

Name: _____

Date: _____

Chemistry 20 Midterm Review (Bonding)

1. Complete the following table.

Atom	Group	# Valence Electrons	# Valence Orbitals	Lewis Diagram	# Lone Pairs	# Bonding Electrons
Br						
Ga						
Ca						
P						
H						

2. For the following draw and build its structural diagram. Include the total number of electrons in each molecule. Give the stereometric shape around the central atom(s). Draw the bond dipoles.

A. NH_3 B. SiH_4 C. CH_3COOH D. N_2Cl_4 E. C_2H_2 F. H_2S

3. What does the boiling point of a substance tell you?

4. What are the six intermolecular forces discussed in class?

5. What are the three elements that form hydrogen bonds when combined with Hydrogen?

6. For each of the following which substance would have the higher boiling point? Why? List the intermolecular forces present in each.

A. H_2O or BrF B. C_2H_6 or NCl_3 C. CO_2 or C_2F_2 D. NaCl or HF E. SiO_2 or Al_2O_3 F. Mg or Cl_2

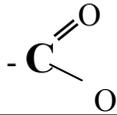
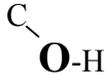
7. Arrange the following substances in a list in order of increasing boiling points. List beside each substance the type of bonding present. For the molecular substances, also list the number of electrons per molecule. Predict the probable state at room temperature

 SiC $\text{C}_3\text{H}_7\text{OH}$ Al_2O_3

Al

 C_3H_8 $\text{C}_3\text{H}_7\text{Cl}$

8. Complete the following table

Molecular Formula	Lewis Dot Diagram of Molecule	Structural Diagram	Stereometric Shape around Central Atom(s)
HCl			
CF ₄			
OBr ₂			
NH ₃			
C ₂ H ₄			
HCN			
CH ₃ -NH-CH ₃			
HOCCOOH			
			

9. How does the number of electrons affect the boiling point?

10. Explain the difference in boiling points between Cl₂ (-35°C) and C₂H₅Cl (13°C) by completing the chart and writing a sentence explaining the chart.

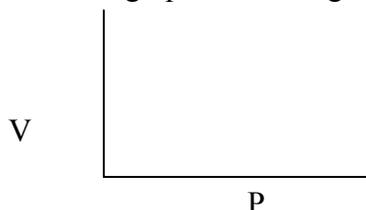
Compound	# of electrons	Intermolecular Forces
Cl ₂		
C ₂ H ₅ Cl		

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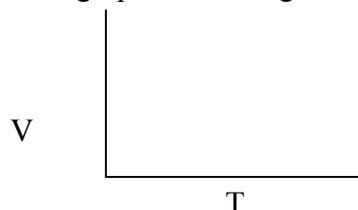
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Chemistry 20 Midterm Review (Gases)

1. Sketch a graph illustrating Boyle's Law



Sketch a graph illustrating Charles' Law



2. Convert the following using

$$1.00 \text{ atm} = 101.3 \text{ kPa} = 760 \text{ mmHg}$$

$$^{\circ}\text{C} = \text{K} - 273.15$$

$$1.0 \text{ psi} = 6.9 \text{ kPa}$$

$$250.4 \text{ K} = \text{_____}^{\circ}\text{C}$$

$$25.25^{\circ}\text{C} = \text{_____}\text{K}$$

$$222 \text{ K} = \text{_____}^{\circ}\text{C}$$

$$200 \text{ kPa} = \text{_____}\text{ mmHg}$$

$$300\text{kPa} = \text{_____}\text{ atm}$$

$$45.0 \text{ psi} = \text{_____}\text{ kpa}$$

3. What is SATP?

The temperature is $^{\circ}\text{C}$ _____ and _____ K. The pressure is _____ kPa

4. What is STP?

The temperature is $^{\circ}\text{C}$ _____ and _____ K. The pressure is _____ kPa

GAS LAWS - Combined ($P_1V_1T_2 = P_2V_2T_1$) and Ideal ($PV = nRT$)

5. A 10.0 L propane tank on a BBQ gas at 25.0°C has a pressure of 150 kPa if the temperature drops to -25.0 what is the new pressure?

6. A hot air balloon has a volume of 345 L at SATP, what is the new volume when the balloon is at 1000 m above the surface where the pressure is 80.0 kPa and 8.0°C .

7. A helium balloon at 22.0°C and 100 kPa has a volume of 5.55 L. Calculate the volume of the balloon after it rises 10 km up into the atmosphere where the temperature is -36.0°C and the outside air pressure is 28.0 kPa.

8. A 1.00 L container of $\text{CO}_2(\text{g})$ in Mr. Urlacher's prep room is pressurized to 1100 kPa at 20.0°C . What volume of gas would fill the room when the pressure in the room is 100 kPa at 20.0°C ?

9. Freon (CFC) is used in many air conditioners. If 500 mL of freon at 1.50 atm and 24.0°C is compressed to 250 mL at 3.50 atm what is the final temperature of the gas. (K and $^{\circ}\text{C}$)

10. One teaspoon of baking soda produces about 0.13 g of carbon dioxide during baking. What volume of gas is produced in a cake while baking at a temperature of 200°C and a pressure of 100 kPa?
11. What is the mass of He (g) that fills a hot air balloon with volume of 1100 L and a pressure of 87.00 kPa and a temperature of 10.0°C?
12. What volume would 5.00 g of methane occupy at STP?
13. What volume would 5.00 g of methane occupy at SATP?
14. A BBQ propane tank holds 20 lbs of propane (20 lbs = 9.08 kg). If the tank was opened what volume would the gas take up at SATP?
15. What is the pressure exerted on a compressor when a 5.00 L tank of is filled with 29.6 g of oxygen at 25°C?
16. A 200 L propane tank is used to heat a home. The tank can be filled to a maximum pressure of 800 kPa at 30°C. What mass of gas can be added to the tank.?
17. At a vehicle manufacturing factory a technician adds 0.0794 g of a gas into each headlight bulb. The bulbs contain 10.00 mL of gas at 150 kPa and 25°C. Calculate the molar mass of this gas. What kind of gas is placed in vehicle headlights?
18. A plant uses 9.86 L (17.5 g) of this gas per day at SATP? What is the molar mass of the gas? Identify the gas?
19. A company that produces natural gas creates 1.315 kg of polluting gas per day. The volume of this gas at 100.0 kPa and 20.0°C is 500.0 L. What is the molar mass of the gas and what is its identity.
20. Design an experiment to test one of the gas laws (Boyles, Charles, or Ideal). Assume you have only everyday materials available to you , such as a pump, a pressure guage, a pail with lid, hot plate, scale, measuring tape, measuring cup or graduated cylinder, a balloon, and a thermometer.

Problem: How can we test _____ Law?

Hypothesis:

Variables - M
R
C

Materials used (from list above)

Procedure (step by step)

Observation Chart

Analysis formulae to be used