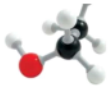
Lab 23A Building Isomer Models

September 28, 2017 11:11 AM

Lab 23A Building Isomer Models

Chemistry 11 Lab Investigation:
23A Molecular Model Building (Isomerism)



Name:_____ **Block:** _____

Group Members:_____ **Due Date:**_____

~~Lab:~~ 23A Molecular Model Building (Isomerism), Heath Chemistry, pg 317

Objective: .....

.....

Task Outline & What to Hand In:

- ☑ This cover page & self evaluation completed
- ☐ Data, Results & Calculations will include your completed diagrams from following Procedure #1-4
- ☐ Follow-up Questions #1, 2 and 3
- ☐ Conclusion: answers the objective of the experiment & explains why there is such a huge number of organi compounds.
- ☐ Presentation *(cover page included, word processed-if needed, calculations may be hand written neatly witl correct significant figures, includes appropriate section headings, completed in order)*
- ☐ Safety *(this mark will be given by teacher during the lab)*

Procedure Changes:

1. Show the structural formula, ***not electron dot diagram***
2. Draw complete structural formula. There are several isomers for organic compounds. The number in brackets shows **how many you are required to draw to answer** this question.
   a. Butane *(2 isomers)* c. Hexane *(5 isomers)* e. Methyl hexane *(show 2 isomers only)*
   b. Pentane *(3 isomers)* d. Cyclohexane *(1)*
3. *Only 4 isomers required* **(note: butene has 1 double bond)**
4. *Only 3 isomers required* **(note: butyne has 1 triple bond)**

Criteria	Student Self Evaluation	Teache Assessm
Objective: Clearly states the aim of the experiment and briefly outlines the related theory **Procedure:** refers to handout/textbook page by correct citation and *note any changes to the method (as noted by your teacher)*	/2	/2
Data, Results & Calculations: *(hand written neatly)* Provides results/observations (and diagrams where appropriate) that are presented in correctly annotated tables and/or graphs	/4	/4
Analysis & Discussion: Correctly identifies and explains the theory relating to the experiment and supports this with accurate observations	n/a	n/a
Evaluation: Identifies and defines the appropriateness of the experimental method (and presents a model for future experimental investigations where appropriate)	n/a	n/a
Follow up Questions: *(hand written neatly)* Questions as per Heath Chemistry Lab Manual	/3	/3
Conclusion: *(hand written neatly)* Identifies and defines important concepts and principles relevant to the experiment by relating back to the aim and hypothesis.	/2	/2
Presentation: Practical report is presented in the correct format, is written fluently and provides appropriate and accurate referencing	/3	/3
Safety: Demonstrates an organized and safe approach to experimental work	/2	/2
Results Summary	/16	

Page 1 of

This is what to hand in!!

Teacher marked

of the double bond remain in fixed positions. Note that in order to have this type of isomerism, each carbon atom in the double bond has to have two different groups attached to it. The compound dichloroethene exhibits this kind of isomerism:

cis-dichloroethene (both chlorines are on the same side of the double bond)

trans-dichloroethene (the two chlorines are on opposite sides of the double bond)

Before doing this experiment, if necessary, refresh your memory as to the number of bonding sites for each atom by referring back to Experiment 12B.

OBJECTIVES

1. to represent molecular structures with ball-and-stick and structural (line) diagrams
2. to construct molecular models of simple substances
3. to construct molecular models illustrating the different types of isomers

+ model kits + virtual lab

MATERIALS

- molecular model kit
- computer (molview.org)

PROCEDURE

1. Construct ball and stick models for each of the following alkanes. In your notebook, draw the structural (line) and electron dot diagrams for each of these molecules.
   a. methane, CH_4
   b. ethane, C_2H_6
   c. propane, C_3H_8

eg. H–C(H)(H)–H

2. Construct the ball and stick models for all structural isomers for each of the following compounds. Draw the structural diagram for each isomer, and then name each one.
   a. butane, C_4H_{10} (2 isomers)
   b. pentane, C_5H_{12} (3)
   c. hexane, C_6H_{14} (5)
   d. cyclohexane, C_6H_{12} (1)
   e. methylhexane, C_7H_{16} (2 isomers only)

cyclo- forms a ring

3. Construct the ball and stick models for all structural isomers of butene, C_4H_8. Draw the structural diagram for each, and then name them. (Note that one of the structures has geometric isomers.)

butene – is a butane chain BUT is has 1 double bond.

butene (4 isomers)

4. Construct ball and stick models for all structural isomers of propyne, C_3H_4, and butyne, C_4H_6. Draw the structural diagram for each, and then name them.

propyne C_3H_4 (1 isomer)

butyne C_4H_6 (2 isomers)

propyne (3 isomers)

propyne - has 1 triple bond.

butyne ↑ triple bond.

the following molecule. Identify the position of the OH group and draw the structural diagram for each isomer, and name them:
n-hexanol, $C_6H_{13}OH$ (the n- designates a straight-chained molecule).

6. Construct a ball and stick model for the following structural isomers. Compare their structures and the placement of the oxygen atom. Draw the structural diagram for each isomer in your notebook.
   a. ethanol, C_2H_5OH
   b. dimethyl ether, CH_3OCH_3

POST LAB DISCUSSION

It can be seen that even with the above relatively simple molecules, there are often many structures possible. The IUPAC system for naming organic compounds was introduced so that there would be no confusion as to the name of a compound of a particular structure. Once you know the rules, the structural formula can be written from the name, and vice versa. Many common names for chemicals are in fact shortened versions of their IUPAC names. For instance, the insecticide DDT takes its name from shortening the name *Dichloro**Diphenyl**Trichloroethane*. Likewise, the common name for the herbicide 2,4-dichlorophenoxyacetic acid is 2,4-D.

Follow-up:

QUESTIONS

1. How many isomers are possible for the following alkanes?
   a. methane
   b. ethane
   c. propane
   d. butane
   e. pentane
   f. hexane
2. Can cyclopentane (C_5H_{10}) be considered an isomer of pentane? Explain.
3. Can the model set you used illustrate the proper geometry of benzene, C_6H_6? Explain.
4. In procedure 2d you made a model for cyclohexane, C_6H_{12}, and were probably able to find only one isomer. In fact, there are two—one in which the carbon skeleton looks like a chair, and another that looks like a boat. Try to show in structural diagram form the difference between the two.

do these

Read to help you answer

(see notes)

CONCLUSION:

Q: Explain why there is such a huge number of organic compounds.

1-2 sentences

...think isomers ✓

...think about how many bonds carbon can form. ✓