

# Chemistry 20

## Lesson 30 – Gas Law Theory

For this lesson read pages 146 to 175 in the *Nelson* Chemistry text book.

### I. Assignment

1. What is the kinetic molecular theory?
2. Name and describe the three types of motion found in matter at the atomic level.
3. What type of molecular motion predominates in:
  - a. a solid
  - b. a liquid
  - c. a gas
4. List and describe three physical properties of gases.
5. Give an operational definition of a gas.
6. What is pressure and what are its two basic units?

7. What do STP and SATP stand for.

STP

SATP

What are the pressures and temperatures for:

STP

SATP

8. What is Boyle's law? Give the equation and an explanation of what it means.

9. If the pressure of a given amount of gas were to be increased by four times, by what factor would the volume change? (Show your work.)

10. What is the difference between the Kelvin scale and the Centigrade scale? Which of these two units do you use in gas theory? Explain why.

11. Express the following temperatures in Kelvin:

a.  $0^{\circ}\text{C}$

c.  $25^{\circ}\text{C}$

e.  $100^{\circ}\text{C}$

b.  $-40^{\circ}\text{C}$

d.  $60^{\circ}\text{C}$

f.  $250^{\circ}\text{C}$

12. Express the following temperatures in degrees Celsius:

a.  $0\text{ K}$

c.  $273\text{ K}$

e.  $298\text{ K}$

b.  $373\text{ K}$

d.  $288\text{ K}$

f.  $1000\text{ K}$

13. What is Charles' law? Give the equation and an explanation of what it means.

14. The piston inside a cylinder is free to move easily. If the temperature were to be tripled, what would happen to the volume of the gas? (Show your work.)
15. What is the combined gas law? Show how it becomes (a) Boyle's law and (b) Charles' law under the right conditions.
16. Kinetic molecular theory is strongly supported by experimental evidence. In your own words, how does kinetic molecular theory explain:
- a. The compressibility of gases?
  - b. Gas pressure?
  - c. Boyle's law?
  - d. Charles' law?
17. What is Avagadro's theory?
18. What is molar volume? Explain why 1.0 L of chlorine gas has the same number of moles as 1.0 L of oxygen gas at the same temperature and pressure.

20. What is the molar volume of a gas at:
- STP
  - SATP
21. How many moles are contained in 10.0 L of  $\text{O}_2(\text{g})$
- at STP
  - at SATP?
22. What volume does 0.250 mol of  $\text{CO}_2(\text{g})$  displace at:
- at STP
  - at SATP?
23. What are the two major differences between an ideal gas and a real gas?
24. What is the ideal gas law? Show how this law becomes (a) the combined gas law, (b) Boyle's law and (c) Charles' law.