

TSOKOS READING ACTIVITY

Section 3-2 (4 Points)

1. Essential Idea: The properties of ideal gases allow scientists to make predictions of the behavior of real gases.
2. Nature Of Science: Collaboration: Scientists in the 19th century made valuable progress on the modern theories that form the basis of thermodynamics, making important links with other sciences, especially chemistry. The scientific method was in evidence with contrasting but complementary statements of some laws derived by different scientists. Empirical and theoretical thinking both have their place in science and this is evident in the comparison between the unattainable ideal gas and real gases.
3. Theory Of Knowledge: When does modeling of “ideal” situations become “good enough” to count as knowledge?
4. Understandings:
 - a. Pressure
 - b. Equation of state for an ideal gas
 - c. Kinetic model of an ideal gas
 - d. Mole, molar mass and the Avogadro constant
 - e. Differences between real and ideal gases
5. Applications And Skills:
 - a. Solving problems using the equation of state for an ideal gas and gas laws
 - b. Sketching and interpreting changes of state of an ideal gas on pressure– volume, pressure–temperature and volume–temperature diagrams
 - c. Investigating at least one gas law experimentally
6. Guidance:
 - a. Students should be aware of the assumptions that underpin the molecular kinetic theory of ideal gases
 - b. Gas laws are limited to constant volume, constant temperature, constant pressure and the ideal gas law
 - c. Students should understand that a real gas approximates to an ideal gas at conditions of low pressure, moderate temperature and low density
7. Data Booklet Reference:
 - a. $p = \frac{F}{A}$
 - b. $n = \frac{N}{N_A}$
 - c. $pV = nRT$

d. $\bar{E}_K = \frac{3}{2} k_B T = \frac{3}{2} \frac{R}{N_A} T$

8. Utilization:

- a. Transport of gases in liquid form or at high pressures/densities is common practice across the globe. Behaviour of real gases under extreme conditions needs to be carefully considered in these situations.
- b. Consideration of thermodynamic processes is essential to many areas of chemistry (see Chemistry sub-topic 1.3)
- c. Respiration processes (see Biology sub-topic D.6)

9. Aims:

- a. Aim 3: this is a good topic to make comparisons between empirical and theoretical thinking in science
- b. Aim 6: experiments could include (but are not limited to): verification of gas laws; calculation of the Avogadro constant; virtual investigation of gas law parameters not possible within a school laboratory setting

10. Read section 3-2, Pg. 126-140, in your textbook.

11. Write a definition for each of the terms listed below.

a. Avagadro Constant - _____

b. Mole - _____

c. Atomic Mass Unit - _____

d. Atomic Mass - _____

e. Molar Mass - _____

f. Pressure - _____

g. Ideal Gas - _____

h. State of a Gas - _____

i. Equation of State - _____

j. Pressure – Volume Law - _____

k. Isotherm or Isothermal Curve - _____

l. Volume – Temperature Law - _____

m. Charles’ Law - _____

n. Pressure – Temperature Law - _____

o. Gay – Lussac’s Law or Amontons’ Law - _____

p. Equation of State of an Ideal Gas - _____

q. Gas Constant (as opposed to constantly having gas) - _____

r. Boltzmann Equation - _____

s. Heat death of the universe (not in book) - _____

12. Answer the following question: Why must models be simple? (Nature of Science) _____

13. Answers may be typed or neatly printed. Drawings may be freehand, but try to make use of the ‘Shapes’ or ‘Insert Clipart’ functions of MS Word. If you submit this assignment electronically, the filename must be in the following format, “LastnameFirstinitialPerXReadActX-X”.