Macromolecules Worksheet

Name:
Course:
Date:

Classify each as a carbohydrate, protein, lipid or nucleic acid.

1. _____ starch
2. _____ cholesterol
3. _____ steroid
4. _____ glycogen
5. _____ nucleotide
6. _____ RNA
7. _____ polypeptide chain
8. _____ glucose
9. _____ unsaturated fatty acid
10. _____ polysaccharide
11. _____ phospholipid
12. _____ glycerol
13. _____ monosaccharide
14. _____ cellulose
15. _____ amino acid
16. _____ enzyme
17. _____ saturated fat
18. _____ DNA

Identify the <u>specific</u> molecule for each description. Some terms (from above)may be used more than once.

17. _____ provides long-term energy storage for animals
18. _____ instructions for building proteins
19. _____ provides immediate energy
21. _____ provides short-term energy storage for plants
23. _____ forms the cell membrane of all cells
24. _____ speeds up chemical reactions by lowering activation energy
25. _____ one sugar
26. _____ cells convert this into ATP
27. _____ monomer of proteins
28. _____ provides long-term energy storage for plants
29. _____ genetic material
30. _____ steroid that makes up part of the cell membranes
31. _____ 3-carbon “backbone” of a fat
32. _____ provides short-term energy storage for animals
33. _____ many sugars
34. _____ monomer of nucleic acids
35. _____ forms the cell wall of plant cells

Which <u>specific</u> molecule (e.g. saturated fat, unsaturated fat, protein, glucose, starch, cellulose) is each food <u>mostly</u> made of?

36. _____ almond
37. _____ spinach
39. _____ bacon
40. _____ noodles
41. _____ orange juice
43. _____ wheat
44. _____ celery
45. _____ soy beans
47. _____ egg white
48. _____ table sugar
49. _____ popcorn
51. _____ olive oil

State whether each is found in animals, plants or both.

52. _____ saturated fat
53. _____ protein
54. _____ steroid
55. _____ amino acid
56. _____ DNA
57. _____ cellulose
58. _____ monosaccharide
61. _____ glucose
62. _____ RNA
63. _____ polysaccharide
64. _____ glycogen
65. _____ starch
66. _____ phospholipid
67. _____ enzyme

Are lipids polar or non-polar?

Are lipids soluble in water?

Draw the general chemical structure of an amino acid.

What are the three parts that make up a nucleotide?

Draw a nucleotide.

a. _____

b. _____

c. _____

What are the four bases for DNA?

What are the four bases for RNA?

Macromolecules Lab Experiment

Due: Tuesday September 18 by 1pm

Name:

Course:

Pre-Lab

Lab Manual – pages 48 – 49 "discussion and review"

Concepts in Biology text book – Ch. 3

Part 1. What will happen when a protein is cooked?

Hypothesis:

Materials:

cooking pan, egg (optional)

Procedure:

- Watch the following video. http://highered.mcgraw-hill.com/sites/0072943696/student_view0/chapter2/animation__protein_denaturation.html
- Cook (or imagine or watch a video) an egg sunny side up.
- Observe how the egg looks (out of the shell) before it is cooked and compare it to how it looks once it is cooked
- Record your observations (hint hint - this should be put in your "results" section. Remember from lab #1 all the things to include when observing. Maybe include taste this time too.)

Questions:

1. What type of bonds link individual amino acids together?
2. The helix that forms in a protein chain as a result of hydrogen bonds and other weak forces is an example of ____.
3. In the stable form of protein, what is generally oriented to the interior of the protein molecule?
4. When an egg is fried, what happens to the protein in the egg?
5. When forming a semi-solid gel such as gelatin, what type of molecule does the process of protein coagulation entrap?

Conclusion:

What causes the change in appearance of the egg white?

Part 2: How is mayonnaise made?

Materials:

white vinegar, one egg, vegetable oil, bowl, whisk

Procedure:

Taken from Lab Manual, page 56, part 5

- Into a mixing bowl, place an egg yoke (not the egg white).
- Add 25 mL of white vinegar and mix.
- V-e-r-y slowly add vegetable oil to the bowl as you whip the mixture vigorously with a whisk
- Stop mixing when you reach the right consistency for mayonnaise.

- It normally takes about one cup of vegetable oil to make this recipe.
- Add a pinch or two of salt to taste and other seasonings, such as garlic, if desired.
- Store the mayonnaise in your refrigerator!
- Record observations

Results:

Bring your mayonnaise into lab on Thursday September 13

Questions:

1. How long did it take for the materials to mix together?
2. Does your resulting substance look and taste like mayonnaise?
3. Did a chemical or physical change take place?

Conclusion:

Why/How were the vinegar and the oil able to mix together?

Part 3: Will oil and water mix?

Hypothesis:

Materials:

water, detergent, dye, 10 mL graduated cylinder, stir rod

Key words may be found at: http://www.biologylessons.sdsu.edu/classes/lab1/lab1.html

Procedure:

1. Put 8 ml of water into a 10 ml graduated cylinder.

Predict

2. What will happen if you add cooking oil? (Predict by choosing a, b, c, d, or e below)
   a. the oil will float on top of the water
   b. the oil will sink to the bottom of the water
   c. the oil will dissolve in the water
   d. the oil will become mixed up with the water
   e. other (what?)
3. Gently add 2 ml of cooking oil by tilting the cylinder of water slightly and letting the oil run slowly down the inside of the cylinder.

Results

4. What happened?
5. Save this graduated cylinder with its contents and get a clean 10 ml cylinder for the next experiment.

1. Place 8 ml of cooking oil in a 10 ml graduated cylinder.

Predict

2. What will happen when you add water? (Predict by choosing a, b, c, d, or e below)
   a. the water will float on top of the oil
   b. the water will sink to the bottom of the oil
   c. the water will dissolve in the oil
   d. the water will become mixed up with the oil
   e. other (what?)
3. Gently add 2 ml of water by tilting the cylinder of oil slightly and letting the water run slowly down the inside of the cylinder.

Results

4. What happened?

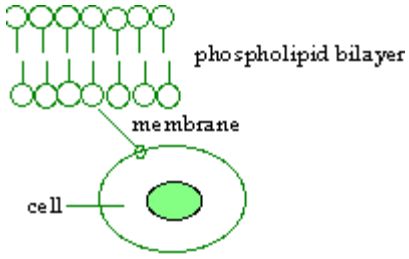
Question

5. Which is less dense (that is that has less weight per ml.), oil or water? _____
   What is the characteristic that causes oil and water to act this way?

Interpret

6. This characteristic behavior of water and oil is of critical importance for living things, determining many properties of the cell. Can you explain how? Consider the picture that follows:

Figure 10. Enlargement of Cell Membrane to Show Phospholipid Bilayer.



Question

6. What mechanism causes water molecules and oil molecules to separate from one another? Your explanation should involve **polar** and **non-polar** molecules, the effects of **polarity** on the molecular interactions, and **hydrogen bonding**.

Predict

1. Predict what will happen if you add a few drops of a water-soluble dye solution to each of the above graduated cylinders containing water and oil. Will the dye mix with the water, the oil, or both?
2. Perform the experiment. Add a few drops of dye to each cylinder. Use a glass stirring rod to penetrate the interface between each layer, giving the dye access to both water and oil. How does the dye behave in each cylinder? Does it diffuse into the oil? Into the water?

Results

3. Compare your predictions and results. Explain any differences.
4. Stir the contents of each cylinder with a stirring rod and then let it sit.

Predict

5. Will the contents remain mixed? Why do you think so?

Interpret

6. Observe what happens, compare with your prediction, and explain why it happens. Your explanation should involve **polarity**, **polar** and **non-polar** molecules, **solution**, and **hydrogen bonding**.

3d Sheen

Predict

1. Take a clean beaker of water. Predict what will happen if you add one small drop of oil to the water using a medicine dropper.
2. Do this experiment. Can you see the oil? Was your prediction correct? Add more drops of oil if necessary to see it clearly. Describe. Your description should focus on the separation of**polar** and **non-polar** layers and why that occurs.

Predict

3. Predict what will happen if you add a drop of **detergent** to the beaker.
4. Now add a drop of **detergent** to the beaker of water with oil on top. Record your results

Interpret

5. Compare the results with your prediction, and explain how the **detergent** works in molecular terms. Your explanation should focus on the ways in which **amphipathic** molecules disrupt **cohesion**.

Interpret

6. Explain some of the consequences of oil spills in the sea. What effects do they have on sea life and bird life, and what methods are used to 'clean up' oil spills?