

Reactions of Functional Group – 1

Some Reactions of Hydrocarbons

الهدف من التجربة

To distinguish alkanes, alkenes and aromatic hydrocarbons by their chemical reactions and reactivity.

- Hydrocarbons are organic compounds containing carbon and hydrogen atoms in their structure.
- themselves are separated into two types: **aliphatic hydrocarbons and aromatic hydrocarbons.**

1. Aliphatic hydrocarbons are hydrocarbons based on chains of C atoms.

يجب التمييز بينها

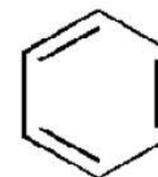
<u>Alkanes</u>	<u>Alkenes</u>	<u>Alkynes</u>
are aliphatic hydrocarbons with only single covalent bonds between carbon-carbon atoms, they are relatively unreactive, because they have strong c-c single bond.	are hydrocarbons that contain at least one C–C double bond, more reactive than alkanes	are hydrocarbons that contain a C–C triple bond, more reactive than alkenes.
C_nH_{2n+2}	C_nH_{2n}	C_nH_{2n-2}
single covalent bonds	double bond	triple bond
saturated hydrocarbons.	unsaturated hydrocarbons.	unsaturated hydrocarbons.
<u>Under go Substitution reactions</u> Because alkanes have the maximum number of H atoms possible according to the rules of covalent bonds	<u>Addition reactions</u>	<u>Addition reactions</u>

- ✓ alicyclic hydrocarbons. Occasionally, we find an aliphatic hydrocarbon with a ring of C atoms; these hydrocarbons are called cycloalkanes (or cycloalkenes or cycloalkynes).
- ✓ In general the reactivity of alicyclic hydrocarbons are similar to that of linear alkanes and alkenes.

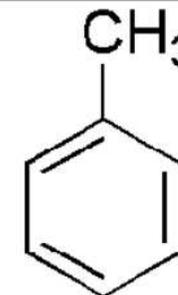
خصائصها

2. Aromatic Hydrocarbons

Benzene



Toluene



Aromatic hydrocarbons are sometimes known as “arenes” or “aryl hydrocarbons”.

Most aromatic hydrocarbons contain a benzene ring in their structure; but

there are non-benzene aromatic hydrocarbons called heteroarenes, which follow the “Huckle’s rule” (Cyclic rings which follow the Huckle’s rule have $4n+2$ number of π -electrons; where $n = 0,1,2,3,4,5,6$).

Some aromatic hydrocarbons have more than one ring; they are called polycyclic aromatic hydrocarbons.

Planer (sp²)

Resonance (more resonance, more stable)

Aromatic hydrocarbons are unsaturated, but have a stable conjugated electron system, so that they are more liable to substitution reactions rather than addition reactions.

Properties of Aliphatic hydrocarbons

○ STRUCTURE AFFECTS MOLECULAR PROPERTIES

- Alkanes are not polar and are good solvents for other nonpolar molecules
- Alkanes have low reactivity because they are nonpolar and have no charge, and because they have strong single bonds between carbon atoms.
- Alkenes are nonpolar and have low solubility in water. Alkenes are more reactive than alkanes because the double bond increases electron density between the two carbon atoms, providing a good site for chemical reactivity
- Alkynes have physical and chemical properties similar to alkenes but are generally more reactive because the triple bonds cause even larger electron densities than double bonds

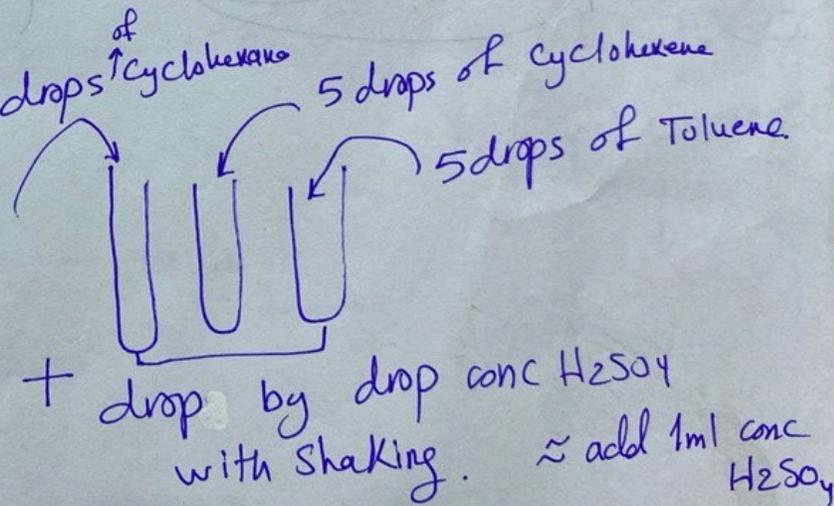
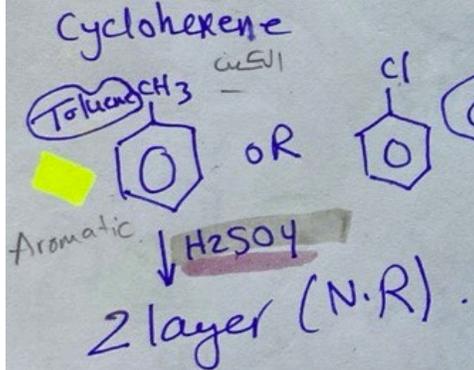
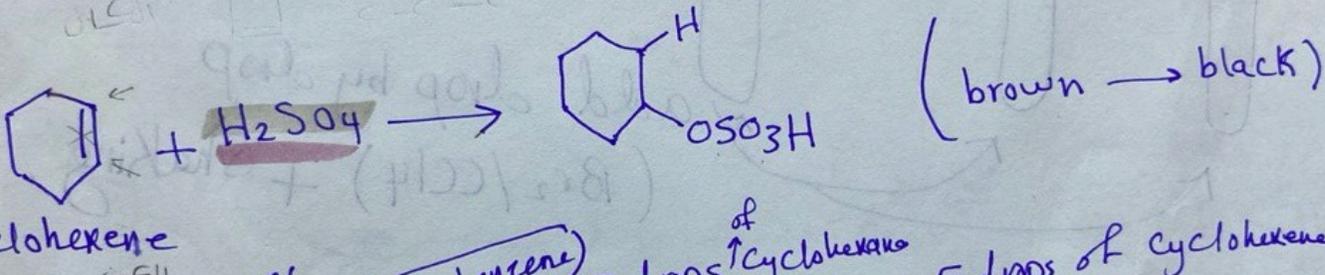
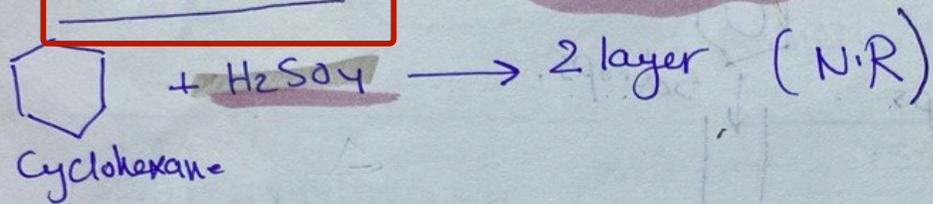
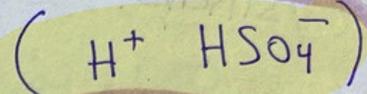
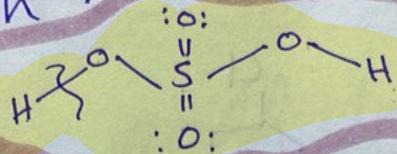
Uses of Hydrocarbons

- Hydrocarbons are widely used as fuels. For example LPG (liquefied petroleum gas), CNG (Liquefied natural gas).
- They are used in the manufacturing of polymers such as polyethene, polystyrene etc.
- These organic compounds find their application in the manufacturing of drugs and dyes as a starting material.
- They serve as lubricating oil and grease.

* To Distinguish :

①

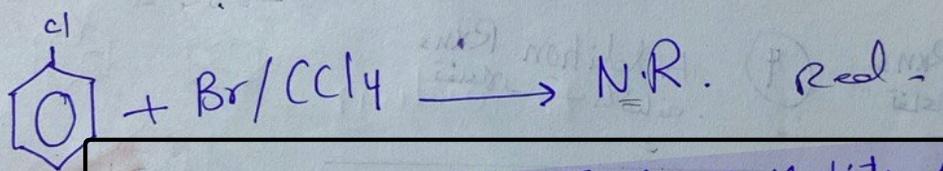
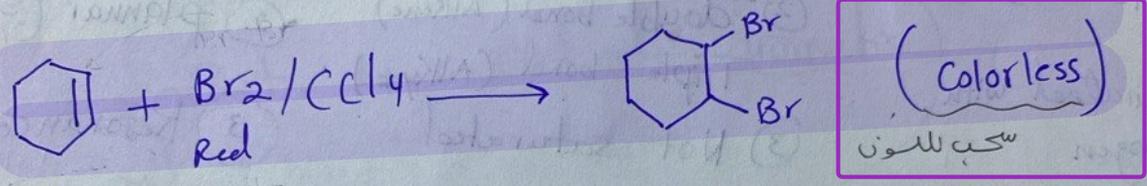
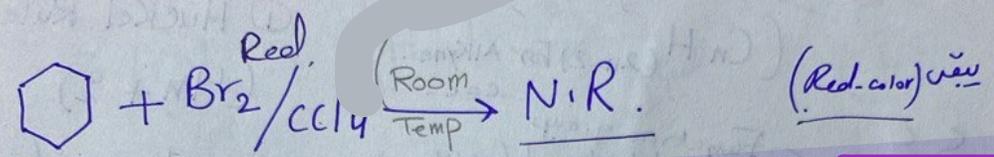
Conc H_2SO_4
Sulfonation Rxn



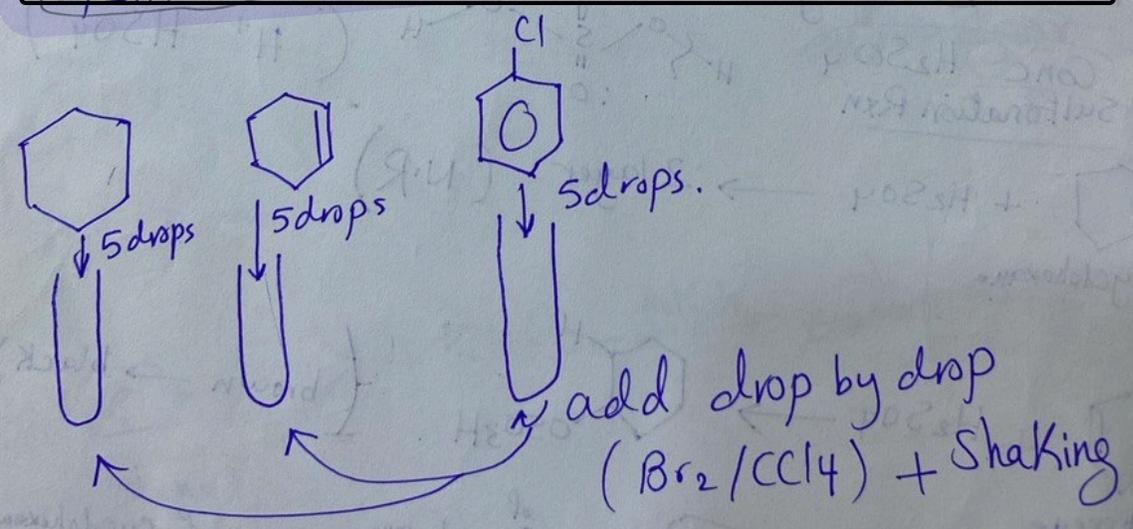
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Halogenation Rxn:-

Br₂/CCl₄



وهم من اهم التفاعلات المستخدمة لقياس ال Alkenes.



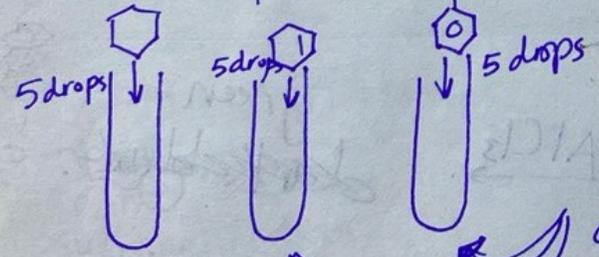
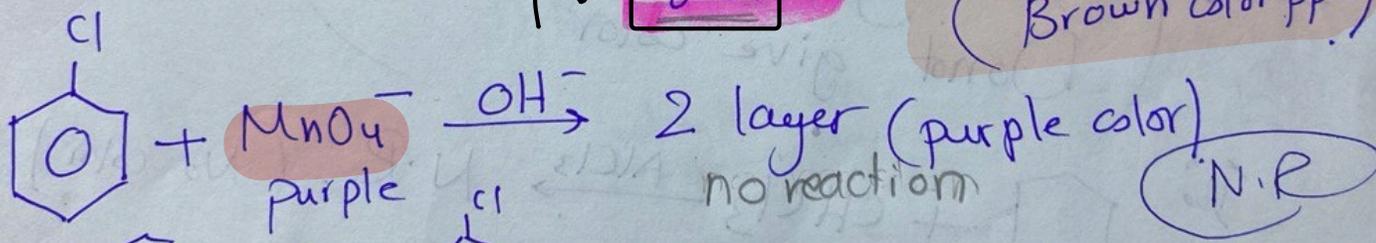
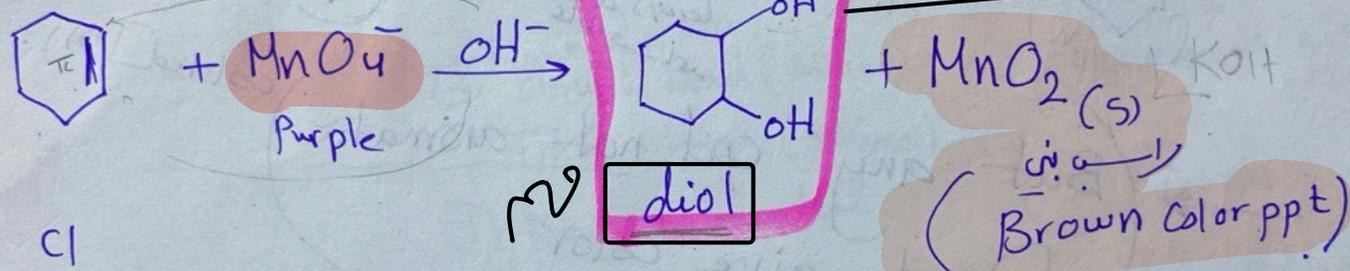
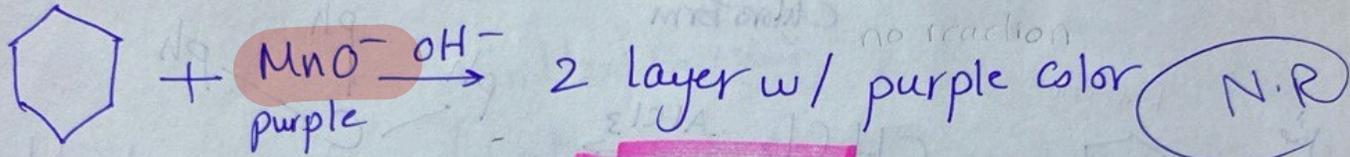
يتم سكب
 اللون
 عند التفاعل
 Colorless

oxidizing agent

Bayer Test:

Reagent
 $KMnO_4 / OH^-$
 (MnO_4^- / OH^-)

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add drop by drop
 $(KMnO_4 / OH^-)$.

test اسم ال
And reagents

test اسم الناتج وفي اي

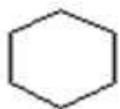
يجب التنويه إلى ان الألكان
Unreactive in every test

Combustion of Hydrocarbon in Presence of O₂

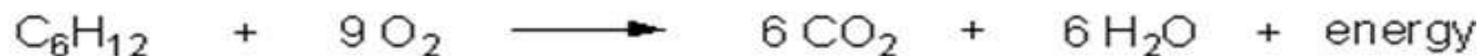
Saturated compounds burn cleanly, while unsaturated ones tend to produce soot.



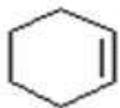
Alkane



cyclohexane

**Less soot**

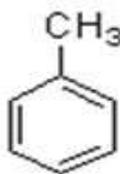
Alkene



cyclohexene

**Moderate soot**

Aromatic

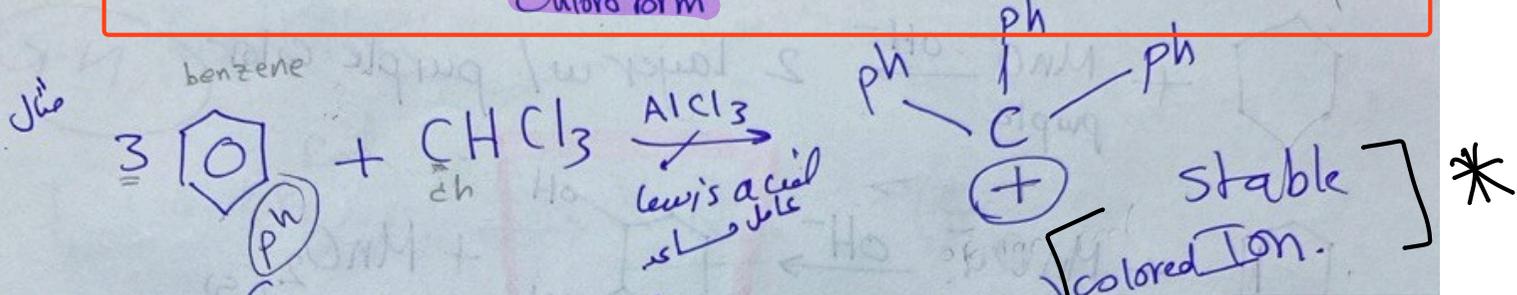
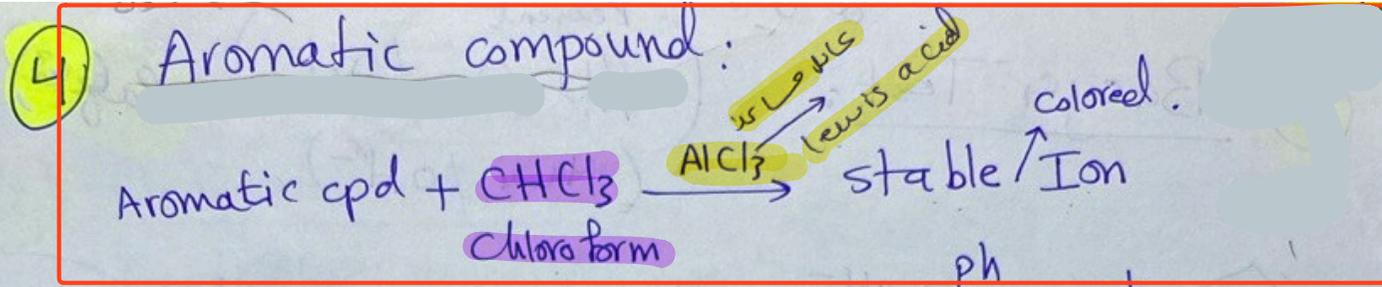


toluene

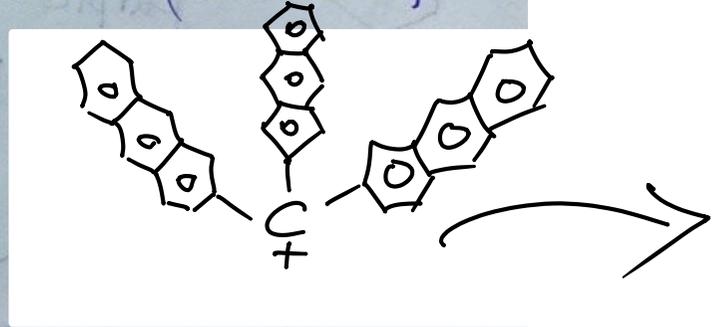
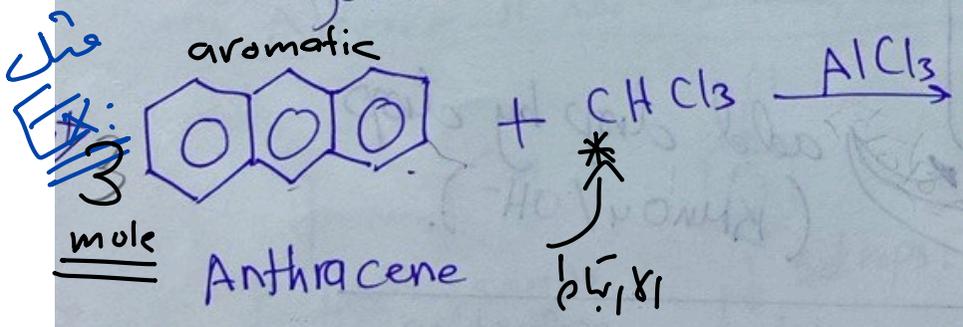
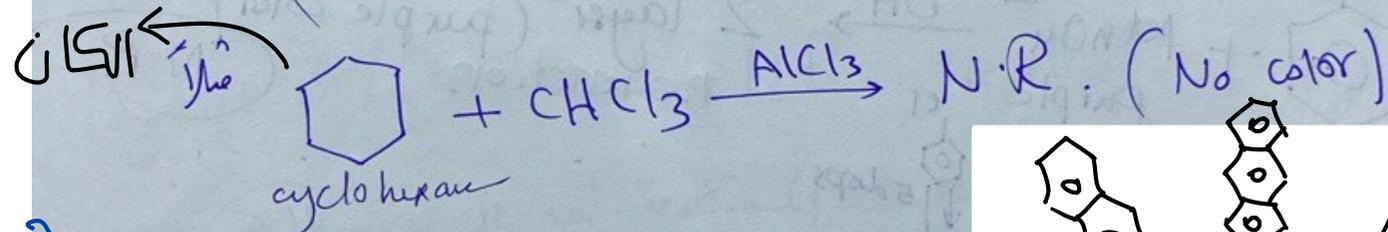
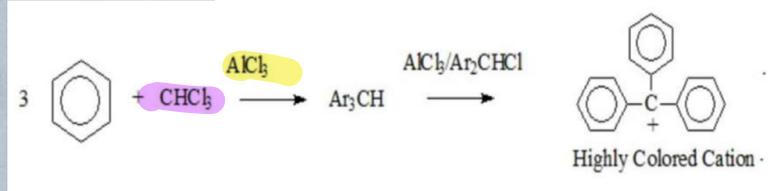
**More soot**

كلما زاد ال double bond ... أعطى soot اكثر

آخر جزء بالتجربة كان عبارة عن كشف ألوان ال aromatic compounds



But any cpd not aromatic
Donot give color



طريقة كتابة المعادلة مهمة

الألوان الناتجة من تفاعل مشتقات البنزين مع

chloroform and

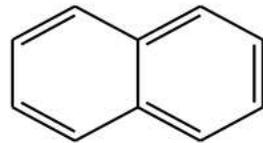
AlCl₃

مهمه

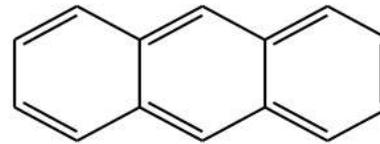
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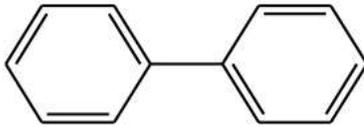
Benzene



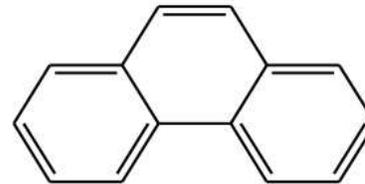
Naphthalene



anthracene



Biphenyl



Phenanthrene

Reaction of aromatic compound with Aluminum Chloride and Chloroform will give colored ion like:

Benzene orange-red

Naphthalene blue,

biphenyl purple

phenanthrene

purple

Anthracene green.

Note: It is essential that the aluminum chloride be anhydrous (water free). Be sure your test tubes and other materials are clean and dry before performing this test.

Notes

عن التعامل ع المواد

Cause it's dangerous

Caution.

- Bromine is highly toxic and can cause severe skin burns. Wear disposable gloves to avoid skin contact with the bromine solution, and do not breathe the vapors. Work in a hood, if possible.**
- Sulfuric acid is a corrosive liquid. Avoid skin contact.**
- Sulfuric is extremely corrosive liquids. Avoid contact of these acids with your skin or clothing. Wear disposable gloves. If you have an accidental spill, wash immediately with a large amount of water.**
- Cyclohexane and cyclohexene are flammable. Do not use an open flame as a heating source during this experiment**