8. Use the AGROCHEMICALS HANDBOOK (CHEM3) database which has information on more than 700 pesticides used worldwide. Research and report on toxicity to mammals or birds. Find the chemical name plus the common name and physical properties of a pesticide of your choice. The articles on dioxins in *Chemical Matters* February 1988 and April 1988 are good references.
9. Chemicals used on carpets and fumes from your furniture may be hazardous to your health. Research and report on the effects of chemicals on indoor air quality.
10. Research and report on how poisonous drinking alcohol is.

Enrichment Reading

Read *A Whiff of Death* by Isaac Asimov. Write a report about the chemistry in the book (200 pts).

Enrichment Video

Watch the video on Alfred Nobel, (60 min). Take one page of notes and have the librarian sign to indicate you viewed the video (100 pts).

8.4 Alcohols

Although you are probably most familiar with drinking or rubbing alcohol, there are many different alcohols. **Alcohols** are hydrocarbons with an **-OH** functional group.

Methanol, CH_3OH, is the simplest alcohol. Methanol is 35 times more intoxicating than drinking alcohol. Some street alcoholics use methanol to produce the desired effect, because they can buy it without paying liquor tax. The problem with ingesting even as much as 30 mL of methanol is that is causes blindness or death. The body metabolizes methanol into formaldehyde (HCHO). It is the formaldehyde that destroys the optic nerves. Methanol is used for varnishes, shellacs, duplicating fluid, and windshield washer fluid. It is colored blue to keep people from drinking it. Methanol is added to gasoline to produce gasohol. Methanol burns cleaner than gasoline, because it does not add unburned hydrocarbons to the atmosphere.

$$CH_3OH + 3O_2(g) \text{ -------> } 2CO_2(g) + 4HOH(g) + \text{energy}$$

Grain alcohol, **ethanol**, is the active ingredient in alcoholic drinks such as rum, whiskey, vodka. Glucose is fermented with yeast to make ethanol.

$$C_6H_{12}O_6 + \text{yeast} \text{ ---------> } 2C_2H_5OH + 2CO_2$$

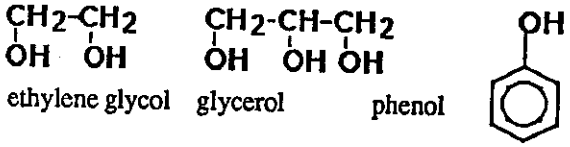
The percentage of ethanol in rum, whiskey, or vodka is reported as proof. For example, 70 proof whiskey is 35% ethanol. Before there were government regulations on alcohol content of whiskey, customers demanded "proof" that the whiskey they were purchasing was not watered down. To get the proof, a bit of whiskey was poured on gunpowder. If the gunpowder ignited, the customer had 100% proof that the whiskey was at least 50% alcohol (*World Book*).

Ethanol is toxic but less so than methanol. One pint (500 mL) of pure ethanol, drunk rapidly, will kill. Every year we read of a teenager who dies from chugg-a-lugging a bottle of vodka. He passes out before he vomits and dies because of too much alcohol in his blood.

2-Propanol, $CH_3CH(OH)CH_3$, or isopropyl alcohol, is rubbing alcohol. Drinking 2-propanol is not so dangerous as drinking methanol, because 2-propanol causes severe vomiting. It doesn't stay down long enough to kill you, although you may wish you were dead.

2-Propanol is added to gasoline as an antifreeze. You can buy 2-propanol as Isopropyl® or Heat®. It seems smarter to purchase gasohol which contains ethanol or methanol since the alcohol is already added, and there is no need to pay extra for the Isopropyl® or Heat®.

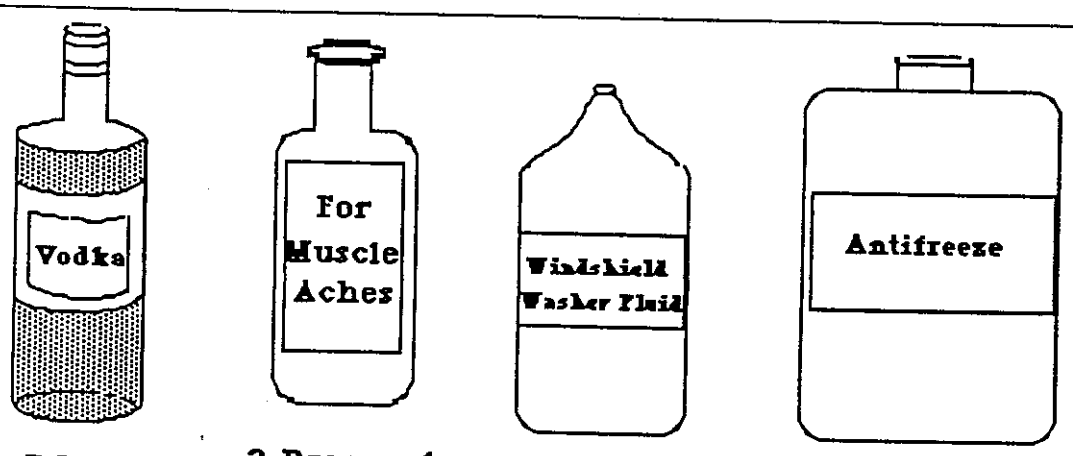
Ethylene glycol is used as antifreeze in car radiators and **glycerol** is used in handcreams. **Phenols** are used to manufacture dyes, drugs, photographic developers, and adhesives.



ethylene glycol glycerol phenol

To **name alcohols,** use the following rules:

a) Number the longest continuous chain of carbon atoms that contains the -OH group so that the -OH has the lowest possible number.
b) Drop the final -e from the hydrocarbon name, and use the ending -ol.
c) Indicate by number the alkyl groups attached to the chain.



Ethanol 2-Propanol methanol Ethylene Glycol

Self Test 8.4

1. Name the following, and give the use:

a) $CH_3\text{-}\underset{\underset{OH}{|}}{CH}\text{-}CH_3$

b) CH_3CH_2OH

c) CH_3OH