

## Functional Groups Lab

### Teacher's Guide

For more detailed background information consult the Ryler Enterprises Kit “Organic Chemistry” kit available on the Ryler Enterprises website: [www.rylerenterprises.com](http://www.rylerenterprises.com). Click on “Instructions and Quizzes,” locate the **Organic Chemistry** section, then click on Organic Chemistry (ORG-1).

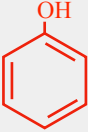
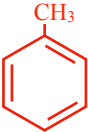
ATOM CENTERS		
Qty	Element	Color/Holes
12	Hydrogen	White/1
7	Carbon	Black/4

BONDS		
Qty	Length	Color
16	Short	Tan
6	Long	Grey

The students should fill in the empty slots on the lab sheet and build the model. You check the model and verify it with your initials or stamp in the “Model” column on the lab sheet.

### Key:

	Name	Chemical Formula	Type of Functional Group	Structural Formula (use dashes)	Model
1	methanol	$\text{CH}_3\text{OH}$	alcohol	$\begin{array}{c} \text{OH} \\   \\ \text{H}-\text{C}-\text{H} \\   \\ \text{H} \end{array}$	
2	2-butanol	$\text{C}_4\text{H}_9\text{OH}$	alcohol	$\begin{array}{c} \text{H} \text{ OH} \text{ H} \text{ H} \\   \quad   \quad   \quad   \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\   \quad   \quad   \quad   \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$	
3	1,2-ethandiol	$\text{C}_2\text{H}_6(\text{OH})_2$	alcohol	$\begin{array}{c} \text{OH} \text{ H} \\   \quad   \\ \text{H}-\text{C}-\text{C}-\text{H} \\   \quad   \\ \text{H} \quad \text{OH} \end{array}$	
4	propanone	$\text{C}_3\text{H}_6\text{O}$	ketone	$\begin{array}{c} \text{H} \quad \text{O} \quad \text{H} \\   \quad    \quad   \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\   \quad \quad   \\ \text{H} \quad \quad \text{H} \end{array}$	
5	3-hexanone	$\text{C}_6\text{H}_{12}\text{O}$	ketone	$\begin{array}{c} \text{H} \text{ H} \quad \text{O} \quad \text{H} \text{ H} \text{ H} \text{ H} \\   \quad   \quad    \quad   \quad   \quad   \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\   \quad   \quad \quad   \quad   \quad   \\ \text{H} \quad \text{H} \quad \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$	

6	3-methylbutanal	$C_5H_{10}O$	aldehyde	$  \begin{array}{cccc}  & O & H & H & H \\  &    &   &   &   \\  H & -C & -C & -C & -C-H \\  & & H & CH_3 & H  \end{array}  $	
7	phenol	$C_6H_5OH$	aromatic w/ alcohol		
8	methylbenzene	$C_7H_8$	aromatic w/ alkyl		
9	propanoic acid	$C_3H_6O_2$	carboxylic acid	$  \begin{array}{ccccc}  & H & H & & O \\  &   &   & &    \\  H & -C & -C & -C & -OH \\  &   &   & & \\  & H & H & &  \end{array}  $	
10	ethylpropyl ether	$C_5H_{12}O$	ether	$  \begin{array}{ccccccc}  & H & H & & H & H & H \\  &   &   & &   &   &   \\  H & -C & -C & -O & -C & -C & -C-H \\  &   &   & &   &   &   \\  & H & H & & H & H & H  \end{array}  $	
11	propylethanoate	$C_5H_{10}O_2$	ester	$  \begin{array}{ccccccc}  & H & O & & H & H & H \\  &   &    & &   &   &   \\  H & -C & -C & -O & -C & -C & -C-H \\  &   & & &   &   &   \\  & H & & & H & H & H  \end{array}  $	
12	dichlorodifluoro methane	$CCl_2F_2$	halocarbon	$  \begin{array}{c}  Cl \\    \\  F-C-F \\    \\  Cl  \end{array}  $	

## Functional Groups Lab

### Student Procedure

**Objective:** To model and visualize the structure of organic functional groups.

**Materials:** Ryler Enterprises model kit parts: 7 black (carbon) atom centers, 12 white (hydrogen) atom centers, 2 red (oxygen) atom centers, 4 green (halogen) atom centers, 16 single bonds, 6 long double (or triple) bonds.

1. Make one copy of the table the “Master” copy and have the instructor stamp only that one sheet. Each student should fill out a sheet, but only the Master copy will be used for the final grade.
2. Use a pencil to fill in all blank boxes, except the “Model” column. This is where your instructor stamps or initials when your model is correct.
3. Students should be prepared to answer questions about the models. Students may use scratch paper to draw Lewis structures to help determine structural formulas.

	Name	Chemical Formula	Type of Functional Group	Structural Formula (use dashes)	Model
1	methanol		alcohol		
2	2-butanol				
3	1,2-ethandiol				
4	propanone				
5	3-hexanone				
6	3-methylbutanal				
7	phenol				
8	methylbenzene				
9	propanoic acid				
10	ethylpropyl ether				
11	propylethanoate				
12	dichlorodifluoro methane				

