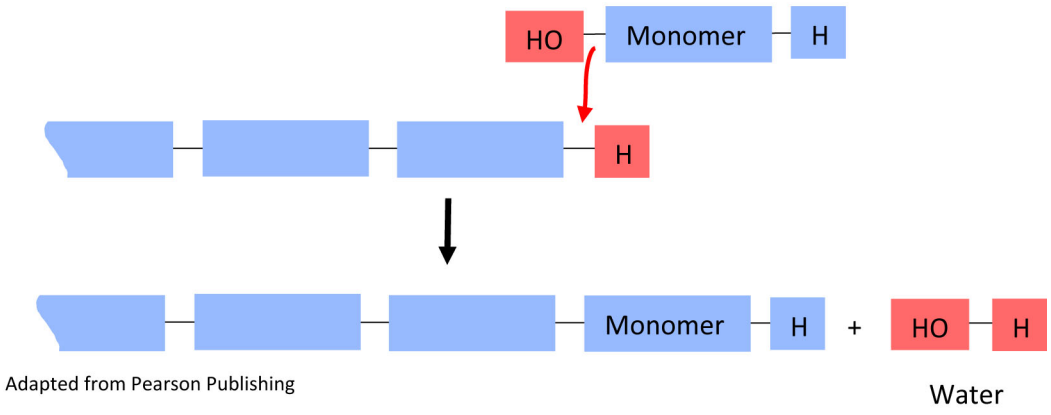
MOLECULES OF LIFE

This worksheet accompanies the Jmol exploration Molecules of Life available at: https://crestresources.org/tutorials/mol.html.

1. How many monomers are already in the growing polymer chain? Hint – that does NOT include the monomers with arrows.

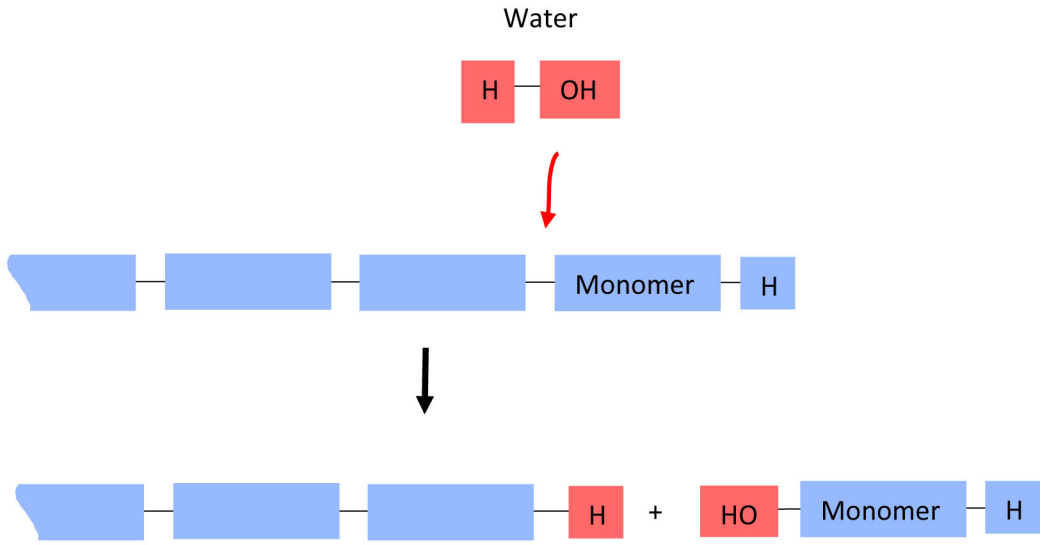
2. What are the monomers on the far right (there are three of them) doing?

3. When all the monomers are added, how many monomers will the polymer chain contain?



Adapted from Pearson Publishing

4. In the above condensation reaction, circle the water molecule that is eliminated when the monomer joins the polymer chain in both the top reaction and the bottom result.



Adapted from Pearson Publishing

5. In the hydrolysis reaction above, circle the water molecule that is being added to break the monomer unit off the polymer chain in both the top reaction and the bottom result.

Part 1: Molecules of Life

6. An "average" cell is about 10 µm (1 µm is 10^{-6} m) in diameter. What would be the diameter of the cell (in meters) if it is magnified to the same scale? Then give an example of something *that you can relate to* that is about the same size.

Carbohydrate Monomers

7. What is the monomer of carbohydrates?

8. What elements is it made of?

9. Where are the carbon atoms located in the monomer?

10. Where are the oxygen atoms located in the monomer?

11. What is the name of the specific monomer that makes the specific polymers shown?

12. What process do plants use to make that monomer?

13. What is that monomer used for in both animals and plants?

Carbohydrate Polymers: Complex Carbohydrates

14. Where are the carbon atoms located in the polymers?

15. Where is the oxygen atom located in the polymers?

16. Complete the following table about carbohydrate polymers.

	Name of polymer	Structure	Purpose
Plant polymer			
Plant polymer			Protection as outer part of plants Not easily degraded
Animal polymer			

Cell Membrane Monomers

17. What is the building block of cell membranes?

18. What elements is it made of?

19. Where are the phosphorus atoms located in the monomer?

20. Where are the oxygen atoms located in the monomer?

21. Where are the carbon atoms located in the monomer?

22. What is the unique characteristic of this monomer?

23. Define and identify the part of the phospholipid that is hydrophobic.

24. How do these characteristics help make the cell membrane?

Cell Membrane ('Polymer')

25. Where are the phosphorus atoms located in the polymer?

26. Where are the oxygen atoms located in the polymer?

27. Where are the carbon atoms located in the polymer?

28. Can small molecules move easily in and out of the cell through the cell membrane – why or not?

29. What other molecules are found in the cell membrane and what is their job?

Protein Monomers

30. What are the monomers?

31. What elements do they contain?

32. What is the specific monomer shown?

33. How many types of these monomers are used to build the polymer?

34. What is different about each?

Protein Polymer

35. What is the name of a general polymer?

36. What is the name of this specific polymer?

37. Where does the information to build the polymer come from?

38. What is the function of this polymer?

Nucleic Acids Monomer

39. What are the monomers called?

40. What elements do they contain?

41. What is the specific monomer shown?

42. How many of the monomers are there and what are their names?

Nucleic Acid Polymers

43. What are the two polymers that these monomers can make?

44. What are the differences between these two polymers?

45. What does the information from one of these polymers do?

46. How many base pairs are in the human genome?

Water

47. What are the elements in the water molecule?

48. Draw the water molecule and label the elements.

49. Is water polar or nonpolar and why?

50. What are the three states of water?

51. Why does ice float?

52. What is the result of that to living things?

Review

53. This is a general table to compare the types of atoms found in each of the molecules of life – polymers. Review the material and complete the information in this table.

	Carbohydrates	Lipids	Proteins	Nucleic Acids
Monomers are called:				
Example of polymer:				
Composed of atoms of:				
Purpose in the cell:				

54. Which molecule consists of a hydrophobic carbon tail and a hydrophilic phosphate group?

55. What protein helps to transport water molecules across the cell membrane?

56. What are the three components of a nucleotide?

57. What sugar (i.e., carbohydrate) is used by plants to store energy that is captured from the sun in photosynthesis?

58. Which complex carbohydrate is used to store glucose in plants?

59. Which complex carbohydrate is used to store glucose in animals?