

35.1 Describing the Properties of Gases

Chemistry

Summarize main points from each video.

Video Title / topic _____

Video Title / topic _____

Video Title / topic _____

Topic Introduction



Summarize your understanding of each paragraph.

Gas is one of the four fundamental states of matter (the others being solid, liquid, and plasma). A pure gas may be made up of individual atoms (e.g. a noble gas like neon).

The gaseous state of matter is found between the liquid and plasma states, the latter of which provides the upper temperature boundary for gases.

NOTE: Diatomic molecules are molecules composed of only two atoms, of the same or different chemical elements.

NOTE: Homonuclear molecules are molecules composed of only one type of element.

The only chemical elements that are stable diatomic homonuclear molecules at standard temperature and pressures (STP) are hydrogen (H_2), nitrogen (N_2), oxygen (O_2), and two halogens: fluorine (F_2) and chlorine (Cl_2).

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.

Overview of Gas Characteristics and Properties

1

Gas Characteristics and Properties

2

Gases have three characteristic properties: (1) they are easy to compress, (2) they expand to fill their containers, and (3) they occupy far more space than the liquids or solids from which they form.

There are several basic properties of gases which differentiate gases from liquids and solids: (1) A gas has no definite shape or volume, it will expand to fill its container. (2) A gas is easily compressible. (3) Gases form homogeneous mixtures with each other (without exception)

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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.

Boyle's Law (Extract from Online Encyclopedia Britannica)

Boyle's law, also called Mariotte's law, a relation concerning the compression and expansion of a gas at constant temperature. This empirical relation, formulated by the physicist Robert Boyle in 1662, states that the pressure (p) of a given quantity of gas varies inversely with its volume (v) at constant temperature.

In equation form, $pV = k$, a constant. The relationship was also discovered by the French physicist Edme Mariotte (1676).

The law can be derived from the kinetic theory of gases assuming a perfect (ideal) gas (see perfect gas). Real gases obey Boyle's law at sufficiently low pressures, although the product pV generally decreases slightly at higher pressures, where the gas begins to depart from ideal behavior.

<https://www.britannica.com/science/Boyles-law>

Boyle's Law (Extract from NASA Online)

Gases have various properties which we can observe with our senses, including the gas pressure, temperature, mass, and the volume which contains the gas. Careful, scientific observation has determined that these variables are related to one another, and the values of these properties determine the state of the gas.

In the mid 1600's, Robert Boyle studied the relationship between the pressure p and the volume V of a confined gas held at a constant temperature. Boyle observed that the product of the pressure and volume are observed to be nearly constant. The product of pressure and volume is exactly a constant for an ideal gas.

$$p * V = \text{constant}$$

This relationship between pressure and volume is called Boyle's Law in his honor.

<https://www.grc.nasa.gov/www/k-12/airplane/boyle.html>

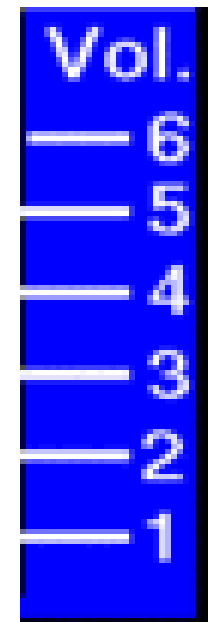
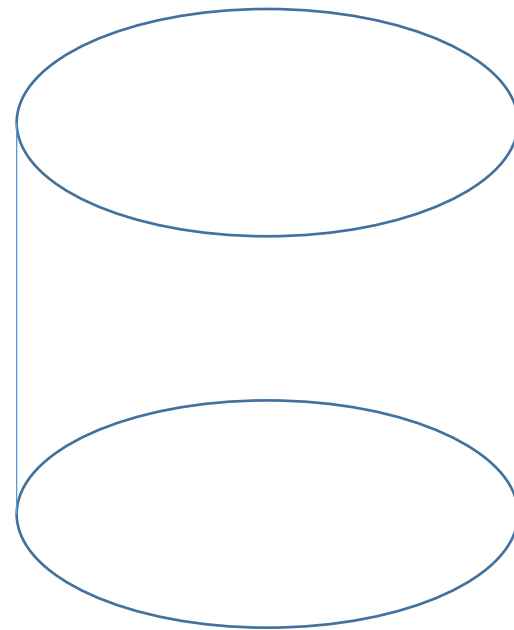
Also refer to related Topic 36 – Using Gas Laws to Solve Problems

Design an Experiment



Copy and Label the Illustration in the Space Provided

Based on what you currently understand about the relationship of pressure, volume, and temperature (of a gas), sketch a possible design to test these ideas.



Hint: You will need some type of container – and a way to measure pressure, temperature, and volume.

Adapted from: https://en.wikipedia.org/wiki/Boyle%27s_law

In this space provided, draw your best-idea about how to design/configure the experiment.

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

Adapted from: https://en.wikipedia.org/wiki/Boyle%27s_law

V=Volume

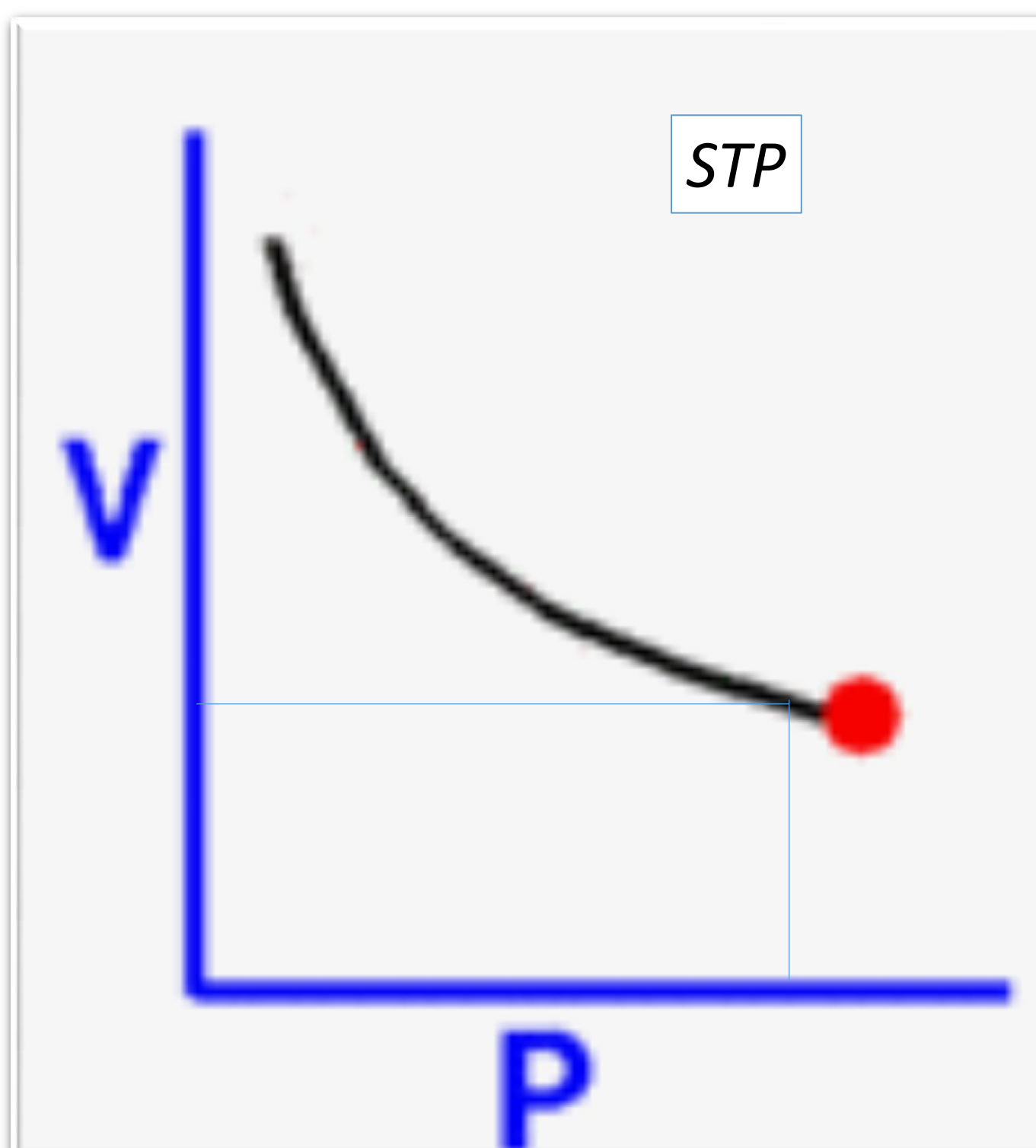
P=Pressure

Related information:

STP in chemistry is the abbreviation for Standard Temperature and Pressure.

STP most commonly is used when performing calculations on gases, such as gas density. The standard temperature is 273 K (0° Celsius or 32° Fahrenheit) and the standard pressure is 1 atm pressure.

www.thoughtco.com



Show-Off Your Smarts!



Instructions

- Complete as an individual.
- Prepare to share your ideas/answers/responses with the class.

Q1. In what way does a combustion engine (*in a car*) make use of these concepts?

Q2. A tea kettle “whistles” when the water boils. Explain the relationship of boiling water in a kettle and concepts from this topic.

Q3. Identify three additional (real-life) examples where you have observed the concepts described in this topic. Briefly explain how they are related to this topic.

1.

2.

3.

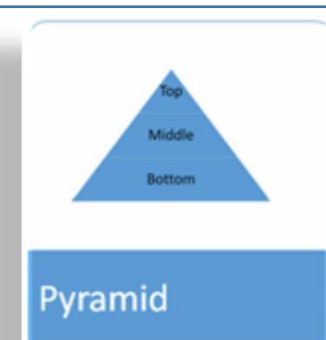
Make a Poster

In the space provided, illustrate concepts presented in *Properties of Gases* through the use of four diagrams suggested.

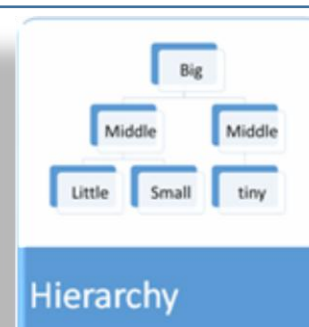
Process



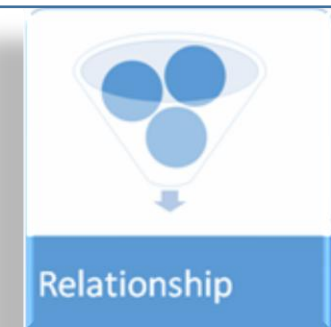
Pyramid



Hierarchy



Relationship



Suggestion: Use one of these diagrams to illustrate/explain standard temperature and pressures (STP)