36.1 Using Gas Laws to Solve Problems

Chemistry

Summarize main points from each video.

Video Title / topic _____

Video Title / topic _____

Video Title / topic _____

Topic Introduction

Summarize your understanding of each paragraph.

The Ideal Gas Law: This combines concepts from Boyle's law, Charles' law, and Avogadro's law. Four variables (P, V, n, and T) are inter-related. Knowledge of the value for any combination of three of these is enough to determine the remaining value.

Dalton's Law of Partial Pressures: Air is a mixture of components (including N_2, O_2, and CO_2 for example). Studies of gaseous mixtures show that each component behaves independently of the others.

Gas Stoichiometry: Because n=PV/RT scientists and students can calculate the number of moles present. This makes it possible to do stoichiometric calculations for reactions involving gas.

Remember that R = 8.314 J/mol. The ideal gas law is: pV = nRT, where n is the number of moles, and R is universal gas constant. The value of R depends on the units involved, but is usually stated with S.I. units. Here we use R = 8.314 J/mol.

Read/Summarize Text

1. **Read the passage.**
2. **Underline key expressions in each sentence.**
3. **Re-write each word (or expression) you underlined.**
4. **Summarize the passage.**

About Gas Laws

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Gas laws are the physical laws that describe the properties of gases, including Boyle's and Charles' laws.

One of the gas laws chemistry students learn is the ideal gas law. It has four variables. The four gas variables are: pressure (P), volume (V), number of mole of gas (n), and temperature (T). The constant in the equation is R, known as the gas constant.

PV=nRT

The ideal gas law is a good approximation for most gases under moderate pressure and temperature.

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Re-write words you underlined

3

_____ _____ _____

_____ _____ _____

Using a complete sentence, summarize or rephrase the passage

4

Read Text for Comprehension

Read this article for deeper understanding. No summary is required, although you may want to circle, underline, or mark key ideas and words.

EXTRACT: A Brief History of the Study of Gas Chemistry.

20th Century: Nuclear Chemistry

If we were to greatly simplify the history of chemistry so that each century were defined by a single major field of discovery, the twentieth century would be remembered as the Century of Nuclear Chemistry during which our considerable understanding of the subject was developed from earlier theories.

19th Century: Organic Chemistry

Then moving backwards in time, the nineteenth century would be remembered as the Century of Organic Chemistry during which period most of the concepts and principles of organic chemistry were discovered.

18th Century: Gas Chemistry

The eighteenth century would be the Century of Gas Chemistry, marked by the discovery of most of the common gases. Ingenious techniques with which to generate, collect and study gases were invented at that time . Entire laboratories were dedicated to the study of the new discipline of '*pneumatics*'.

Their discoverers gave the gases names such as '*fixed air*', '*dephogisticated air*', and '*inflammable air*'.

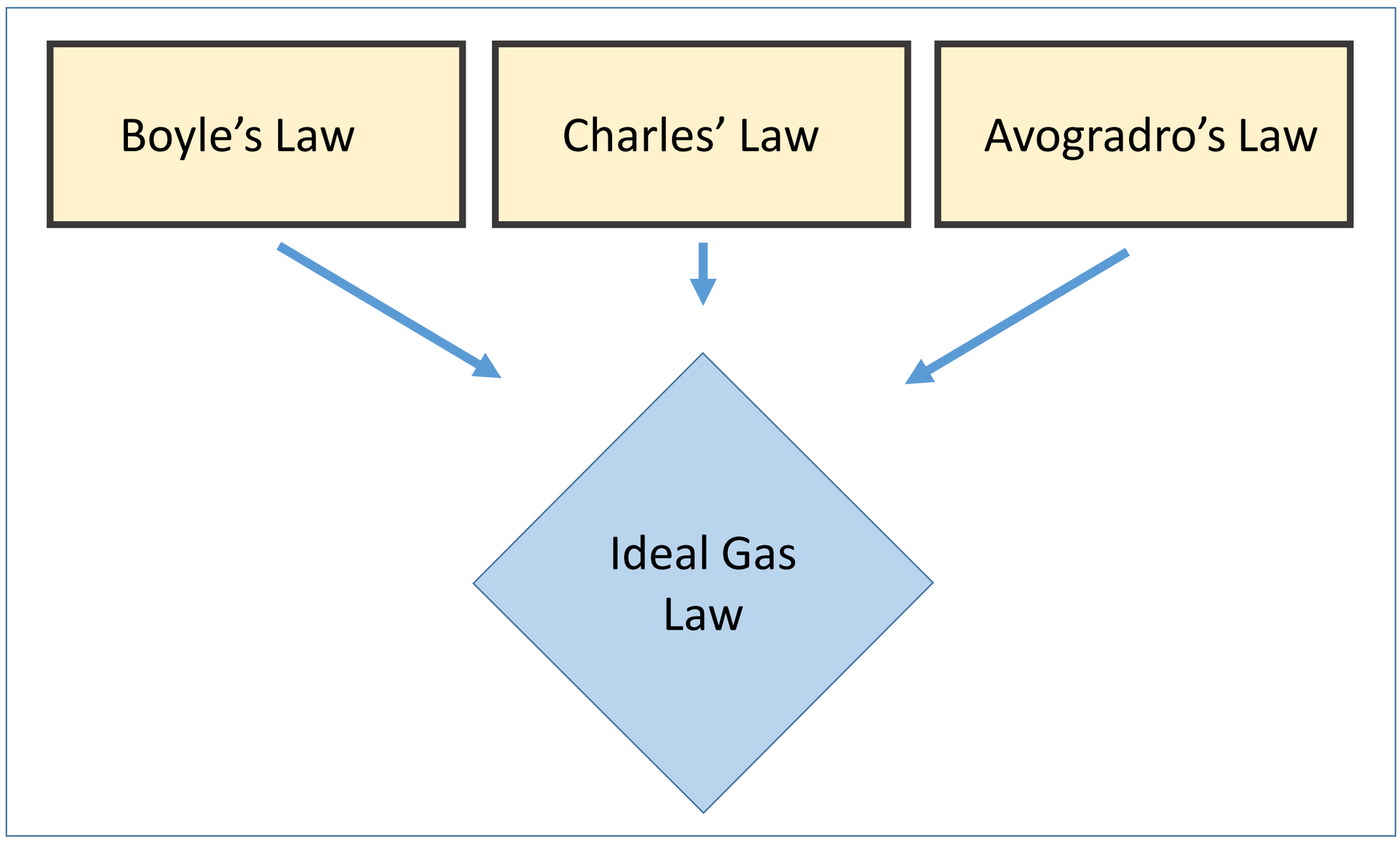
Despite these substantial laboratory accomplishments, the actual chemical identities of these gases remained complete mysteries until the very end of the century. The story of the early days of gas chemistry is interesting and important. It spans the entire century and serves as an example of how an erroneous theory can shape and misguide understanding and investigation. It is a story in which the chemical behavior of the gases eventually allowed the genius of one man, Antoine Lavoisier, to first postulate the precepts of modern chemistry as we know them even to this day.

Investigation suggestion: *what did 18th Century scientists describe as fixed, dephogisticated, and inflammable air?*

Adapted from: http://mattson.creighton.edu

Draw Illustration

Copy the Illustration (Ideal Gas Law) in space provided.



Recreated based on diagram appearing at https://chem.libretexts.org

Draw (Copy) the Illustration Here

Interpret a Graph

Write the title of the graph _____

Circle the type of chart this represents

Bar Chart *Line Chart* *Pie Chart* *Other*

If applicable,

What does the X-axis represent _____

What does the Y-axis imply _____

Summarize what this graph represents or conveys

_____

https://www.researchgate.net/

P2.7 THE 2006 CAPE CANAVERAL AIR FORCE STATION RANGE REFERENCE ATMOSPHERE MODEL VALIDATION STUDY AND SENSITIVITY ANALYSIS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION'S SPACE SHUTTLE

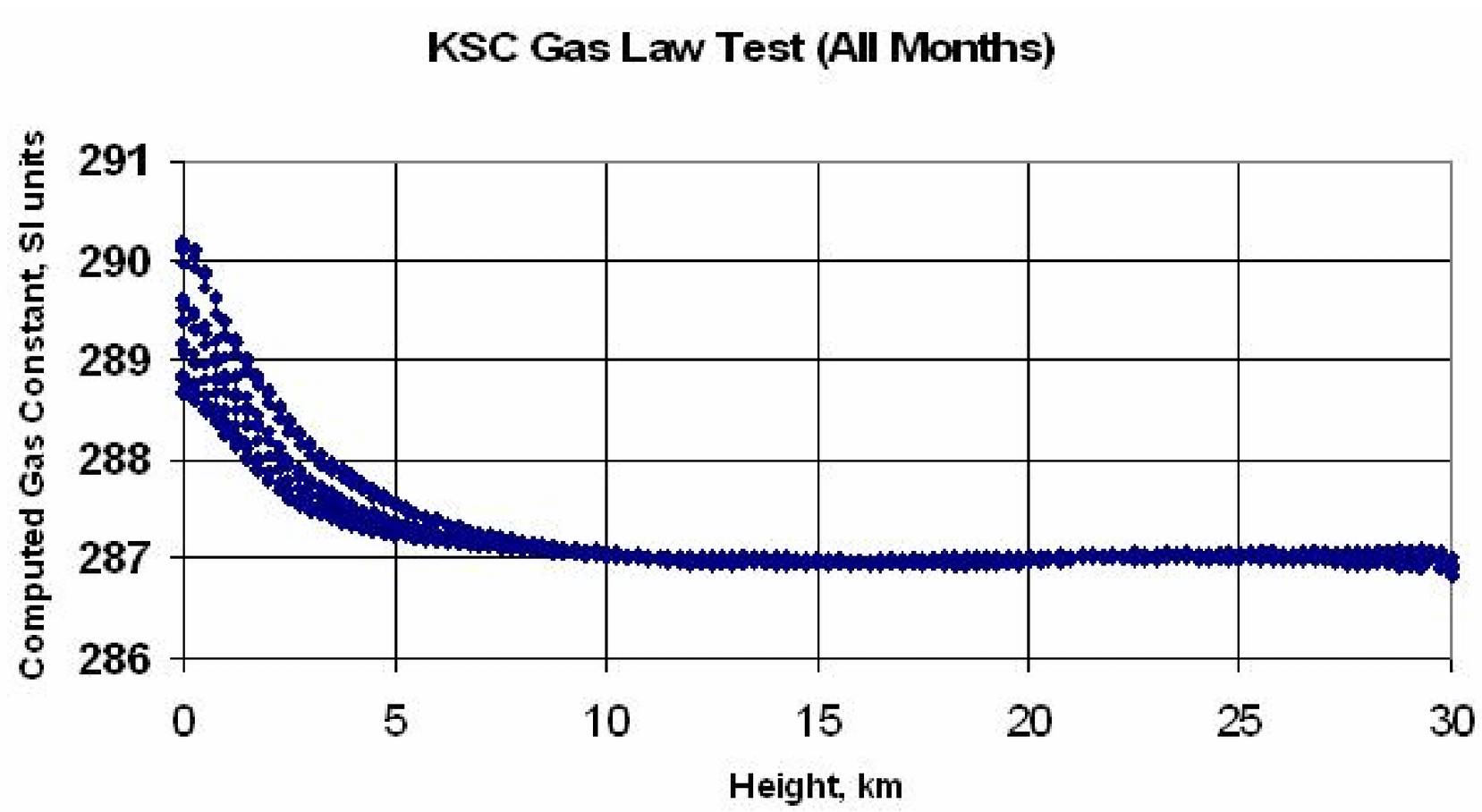


Fig 4 - uploaded by Lee Burns. Universal Gas Constant, R, computed from equation 3 and mean state variables from the 2006 RRA.

Show-Off Your Smarts!

Instructions

- Complete as an individual.
- Prepare to discuss your ideas/answers/responses in class.

Generally, a gas behaves more like an ideal gas at higher temperature and lower pressure, as the potential energy due to intermolecular forces becomes less significant compared with the particles' kinetic energy, and the size of the molecules becomes less significant compared to the empty space between them. (https://en.wikipedia.org/wiki/Ideal_gas)

That said, a key assumption of the Kinetic Theory for ideal gases is that there are no intermolecular forces between the molecules. And this assumption is wrong for every **real gas**. If there weren't any intermolecular forces then it would be impossible to condense the gas as a liquid. (https://chem.libretexts.org)

Q1. Given the information presented here … why do we teach the Ideal Gas Law?

Q2. In your best judgment, what is the difference between an Ideal Gas and a Real Gas?

Show-Off Your Smarts!

Instructions

- Complete as an individual.

Write an essay providing evidence of your understanding of this:
”Four variables (P, V, n, and T) are inter-related. Knowledge of the value for any combination of three of these is enough to determine the remaining value.”