Kinetic Molecular Theory

- Gases are made up of particles that have (relatively) large amounts of energy.
- No definite shape or volume, takes shape of its container.
- As a result of the large amount of empty space in a volume of gas, they are easily compressible.

KMT

- ***Here are the main ideas:***
- • All particles are in **constant**, **random motion**
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- • **Temperature** is a measure of the **average kinetic energy**
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- • **Pressure** is due to **collisions** of gas particles with the walls
- of the container
-
- • Increased **temperature** causes **more** collisions as well as
- **harder** collisions
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- • Some particles are moving **fast**, some are moving **slowly**
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KMT

- 1. the volume of the **actual, individual particles** in a gas can be assumed to be negligible compared to the volume of the container.

- 2. Particles move randomly in straight lines in al directions at various speeds.

- 3. forces of attraction or repulsion between two particles are negligible except when they collide.

- 4. Collisions are elastic between particles. Collisions with the walls of the container create the gas pressure.

- 5. average KE of a gas particle is proportional to the Kelvin temperature.

- (Kelvin is used to eliminate negative volumes)

Avagadro’s law

- At a constant temperature and pressure, volume is directly proportional to the moles of gas present.

- Volume increases with increasing # of moles.

Ideal Behavior

- At high pressures and low temperatures gas particles come close enough to one another to make 2 of the postulates from the KMT invalid.

- The assumption that gases are composed of tiny particles whose size is negligible compared to the average distance between them begins to fail-
  - When the gas is pressurized into a small space the gas particles size becomes more significant compared to the total volume.

- The assumption that the forces of attraction or repulsion between two particles in a gas are very weak or negligible begins to fail-
  - Low temp means less energy, so the particles are attracted to each other more.

Under these conditions (high P and low T) gases are said to behave non-ideally or like "real" gases.
Has these 2 consequences.

- 1. When compressed at high pressures, the size of the gas particles is no longer negligible compared to the total space occupied by the gas (its total volume). Therefore, the observed total volume occupied by the gas under these real conditions is artificially large since the gas particles are now occupying a significant amount of the total volume.

- 2. The actual pressure of a gas is lower than one would expect when assuming there were no attractive forces between particles.

Soooo?

- All of these corrections lead to the Van der Waals equation. You would not be asked to perform a calculation using this equation on the AP Exam, but you may be expected to relate the relative size of a and b (constants for a particular gas) to the deviations.
- Whattttt?

- van der Waals equation predict the behavior of real gases at low temp &/or high pressure.
- you do not need to know the equation, just that it implies more deviation from ideal behavior under the following conditions:
  - large molecular mass
  - low volume/high pressure
  - low temperature

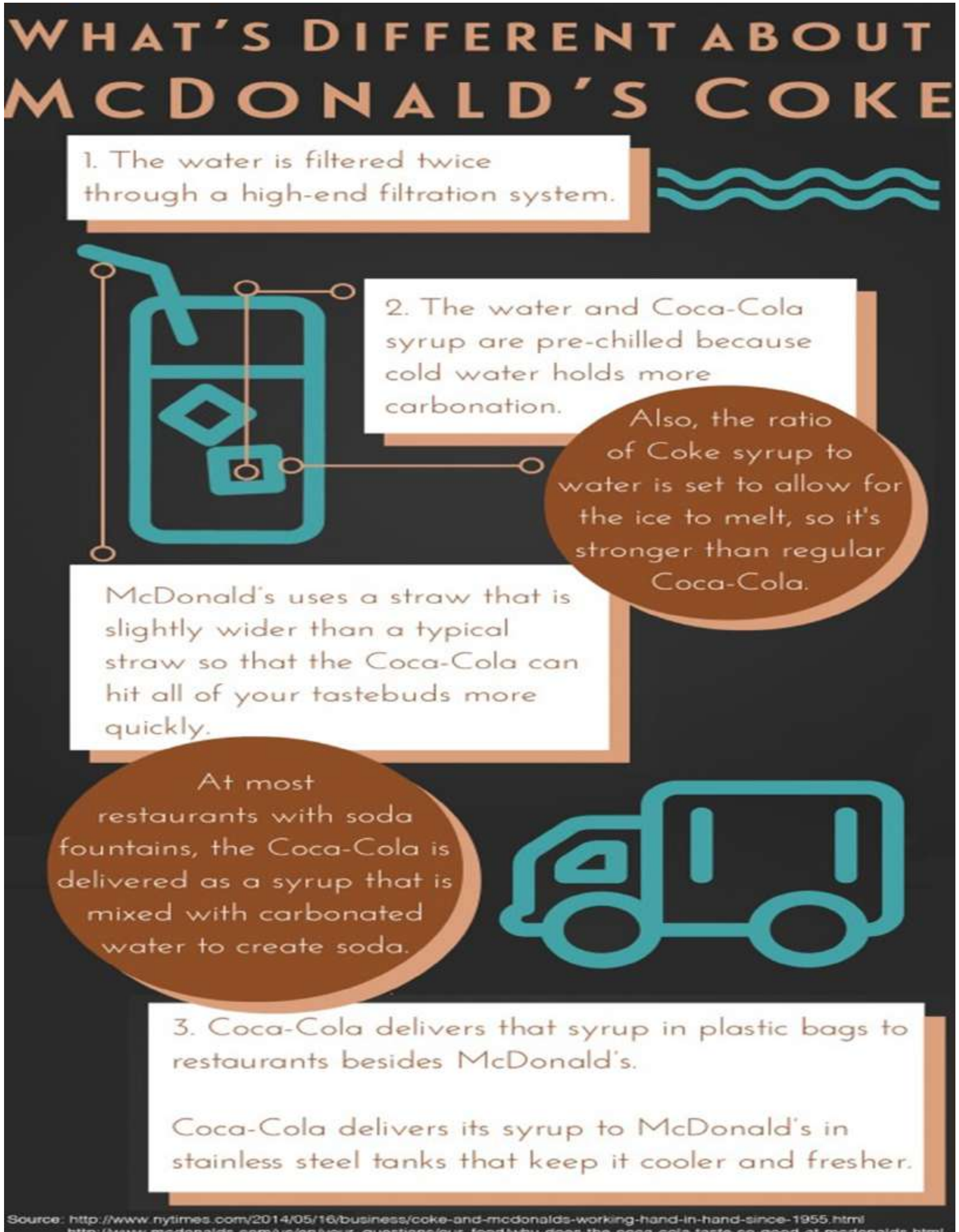
Grahams law

- Effusion is the process in which a gas escapes from a tiny hole.
- Diffusion is the process by which a homogeneous mixture is formed by the random mixing of 2 different gases.

- You will NOT be asked to perform a calculation on this on the AP Exam, but you SHOULD appreciate that smaller gas particles effuse and diffuse at higher rates than larger particles.

Henry’s law

- Imagine a solution, in a closed container, with a gas filling the space above it.
- At higher pressures, more gas particles strike the surface of the solution and enter the solvent.
- Solubility of gases decreases with increase in temperature of the solution.


WHAT'S DIFFERENT ABOUT
MCDONALD'S COKE
1. The water is filtered twice through a high-end filtration system.
2. The water and Coca-Cola syrup are pre-chilled because cold water holds more carbonation.
Also, the ratio of Coke syrup to water is set to allow for the ice to melt, so it's stronger than regular Coca-Cola.
McDonald's uses a straw that is slightly wider than a typical straw so that the Coca-Cola can hit all of your tastebuds more quickly.
At most restaurants with soda fountains, the Coca-Cola is delivered as a syrup that is mixed with carbonated water to create soda.
3. Coca-Cola delivers that syrup in plastic bags to restaurants besides McDonald's.
Coca-Cola delivers its syrup to McDonald's in stainless steel tanks that keep it cooler and fresher.
Source: http://www.nytimes.com/2014/05/16/business/coke-and-mcdonalds-working-hand-in-hand-since-1955.html
http://www.mcdonalds.com/us/en/your_questions/our_food/why-does-the-coca-cola-taste-so-good-at-mcdonalds.html