

Date: February 2, 2018

Objectives:

The objective of this study was to identify and characterize the physical and chemical properties of Cyclohexane, Cyclohexene, Toluene, Ethanol, Acetone, Aniline, and Lactic Acid. Observing solubility, density, and color change. Observations were recorded after adding water to the samples. A second round was observed adding methylene chloride (Dichloromethane).

To measure the acid-base properties of each of our test chemicals we utilized litmus and pH paper. Results were recorded.

To test for the presence of double bonds in samples of cyclohexane, cyclohexene, and toluene we initially added 2 ml of methylene chloride, and subsequently two drops of a 2% solution of Br₂ to test-tubes containing 10 drops of each the test chemicals. Any immediate changes in coloration that occurred were noted (an immediate disappearance of the red bromine color is evidence for the presence of a double bond). To confirm these data we also used the Baeyer test to investigate the presence of double bonds: Three drops of 0.5% of a Potassium Permanganate mix was added to test tubes containing 10 drops of each of the test samples, and any reaction observed and noted (evidence of reaction is a color change from the purple of the permanganate solution to the brown of a manganese dioxide precipitate).

Data Table/Observations: NS= not soluble S=Soluble

Results for Solubility, Density, Litmus, and pH:

Substance	Solubility in Water	Solubility in Methylene Chloride	Density Comparison with Water	Density Comparison with Methylene Chloride	Litmus Results (acid, base or neutral)	pH
Cyclohexane	NS	S	Less dense		Neutral	4
Cyclohexene	NS	S	Less dense		Neutral	3
Toluene	NS	S	Less dense		Neutral	2
Ethanol	S	NS		Cloudy mix w/precipitate	Neutral	3
Acetone	S	NS		Less dense Sat on top	Neutral	3
Aniline	NS	S	Less dense		Neutral	4
Lactic Acid	S	NS		Less dense Sat on top	Blue turned pink-weak acid	1

We omitted the pH testing by accident. We used another groups numbers. The neutral reactions with litmus paper seemed counter to the pH results.

Results for Bromine in Methylene Chloride:

Substance	Observation
Cyclohexane	Brown
Cyclohexene	Clear
Toluene	Clear

Results for Potassium Permanganate:

Substance	Observation
Cyclohexane	Purple
Cyclohexene	Brown
Toluene	Purple

Conclusions & Study Questions**Conclusion:**

I think better observation and recording techniques will help improve future lab results. We tried to be very focused and purposeful in our process but I can see where we have inconsistencies. I also think there is a need to understand why the reactions are happening versus just observing them and I don't believe I was 100 percent successful in achieving and understanding the why.

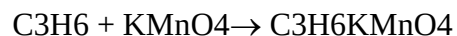
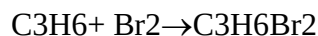
STUDY QUESTIONS

1. Were the hydrocarbons used in this experiment soluble in water? In methylene chloride? Were the hydrocarbons more or less dense than water? Explain.

Cyclohexane, cyclohexene, and toluene were not soluble in water. The hydrocarbons were less dense than water as they sat on the top.

Cyclohexane, cyclohexene, and toluene were soluble in Methylene Chloride. Although after looking into this it sounds like Cyclohexane is not soluble in anything so we clearly had an error in either procedure or observation.

2. Write balanced chemical equations for the reaction of propylene (propene) with bromine and with potassium permanganate.



3. Consider one of the resonance structures of benzene. Write chemical equations for an addition reaction and a substitution reaction involving benzene with one molar equivalent of bromine. The product of addition is quite unfavorable, which is why the addition reaction actually does not occur. Explain why the product of addition is so unfavorable.



I don't fully understand this, I got help on this one.

The product of addition is so unfavorable because Benzene is stable due to localized bonding of electrons. An addition reaction would interfere with this.

4. Compare the solubility of the various substances in water. Identify each of the functional groups for the substances that were soluble in water. Identify each of the functional groups for the substances that were insoluble in water.

Cyclohexane and the functional group is Alkane, not soluble in water.

Cyclohexene and the functional group is Alkene, not soluble in water.

Toluene and the functional group is Benzene, not soluble in water.

Ethanol and the functional group is alcohol (OH), soluble in water.

Acetone and the functional group is ketone, soluble in water.

Lactic acid and its functional group is carboxylic acid, soluble in water.

Aniline and the functional group is amine, was not soluble in water.

5. The label on a gas cylinder was partially destroyed and read "Prop ne". What tests could be performed to determine whether the cylinder contained propane or propene? Describe what you would do and what you would see.

Propane is saturated, Propene is unsaturated. A positive test with Br₂ and/or KMnO₄ is unsaturated. Unsaturated hydrocarbons produce distinct color changes. No color change means it is saturated.

6. If you were given 2-propanol, (an alcohol with three carbons) to dissolve, which solvent would you choose for dissolving it based on the results of today's lab? Why?

Water, Ethanol dissolved in water. It dissolves in water because Ethanol is part polar and non polar.

7. List the compounds tested with litmus paper and pH paper. Give the functional group for each. Identify whether the compound was an acid, base, or neutral substance.

Cyclohexane	Alkane	Neutral	Weak Acid
Cyclohexene	Alkene	Neutral	Weak Acid
Toluene	Benzene	Neutral	Weak Acid
Ethanol	Alcohol	Neutral	Weak Acid
Acetone	Ketone	Neutral	Weak Acid

Aniline	Amine	Neutral	Weak Base
Lactic Acid	Carboxylic acid	Acid	Acid

Again, the litmus versus pH results don't seem to match.

8. Draw the structures for cyclohexane, cyclohexene, toluene, ethanol, acetone, and aniline.