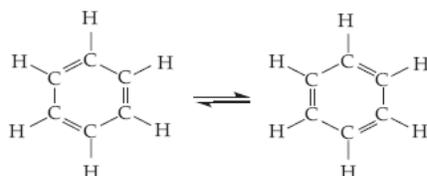


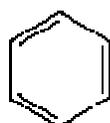
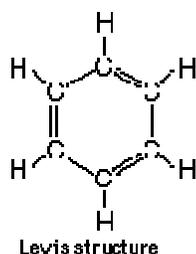
## Aromatic Hydrocarbons

### What is an aromatic hydrocarbon?

- A hydrocarbon whose molecular structure incorporates one or more planar sets of six carbon atoms that are connected by delocalized electrons numbering the same as if they consisted of alternating single and double covalent bonds



- The name aromatic originated from the pleasant odor of many naturally occurring compounds
- The configuration of six carbon atoms in aromatic compounds is known as a benzene ring
  - Benzene:  $C_6H_6$



old symbol



modern symbol

## Benzene

- Benzene is a colorless liquid with a sweet odor.
- It evaporates into the air very quickly and dissolves slightly in water.
- It is highly flammable and is formed from both natural processes and human activities.

- Benzene is widely used. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and other synthetic fibers.
- Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides.
- Natural sources of benzene include emissions from volcanoes and forest fires. Benzene is also a natural part of crude oil and gasoline.

## Other Commonly Used Aromatic Hydrocarbons

- Polychlorinated biphenyls (PCBs)
- Caffeine
- Steroids
- Organic solvents (toluene, xylene)

## Steroids

- A steroid is a terpenoid lipid characterized by a carbon skeleton with four fused rings, generally arranged in a 6-6-6-5 fashion.
- Steroids vary by the functional groups attached to these rings and the oxidation state of the rings.
- Hundreds of distinct steroids are found in plants, animals, and fungi.

- Steroids include estrogen, cortisol, progesterone, and testosterone.
- Anabolic steroids are synthetically produced variants of the naturally occurring male hormone testosterone.

## Polychlorinated Biphenyls (PCBs)

- Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds.
- There are no known natural sources of PCBs.
- PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air.
- PCBs have no known smell or taste.
- Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

- PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators.
- The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects.
  - acne-like skin conditions in adults and neurobehavioral and immunological changes in children
  - PCBs are known to cause cancer in animals.

- Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

## Caffeine

- 1,3,7-trimethyl-1*H*-purine-2,6(3*H*,7*H*)-dione
- Caffeine is a bitter, white crystalline xanthine alkaloid that acts as a psychoactive stimulant drug.
- In humans, caffeine is a central nervous system (CNS) stimulant, having the effect of temporarily warding off drowsiness and restoring alertness.

- Caffeine has diuretic properties, at least when administered in sufficient doses to subjects who do not have a tolerance for it.
- Regular users, however, develop a strong tolerance to this effect, and studies have generally failed to support the common notion that ordinary consumption of caffeinated beverages contributes significantly to dehydration.

## Organic Solvents - Toluene

- Toluene is a clear, colorless liquid with a distinctive smell.
- Toluene occurs naturally in crude oil and in the tolu tree.
- It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

- Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

## Organic Solvents - Xylene

- There are three forms of xylene in which the methyl groups vary on the benzene ring: meta-xylene, ortho-xylene, and para-xylene (m-, o-, and p-xylene).
- Xylene is a colorless, sweet-smelling liquid that catches on fire easily
- It occurs naturally in petroleum and coal tar. Chemical industries produce xylene from petroleum.

- Xylene is used as a solvent and in the printing, rubber, and leather industries.
- It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes.
- It is found in small amounts in airplane fuel and gasoline.