Milton Area School District
Organic Chemistry Syllabus
Grade Level(s): 11-12

Organic Chemistry Description:

Organic Chemistry is designed as a one semester course for students who have successfully completed Chemistry 1 and are interested in continuing their chemistry knowledge for another semester. The class will include the study of carbon, its compounds, and reactions with these compounds. Learning will be through both lecture and laboratory experiences. This class is strongly suggested for those students who may or may not be taking AP Chemistry, and are planning on entering post-graduate work in the sciences, including engineering, health or veterinary fields.
Prerequisite – Honors Chemistry or Instructor Recommendation

Organic Chemistry Goals:

The skills and conceptual knowledge of advanced chemistry principles will address the following:

- Introduce Organic Chemistry, noting similarities and differences when compared to Inorganic chemistry by looking at its historical development.
- Comparison of alkanes, alkenes, and alkynes: Including structure, nomenclature, and cycloalkanes.
- An analysis of Benzene and Aromatics: their structures, formulas, and common uses.
- A look at the structures, uses and reactions of Alcohols, Phenols, and Thiols .
- Additional characteristics and reactions with functional groups: Carboxylic Acids, Esters, Aldehydes, and Ketones, acid anhydrides, and acyl halides.
- Compare a final set of functional groups and simple organic reactions: Ethers, Amines, and Amides.
- Discover the history, development, and uses of polymers.
- An initial look at Biochemistry (Time permitting)
- Use laboratory experiences and Inquiry Labs to discover the following:
    - Examine the status of existing theories.
    - Evaluate experimental information for relevance and adherence to science processes.
    - Judge that conclusions are consistent and logical with experimental conditions.
    - Interpret results of experimental research to predict new information, propose additional investigable questions, or advance a solution.
    - Communicate and defend a scientific argument.

Student Literacy Objectives for Organic Chemistry

- Effective readers use appropriate strategies to construct meaning.
- Critical thinkers actively and skillfully interpret, analyze, evaluate, and synthesize information.
- Active listeners make meaning from what they hear by questioning, reflecting, responding, and evaluating.
- Effective speakers prepare and communicate messages to address the audience and purpose
- Effective research requires the use of varied resources to gain or expand knowledge.
- Audience and purpose influence a writer's choice of organizational pattern, language, concepts using appropriate literacy techniques.
- Language conventions support clarity of communications between writers/speakers and readers/listeners.
- An expanded vocabulary enhances one's ability to express ideas and information

Organic Chemistry Instructor Policies

Organic Chemistry Resources:

- This class is an overview of chemistry for students interested in the sciences. It will encompass an introduction to chemistry as well as a variety of current topics in the subject. It will include laboratory work and appropriate lab reporting. We will work from the text and also from other materials to enhance that information. An electronic version of Pearson Chemistry will be given to each student. Homework assignments will include reading and doing practice problems from the book.

Organic Chemistry Requirements:

Course Requirements:

- Notebook: A notebook is required. It should be organized in a logical manner. Your notes will be your main source for compiling the variety of material that will be used in class. It will be important that you bring your notebook and a folder (with handouts I have given) to class daily.
- Calculator: A scientific calculator is required. Any calculator that can use of exponents will be sufficient. About half of the class material will contain calculations with exponents. If you are in need of a scientific calculator let me know and I can arrange one for you to use during class time.
- Homework: Homework will be written on the side board for the length of the class. Homework is taken up for grading the majority of times that it is assigned. It may be from your text, a handout, or a project. Remember: If you are absent, you are responsible for getting the assignments and for turning in anything that has been collected when you return to school. If you are absent for several days, you must schedule time with me to make up the missed work. You may get help on homework, but this is not the same as "borrowing" someone's work and copying it.
- Labs: Lab work is sometimes done individually, but usually with a partner or a group. If work is done with others, data may be collected together; however you will usually complete lab reports on your own. Some labs receive both a group grade and an individual grade. Others are just an individual grade. Every member of a lab group must contribute to the work. Note: You must wear covered shoes for lab work. Without covered shoes you may not go into the lab. It is a safety issue.

- Tests and Quizzes: A test or quiz will be given at the completion of each unit. The amount of information covered may vary. All examinations will include different types of problems. These will consist of multiple choice questions, short answer, matching, discussion, and word problems. Completing your chapter assignments, the lab projects, and reviewing notes and competing the unit review are great ways to study for a test or quiz.

Organic Chemistry Attendance Policy:

- The class policy follows that of the district. Unexcused absences result in a zero for the work. Excused absences are at a maximum of 10.

Organic Chemistry Grading Policy:

- Grades are calculated using the Total Point System, which includes homework, quizzes, tests, and lab work. Some work is in a group setting, however copying and cheating will result in a zero for all parties on that assignment. There will be extra credit opportunities during the semester.

Course Content Schedule – Subject to change during the semester

WEEK SCHEDULE IS SUBJECT TO CHANGE
CORE CONTENT WILL REMAIN AS TRUE TO SCHEDULE AS POSSIBLE

Week	Unit Title	Focus/Concept(s)	Unit Essential Question(s)	Related Academic Standards
1	Introduction to Organic Chemistry	Introduction to Chemistry: Chemistry as a physical science, describing and analyzing mixtures, compounds, and elements using the scientific method and appropriate lab skills.	How can we investigate the behaviors of matter and energy? How do we apply scientific skills to solve real world problems? How can I enjoy lab safely?	**Chem.3.2.C.A6.** *Science as Inquiry* in the Introduction for grade level indicators.
2	Unit 1: Measurements and conversions	Introduction to chemistry study utilizing conversions of measurements, review math skills that will be used for the subject	How do we use the International System of Units (metrics) to better understand chemistry problems? What are the relationships between units in the SI System of measurement? Why do I want my pharmacist to be both accurate and precise? How can we write very small or very large numbers?	**Chem.3.2.C.A6.** *Science as Inquiry* in the Introduction for grade level indicators. **Chem.3.2.C.A1.** Differentiate between physical properties and chemical properties.

			How can I keep all my numbers organized and make sense out of what they are telling me?	
3 - 5	Unit 1: Properties and Classification of Matter	Atoms and Subatomic Particles: Utilize the periodic table to describe elements, subatomic particles, and the development of the modern atomic theory.	How do we know the atom exists? How can we model the structure of the atom as the basic building blocks of matter? How can we count objects we do not see?	**Chem.3.2.C.A1.** Differentiate between physical properties and chemical properties. Differentiate between pure substances and mixtures; differentiate between heterogeneous and homogeneous mixtures.
6 - 7	Unit 2: Atomic Theory and Parts of the Atom	Chemical Bonding: Predict and describe how elements form compounds through types of bonding, discover periodic trends, correctly describe compound formulas and nomenclature	Why is the periodic table in such a funny shape? What information can be found on the Periodic Table? How can we predict what type of bond is in a substance and what is the impact on the properties of the substance? How can we predict the shape, structure, and properties of molecules? Why do molecules have such properties?	**Chem.3.2.12.A5.** MODELS/PATTERNS Use VSEPR theory to predict the molecular geometry of simple molecules. **Chem.3.2.C.A2** Explain how atoms combine to form compounds through both ionic and covalent bonding. Draw Lewis dot structures for simple molecules and ionic compounds.
8	Unit 3: Periodic Table and Trends	Predict and describe how elements form compounds through types of bonding, discover periodic trends, correctly describe compound formulas and nomenclature	Why is the periodic table in such a funny shape?	**Chem.3.2.C.A1.** Explain the relationship of an element's position on the periodic table to its

			What information can be found on the Periodic Table? How can we predict what type of bond is in a substance and what is the impact on the properties of the substance?	atomic number, ionization energy, electro-negativity, atomic size, and classification of elements. Use electro-negativity to explain the difference between polar and nonpolar covalent bonds.
9+	Unit 4: Bonding of compounds	Chemical Bonding: Predict and describe how elements form compounds through types of bonding, discover periodic trends, correctly describe compound formulas and nomenclature	*How can we count objects we cannot see?*	**Chem.3.2.C.A2** Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons.
10 - 11	Unit 4: Nomenclature and Compound Formulas	Chemical Bonding: Predict and describe how elements form compounds through types of bonding, discover periodic trends, correctly describe compound formulas and nomenclature	How can I translate between a compound's name and its formula? How can you relate the charge of an atom or ion to the name of the compound?	**Chem.3.2.C.A2** Explain how atoms combine to form compounds through both ionic and covalent bonding. Predict chemical formulas based on the number of valence electrons
12	Unit 5: Stoichiometry with Compounds		How can an equation represent a chemical reaction on paper?	**Chem.3.2.C.A2.** Use the **mole** concept to determine number of particles and **molar mass**

				for elements and compounds. **Chem.3.2.C.A4.** Use stoichiometry to predict quantitative relationships in a chemical reaction Use the **mole** concept to determine number of particles and **molar mass** for elements and compounds. Determine percent compositions, empirical formulas, and molecular formulas.
13 - 14	Unit 6: Chemical Equations	Chemical Equations and Reactions: Perform and describe types of chemical reactions, predicting the outcome and writing balanced equations for those reactions.	How can an equation represent a chemical reaction on paper?	**CHEM.B.2.1.3** Classify reactions as synthesis, decomposition, single replacement, double replacement, or combustion. **CHEM.B.2.1.4** Predict products of simple chemical reactions (e.g., synthesis, decomposition, single replacement, double replacement, combustion). **CHEM.B.2.1.5** Balance chemical equations by applying the Law of Conservation of Matter.

15	Unit 6: Stoichiometry and Chemical Equations	Stoichiometry and Equations: Use balanced chemical equations to complete simple stoichiometric calculations, including limiting reactants and percent yields in laboratory exercises	How can we predict how much product is produced in a chemical change?	**CHEM.B.2.1.3** Classify reactions as synthesis, decomposition, single replacement, double replacement, or combustion. **CHEM.B.2.1.4** Predict products of simple chemical reactions (e.g., synthesis, decomposition, single replacement, double replacement, combustion). **CHEM.B.2.1.5** Balance chemical equations by applying the Law of Conservation of Matter
16 - 18	Unit 7: States of Matter and Solutions	States of Matter: Gases: Describe gases via the kinetic molecular theory and both predict and calculate their behavior considering several gas laws Conversions from gases to liquids to solids Solution and their concentrations	How would you recognize a gas if you saw one? How are gases different from liquids? How do solids keep their shape? Why does water have unusual properties? Why is water so cool even when it is hot? What happens during a phase change?	**Chem.3.2.10.A3.** Describe phases of matter according to the **kinetic molecular theory**. **Chem.3.2.C.A3**. Describe the three normal states of matter in terms of energy, particle motion, and phase transitions. **Chem.A.1.2.3.** Describe how factors (e.g., temperature, concentration, surface area) can affect solubility.

Appendix A
Student and Teacher Roles with a Defined Focus on Literacy

Students will:

1. **Work independently in their learning to:**

- Comprehend and evaluate complex situations, be a critical consumer of ***chemistry*** text, produce; research and gather evidence, communicate effectively, listen actively to engage in a range of conversations, to analyze and synthesize idea and positions, and to evaluate accuracy in order to learn, reflect, and respond.

2. **Construct content-meaning for self-efficacy and the efficacy all learners:**

- Build personal engagement in ***chemistry*** literacy (RWSL), take and share power for learning, self-assess, monitor and reflect on. Set goals for extending math skills, use text-based evidence to establish clear relationships among claims, explore ***chemistry*** concepts beyond the classroom and search to discover global perspectives

3. **Develop a Classroom Learning Community of respectful collaborative, collective dynamics:**

- Contribute and collaborate in a community of ***chemistry*** learners, provide multiple perspectives to solve problems toward shared understanding, value, represent, and respect diverse opinions and perspectives.
- Tasks or assignments are completed on time in support of a shared responsibility
- Self-monitoring for preparation and understanding is encouraged to promote contribution and respect for equity of time

4. **Participate in the assessment process:**

- Set goals and self-monitoring their progress with an expectation for fulfilling assessment requirements
- Produce and complete tasks and assignments according to the parameters and expectations of the learning process and the instructor's timeline.
- Seek help in understanding and clarifying confusions is an expectation to foster student independence and confidence as a life-long learner.

5. **Use of technology to support their learning:**

- Explore creative and innovative uses of technology to enhance and express their learning.
- Participate as a 21st Century student to make connections to the global learning environment
- Use and evaluate research available resources for validity and reliability

Instructor will:

1. **Conduct the learning environment that promotes a student-centered community of learners.**

- Conceptualizes instruction to include students as part of the learning community; students formally collaborate on important learning tasks
- Share learning experience to bring multiple perspectives to solve problems such that each perspective contributes to shared understanding for all; goes beyond brainstorming
- Set up the learning environment and experiences for valuing diversity, multiple perspectives, and strengths of the student.
- Foster and encourage development of new ideas and understanding in conversations and work with others
- Arrange groups to support collaboration and inquiry; students work independently, in pairs, in small groups and as a class dependent on the task.

2. **Represent themselves as a facilitator, a guide for learning, a co-learner, or as an investigator.**

- Engage in negotiation, stimulates and monitors discussion and project work but does not control
- Help students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options
- Considers themselves as self- learner; willing to take risks to explore areas outside his or her expertise; collaborates with other experts and practicing professionals

3. **Design the instructional model and learning context driven by standards and researched-based best practices.**

- Identify the specific PACCS standards addressed in all lessons and units**.**
- Provide students with an understanding of PACCS standard guiding the instruction and the relationship to the student learning goals.

4. **Develop authentic tasks to engage all learners with relevance to transfer knowledge to outside world situations**.

- Pertains to real world, meaningful intellectual work; may be addressed to personal interest
- Challenge and engage students with tasks with different levels of difficulty, enough to be interesting but not totally frustrating, and sustainable.
- Involves integrating disciplines to solve problems and address issues in context
- Engage students with rigorous course content to prepare them for College and Career readiness.
- Construct processes that engage students through cognitive application as an intentional principle of instruction.

5. Motivate and intentionally organize classroom instructional structure.

- Direct students to set goals, self-assess their progress to produce quality products and determine next steps
- Integrate the Literacy skills of Reading, Writing, Speaking and Listening that is discipline specific
- Activate and develop students' repertoire of thinking/learning strategies for changeable and complex knowledge building**.**
- Promote intrinsic learning with a passion for exploring and solving problems.
- Use data-driven instruction to plan for individual and group learning situations.

6. Assess students with a multitude and variety of formative, performance-based, generative, and summative assessments to address the needs and levels of all learners.

- Create assessments with meaning for the learner to produce product, performance, or service
- Make assessments transparent and integral to instruction; students learn during/through challenging meaningful activities
- Evaluate students fairly and equitably based upon student individual needs and achievement level.
- Use the most appropriate and effective technology available to enhance tasks and the evidence on learning

7. Utilized discipline-specific digital literacy and processes to engage and connect students in furthering 21st century teaching and learning.

- Use the most appropriate and effective technology available to allow for interaction by communicating and collaborating in diverse ways
- Use the most appropriate and effective technology available to access simulations, goals-based learning and real-world productivity tools.
- Use the most appropriate and effective technology available to complete and access task, locate data, and learning opportunities that stimulate thought and inquiry.
- Build awareness of and where possible, access media technologies to keep pace with the ever-changing technological devices to further educational possibilities.

Appendix B
Engaged Learning Framework for Course Content Reflection and Review

Indicators of Engaged Learning		Indicator Definition
Evaluation		
Tasks	• Authentic • Challenging • Multidisciplinary	• Pertains to real world, meaningful intellectual work; may be addressed to personal interest • Difficult enough to be interesting but not totally frustrating, usually sustained • Involves integrating disciplines to solve problems and address issues in context
Assessment	• Performance-based • Generative • Seamless and ongoing • Equitable	• Involving a performance or demonstration, usually for a 'real' audience and addressing a useful purpose • Assessments having meaning for learner; may produce information, product, service • Assessment is transparent and integral; students learn during/through challenging and meaningful activities • Assessment is culture fair
Process		
Instructional Model	• Interactive • Generative	• Instruction actively engages learners through meaningful context and construction of knowledge; encourages, supports and responds to student contributions, needs, requests for clarification, etc. • Instruction oriented to constructing meaning; providing meaningful activities/experiences
Learning Context	• Collaborative • Knowledge-building • Empathetic	• Instruction conceptualizes students as part of learning community; students formally collaborate on important learning tasks • Learning experiences set up to bring multiple perspectives to solve problems such that each perspective contributes to shared understanding for all; goes beyond brainstorming • Learning environment and experiences set up for valuing diversity, multiple perspectives, strengths
Grouping	• Heterogeneous • Equitable • Flexible/agile	• Small groups with persons with different skill sets, backgrounds, interests • Groups sized and organized so that over time all students have challenging learning tasks/experiences • Different groups organized for different instructional purposes; supports collaboration across multiple contributors
Roles		
Instructor Role	• Facilitator • Guide • Co-learner/co-investigator	• Engages in negotiation, stimulates and monitors discussion and project work but does not control • Helps students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options • Instructor considers self as learner; willing to take risks to explore areas outside his or her expertise; collaborates with other experts and practicing professionals
Student Role	• Explorer • Cognitive Apprentice • Teacher • Producer	• Students have opportunities to explore new ideas/tools; push the envelope in ideas and research • Learning is situated in relationship with mentor who coaches students to develop ideas and skills that simulate the role of practicing professionals (i.e., engage in real research) • Students encouraged to teach others in formal and informal contexts • Students develop products of real use to themselves and others; demonstrated learning
Resources		
Technology	• Interconnectivity • Access to challenging tasks • Enables learning by doing • Media Use	• Technology allows interaction by communicating and collaborating in diverse ways • Technology offers or allows access to tasks, data, and learning opportunities that stimulate thought and inquiry • Technology offers access to simulations, goals-based learning, and real-world problems and productivity tools • Technology provides opportunities to use media technologies