Class: Chemistry 11 Date: Nov – 03 – 2021
Unit: Gas Laws Teacher: Mr. R. Li

Lesson Plan Template

<table>
<tr><td colspan="2">Stage 1: Desired Results</td></tr>
<tr><td colspan="2">Established Goals (General)
Students can explain and apply Avogadro’s law, the partial gas law, Dalton’s law, charles law, boyle’s law, and the ideal gas law
Students can solve example/practice problems related to the above concepts.</td></tr>
<tr><td>Big Ideas
Atoms and molecules are building blocks of matter.</td><td>Essential Questions:
How do gasses behave in relations to pressure, temperature, volume and amount?</td></tr>
<tr><td>Content
The mole
Stoichiometric calculations</td><td>Curricular Competencies
Questioning and predicting: Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world.
Processing and analyzing data and information: Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies.
Communicating: Formulate physical or mental theoretical models to describe a phenomenon.</td></tr>
<tr><td colspan="2">Core Competencies:
Communicating: working collectively, supporting group interactions
Thinking: Analyzing and critiquing, questioning and investigating.
Social/Emotional: Resolving problems, valuing diversity.</td></tr>
<tr><td colspan="2">Stage 2: Assessment Evidence</td></tr>
<tr><td colspan="2">Fill in the blank handout
Worksheet with questions relating to class content</td></tr>
<tr><td colspan="2">Preparation</td></tr>
<tr><td colspan="2">Materials Needed:

One large board.
Vacuum chamber
Marshmallow and/or balloon</td></tr>
</table>

Large clear plastic bottle.
Eye dropper
(Empty coke can, Hot plate, Large beaker with cold water)

Action Plan: Go through each of gas laws, with certain demos to illustrate the laws.
Hook: Cartesian Diver
Partial gas law: student analogy
Boyle's law: vacuum balloon demo
Charles law: hot coke can in cold water demo (in case we finish early)

Stage 3: Learning Plan

Attendance (3 min)
Brain Break. "Raise your hands in the air! And wave them like you just don't care"

Hook: (5 min)
Cartesian diver demo: TPS on what would happen if I squeeze the bottle.
Listen student predictions before performing the "squeeze". Now ask students to TPS on explaining what they observed.
"We will explore why the diver dived down from the squeeze. To do that, we need to learn about gases."

Intro
Inquiry question: What are the physical behaviors of an ideal gas?
First define Ideal gasses: a gas that does not interact with anything else. That behaves perfectly every time, always.
Help students come up with the following physical behaviors: **Have mass, Easy to compress, no definite shape or volume (fill their container completely), exert pressure, rapidly move through another gas**. (5 min)

Define kinetic theory of gases on slides. (10 min)

Body
Dalton's law activity: Have three student volunteers come up.
Each can be a different type of gas.
Let students know that each gas will push on the vessel (me with board). Have one "gas" push on my board as the vessel wall.
Ask: "what is the total pressure experienced by me?" (it's the pressure from the first gas.)
Have second student push on me. **Ask**: "does the addition of this new gas make the first gas push on me more or less?" (no effect)
Ask: "what is the total pressure experienced by me now?" (sum of first and second gas). Have third gas push on me. Ask same questions.

Give applause to students. Define Dalton's law and show equation. (10min)

Define Avogadro's law. Students should already be familiar with concept. (2 min)

Boyle's law undemo: Ask students to think about relationship of pressure and volume of a gas. If I increase pressure, what will happen to the gas volume? Predict (5 min) in pairs while teacher set up vacuum.
Ask student to share their opinions and EXPLAIN. Observe (5 min) as we put balloon or marshmallow in vacuum. (class vote on if you think the balloons will expand, shrink, or stay the same)
Ask students to explain what they just saw. Explain (5 min) Boyle's law on slides with equation.

Work through example problem on tablet. (5 min)

Individual Practice
Work through practice problems for Dalton's law, Avogadro's law, and Boyle's law from fill in the blank worksheet. (20 min)

Conclusion
Come back to the Cartesian diver.
Ask students what they know about the physical properties of the air trapped in the dropper. (Air have mass, air can be compressed, air exerts outwards pressure).
Knowing what they know about Boyle's law, how can they explain the eyedropper's behavior when I squeeze the bottle? (10 min)

"so now we've talked about how gas behaves with different volume and pressure. What is another factor that can change how gasses behave?" (temperature) Which we will learn next class.

Technical Notes:

1. Test vacuum before using! Has cracks.
2. Explain how each "gases" work for dalton's law with student volunteers.

Reflection: