

# **PETERS TOWNSHIP SCHOOL DISTRICT**

## **CORE BODY OF KNOWLEDGE (CBK)**

### **ORGANIC CHEMISTRY HONORS**

#### **GRADES 11-12**

For each of the sections that follow, students may be required to understand, apply, analyze, evaluate or create the particular concepts being taught.

#### **COURSE DESCRIPTION**

This is a demanding lecture-oriented elective course that deals with the chemistry of carbon compounds, their structure, nomenclature, reaction mechanisms, and syntheses.

This course focuses on the naming and reactions of carbon-based compounds. Students will follow naming and drawing rules for Organic compounds and be introduced to chemical reactions of Organic substances. Throughout the course, the students will learn how the rules for nomenclature evolve from basic hydrocarbons through various functional groups.

Students will extensively study the International Union of Pure and Applied Chemistry rules for nomenclature and apply those rules for each functional group.

Organic Chemistry is an honors-level course that builds upon naming and bonding concepts introduced in Honors Chemistry or AP Chemistry. Students who intend to pursue a career in chemistry, medicine, pharmacy, biology, nursing, or veterinary medicine will find this course extremely beneficial. It will provide a foundation for students who will study Organic Chemistry in college. Organic Chemistry is not a subject confined to the lecture room. We, and most of the biological world around us, are made largely of carbon. A keen eye will always be focused on this world. This course will count toward 0.5 elective credits, and it may **not** be used toward science credit.

#### **STUDY SKILLS**

- Students will be given a unit assignment for each chapter with problems that are representative to those on the chapter exam.
- Students will have access to model kits to help visualize organic compounds and reaction mechanisms.
- Time during class will be utilized to practice more complex example problems that are representative to those on the chapter exam.
- Students are encouraged to work in study groups to prepare for exams so that they can self-reflect on their true level of understanding of the course material.

## MAJOR UNIT THEMES:

### 1. BACK TO BASICS

- Identify characteristics of organic chemistry
- Discuss atomic structure, electron configurations, orbital diagrams
- Describe chemical bonding theory and nature of chemical bonds
- Interpret and draw organic structures
- Draw out valence bond theory and hybridization schemes

### 2. THE OLD BUCKY BALL AND CHAIN: HYDROCARBONS

- Calculate formal charge
- Identify patterns for drawing resonance structures
- Identify significant resonance structures
- Use pKa to identify reaction direction
- Qualitatively describe acid strength by evaluating the conjugate base
- Identify and classify organic functional groups
- Name and draw alkanes
- Distinguish common names vs. IUPAC names
- Draw Conformations of alkanes (Chair conformations and Newman projections)
- Name and draw alkenes and alkynes
- Classify and identify isomers of alkenes
- Name and draw complex alkenes
- Write reactions and mechanisms of alkenes and alkynes
- Name and draw alcohols

### 3. SMELLS GOOD: AROMATICS

- Explain the stability of benzene compared to other alkenes
- Name and draw aromatic compounds
- Explain mechanisms of Electrophilic Aromatic Substitution Reactions
- Explain substituent effects of EAS reactions (ortho-/para- directing groups vs. meta- directing groups)
- Explain how to synthesize aromatic compounds from benzene

### 4. STEREOCHEMISTRY

- Identify chirality and chiral molecules
- Classify molecules as R or S enantiomers
- Investigate properties of common enantiomers
- Identify meso compounds

## 5. ALKYL HALIDES

- Describe methods of preparation of alkyl halides
- Write mechanisms for nucleophilic substitution reactions and mechanisms
- Write mechanisms for elimination reactions
- Choosing the correct reaction pathway by evaluating the substrate and reactants

## 6. DID SOMEBODY SAY OH? ALCOHOLS, PHENOLS, AND ETHERS

- Name and draw alcohols, phenols, and ethers
- Predict reactions of alcohols, phenols, and ethers

### MATERIALS (and Supplemental materials used in course):

- Introduction to Organic Chemistry, 5<sup>th</sup> edition; William H. Brown & Thomas Poon; Copyright 2013; Wiley
- Organic chemistry as a 2<sup>nd</sup> language: First semester topics, 3<sup>rd</sup> edition; David Klein; Copyright 2012; Wiley
- Organic model kit

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