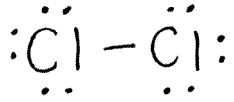
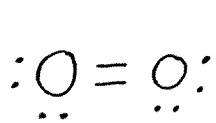
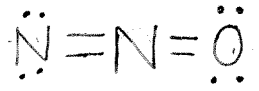
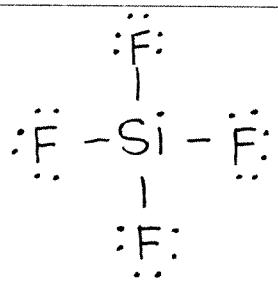
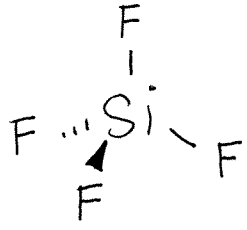
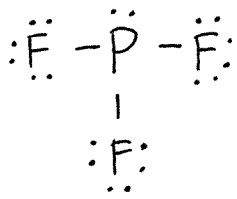
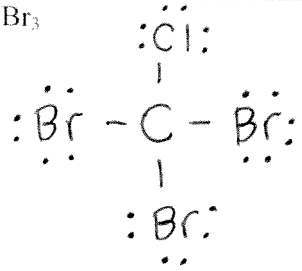
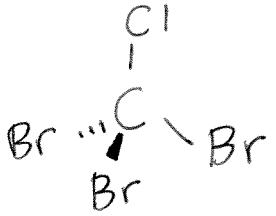
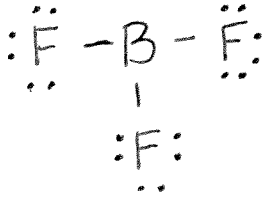
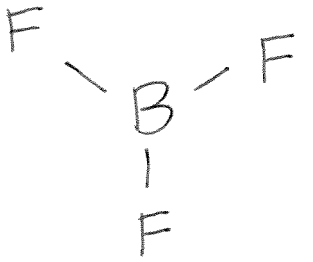
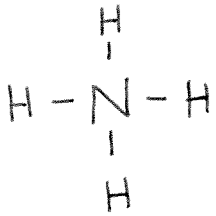
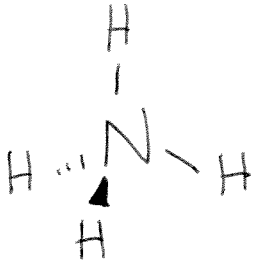
Bonding & Mole Practice Name: KEY Block: ____

Part I: Draw the Lewis Dot Structure & Shape of each molecule below. (See notes for help).

	Lewis Structure	# boding e⁻ conc.	# lone e⁻ pairs	Total e⁻ conc.	Picture of Shape (molecular geometry)	Shape Name
1.	Cl_2 	1	0	1	Cl – Cl	linear
2.	O_2 	1	0	1	O – O	linear
3.	N_2 	1	0	1	N – N	linear
4.	N_2O 	2	0	2	N-N-O	linear
5.	SiF_4 	4	0	4		tetra-hedral
6.	PF_3 	3	1	4		pyrami-dal

	Lewis Structure	# boding e^- conc.	# lone e^- pairs	Total e^- conc.	Picture of Shape	Shape Name
7.	$CClBr_3$ 	4	0	4		tetra-hedral
8.	OI_2 	2	2	4		Bent
9.	BF_3 (boron is an exception: only needs 6 valence e^-) 	3	0	3		trigonal planar
10	NH_4^+ (+1 charge, must subtract 1 e^- from total valence e^- needed) 	4	0	4		tetra-hedral

Part II: Determine the electronegativity difference (ΔEN) (use your blue periodic tables) between the two atoms and predict the type of bond that will form (ionic, polar covalent, or nonpolar covalent).

11. N – H N = 3.0 H = 2.1 ΔEN = 3.0 - 2.1 = 0.9 = polar covalent
12. Si – O Si = 1.8 O = 3.5 ΔEN = 3.5 - 1.8 = 1.7 = polar covalent
13. S – Cl S = 2.5 Cl = 3.0 ΔEN = 3.0 - 2.5 = 0.5 = polar covalent
14. Na – Cl Na = 0.9 Cl = 3.0 ΔEN = 3.0 - 0.9 = 2.1 = ionic

Part III: Solve each problem. Clearly show all your work. Round answers to the correct number of significant figures and include appropriate units.

15. How many moles of SO_2 are in 2.12 grams of SO_2? $MM_{SO_2} = (32.07) + 2(16) = 64.07\ g$

$$2.12\ g\ SO_2 \left| \frac{1\ mol\ SO_2}{64.07\ g\ SO_2} \right. = .0331 = \boxed{3.31 \times 10^{-2}\ mol\ SO_2}$$

16. How many grams of C_2H_6 are in 5.02 moles of C_2H_6?

$MM_{C_2H_6} = 2(12.01) + 6(1.01) = 30.08\ g = 1\ mol\ C_2H_6$

$$5.02\ mol\ C_2H_6 \left| \frac{30.08\ g\ C_2H_6}{1\ mol\ C_2H_6} \right. = \boxed{151\ g\ C_2H_6}$$

17. How many molecules of H_2O are in 3.1 moles of H_2O?

$1\ mol\ H_2O = 6.02 \times 10^{23}$ molecules H_2O

$$3.1\ mol\ H_2O \left| \frac{6.02 \times 10^{23}\ molecules\ H_2O}{1\ mol\ H_2O} \right. = \boxed{1.9 \times 10^{24}\ molecules\ H_2O}$$

18. How many moles of Cl_2 gas at STP are in 10.5 liters of Cl_2 gas?

$1\ mol\ Cl_2 = 22.4\ L\ Cl_2$

$$10.5\ L\ Cl_2 \left| \frac{1\ mol\ Cl_2}{22.4\ L\ Cl_2} \right. = .469 = \boxed{4.69 \times 10^{-1}\ mol\ Cl_2}$$

19. How many liters of NO_2 gas at STP are in 41.9 grams of NO_2 gas?

$MM_{NO_2} = 14.01 + 2(16) = 46.01\ g = 1\ mol\ NO_2 = 22.4\ L\ NO_2$

$$41.9\ g\ NO_2 \left| \frac{1\ mol\ NO_2}{46.01\ g\ NO_2} \right| \frac{22.4\ L\ NO_2}{1\ mol\ NO_2} = \boxed{20.4\ L\ NO_2}$$

K_2O

20. How many formula units of potassium oxide are in 2.0 moles of potassium oxide? (Hint: you must first write the correct formula for this ionic compound)

$1\ mol\ K_2O = 6.02 \times 10^{23}$ formula units K_2O

$$\frac{2.0\ mol\ K_2O \mid 6.02 \times 10^{23}\ \text{formula units } K_2O}{\mid 1\ mol\ K_2O} = \boxed{1.2 \times 10^{24}\ \text{formula units } K_2O}$$

LiBr

21. How many grams of lithium bromide are in 8.04×10^{24} formula units of lithium bromide?

6.02×10^{23} formula units LiBr = 1 mol LiBr = MM_{LiBr} = 86.84 g

$$\frac{8.04 \times 10^{24}\ \text{formula units LiBr} \mid 1\ mol\ LiBr \mid 86.84\ g\ LiBr}{\mid 6.02 \times 10^{23}\ \text{formula units LiBr} \mid 1\ mol\ LiBr} = \boxed{1.16 \times 10^{3}\ g\ LiBr}$$

PO_5

22. How many grams of phosphorus pentoxide are in 4.3×10^{26} molecules of phosphorus pentoxide?

6.02×10^{23} molecules PO_5 = 1 mol PO_5 = MM_{PO_5} = 110.97 g

$$\frac{4.3 \times 10^{26}\ \text{molecules } PO_5 \mid 1\ mol\ PO_5 \mid 110.97\ g\ PO_5}{\mid 6.02 \times 10^{23}\ \text{molecules } PO_5 \mid 1\ mol\ PO_5} = \boxed{7.9 \times 10^{4}\ g\ PO_5}$$

BBr_3

23. How many molecules of boron tribromide are in 27 grams of boron tribromide?

$MM_{BBr_3} = 250.51\ g = 1\ mol\ BBr_3 = 6.02 \times 10^{23}$ molecules BBr_3

$$\frac{27\ g\ BBr_3 \mid 1\ mol\ BBr_3 \mid 6.02 \times 10^{23}\ \text{molecules } BBr_3}{\mid 250.51\ g\ BBr_3 \mid 1\ mol\ BBr_3} = \boxed{6.5 \times 10^{22}\ \text{molecules } BBr_3}$$

N_2O_4

24. How many molecules of dinitrogen tetroxide gas at STP are in 5.0 liters of dinitrogen tetroxide gas?

$22.4\ L\ N_2O_4 = 1\ mol\ N_2O_4 = 6.02 \times 10^{23}$ molecules N_2O_4

$$\frac{5.0\ L\ N_2O_4 \mid 1\ mol\ N_2O_4 \mid 6.02 \times 10^{23}\ \text{molecules } N_2O_4}{\mid 22.4\ L\ N_2O_4 \mid 1\ mol\ N_2O_4} = \boxed{1.3 \times 10^{23}\ \text{molecules } N_2O_4}$$

$Ca(OH)_2$

25. How many formula units of calcium hydroxide are in 3.99 grams of calcium hydroxide?

$MM_{Ca(OH)_2} = 40.08 + 2(16) + 2(1.01) = 74.1\ g = 1\ mol\ Ca(OH)_2 = 6.02 \times 10^{23}$ formula units $Ca(OH)_2$

$$\frac{3.99\ g\ Ca(OH)_2 \mid 1\ mol\ Ca(OH)_2 \mid 6.02 \times 10^{23}\ \text{formula units } Ca(OH)_2}{\mid 74.1\ g\ Ca(OH)_2 \mid 1\ mol\ Ca(OH)_2} = \boxed{3.24 \times 10^{22}\ \text{formula units } Ca(OH)_2}$$