STRUCTURE-REACTIVITY RELATIONSHIPS: HYDROCARBON REACTIVITY

EXPERIMENTAL PROCEDURE

- **Wear gloves when handling bromine, dichloromethane or the hydrocarbons and the products.**
- **They are toxic and have harmful vapours.**
- **Avoid skin contact and breathing the vapours.**
- **Work in the fumehood.**

Notes :

- **Be very careful not to cross contaminate any hydrocarbon samples.**
- **Make sure to use clean and dry test tubes.**
- **Be as consistent as possible with the amounts used otherwise the comparison of the test tubes becomes difficult.**

Label a set of 6 **clean**, **dry** small test tubes ((10 x 75mm *i.e.* pinkie size) with letters **A-F**. Add 1.0 mL of dichloromethane to each tube. Add 5 drops of one of the hydrocarbons cyclohexane, cyclohexene, toluene, ethylbenzene, isopropylbenzene and t-butylbenzene to the dichloromethane in each test tube and then mix (swirl / shake the test tube). Add 0.5ml of 0.5M bromine in dichloromethane to each tube in turn, recording the time of the addition. Stopper and shake the test tubes and observe the tubes for the next 5 minutes. If some of the tubes don't react after 15 minutes move the test tubes into sunlight on a bright windowsill (or if there is no sunlight, then use a UV lamp) and continue to observe the test tubes closely for the next 15 minutes, and then at regular intervals until one hour has elapsed. Compare the relative intensity of the colours in the test tubes in order to determine the relative reactivity order of each of the six hydrocarbon substrates and rank the substrates from 1 to 6, where 1 is the most reactive and 6 the least reactive.

CLEAN UP

- Dispose of all solutions in the drum for **organic waste** in the fume-hood.

REFERENCES

1. a. M. Jones and S. A. Fleming, in "Organic Chemistry", Norton: 4th edn., Chapter 11, pp. 468-81, 490-500 Chapter 10, pp. 409-20, Chapter 13, pp. 610-13, Chapter 14, pp. 631-9.
   b. M. Jones and S. A. Fleming, in "Organic Chemistry", Norton: 5th edn., Chapter 12, pp. 545-59, 568-78 Chapter 11, pp. 488-97, Chapter 14, pp. 678-81, Chapter 15, pp. 698-705.

https://www.chem.ucalgary.ca/courses/351/Carey5th/Ch04/ch4-4-4.html
https://www.chem.ucalgary.ca/courses/351/Carey5th/Ch06/ch6-7.html
https://www.chem.ucalgary.ca/courses/351/Carey5th/Ch12/ch12-5.html

REPORT

Before writing any Chem 353 laboratory report, we strongly recommend that you review section 8 in the introductory section of the student laboratory manual that discusses how to write reports and/or from "writing reports" on the course website. Students often don't get the grades they would like because they make errors that are addressed in that section of the manual. These are avoidable errors.

The report for this experiment is to be completed in the Word template provided, then printed to PDF and submitted to the appropriate D2L Dropbox by the start of your next scheduled Chem 353 laboratory period. Remember that more it not necessarily better. It is important to be accurate and concise rather than verbose and vague. Proper English should be used and it should be written in your own words.

The key to getting the most out of this experiment is a careful and logical analysis of the results. That method should allow you to deduce the answer to what is going on. This template type report will guide you through the process. In order for this to "work" you should completely answer each of the questions in the order that they are asked *before* moving on to the next question.