|  |  |
| --- | --- |
| **TEAM Lesson Plan Template** | |
| Teacher: Holland Brewer | |
| Subject/Grade: High School Chemistry 1 | |
| Lesson Title: Lewis Dot Structures, polarities, molecular shapes | |
| **STANDARDS** | **Identify what you intend to teach.** State, Common Core, ACT College Readiness Standards and/or State Competencies; Enduring Understandings and Essential Questions. |
| CHEM1.PS1 14) Use Lewis dot structure and electronegativity differences to predict the polarities of simple molecules (linear, bent, trigonal planar, trigonal pyramidal, tetrahedral). Construct an argument to explain how electronegativity affects the polarity of basic chemical molecules.  This lesson emphasizes:  SEP: Developing and Using Models  CCC: Structure and Function  Learning performance: Students will develop and use models to predict the polarity of simple molecules (linear, bent, trigonal planar, trigonal pyramidal, tetrahedral) highlighting the relationship between molecular structure and the polarity of compounds. | |
| **OBJECTIVE(s)/Sub-Objectives** | **Connect prior learning to new learning.** Clear, Specific, Observable, Demanding, High Quality, Measurable, Aligned to Standard(s), and Integrated with other subjects, build on prior student knowledge  Student-Friendly (I Can Statement) |
| I can create a VSEPR model from a Lewis structure for a compound  I understand that a molecule’s shape contributes to observed physical properties of a substance. | |
| **MATERIALS AND RESOURCES** | **Content-related:** Clearly supports lesson objective(s); rigorous & relevant; Incorporates multimedia & resources beyond the textbook. |
| **Activities & Materials**  **Per student**: Goggles  **Per group/pair**: Pen or pencil, molecular model kit, Chem Models Student Activity Sheet  **Per class**: White board and Projector/computer/screen, Internet access, two pie pans, acetone, distilled water, three Styrofoam cups. Chem models teacher guide.  **What if the technology is not working?**  **Routine for distributing materials:** Pass out the worksheet and molecular model kits. Walk around to distribute toothpicks and gumdrops. Prepare slips of paper with the molecules from page 6 of the teacher guide. Distribute strips so that one member of each pair has a polar molecule and the other member has a non-polar molecule. | |
| **ACCOMMODATIONS/ADAPTATIONS** | **Learning styles and interests.** Anticipate learning difficulties, regularly incorporate student interests & cultural heritage; differentiate instructional methods. |
| **Modifications/Plans for Diverse Learners *(NOTE: Clearly identify where you will use each of these in your lesson; do not just check the box!)***  **Differentiation**  **\_\_\_\_ Flexible Grouping**  **\_\_\_\_ Other**  **Accommodations**  **\_\_\_ Preferential Seating \_\_\_ Extended Time \_\_\_ Small Group \_\_\_ Peer Tutoring**  **\_\_\_ Modified Assignments \_\_\_ Other**  **Early Finishers:** | |

|  |  |
| --- | --- |
| **MOTIVATING STUDENTS/ANTICIPATORY SET** | **“Hook”: Engage students’ attention and focus on learning.** Personally meaningful and relevant. |
| Gain the whole group’s attention. Dissolve a Styrofoam cup in a pie pan of acetone.  Volunteer: Post the “I can” statements. | |
| **INSTRUCTIONAL PROCEDURES** | **Step-by-Step Procedures-Lesson Sequence: Basic to Complex.** Lesson includes visuals, modeling, logical sequencing and segmenting (beginning, middle, ending); essential information; concise communication; grouping strategies; differentiated instructional strategies to provide intervention & extension; seamless routines; varied instructional strategies; key concepts & ideas highlighted regularly. |
| **Introduction**  Ask students, “What is in the beaker?” Draw the Lewis structures for acetone and water on the board. Have students discuss with partners two similarities and two differences in the molecules. Have students share these observations. Use two pie pans or glass pans and pour 100 mL of distilled water into one pan and 100 mL of acetone into the other. Have students make observations about the two liquids before completing the demonstration. Place a Styrofoam cup in the pan with acetone. Students will make observations that the acetone dissolves the Styrofoam. (This is because the acetone contains nonpolar segments, and therefore, it dissolves the nonpolar monomer of the Styrofoam). Then, repeat the experiment using the distilled water using a second Styrofoam cup. (Nothing happens this time because water is a polar molecule, while the Styrofoam is nonpolar). Instructor will then explain the difference in polar and nonpolar molecules and the effect of molecular shape and electronegativity differences on the polarity of molecules.  Write and tell students that they will be using Valence Shell Electron Pair Repulsion (VSEPR) Theory.  **Middle**  Show a video describing an ionic compound dissolving in water:  <https://www.youtube.com/watch?time_continue=5&v=nxebQZUVvTg>  <https://www.youtube.com/watch?v=cdo6FtSU_k8>  <https://www.youtube.com/watch?time_continue=2&v=Qcy-TjJ10xk>  Arrange students in pairs. Distribute copies of the student activity sheet. Distribute slips of paper with molecules on them so that each pair of students has one polar molecule and one non-polar molecule. Students will complete the activity by drawing the Lewis structure of their compound, identifying the elements within the compound, identifying the shape of compound, and identifying the electronegativity. Students will then create a model of their compound using a molecular model kit. Students will compare both models. Together the partners will determine if the compounds are polar or nonpolar based on the information collected.  **End/Closure**:  Regain the whole group’s attention. Call on individuals to describe their models and explain why the molecule is polar or non-polar. See if the whole group agrees.  **Motivating Students**  \_x\_ Lab & Verbal reinforcement  **Presenting Instructional Content**  \_x\_ Guided practice The worksheet provides steps for the lab.  \_x\_ Video Covers VSEPR theory  ***Instructional strategies:***  ***Input -* Hook (Set)** There is a brief video or online game to reintroduce equation balancing.  **Modeling and Guided Practice *–*** The online game lays out steps for students.  **Check for Understanding (CFU) –**  ***What am I doing for students that progress at different rates?***  ***What do I do if they get it?***  ***What do I do if they don’t get it?*** | |
| **QUESTIONING/THINKING/PROBLEM SOLVING (embedded throughout)** | **Balanced mix of question types.** Utilizes Blooms Taxonomy/Webb’s Depth of Knowledge; high frequency; purposeful & coherent; require active responses; balance based on volunteers/non-volunteers, ability, & gender; lead to further inquiry & self-directed learning.  **Implement four types of thinking (Analytical, Practical, Creative, & Research-based) & Teach/Reinforce problem-solving types**. Provide opportunities for students to generate ideas & alternatives; analyze, evaluate & explain information from multiple perspectives& viewpoints. |
| **Questioning** These questions will occur throughout the activity as prompts based on groups’ or individual students’ progress.  **Knowledge:**  What are the elements in your chosen compound?  Find these elements on the periodic table.  What are the polarities that we might encounter? [ linear, bent, trigonal planar, trigonal pyramidal, tetrahedral ]  **Comprehension:**  Which element is the central element in your compound?  How many atoms would we need to have a tetrahedral shape?  How many valence electron pairs does the central atom have?  **Application:**  Construct a tetrahedral molecule using pieces from your molecular model kit. Do not worry about the elements for the moment, just show me a tetrahedral shape.  **Analysis:**  **Synthesis:**  **Evaluation:**  **Thinking**    \_\_ **Practical** –  \_\_ **Creative**–  \_\_ **Analytical** –  \_\_ **Research-based** –  **\*What am I going to do to give Students an opportunity to?**  **1. Generate variety of ideas:**  **2. Analyze problems from multiple viewpoints:**  **Problem Solving *Note: Teach 2 or more types of problem solving (NOTE: Clearly identify where you will use each of these in your lesson; do not just check the box!)***  **\_x\_\_ Abstraction**  **\_x\_\_ Categorization**  **\_x\_\_ Predicting Outcomes** | |

|  |  |
| --- | --- |
| **GROUPING** | **Maximize student understanding & learning** Varied group composition (race, gender, ability, & age); clearly understood roles, responsibilities & group work expectations; accountability for group & individual work; student opportunities for goal setting, reflection & evaluation of learning. |
| * Heterogeneous groups of two * Roles. Facilitator: collect materials and keep group on task; Communicator: may ask teacher questions if no group member can answer the question. Describes group’s design to teacher for approval; Reporter: records data for group and submits paperwork required by teacher. * Group members assign roles and acknowledge their understanding of their role during the lesson introduction. * Transition to groups. Students will begin class at lab tables already separated into groups. The teacher will signal for the whole group’s attention or return students to group work. * Product. The group will produce a completed worksheet. | |
| **ASSESSMENT** | **Formative and/or summative assessment.** A variety of assessments, including rubrics, measure achievement of objectives and informs instruction. |
| ***Assessments: aligned with state stds; measurement criteria; measure student performance in more than 2 ways (project, experiment, presentation, essay, short answer, multiple choice test) (NOTE: Clearly identify where you will use each of these in your lesson; do not just check the box!)***  **\_\_x\_\_ Exit Ticket** described below  *\****Students should achieve \_\_\_\_\_% mastery of this objective: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** | |
| **CLOSURE** | **Reflection/Wrap Up.** Summarizing, reminding, reflecting, restarting, connecting. |
| * ***Review/Summary: wrap up what has been learned and accomplished in the lesson (even if they are in the middle of an exercise, it is still important to summarize to the point where they are now). Ideally involve students in this synthesis.*** * ***Preview for next lesson: link what they did to day with where they are going next.*** * ***Upcoming assignments: remind them of any upcoming assignments.***   ***Today we…. Turn to your partner and…. Let’s review our I Can statements……***  **Here is your exit ticket for today**. Determine which of the following are polar:  a. Carbon Tetrafluoride (CF4)  b. water (H2O)  c. Sulfur Dioxide (SO2)  d. Phosphorus Pentachloride (PCl5)  e. Hydrogen Sulfide (H2S)  **Follow-up Activities/Extension *These may be designed to create a longer or more intense lesson. For example, if the class is able to cover the material in a lesson much faster than expected, extensions may prove helpful. Extensions may also be useful in various parts of a lesson where the teacher (and class) decides they should spend more time on a skill or topic.***  ***Reflection: You must reflect on every lesson you teach.*** | |

**NOTES:**

This work is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.