Justin Barry
Advanced Chemistry
Nature of Gases Unit
Lesson 1

LESSON PLAN

I. TOPIC:

The topic of this lesson is to introduce secondary students to the nature of gasses are and why their behavior is important in chemical systems.

Vocabulary:

Kinetic Theory-tiny particles in all forms of matter are in constant motion
Vacuum-empty space, with no particles and no pressure
Atmospheric Pressure-the pressure exerted by air molecules in the atmosphere surrounding Earth, resulting form collisions of air molecules with objects
Standard atmosphere (atm)-the pressure required to support 760 mm of mercury in a mercury barometer at 25 degrees Celsius 1 atm = 760 mmHg = 101.3 kPa

II. OBJECTIVES AND STANDARDS:

- Given the instruction on kinetic theory, TSWBAT correctly list the three basic assumptions associated with this theory and how these theories relate to the motion of gas particles to 66% accuracy (3.4.10 A).
- Given instruction on kinetic theory, TSWBAT correctly describe relationship between kinetic energy and temperature to 80% accuracy (3.4.10 B).
- Given conversion factors for pressure, TSWBAT correctly convert pressure from mmHg to kilopascals to 90% accuracy from independent practice (3.4.12 B).
- Given a lecture and video on the variables that change for gases, TSWBAT correctly list the variables given closure questions to 100% (3.4.12.B)

III. TEACHING PROCEDURES:

1) Introduction:
Anticipatory Set:
   - Demo: Have a 2 L bottle and place warm water in it. Squeeze the bottle and cap the top. Shake the bottle and allow the warm water to heat up the bottle. As the gas is cooled, the volume is decreased in front of the students.
   - Show short video on "Characteristics of Gases" (www.unitedstreaming.com) . What are the main characteristics of gases? How are gases affected?
   - (If time…) Give some students a balloon and ask them why the balloon has its shape? What is providing the pressure? Can you see what is keeping the form?
   - From the introductory lesson, lead into the specifics of talking about the nature of gasses using worksheet notes.

2) Development: Continues Anticipatory Set.
   - Review HW from the previous night by allowing students to go to the board to put up conversion problems on temperature and pressure. (from worksheets, Students will have had a fairly thorough explanation of conversions so that they will be able to solve gas problems)

- Explain and write on board that the hw is to study for a 20 pt quiz on conversions.
- Kinetic Theory (see notes)
  1. Describe the three assumptions
     - Write on board and have students put in notebook
     - What is compressibility? (Kinetic Theory #1)
     - What is elasticity? (Kinetic Theory #3)
  2. Ask specific students to repeat the assumptions
  3. Show video "Kinetic Molecular Theory" from www.unitedstreaming.com
- Gas Pressure
  1. Describe how gas particle collisions cause gas pressure.
  2. Ask what a vacuum is? How is one created?
  3. Barometer
     - How does it work? What causes the mercury to rise in the column? What does it measure? What does this measurement mean?
     - Explain the barometer
  4. Show conversions on board.
- Kinetic Energy and Kelvin Temperature
  1. What would happen if I threw an aerosol can in a fire? Why?
  2. How does kinetic theory explain this?
  3. Explain what happens to particles at absolute 0 K
     - If kinetic energy is determined by how fast particles move in a system, how does temperature affect kinetic energy?
     - Show video from united streaming called "Kinetic Molecular Theory"

3) <u>Guided/Independent Practice</u>
- Give sample problem of converting mmHg to kPa on board
- With the students neighbor have them work on the following three questions to be placed on paper:
  1. List the three basic assumptions of the kinetic theory
  2. Convert 678 mmHg to kPa
  3. How do the average kinetic energies of the two liquids compare on Figure 10.4 (overhead)?
- Go over answers

4) <u>Closure:</u>
- Check for understanding
  1. Ask: According to the assumptions of kinetic theory, how do the particles in a gas move?
  2. What does a barometer measure? (Explain scientifically)
  3. Describe how kinetic energy of gas particles is affected by temperature.
- Refer to anticipatory set
  1. Have students explain, based on kinetic theory, why the balloon keeps its shape.
  2. Relate the collisions of gas particles to atmospheric pressure on earth and on the moon.
- Describe that the next class we will be talking about the nature of gasses.

IV. MATERIALS:
- Balloons for some members of the class
- Short video clips
  1. "Characteristics of Gases" www.unitedstreaming.com
  2. "Kinetic Molecular Theory" www.unitedstreaming.com
- Barometer (old style) (picture used)
- White Board
- Bulkpack notes
- Powerpoint notes

V. ADAPTATIONS/PLAN MODIFICATIONS:

- A note sheet is provided in the bulkpack with powerpoint slides included for the visual student.
- Videos help transition the lecture material to the visual learner.

VI. EVALUATION:

1) Student:
   - Was the anticipatory set effective in grabbing their attention?
   - Did the students meet the objectives given?
   - Were the students working efficiently during the guided practice?
   - Did they get the problems correct on the mini-worksheet correct to 90% accuracy?

2) Teacher:
   - Did I speak slowly/clearly?
   - Were definitions and steps understandable?
   - Were the students interested in the lesson and eager to participate in their groups?
   - Was the closure effective?
   - What improvements could be made?

Comments:

What I planned for the lesson and what actually happened:

I spent some extra time the day before converting pressure and temperature in the same class. With conversion knowledge present ahead of time, the students were able to understand a barometer and the inHg units better. The guided/independent practice from this lesson plan was completed in the previous days lesson (which was an introductory lesson/review on conversion of units) Today, the students learned the nature of gasses, the variables involved with gases, and the kinetic molecular theory. I did not have time to complete the anticipatory set with the balloons.

The "nature of gases" video was a great overall summary. Students were very interested and participated because of the anticipatory set. Many could relate the 2 L bottle decreasing in volume to milk jugs and other real life examples in their life.

Students seemed to understand the objectives. Kinetic molecular theory was a bit unclear because of the abstract nature of the topic.

The closure was effective because of the questions that I asked (What are the assumptions associated with ideal gases? What are the variables associated with gases?