

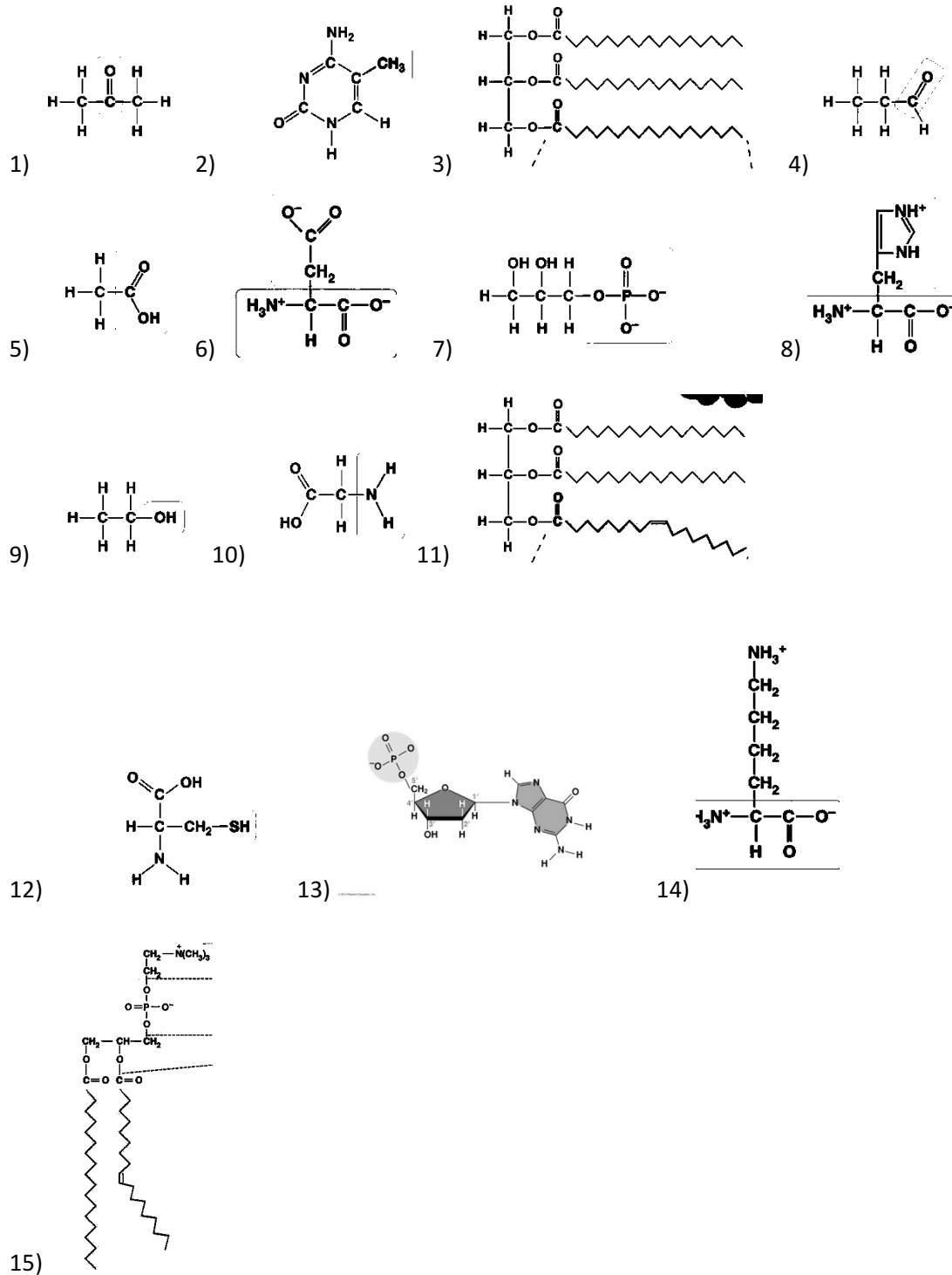
## Macromolecules

### Carbon Skeletons

1. How many different ways can you arrange the carbon atoms in a 5-carbon molecule?
  - a. Use the model kits.
  - b. Sketch your models of the different skeletons of carbon atoms first, then add in hydrogen atoms.
  
- c. What are the molecular formulas for these molecules? For example, the molecular formula for the molecule ethane in Fig 3.4a is  $C_2H_6$ .

## Identifying Biologically Important Functional Groups & Molecules

Use the numbered structural diagrams below to answer the questions on the next page. Use figures in your textbook to help identify the functional groups and molecules specified in the questions.



All molecules are numbered on the lower left of the structural diagrams on the previous page.

1. List all molecules (by number) that contain a hydroxyl group.
2. List all molecules above that contain a carbonyl group.
3. List all molecules that contain a carboxyl group.
4. List all molecules that are amino acids.
5. List all molecules that contain an amino group.
6. List all molecules that contain fatty acids.
7. List all molecules that are lipids.
8. List all molecules that contain a methyl group.
9. List all molecules that could be joined by peptide bonds to form a protein.
10. Which molecule(s) above is(are) nucleotide(s)?
11. Identify the molecules above that contain ester linkages.
12. Which molecules above are likely to act as acids, releasing  $H^+$  into aqueous solution?
13. Which molecules above can act as a base, attracting  $H^+$ ?
14. Identify the molecule(s) containing saturated fatty acids.
15. Identify the molecule(s) containing at least one unsaturated fatty acid.
16. Which molecule(s) above is(are) phospholipid(s)?

## Protein Structure

Define each level of protein structure.	What <u>kinds of bonds</u> hold this level of structure together?
Primary:	
Secondary:	
Tertiary:	
Quaternary:	

Use the pipe cleaners and paper provided to model primary, secondary, tertiary, and quaternary structure. Sketch your model below:

**Primary:**

**Secondary:**

**Tertiary:**

**Quaternary:**

### Macromolecule Structure

Use this table to summarize the structural features of each type of macromolecule.

Macromolecule	Functional Groups	Monomer (Building block)	Connecting Bond	Examples
Carbohydrates				
Lipids				
Proteins				
Nucleic Acids				

## Teaching Tips for Peer Leaders

Have students use the model kits to answer question 1 on the Carbon Skeletons sheet. Physically building the models and sketching them will help them with their mental images of molecules in 3D vs 2D as they progress through their biology and chemistry courses.

Students can use their books to help them identify the functional groups and identify the molecules on the “Biologically Important Functional Groups” sheet. Students do not need to be able to draw the molecules but they should be able to recognize their key features.

Have students use the pipe cleaners to demonstrate primary, secondary, tertiary, and quaternary structures. They can fold paper into pleats if they want to make beta-sheets.

On the Macromolecules chart, there is no repeating unit for lipids. It is not a polymer. See if the students can figure that out on their own. Help them out if they can't. Walk them through the reasoning to the answer. Don't just give it to them. Encourage them to use their books.

## Notes to Faculty

*Materials:* The model kits referenced in the Carbon Skeletons are the Inorganic/Organic Student Set, available from MolyMod ([www.molymod.com](http://www.molymod.com)), SKU # 884413000099.