

Krug Chemistry – Deep Run Daily Planning Guide

Date of Lesson: Q3 Day 14 – KMT and Gas Laws 1 - 4

Topic /Big Questions: (Question Stems & Question Creation Chart)	
<ul style="list-style-type: none"> • How does heat energy affect the movement of molecules? • How are pressure, temperature, and volume related for ideal gases? • 	
State SOL CH.6	Unpacking the Standards (Video explanation shown at 3:18) CH.6 The student will investigate and understand that the phases of matter are explained by the Kinetic Molecular Theory. Key ideas include a) pressure and temperature define the phase of a substance; b) properties of ideal gases are described by gas laws; and c) intermolecular forces affect physical properties.
Visible Learning (For the three items with asterisks*, think from a student perspective. Use simple language)	
*What am I learning today? The principles of the Kinetic Molecular Theory and the first four Gas Laws: Boyles, Charles, Gay Lussac, and Avogadro	
*Why is it important? The movement of atoms and the relationship of energy and the phases is outlined in the Kinetic Molecular Theory. The gas laws describe the relationships of pressure, volume, temperature and number of particles of a gas.	
*How will I know I've learned it? I will understand how energy affects the movement of molecules. I will understand the relationship between temperature, pressure, volume, and moles of an ideal gas at STP.	
Differentiation strategies: Peeling an Orange Lab Activity PhET Gas Properties https://phet.colorado.edu/sims/html/gas-properties/latest/gas-properties_en.html Gas Law Practice Problems	
Accommodations and/or modifications are being met for students with IEP's/504's. frequent checks for understanding; materials available on Schoology; small group activities	

Daily Plan/Sequence of Instruction:

Before class teacher will place a paper plate on a digital balance. As students begin to enter, the teacher will warm up an orange by rolling it between hands and gently squeezing it. Teacher will tare the plate on the balance in order to obtain the initial mass of the orange. Students will record the initial mass in their notebooks. Teacher will peel the orange and place it back on the balance. After a minute or two, teacher will ask students to observe the mass. (It will be lower!) Teacher will ask "Where did the mass go?" and tell students to draw a particle diagram of what is happening to the orange in their lab notebooks. As time passes, the mass of the orange will continue to fall. Ask the students to tell you when they can smell the orange. Ask questions to investigate how the particles are traveling from the orange to the student's noses.

Next, use the **PhET Gas Properties Diffusion Simulation** (https://phet.colorado.edu/sims/html/gas-properties/latest/gas-properties_en.html) to investigate the movement of gas particles. First click on the **blue** particles. Add 10 particles and watch how they move. Ask students about the path and speed of the molecules. Ask students what happens when the molecules collide. How does changing the mass affect the behavior of these molecules? Does the radius matter? Does temperature matter? Now add the **red** particles. Choose a different # of particles, mass, radius, and temperature so students can do a side-by-side comparison. Discuss similarities and differences. Then remove the divider. Ask question what happens when the molecules mix. Discuss how long it takes for the molecules to spread out equally (equilibrium).



Next click the menu buttons at the bottom to investigate the other PhET Gas Property Simulations. Encourage students to record observations in their lab notebook. For Energy Simulation, if students enter too many particles, the lid will actually pop off the box! Ha! For the Ideal Gas Simulator, click and drag the pump to add gas molecules to the box. Then choose Volume to hold constant. Click the Collision Counter. Click the bucket at the bottom to add heat. Observe the change in pressure. As students what relationship they see. Now reset and choose a different variable. Change something and discuss the effects. **DO NOT tell the students the name of the laws until AFTER they write the relationships in their notebook.**

Once students write the equations and the name of the laws, give them the Gas Law Practice Problems and tell them to complete the practice problems for the first four laws. This will be due at the beginning of the next class.

Assessments (List all formative/summative assessments used to check for understanding during this lesson. Summative assessments may occur during a different class period.):

Orange Lab and PhET Simulations - (formative)

Gas Law Practice Problems - (summative)

After assessing today's lesson are you and your students comfortable moving forward with your next objective?

Yes – students understand direct and indirect relationships between pressure, temperature, volume and moles.

No, remediation required to proceed – tutoring available during One Lunch

Teacher Reflection: