Players in the Game Draft 1.1 December 2002
Molecular Geometry-VSEPR
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Objective: To observe and recognize molecules as three-dimensional structures.

Target student audience: YR. 1 GENERAL CHEMISTRY

ChemSense user level: Intermediate

ChemSense tools used: ANIMATION

Specialized tools needed: Molecular model kits

Classroom implementation

Time: 2 short period classes (45-55 minute) or equivalent long period
Student grouping: Group and pairs
Activity Type: ANIMATION, hands on model-building

Chemistry concepts in activity (linked to CA standards & ChemSense 5 themes):

Standard 2f- Students know how to predict the shape of simple molecules and their polarity from Lewis dot structures.

Standard 2g- Students know how electronegativity relates to bond formation.

Prerequisite chemistry concepts: Molecular compounds; Electronegativity; Covalent Bonding; Lewis Structures.

Inquiry skills (linked to NSES):

Communicate and defend a scientific argument (NSES).
Formulate and revise scientific explanations and models using logic and evidence (NSES).

ACTIVITY Summary:

1. Discussion Question- Does the shape of a molecule affect its polarity?
2. Teacher led discussion- Explanation of VSEPR model.
3. ChemEquation- Reinforce geometry of molecules by watching ChemSense animation.
4. Molecular Models- Create molecular models with supplies. Use formula to predict Lewis structures and subsequent molecular models.
5. ChemSynthesis- Use ChemSense to show bond polarity within each molecule.

Sources: none

Application: Geometric shapes and angles; furthers the discussion of molecular polarity and intermolecular forces.

Activity:

1. Discussion Question- Start thinking about the question, "Does the shape of a molecule affect its polarity." Think about this questions and jot down some ideas to share with the class. (5 min).

2. Teacher led discussion- After sharing ideas of the importance of shape and polarity, teacher gives explanation of the shape of molecular compounds. According to the VSEPR theory, discuss electron repulsion. Use models and diagrams as necessary. (15 minutes)

3. ChemEquation- Use ChemSense animations to show animations of how VESPER works (students could view these individually or with a projector teacher could show them to the whole group). Examples of CO_2, SO_2, H_20, PCl_3, Cl_4, and NO_3 are used as examples of each type of shape. (15 minutes)

4. Molecular Models- For each formula given, predict the Lewis structure and # of valence electrons in the molecule or ion. Use the molecular shapes to predict shape. Record results and structures in the provided table. (25-30 minutes)

5. ChemSynthesis- Use ChemSense to show the bond polarity based on the shape of the structures. By using the models and visualization tools on ChemSense, try to figure out the overall polarity of the molecule, given the particular bonds and orientations of bonds.

Rubric for grading:

A = Shows bonding angles true to VSPER prediction, accounts for nonshared electron pairs, effort to display three dimensional relations in a true manner, labels on all atoms, single double and triple bonds shown, resonance taken into account. Where requested, dipole moments shown on bonds.

B = Shows bonding at angles for electron repulsion but may not reflect continuity for molecule, three dimensional relationships sometimes lost or magnified. Shows bonds as single, double or triple. Where requested dipole moments sometimes missing.

C = Shows molecules from books copied or examples in class copied, three dimensionality missing, small simple structures, may substitute ion structures for molecular. Bond types are not appropriate or incorrect. Where requested Dipole moment sometimes provided.

D = Shows simple structures, errors in bonding order, molecule reflects a lack of three dimensional consideration and atoms not labeled. No bond types displayed.

F = Show simple stuctures, atoms or formula's missing, no indications of three dimensional consideration, no bond types used. Molecules show a lack of effort or time. Research not supported or demonstrated.