

Organic Chemistry



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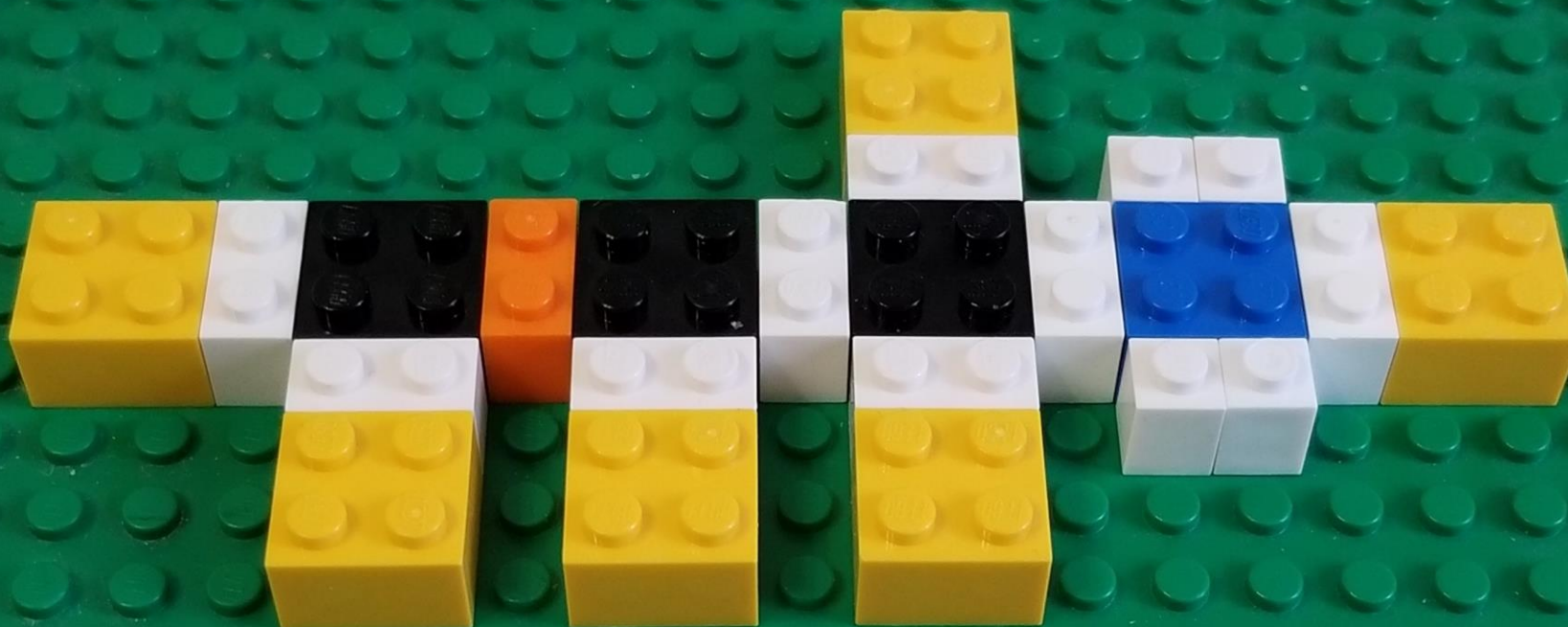
rick

Part 10

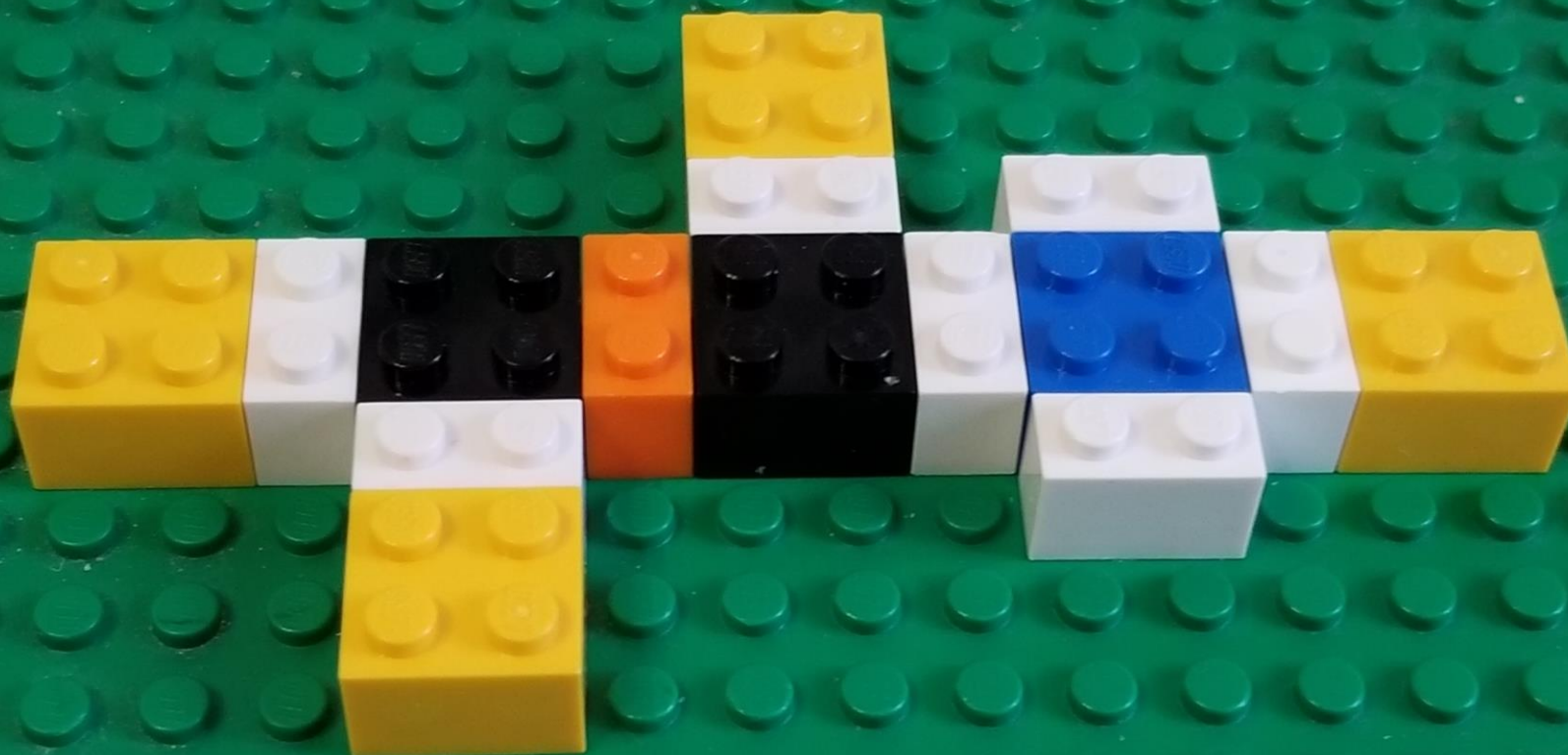
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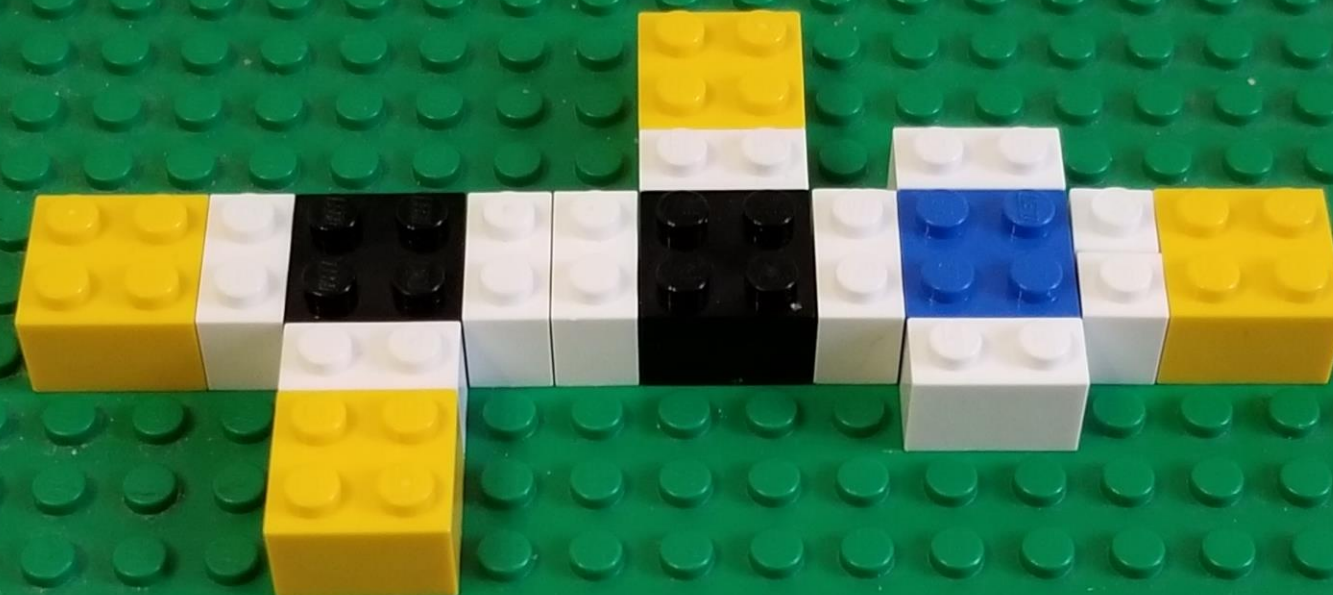
This is an example of an alkenol (an alcohol molecule with a double bond) – prop-2-en-1-ol ($\text{CH}_2=\text{CH}-\text{CH}_2-\text{OH}$).



This is the same molecule but with depicted single bonds and hydrogen atoms.

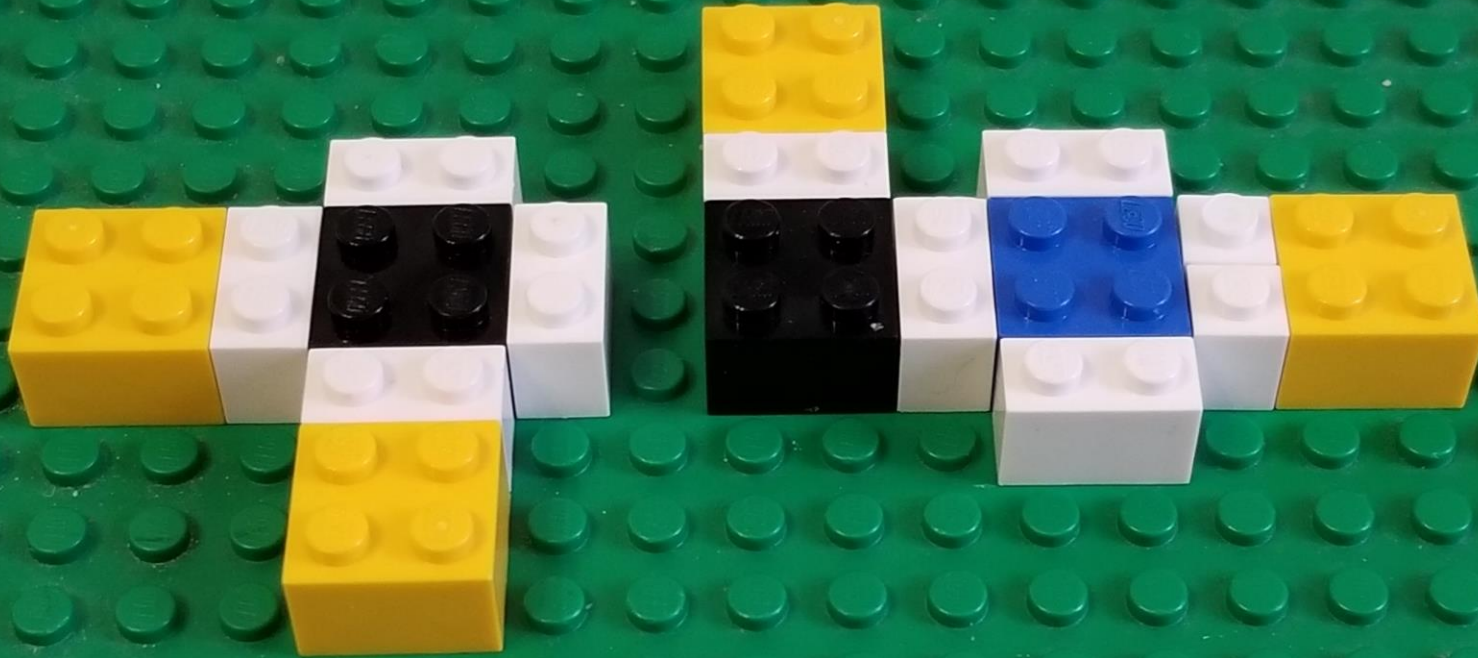


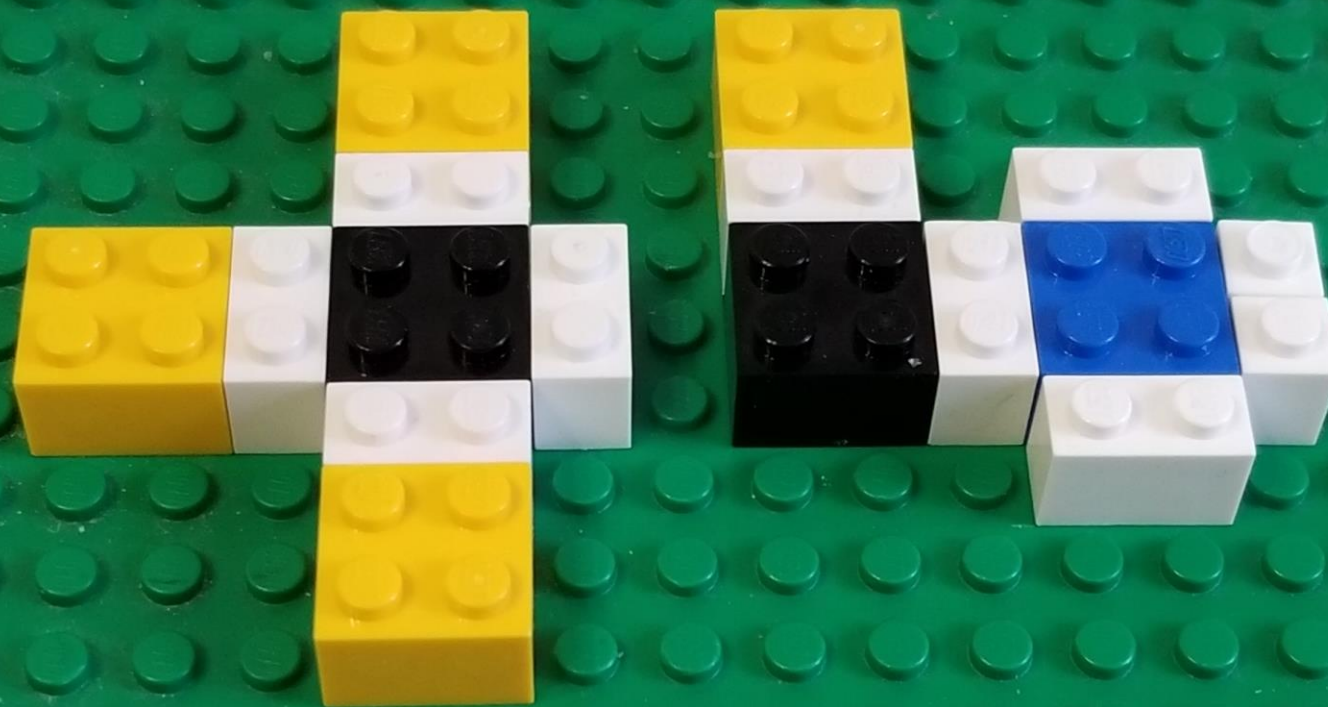
This is a molecule of vinyl alcohol (ethenol, $\text{CH}_2=\text{CH-OH}$).



An ethenol molecule easily converts (tautomerizes) to a molecule that has a double bond between carbon and oxygen atoms (acetaldehyde). We illustrate this in the next slides. One pair of electrons from a double bond migrates to a carbon atom ...

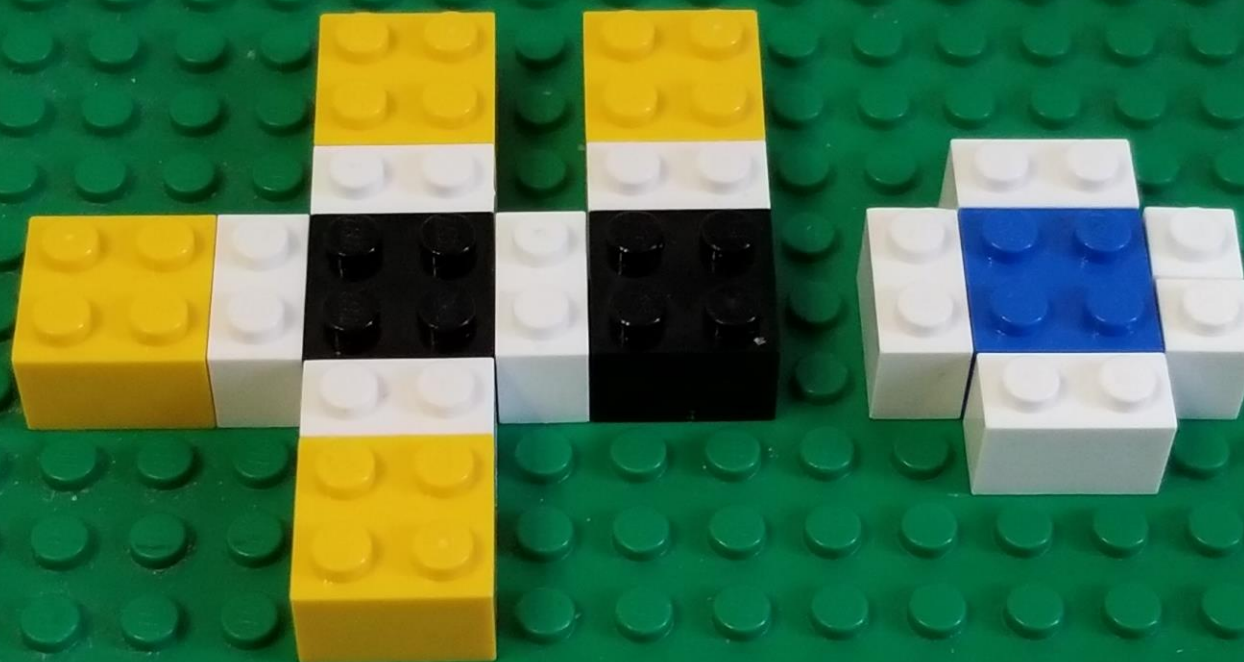
... then a hydrogen atom from the hydroxyl group attaches to that pair ...

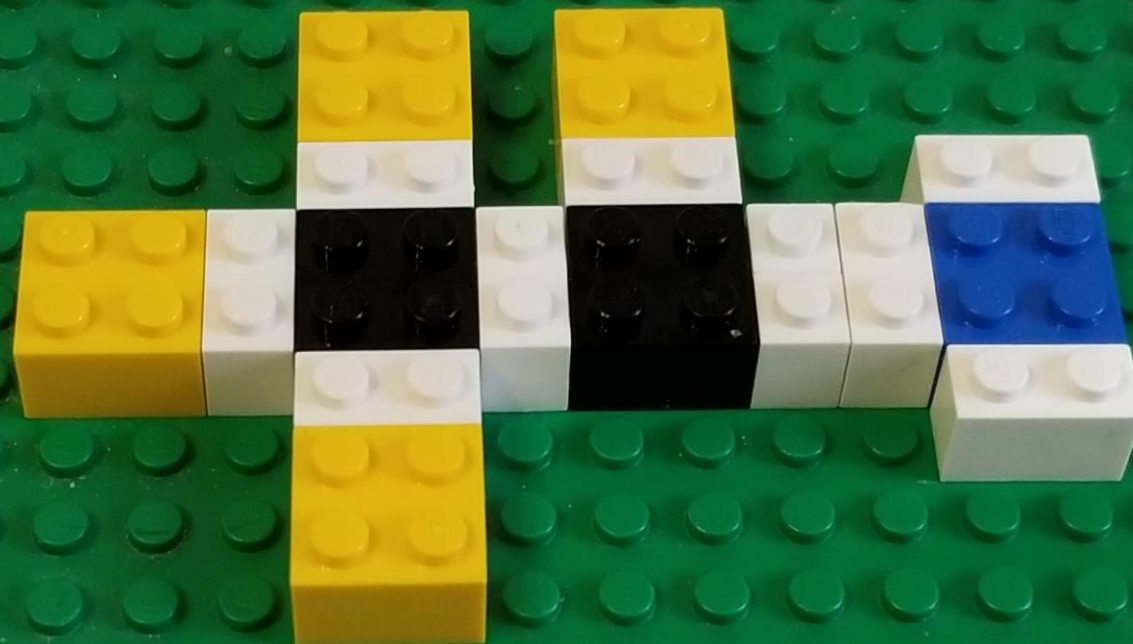




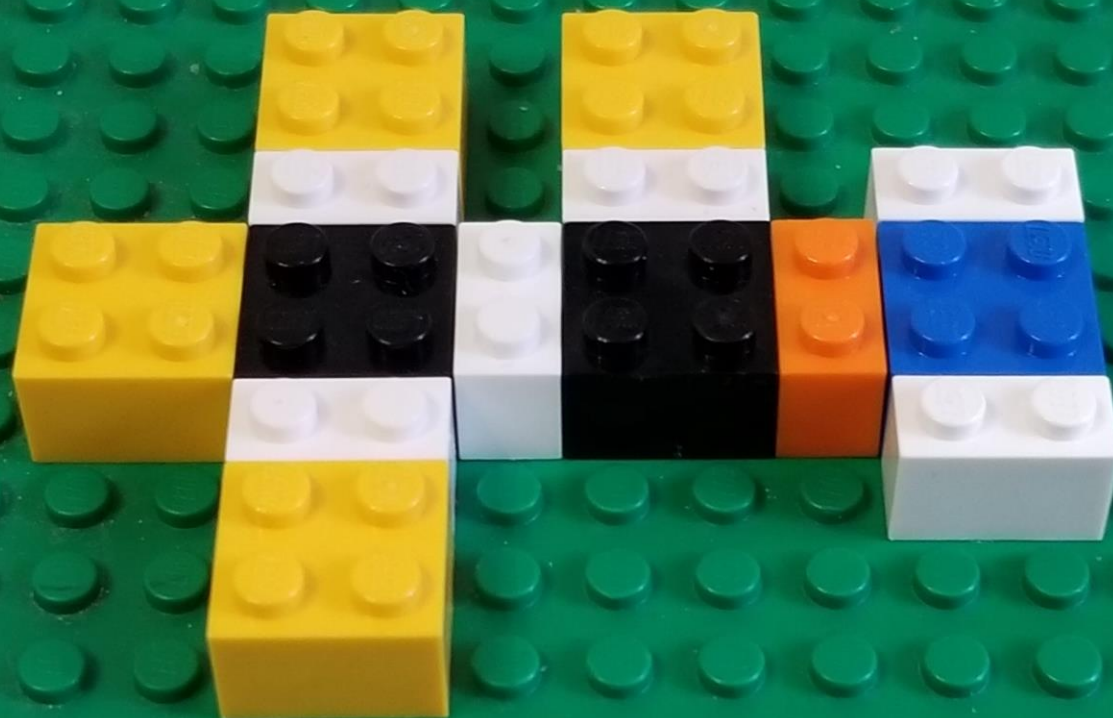
... and where we had the double bond we now have a single bond ...

... and a free pair of electrons from the oxygen atom migrates to the adjacent carbon atom with the formation of a double bond.

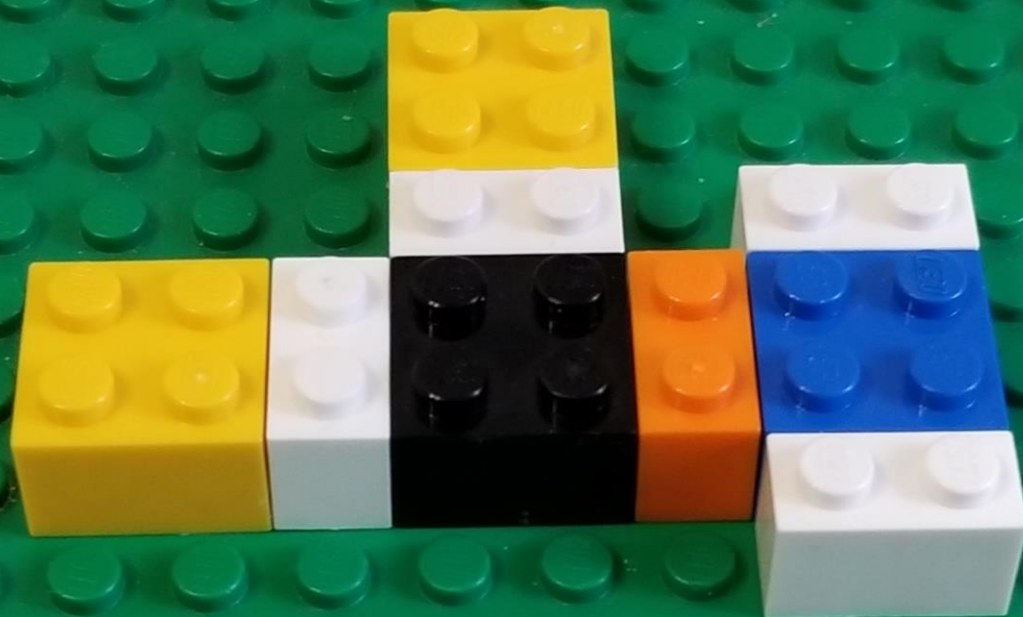




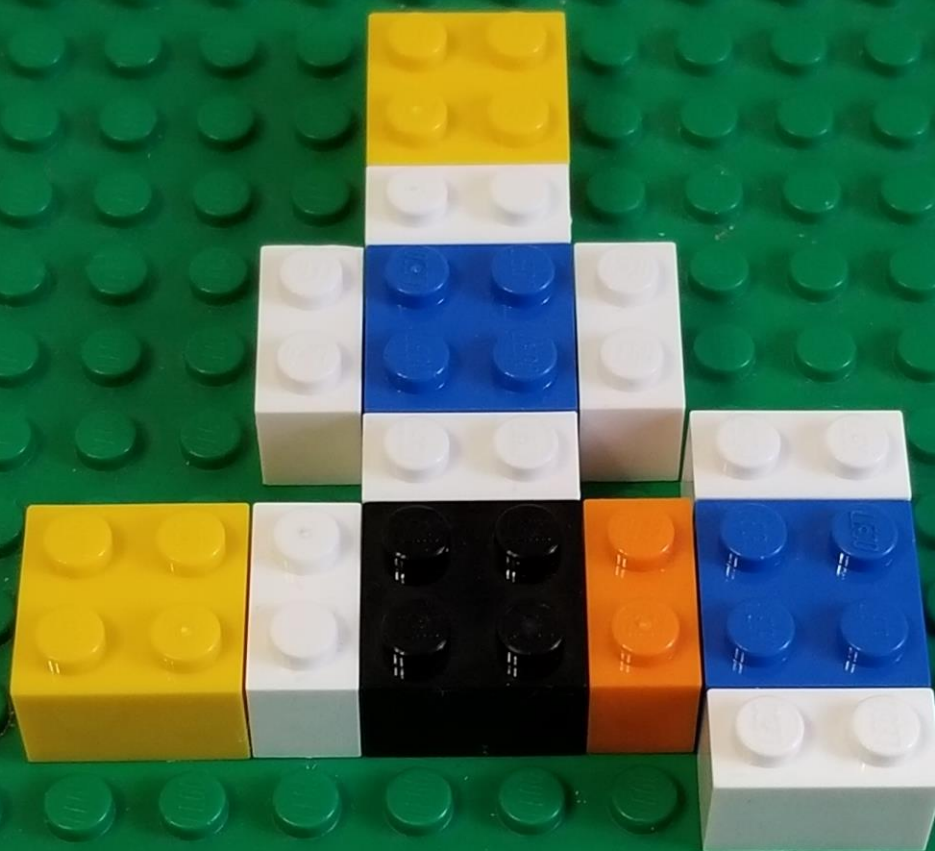
We now have a molecule of acetaldehyde (ethanal, $\text{CH}_3\text{CH}=\text{O}$).



This is the same molecule but with depicted double bond using orange color.

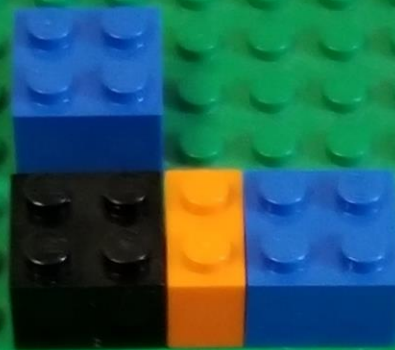


This is the simplest aldehyde – formaldehyde (methanal, $\text{CH}_2=\text{O}$).
The functional group $>\text{C}=\text{O}$ is called a carbonyl group.



This is an example of a carboxylic acid – a formic acid (methanoic acid, **HCOOH**). The functional group **-COOH** is called a carboxyl group. It “contains” a carbonyl (**>C=O**) and hydroxyl groups (**-OH**).

Methanoic acid (HCOOH)



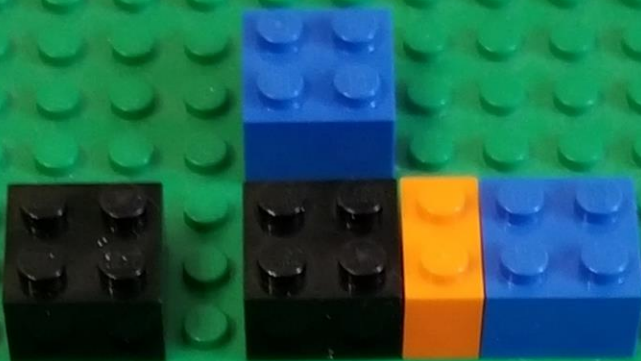
Methanal (HCHO)



Methanol (CH_3OH)



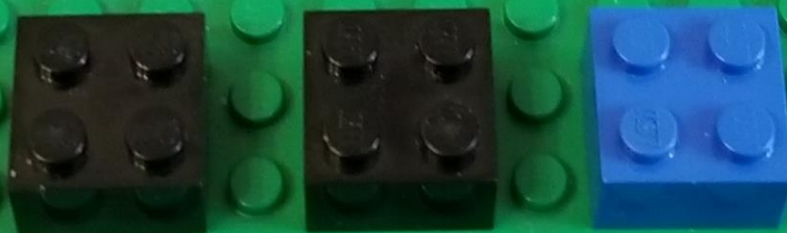
Acetic acid (ethanoic
acid, CH_3COOH)



Acetaldehyde
(ethanal, CH_3CHO)

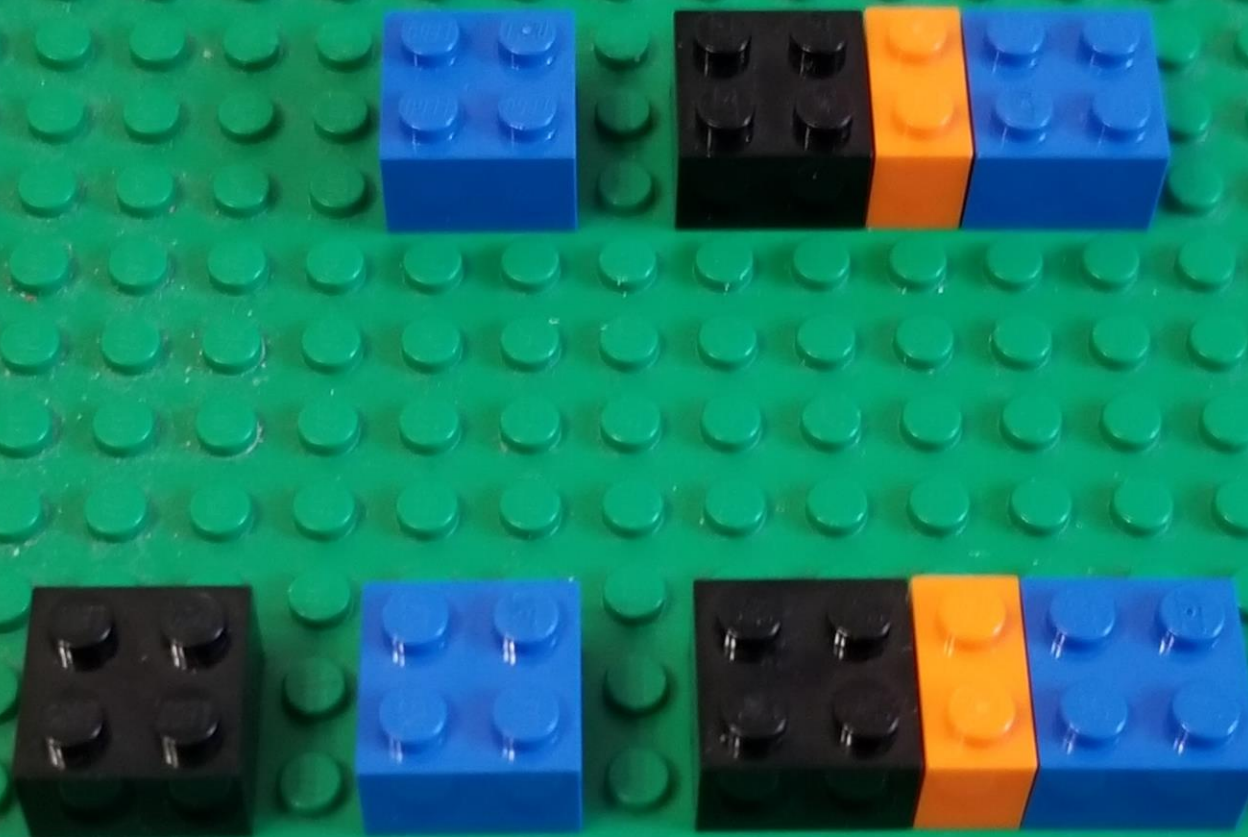


Ethanol ($\text{CH}_3\text{CH}_2\text{OH}$)

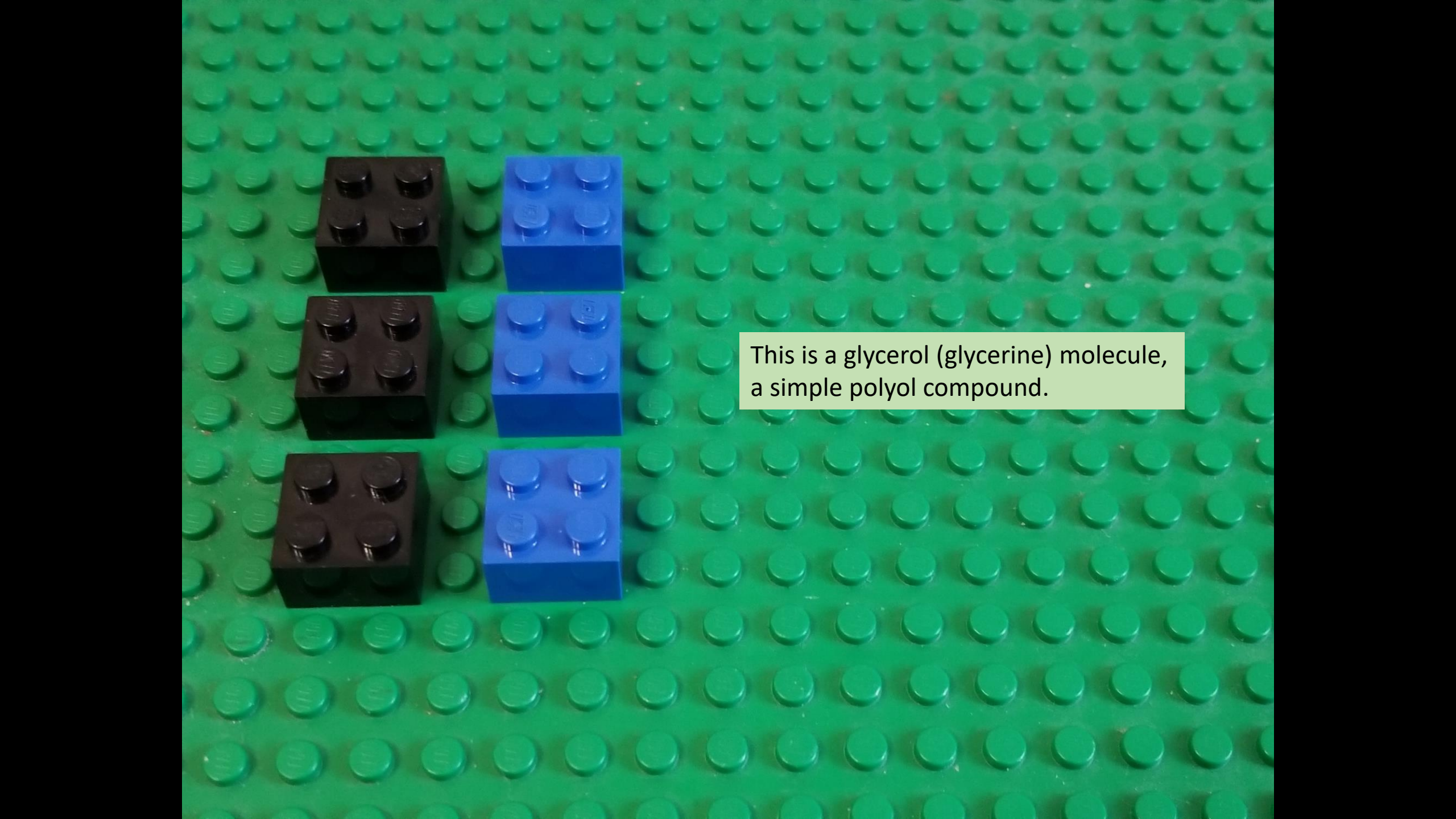




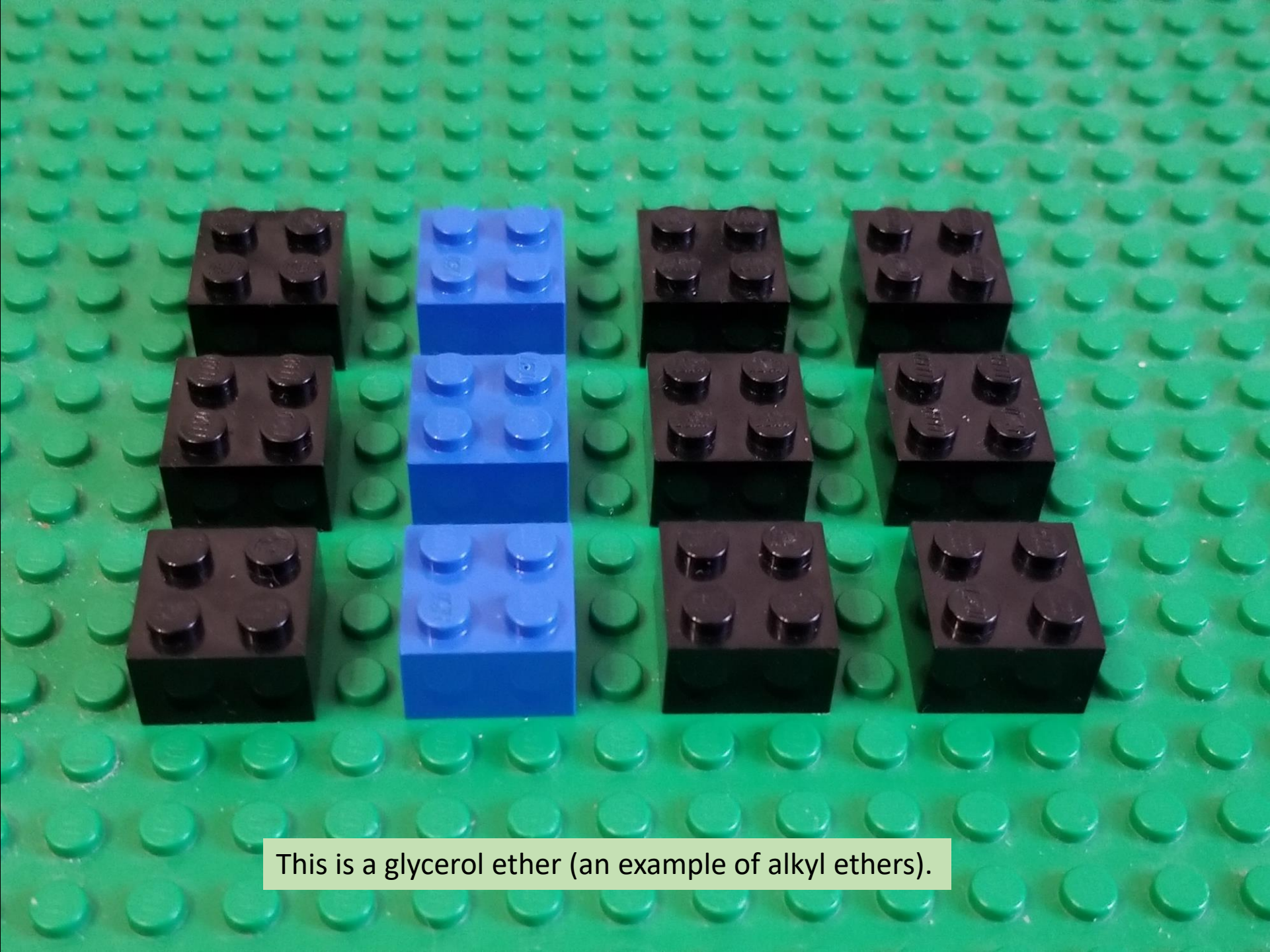
If we replace the hydrogen atom in a methanol hydroxyl group with a methyl group (CH_3), we get a dimethyl ether molecule ($\text{CH}_3\text{-O-CH}_3$). Such compounds are called ethers.



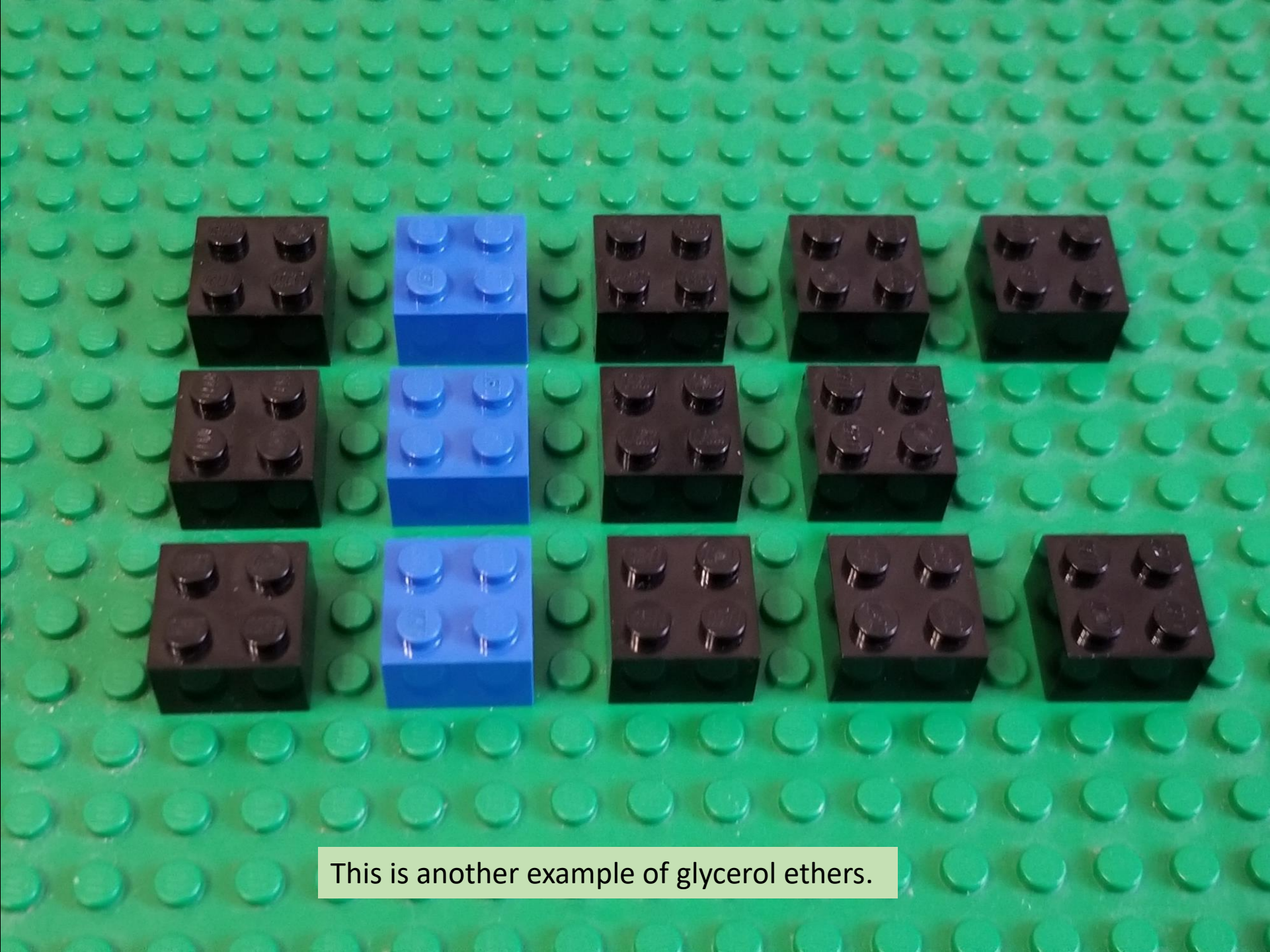
If we replace the hydrogen atom in a methanoic acid carboxyl group with a methyl group (CH_3), we get a methyl formate molecule (methyl methanoate, HCOOCH_3). Such compounds are called esters.

The image shows a molecular model of glycerol (glycerine) constructed from LEGO bricks. The model is built on a green baseplate with a grid of studs. It consists of three black bricks and three blue bricks arranged in a staggered, zig-zag pattern. The black bricks are positioned at the top, middle, and bottom, while the blue bricks are positioned between them, offset to the right. This arrangement represents the three carbon atoms of the glycerol molecule, with the black bricks likely representing the carbon atoms and the blue bricks representing the oxygen atoms in the hydroxyl groups. The text overlay on the right side of the image states: "This is a glycerol (glycerine) molecule, a simple polyol compound."

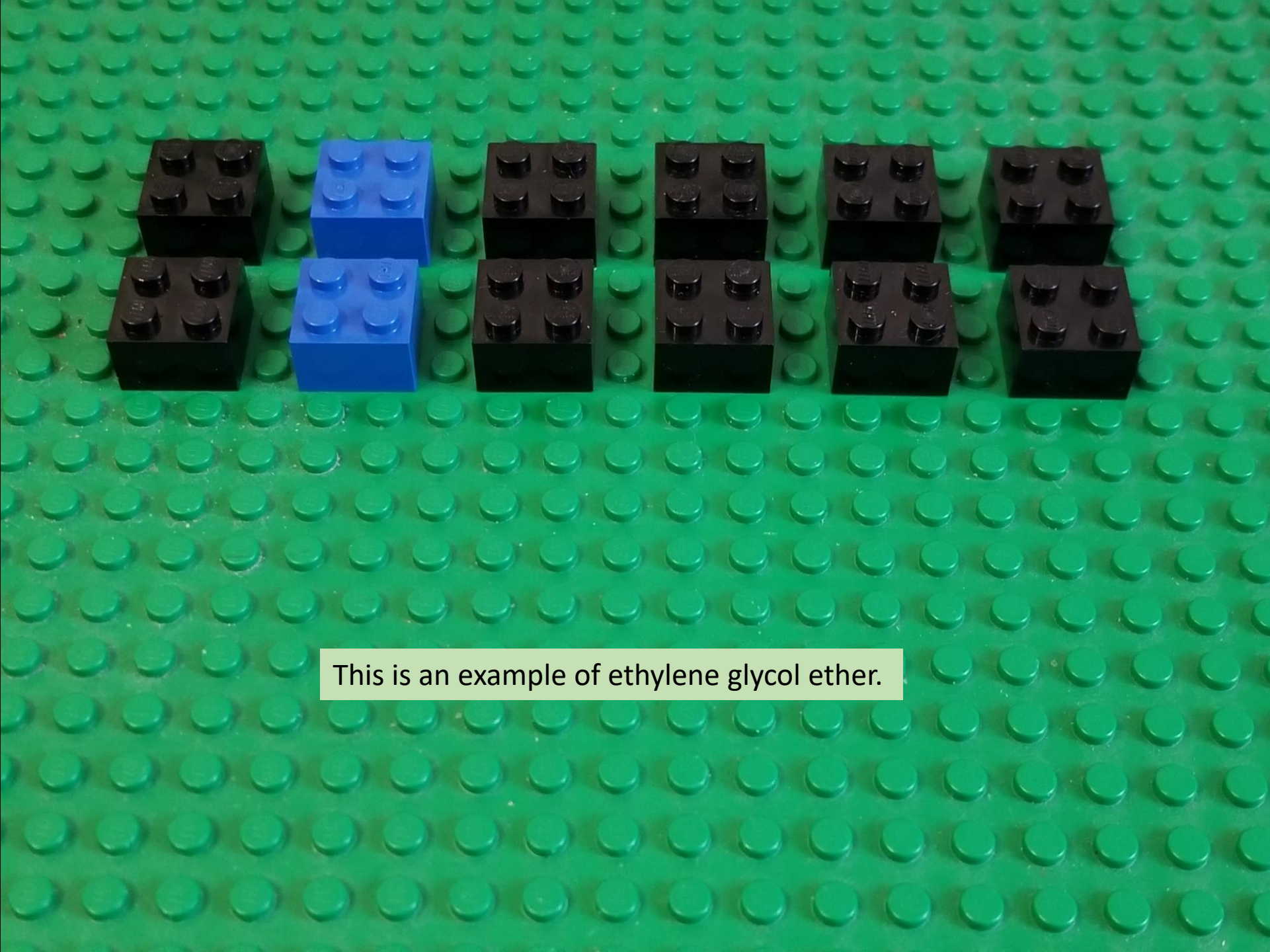
This is a glycerol (glycerine) molecule,
a simple polyol compound.



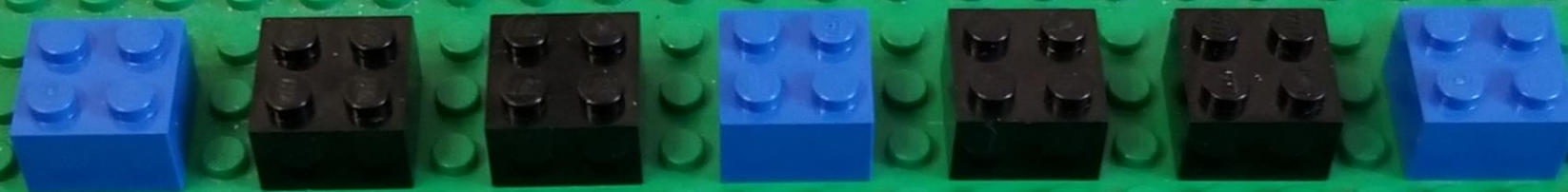
This is a glycerol ether (an example of alkyl ethers).




This is another example of glycerol ethers.



This is an example of ethylene glycol ether.



This is an example of a molecule which is ether and diol (two hydroxyl groups).



Continued with
Part 11