Chem 11 Review Handout – Answer Key

1. A) He B) He C) Ho D) He E) Ho

2. a) C b) P c) C d) P e) C f) P g) P

3.

Subatomic Particle Name	Charge (be specific!)	Location within atom
Proton	*+1*	*Nucleus*
Electron	*-1*	*Orbiting nucleus*
Neutron	*0*	*Nucleus*

4.

Element Name	***Symbol***	***Atomic Number***	***# of Protons***	***# of Electrons***	***# of Neutrons***	***Mass Number***	***Charge***	***Cation / Anion /Neither***
Nitrogen	*N*	*7*	7	*7*	*7*	14	0	*Neither*
Sulfur	*S*	16	*16*	*18*	16	*32*	2-	*Anion*
Sodium	Na	*11*	*11*	10	*12*	23	*1+*	*Cation*
Selenium	*Se*	34	*34*	36	45	*79*	*2-*	*Anion*
Chromium	*Cr*	*24*	*24*	*24*	*28*	52	0	Neither

5. a) $^{35}_{17}Cl$ b) $^{39}_{19}K^{+1}$ *c)* $^{19}_{9}F^{-1}$ d) $^{70}_{31}Ga$

6. Describe:

(a) Dalton's Atomic Theory

All matter is composed of small indivisible particles
Atoms of an element are identical in size shape and mass
Atoms of one element are different than atoms of another element
Chemical reactions are the rearrangement of atoms (number of atoms before and after the same
Picture: solid ball, no parts

(b) Thomson's model of the atom

Atom small particle made up of positive matter with negative electrons imbedded

Picture: Cookie model: electrons floating in positive background

(c) Rutherford's model of the atom

Gold Foil Guy!
Atom with dense, positively charged nucleus surrounded by electrons. The nucleus contained the protons and neutrons.

(d) Bohr's model of the atom

Positively charged nucleus, surrounded by orbiting electrons orbiting in energy levels. Orbits determined by energy level.

e) The Quantum Mechanical model of the atom

Electrons orbiting in clouds with definite shape. Orbit around positively charged nucleus. Probability function to estimate where electrons are. (s, p , d, f) shapes!!

7. Answer (C) : *(0.3000)(24.02)+(0.7000)(26.10) = 25.48 u*

8. *a) Rep b) Rep c) Trans d) Inner Trans e) Trans f) Metalloid g) Rep h) Trans i) Trans j) Rep*

9. *a)* H^+ *b)* Mg^{2+} *c)* S^{2-} *d)* I^- *e)* Al^{3+}

10. *a) N b) Au c)K d) Ga*

11. *a)O b)Ag c)Ca d) Ge*

12. *a) O b) Ag c) Ca d) Ge*

13.

(a) K $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

(b) K^+ $1s^2 2s^2 2p^6 3s^2 3p^6$

(c) S $1s^2 2s^2 2p^6 3s^2 3p^4$

(d) S^{2-} $1s^2 2s^2 2p^6 3s^2 3p^6$

(e) Ca $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

(f) Ar $1s^2 2s^2 2p^6 3s^2 3p^6$

(g) Ru $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^6$

(h) W $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^4$

14.

Element	*# of valence e⁻*	*Electron Dot Structure*	*Ions formed*	*Ion is: Cation or Anion*
O	*6*		O^{2-}	*Anion*
Na	*1*		Na^+	*Cation*
P	*5*		P^{3-}	*Anion*
Ca	*2*		Ca^{2+}	*Cation*

15. Metals are elements that have atoms arranged in rows. The electrons are easily released from metal atoms so that layers of metal atoms exist in a 'sea' of electrons.
Physical Properties of Metals include shiny lustre, greyish - silver colour, hardness, good heat and electricity conductivity, high melting and boiling points, malleability (can be hammered into a sheet) and ductility (can be pulled into a wire).
Examples of Metals are gold, copper, lead, zinc, iron, magnesium, sodium, calcium and mercury.

16. *Ionic compounds contain metals and nonmetals and are formed when the metal atoms loses valence electron(s) to the nonmetal (atoms end up with a complete octet). The metal cation attracts the nonmetal anion. The ions arranged in a crystal lattice which maximizes the neutralization of the ionic charges. Also: good conductor of electricity, solid form*

Molecular compounds contain nonmetal with a nonmetal and are formed when the atoms share valence to attain a complete octet. The mutual attraction to these shared (bonding) electrons holds the atoms together to form a molecule – an electrically neutral particle. When the bonding electrons are shared equally a nonpolar bond is formed. When the bonding electrons are not shared equally a polar bond is formed. Also: poor conductor, can be solid, liquid or gas form.

17. Ionic (metal and non-metal) Molecular: two non-metals covalently bonded

a) Ionic b) Molecular c) ionic d) molecular e) ionic f) ionic g) molecular

18. *(*least*) Fr, Te, Ge, Mg, C, F (most*

19. N_2, O_2, F_2, Cl_2, Br_2, I_2, H_2

20. **Balance** the following:

a) **3** Mg + **2** H_3PO_4 → **1** $Mg_3(PO_4)_2$ + **3** H_2

b) **1** $Al_2(SO_4)_3$ + **3** $Ca(OH)_2$ → **2** $Al(OH)_3$ + **3** $CaSO_4$

c) **2** K + **2** H_2O → **2** KOH +**1** H_2

d) **6** CaO + **1** P_4O_{10} → **2** $Ca_3(PO_4)_2$

e) **1** C_2H_6 + **1** O_2 → **1** CO_2 + **1** H_2O

f) **4** C_3H_5 + **1** O_2 → **12** CO +**10** H_2O

21. Write the **names** of the following compounds:

a)	Na_2SO_4	Sodium sulfate	e)	Al_2S_3	aluminum sulfide
b)	$(NH_4)_3PO_4$	ammonium phosphate	f)	SO_3	Sulfur trioxide
c)	$BaCl_2$	barium chloride	g)	$ZnCO_3$	Zinc carbonate
d)	$MgCO_3$	magnesium carbonate	h)	$CuPO_4$	copper (III) phosphate

i)	$CoCrO_4$	cobalt (II) chromate	o)	K_2Se	potassium selenide
j)	P_2O_5	diphosphorus pentoxide	p)	$Hg(CN)_2$	Mercury (II) cyanide
k)	$Cr(C_2H_3O_2)_3$	chromium (III) acetate	q)	MnF_2	Manganese (II) fluoride
l)	$Sn_3(PO_3)_2$	tin (II) phosphite	r)	$Pb(NO_2)_2$	lead (II) nitrite
m)	CaH_2	calcium hydride	s)	Sr_3P_2	strontium phosphide
n)	$BaSO_3$	barium sulfite	t)	$Fe_2(Cr_2O_7)_3$	Iron (III) dichromate

22. Write the **formulas** of the following compounds:

a)	Potassium chloride	KCl	k)	Silver oxide	Ag_2O
b)	Magnesium nitrate	$Mg(NO_3)_2$	l)	Chromium (III) sulfate	$Cr_2(SO_4)_3$
c)	Lithium carbonate	Li_2CO_3	m)	Sulfur dioxide	SO_2
d)	Lead (II) phosphate	$Pb_3(PO_4)_2$	n)	Ammonium dichromate	$(NH_4)_2Cr_2O_7$
e)	Cesium oxalate	$Cs_2C_2O_4$	o)	Calcium fluoride	CaF_2
f)	Strontium sulfite	$SrSO_3$	p)	Iron (III) sulfide	Fe_2S_3
g)	Zinc acetate	$Zn(C_2H_3O_2)_2$	q)	Mercury (I) phosphate	Hg_3PO_4
h)	Strontium hydroxide	$Sr(OH)_2$	r)	Potassium nitrite	KNO_2
i)	Aluminum chlorate	$Al(ClO_3)_3$	s)	Carbon tetrachloride	CCl_4
j)	Manganese (V) cyanide	$Mn(CN)_5$	t)	dinitrogen pentaoxide	N_2O_5

23. Balance the following chemical equations. Then write the name for each reactant and each product under each one.

a) **1** $Fe_2(SO_4)_3$ + **3** $Ca(OH)_2 \rightarrow$ **2** $Fe(OH)_3$ + **3** $CaSO_4$

Iron (III) sulfate + calcium hydroxide → iron (II) hydroxide + calcium sulfate

b) **2** $CuNO_3$ + **1** $MnCl_2$ → **2** CuCl + **1** $Mn(NO_3)_2$

Copper (I) nitrate + manganese (II) chloride → copper (I) chloride + manganese (II) nitrate

c) **2** C_2H_6 + **7** O_2 → **4** CO_2 + **6** H_2O : **Dicarbon hexahydride + oxygen → carbon dioxide + water**

d) **4** FeS + **7** O_2 → **2** Fe_2O_3 + **4** SO_2 : **Iron (II) sulfide + oxygen → iron (III) oxide + sulfur dioxide**

e) **4** NH_3 + **5** O_2 → **4** NO + **6** H_2O : **Ammonia + oxygen → nitrogen monoxide + water**

24. Write **balanced chemical equations** for each of the following:

a) bismuth(III) dichromate + gold(I) chlorate → bismuth(III) chlorate + gold(I) dichromate

$Bi_2(Cr_2O_7)_3$ + $6AuClO_3$ → $2\ Bi(ClO_3)_3$ + $3Au_2CrO_7$

b) potassium sulfate + barium phosphite →barium sulfate + potassium phosphite ***$3K_2SO_4 + Ba3(PO_3)_2$ → $3BaSO4$ + $2K_3PO_3$***

c) aluminum oxide + hydrofluoric acid → aluminum fluoride + water ***$1Al_2O_3$ + $6HF$ → $2AlF_3$ + $3H_2O$***

d) potassium iodide + hydrogen peroxide(H_2O_2) → potassium hydroxide + iodine ***$2KI + H_2O_2$ → $2KOH + I_2$***

e) lead(II) sulfide + lead(II) oxide→ lead + sulfur dioxide $\mathbf{PbS + 2PbO \rightarrow 3Pb + SO_2}$

f) aluminum chlorate (heated) →aluminum + chlorine + oxygen $\mathbf{2Al(ClO_3)_3 \rightarrow 2Al + 3Cl_2 + 9O_2}$

g) sodium carbonate + copper (II) sulfate→ sodium sulfate + copper (II) carbonate $\mathbf{Na_2CO_3 + CuSO_4 \rightarrow Na_2SO_4 + CuCO_3}$

Classifying Reactions:

25. Classify & balance the following reactions.

a) **2** C_8H_{18} + **25** O_2 → **16** CO_2 + **18** H_2O

b) **1** Pb + **1** H_2SO_4→ **1** $PbSO_4$+ **1** H_2

c) **1** $Al_2(SO_4)_3$+ **3** K_2CrO_4 → **3** K_2SO_4+ **1** $Al_2(CrO_4)_3$

d) **3** Mg + **1** N_2→ **1** Mg_3N_2

e) **1** Sn + **2** $AgNO_3$→ **1** $Sn(NO_3)_2$+ **2** Ag

f) **1** $Cu_3(PO_4)_2$+ **6** $AgNO_3$→ **3** $Cu(NO_3)_2$+ **2** Ag_3PO_4

g) **1** CH_4+ **2** O_2→ **1** CO_2 + **2** H_2O

(Rxn Types: a: comb, b: SD; c: DD; d: synthesis; e: SD; f: DD; g: combustion)

26. **Predict the products** and then **balance** the equation:

a) $\mathbf{Al_2(SO_4)_3 + 3\ Ca(OH)_2 \rightarrow 2Al(OH)_3 + 3CaSO_4}$ **Double Displacement**

b) $\mathbf{2\ K_3PO_4 + 3\ BaCl_2 \rightarrow 6KCl + Ba_3(PO_4)_2}$ **Double Displacement**

c) Calcium nitrate + ammonium chloride → ?
$\mathbf{Ca(NO_3)_2 + 2\ NH_4Cl \rightarrow CaCl_2 + 2\ NH_4NO_3}$ **Double Displacement**

d) Lithium + chlorine → ? $\mathbf{2Li + Cl_2 \rightarrow 2LiCl}$ **Synthesis**

e) NO_2 → ? $\mathbf{2NO_2 \rightarrow N2 + 2O_2}$ **Decomposition**

Molar mass

27. Calculate the molar mass of potassium ferricyanide, $K_3Fe(CN)_6$. (A:329.27 g/mol)
3K + 1Fe + 6C + 6N = 3(39.10) + 1(55.85) + 6(12.01) + 6(14.01) = 329.27 g

28. Calculate the molar mass of:

a. sodium hydroxide **(NaOH = 40.0 g/mol)**

b. calcium cyanide **($Ca(CN)_2$ = 92.0 g/mol)**

c. magnesium phosphate **($Mg_3(PO_4)_2$ = 262.9 g/mol)**

d. iron(III) dichromate **($Fe_2(Cr_2O_7)_3$ = 759.6 g/mol)**

Moles / Grams/ Molecules

29. Find the mass of 4.50 moles of diphosphorus pentoxide. _____ (A: 639.0 g)
P_2O_5 molar mass: 2(30.97) + 5(16) = 141.94 g/mol

$$4.50\ moles \times \frac{141.94\ g}{1 mol} = 639\ grams$$

30. How many moles is 250.0g of copper (II) sulfate? _____ (A: 1.6 mol)
$CuSO_4$: molar mass: 1(63.55) + 1(32.07) + 4(16.0) = 159.62 g/mol

$$250.0\ g \times \frac{1\ mole}{159.62\ g} = 1.57\ moles = 1.6\ mole$$

31. Find the mass of 0.545 moles of calcium cyanide. _____ (A: 43.6 g)
$CaCN_2$: molar mass: 1(40.08) + 1(12.01) + 2(14.01) = 80.11 g/mol

$$0.545\ moles \times \frac{80.11\ g}{1\ mole} = 43.6\ moles$$

32. How many molecules are in 110g of aluminum nitrate? _____ (A: 3.1x10^{23} molecules)

$Al(NO_3)_3$ = 1(26.98) + 3(14.01) + 9(16) = 213.01 g/mol

$$110\ g \times \frac{1\ mole}{213.01\ g} = 0.516\ moles \qquad 0.516\ moles \times \frac{6.02 \times 10^{23} molecules}{1\ mole} = 3.1 \times 10^{23}\ molecules$$

33. 575g of sodium sulfate to moles _____ (A: 4.0 mol)

Na_2SO_4 = 2(22.99) + 1(32.07) + 4(16.0) = 142.05 g/mol

$$575g \times \frac{1\ mole}{142.05g} = 4.05\ mol$$

34. 0.025moles of diphosphorus pentachloride to grams _____ (A: 6.0 g)

P_2Cl_5 = 2(30.97) + 5(35.45) = 239.19 g/mol

$$0.025\ mol \times \frac{239.19\ g}{1\ mole} = 5.97\ g = 6.0\ g$$

35. 15.0g of iron(III) nitrate to moles _____ (A: 0.062 `1

$$15.0\ g\ Fe(NO3)3 \times \frac{1mole}{241.86\ g} = 0.0620\ \text{g}$$

36. 8.02 x 10^{23} molecules of carbon disulfide to grams _____ (A: 101.5 g)

CS_2 = 12.01 + 2(32.07) = 76.14 g/mol

$$8.02 \times 10^{23}\ molecules \times \frac{1mole}{6.02 \times 10^{23} molecules} \times \frac{76.14\ g}{1\ mole} = 101.5\ g$$

STP Questions

37. What is the volume occupied by 1.0 g of carbon dioxide gas trapped in bread dough at STP? (A: 0.51 L)

CO_2 = 1(12.01) + 2(16.0) = 44.01 g

$$1.0\ \ g \times \frac{1\ mole}{44.01\ g} = 0.02272\ moles$$

$$0.02272\ moles \times \frac{22.4\ L}{1\ mole} = 0.51\ L$$

38. Calculate the volume for 15.0g CO gas at STP. (A: 12.0L)

CO = 1(12.01) + 1 (16.0) = 28.01 g

$$15.0\ g \times \frac{1\ mole}{28.01\ g} = 0.5355\ moles$$

$$0.5355\ moles \times \frac{22.4\ L}{1\ mole} = 11.99\ L = 12.0\ L$$

39. Calculate the volume for 0.350 mol CH_4 gas at STP. (A: 7.84 L)

$$0.350\ moles \times \frac{22.4\ L}{1\ mole} = 7.84\ L$$

Mass Mass

40. Prove with calculations that the reaction of ammonia gas reacts with nitrogen monoxide to form nitrogen gas and water, will follow the law of conservation of mass.

$$4NH_3 + 6NO \rightarrow 5N_2 + 6H_2O$$

Mass of NH_3 = (14.01) + 3(1.01) = 17.04 ∴ 4(NH_3) = 68.16 g
Mass of NO = (14.01) + (16.0) = 30.01 ∴ 6(NO) = 180.06 g
Mass of Reactants = 68.16 + 180.06 = 248.22 g

Mass of N_2 = 2(14.01) = 28.02 ∴ 5N_2 = 140.10 g
Mass of H_2O = 2(1.01) + 16.0 = 18.02 g ∴ 6 H_2O = 108.12 g
Mass of Products = 140.10 + 108.12 = 248.22 g

Mass of Reactants = Mass of Products (no mass lost)

41. Given the formula: $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$ If 25.0g of zinc is reacted with 60.0 g of H2SO4, how many grams of each of the products is formed?

$$25.0g\ of\ Zn \times \frac{1\ mol}{65.39\ g} = 0.3823\ mol\ of\ Zn$$

$$0.3823\ mol\ of\ Zn\ \times \frac{1\ mol\ of\ ZnSO4}{1\ mol\ Zn} = 0.3823\ mol\ of\ ZnSO_4$$

$$0.3823\ mol\ of\ ZnSO_4\ \times \frac{161.46g}{1\ mol} = 61.73\ g\ ZnSO_4$$

$$0.3823\ mol\ of\ Zn\ \times \frac{1\ mol\ of\ H_2}{1\ mol\ Zn} = 0.3823\ mol\ of\ H_2$$

$$0.3823\ mol\ of\ H_2 \times \frac{2.02\ g}{1\ mol} = 0.772\ g\ H_2$$

Percent composition

42. Calculate the percent composition of NH_4NO_3 (A: N:35%, H-5%; 0:60%)

Total Mass : 2(14.01) + 4(1.01) + 3(16.0) = 80.06 g

$$\%\ N = \frac{28.02}{80.06} \times 100 = 34.99\%$$
$$\%\ H = \frac{4.04}{80.06} \times 100 = 5.05\%$$
$$\%\ O = \frac{48.0}{80.06} \times 100 = 59.95\%$$

43. a). Find the percent composition of magnesium phosphate.

$Mg_3(PO_4)_2$ = 3(24.31) + 2(30.97) + 8 (16.0) = 262.87 g

$$\%\ Mg = \frac{72.93g}{262.87g} \times 100 = 27.7\%$$
$$\%\ P = \frac{61.94}{262.87g} \times 100 = 23.5\%$$
$$\%\ O = \frac{128.0g}{262.87g} \times 100 = 48.7\%$$

b. How many grams of magnesium are in 350g of magnesium phosphate? _____

$$27.7\%\ \times 350g = 0.277\ \times 350g = 97\ g$$

Empirical formula

44. 88.0 g of a hydrocarbon is analyzed and found to contain 71.88 g of carbon and 16.12g of hydrogen. Find the empirical formula.

$$71.88\ g\ C\ \times \frac{1\ mol}{12.01\ g} = 5.985\ mol\ \div 5.985\ mol = 1$$
$$16.12\ g\ of\ H\ \times \frac{1\ mole}{1.01\ g} = 15.96\ mol\ \div 5.985\ mol = 2.66 \quad \textit{multiply by 3 to get to whole \#}$$
$$C:\ 1 \times 3 = 3$$
$$H:\ 2.66 \times 3 = 8$$

Empirical Formula: C_3H_8

45. Monosodium gluatamate (MSG) has sometimes been suspected as the cause of "Chinese restaurant syndrome" because this food flavor enhancer can induce headaches and chest pains. MSG has the following composition by mass: 35.51 % C; 4.77 % H; 37.85% O; 8.29 % N; and 13.60% Na. What is its molecular formula if its molar mass is 169 g?

(A: EF: $C_5H_8O_4NNa$; MF: $C_5H_8O_4NNa$)

Molecular formula

46. Determine the molecular formula for nicotine from the following evidence.
Molar mass = 162. 24 g/mol
Percent by mass C = 74.0 %; Percent by mass H = 8.7 %; percent by mass N = 17.3 % (A: $C_{10}H_{14}N_2$)

Assume 100 g sample

$$74.0\ g\ C \times \frac{1\ mole}{12.01\ g} = 6.1615\ mole \div 1.235 = 5$$

$$8.7\ g\ H \times \frac{1\ mole}{1.01\ g} = 8.614\ mole \div 1.235 = 7$$

$$17.3\ g\ N \times \frac{1\ mole}{14.01\ g} = 1.235\ mole \div 1.235 = 1$$

Empirical Formula = $C_5H_7N_1$ **Empirical Formula Mass = 81.13 g**

$$MF\ Ratio = \frac{MM}{EFM} = \frac{162.24g}{81.13g} = 1.7 \sim 2$$

$$\boldsymbol{MF = C_{10}H_{14}N_2}$$

47. Given the following information, determine the molecular formula of a compound composed of 24.5% phosphorus and 75.5%fluorine.
Molar mass = 126 g/ mol (A: PF_5)

Assume 100 g sample.

$$\mathbf{24.5\ g\ P} \times \frac{1\ mol}{30.97g} = 0.791\ moles\ P \div 0.791\ mole = 1 \quad \mathbf{75.5\ g\ F} \times \frac{1\ mole}{19.00\ g} = 3.97\ moles\ F \div 0.791\ mol = 5$$

Empirical Formula : PF_5 and Empirical Formula Mass: 1(30.97) + 5(19.00) = 125.97 g

$$MF\ Ratio = \frac{MM}{EFM} = \frac{126\ g}{125.97g} = 1$$

EF × ratio = Molecular Formula = PF_5 x 1 = PF_5

Molarity

48. What is the molarity of a solution which contains 0.040 moles of sodium hydroxide in 160 mL of solution? (A: 0.25M)

$$Molarity = \frac{moles}{Litres} = \frac{0.040\ mol}{0.160\ L} = 0.25\ mol/L$$

49. How many grams of sodium hydroxide are contained in 1.00 L of 0.25 M solution of sodium hydroxide? (A: 10.0 g)

$$moles = Molarity \times Litres$$

$$moles = 0.25M \times 1.00L = 0.25\ moles\ NaOH$$

$$0.25\ moles\ NaOH \times \frac{40.0g}{1\ mole} = 10.0\ g\ NaOH$$

50. What volume of 75.0 mol/L solution can be prepared from 10.0 g of sodium carbonate?

$$10.0\ g\ Na_2CO_3 \times \frac{1\ mole}{106.01\ g} = 0.0943\ moles$$

$$Litres = \frac{moles}{Molarity} = \frac{0.0943\ moles}{75.0\ M} = 0.001257\ L\ or\ 1.26\ mL$$

51. What is the molarity if 28.6 g of Al $(OH)_3$ is dissolved in 825 mL of water? (A: 0.445M)

$$28.6\ g\ Al\ (OH)_3 \times \frac{1\ mol}{77.98\ g} = 0.3668\ moles$$

$$Molarity = \frac{moles}{Litres} = \frac{0.3668\ mol}{0.825\ L} = 0.445\ mol/L$$

Dilutions

52. Calculate the molarity of 0.856M of sulfuric acid in 450 cm^3 of water that has 100.0cm^3 of water added to it.

$$M_1V_1 = M_2V_2$$
$$(0.856M)(450cm^3) = C2(550cm^3)$$
$$0.700\ M = C2$$

53. How much water must be added to make a 0.107M solution of nitric acid if the starting solution is 84.6 mL of 0.932M nitric acid?

$$M_1V_1 = M_2V_2$$
$$(0.932M)(84.6\ ml) = (0.107\ M)(V2)$$
$$V2 = 736.89\ mL$$
$$How\ much\ water\ added?\ \ 736.89\ ml - 84.6\ ml = 652.29\ ml\ or\ 0.652\ L$$

Gas Laws

54. A sample of oxygen gas occupies a volume of 250. mL at 740. torr pressure. What volume will it occupy at 800. torr pressure? (A: 231 mL)

$$P_1V_1 = P_2V_2$$
$$(740.torr)(250.ml) = (800.torr)(V_2)$$
$$V_2 = 231.25\ ml = 231\ ml$$

55. A sample of carbon dioxide occupies a volume of 3.50 liters at 125 kPa pressure. What pressure would the gas exert if the volume was decreased to 2.00 liters? (A: 219 kPa)

$$P_1V_1 = P_2V_2$$
$$(125kPa)(3.50\ L) = (P_2)(2.00L)$$
$$P_2 = 218.75\ kPa = 219\ kPa$$

56. A 2.0 liter container of nitrogen had a pressure of 3.2 atm. What volume would be necessary to decrease the pressure to 1.0 atm? (A: 6.4L)

$$P_1V_1 = P_2V_2$$
$$(3.2atm)(2.0\ L) = (1.0\ atm)(V_2)$$
$$V_2 = 6.4\ L$$

57. A sample of nitrogen occupies a volume of 250 mL at 25 ºC. What volume will it occupy at 95 ºC? (A: 310 mL)

V_1=250 ml
T_1=25°C+273 =298 K
V_2=?
T_2=95°C+273=368 K

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$
$$\frac{250\ ml}{298\ K} = \frac{V_2}{368\ K}$$
$$\frac{(250\ ml)(368\ K)}{298\ K} = V_2$$
$$V_2 = 308.72\ ml = 310\ ml$$

58. Oxygen gas is at a temperature of 40ºC when it occupies a volume of 2.3 liters. To what temperature should it be raised to occupy a volume of 6.5 liters? (A: 610°C)

T_1=40 ºC+273=313 K
V_1=2.3 L
T_2=?
V_2 = 6.5 L

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$
$$\frac{2.3\ L}{313K} = \frac{6.5\ L}{T_2}$$
$$(2.3\ L)(T_2) = (313K)(6.5L)$$
$$T_2 = \frac{(313K)(6.5\ L)}{2.3\ L}$$
$$T_2 = 884.56\ K - 273 = 610\ ℃$$

59. Hydrogen gas was cooled from 150 ºC to 50.ºC. Its new volume is 75 mL. What was its original volume?

T_1=150 ºC+273=423 K
V_1=?
T_2=50 ºC+273=323K
V_2 = 75 ml

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$
$$\frac{V_1}{423K} = \frac{75\ ml}{323\ K}$$
$$V_1 = \frac{(75\ ml)(423\ K)}{323\ K}$$

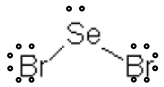
60. *(*least*) Fr, Te, Ge, Mg, C, F (most)*

61. A) C-F b) P-N c) I-F d) C-N

62.

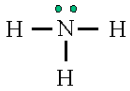
a) $MgCl_2$ ionic Mg^{2+} and Cl^-

b) H_2O (XY_2E_2) Covalent; Bent/ Polar



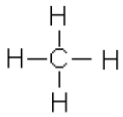
c) $SeBr_2$ (XY_2E_2): Covalent; Bent/ Polar

d) NH_3 (XY_3E): Covalent Polar trig pyramidal



e) Al_2S_3 Ionic: Al^{3+} and S^{2-}

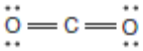
(f) CH_4 (XY_4): Covalent / Non Polar / Tetrahedral



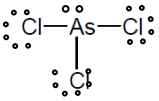
(g) Na_3N Ionic: Na^+ and N^{3-}

(h) CaO Ionic Ca^{2+} and O^{2-}

(i) CO_2 : Covalent : Polar Bond/ Linear/ NP molecule (XY_2)



(j) $AsCl_3$ (XY_3E) : Covalent/ Polar trig pyramidal



(k) N_2 (XY): Covalent/ Linear/ Non Polar :N ≡ N: