Gases Buffet Lab

Perform the gas law related experiment or answer the questions posed at each lab station. Be thorough in your observations and explanations. Safety gear is required at any lab bench that has chemicals present.

Station 1: Steel Wool

1. Place a loose, golf ball sized piece of steel wool in a beaker.
2. Pour vinegar on to the steel wool and allow it to soak in the vinegar for around one minute.
3. Remove the steel wool and drain any excess vinegar.
4. Quickly place the wool in a small Erlenmeyer flask and cap it with a balloon.
5. Monitor the system for around five minutes and record any observations.

Observations:

Q1: Write a balanced equation for the reaction occurring in the beaker, assuming steel wool is pure iron. (Note that you removed the vinegar from the wool)

Q2: What variables are being held constant in this experiment?

Q3: Explain why you observed a change with the balloon using gas laws. Provide an example calculation using arbitrary values for your variables.

Station 2: Splint Test

1. Prior to performing any of the reactions, prepare a Bunsen burner and a glowing wood splint by lighting the splint on fire and gently blowing out the flame to leave glowing ambers.
2. Combine the following in 3 separate gas generators; perform each reaction one at a time!
3. 5mL of Solution A and a small (pea-sized) scoop of Substance C
4. 5mL of Solution B and 2 pieces of Substance D
5. 5mL of Solution B and a small (pea-sized) scoop of Substance E
6. Immediately after mixing the reagents, place the wood splint in the generator directly above the solution. DO NOT DUNK THE SPLINT!
7. Record any observations.

Observations:

a.

b.

c.

Q4: Explain how the splint test can be used to infer what type of gas is being produced by a reaction.

Q5: Using your knowledge of the properties of oxygen, hydrogen, and carbon dioxide, identify which reactions produced which gases.

Station 3: Steam

1. Cap a 125mL Erlenmeyer flask with a balloon.
2. Heat a 600mL beaker filled 2/3 with diH2O to boiling.
3. Place the flask in the hot water bath. Monitor the system for around three minutes and record any observations.

Observations:

Q6: What variables are being held constant in this experiment?

Q7: Explain why you observed a change with the balloon using gas laws. Provide an example calculation using arbitrary values for your variables.

Q8: What would happen to the volume of the balloon if the atmospheric pressure suddenly tripled?

Station 4: Gas Race

1. Remove the saturated cotton balls from each Unknown Solution A & B using clean tongs and quickly place them in the ends of the glass tube.
2. Monitor the system for around five minutes and record any observations.

Observations:

Q9: Assuming that the solutions are at the same temperature, what can you say about the molecules that make-up each solution?

Q10: What do your observations tell you about the relative molar masses of the unknowns?

Q11: If your unknowns were hydrochloric acid and ammonia: identify which traveled farther and write out the complete equation for the reaction.

Station 5: Under Pressure

1. Open the stopcock on the syringe and draw in 20mL of ambient gas mixture.
2. Close the stopcock and depress the syringe to 5mL.
3. Monitor the system and record any observations.

Observations:

Q12: What variables are being held constant in this experiment?

Q13: Explain why you observed a change with the syringe using gas laws. Provide an example calculation using arbitrary values for your variables.

Q14: What would happen to the pressure in the syringe if you removed 1 mol of gas?

Q15: Assume STP, how many moles of N2 are in the syringe at 20mL?

Station 6: Application

Q16: When you fill your tires with air at the gas station, ambient air of 79% N2, 20%O2 and 1%Ar is pumped into them. If you left the nozzle on the highly pressurized tire depressed for 30 minutes how would the mixture of gasses in the tire have changed? Explain your reasoning.

Q17: If the last time you filled your tires to 40psi was in June, hypothesize the relative pressure of your tires today.

Q18: If two containers of H2 and CO2 are at the same temperature, what can be said about their molecular velocities?

Q19: Explain why you purchase “liquid propane” from the store, only to have a gas come out when you turn your grill on.