Gen Chem I Review

Atomic Structure:

1.) a.) Thomsen
b.) Chadwick
c.) Rutherford
d.) Dalton

2.) a.) $^{14}_{6}C$
b.) $^{53}_{24}Cr$
c.) $^{63}_{28}Ni$
d.) $^{92}_{40}Zr$

3.)

Symbol	Zn	Ca	Se	Ar
Atomic #	30	20	34	18
Mass #	65	31	74	40
# p^+	30	20	34	18
# n	35	21	30	22
# e^-	30	20	34	18

4.) a.) $10e^-$ b.) $18e^-$ c.) $18e^-$

5.) AAM $= (63)(.6917) + (65)(.3083) =$ **63.62 amu**

Matter:

6.) a.) gas
b.) solid
c.) liquid

7.) Solution - homogeneous mixture
Suspension - heterogeneous mixture

8.) a.) element
b.) solution
c.) compound
d.) heterogeneous

9.) a.) physical
b.) chemical
c.) chemical
d.) physical

10.) a.) physical
b.) chemical
c.) chemical
d.) chemical

Measurement:

11.) $\%\text{ error} = \frac{8.92 - 7.98}{8.92} \times 100 = 10.5\%$

12.) a.) 3 b.) 2 c) 4 d.) 2

13.) a) 5.48×10^5 c) 0.001200
b.) 7.70×10^5 d.) 92,500,000

14.) $D = \frac{M}{V}$

$\frac{22.57g}{cm^3} = \frac{X}{56.2cm^3}$

$\boxed{X = 1270g}$

15.) a.) $65.2mm \times \frac{1m}{1000mm} \times \frac{10dm}{1m} = \boxed{0.652dm}$

b.) $2.3kg \times \frac{1000g}{1kg} = \boxed{2300g}$

c) $65000\mu L \times \frac{1L}{1 \times 10^6 \mu L} \times \frac{1000mL}{1L} = \boxed{65mL}$

d.) $0.502km \times \frac{1000m}{1km} \times \frac{100cm}{1m} = \boxed{50,200cm}$

16.) $2.0qt. \times \frac{1L}{1.06qt.} \times \frac{1000mL}{1L} = \boxed{1900mL}$

17.) 17.5mL

Electrons in Atoms:

18) $c = \lambda \nu$

$3.0 \times 10^8 m/s = \lambda (2.5 \times 10^5 Hz)$

$\lambda = 1200 m$

19) $E = h\nu$

$E = (6.626 \times 10^{-34} J \cdot s)(7.31 \times 10^{14})$

$E = 4.84 \times 10^{-19}$

20) Bohr's model = nucleus + orbits
Quantum model = nucleus + orbitals

21) Na: $1s^2 2s^2 2p^6 3s^1$

3s ↑
2p ↑↓ ↑↓ ↑↓
2s ↑↓
1s ↑↓

F: $1s^2 2s^2 2p^5$

2p ↑↓ ↑↓ ↑
2s ↑↓
1s ↑↓

V: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$

3d ↑ ↑ ↑ _ _
4s ↑↓
3p ↑↓ ↑↓ ↑↓
3s ↑↓
2p ↑↓ ↑↓ ↑↓
2s ↑↓
1s ↑↓

22) More stable to have both 4s and 3d orbitals half full

23) Pd 46e⁻ $[Kr]\ 5s^2 4d^8$
At 85e⁻ $[Xe]\ 6s^2 4f^{14} 5d^{10} 6p^5$

Periodic Table:

24.) Mendeleev-arranged by increasing atomic mass
Mosley-arranged by increasing atomic #

25.) a.) Ra b.) Xe c.) Ba

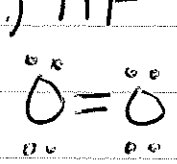
26.) a.) Cl^- b.) Mg

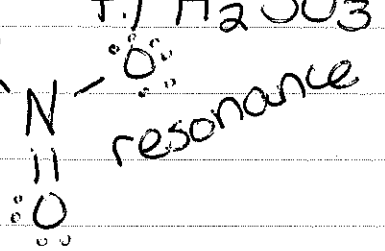
27.) a.) F b.) Li

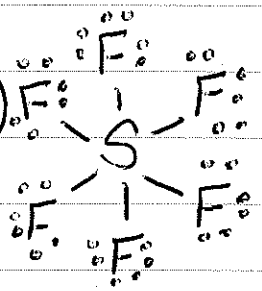
Chemical Bonding:

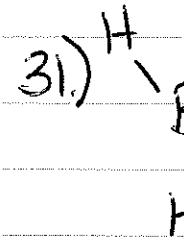
28.) a.) ionic b.) covalent c.) covalent

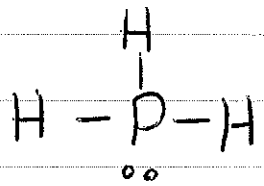
29.) a.) $CaBr_2$ d.) SiO_2
b.) $Fe_2(SO_4)_3$ e.) N_2O_4
c.) HF f.) H_2SO_3

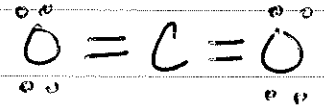
30.) a.) 

b.) 

c.) 

31.) 





trigonal planar — trigonal pyramidal — linear

32.) a.) Chromium (III) chloride
b.) Copper (II) carbonate
c.) arsenic pentachloride
d.) magnesium sulfate
e.) tetraphosphorus hexoxide
f.) chloric acid

Moles

33) $25.0\text{g } MgSO_4 \times \frac{1\text{mol}}{120.38\text{g}} \times \frac{6.022\times10^{23}\text{ f.u.}}{1\text{mol}} = \boxed{1.25\times10^{23}\text{ f.u.}}$

34) $346\text{g } KNO_3 \times \frac{1\text{mol}}{101.11\text{ g}} = \frac{3.42\text{mol}}{.750\text{L}} = \boxed{4.56\text{M}}$

35) $6.0\text{M} = \frac{x}{.05\text{L}}$ $x = .3\text{mol} \times \frac{40\text{g NaOH}}{1\text{mol}} = \boxed{12\text{g NaOH}}$

36) $CuCl_2$ $\%\text{ Cu} = \frac{63.55}{134.45} \times 100 = 47.27\%$

$\%\text{ Cl} = \frac{70.9}{134.45} \times 100 = 52.73\%$

37) $40\text{g C} \times \frac{1\text{mol}}{12.01} = 3.33\text{mol C} \Rightarrow 1$

$6.7\text{g H} \times \frac{1\text{mol}}{1.01\text{g}} = 6.63\text{mol H} \Rightarrow 2$

$53.7\text{g O} \times \frac{1\text{mol}}{16\text{g}} = 3.36\text{mol O} \Rightarrow 1$

empirical = CH_2O

MM $CH_2O = \frac{30.03\text{g}}{\text{mol}}$ $\frac{180}{30} = 6$ $\boxed{C_6H_{12}O_6 \text{ molecular}}$

Chemical Reactions:

38) 1 formula unit of solid barium chlorate decomposes with heat to yield 1 formula unit of solid barium chloride and 3 molecules of oxygen gas

39) $2NaClO_3(s) \xrightarrow{\Delta} 2NaCl(s) + 3O_2(g)$

40.) $Mg(s) + CuSO_4(aq) \rightarrow Cu(s) + MgSO_4(aq)$ single replacement

41.) $C_5H_{12}(l) + 8O_2(g) \rightarrow 5CO_2(g) + 6H_2O(g)$ combustion

42.) $2NH_4Cl(aq) + Pb(NO_3)_2(aq) \rightarrow 2NH_4NO_3(aq) + PbCl_2(s)$ double replacement

Stoichiometry:

$2Cr + 3CuSO_4 \rightarrow 3Cu + Cr_2(SO_4)_3$

43.) $49.48\,g\,Cr \times \frac{1\,mol\,Cr}{52\,g} \times \frac{3\,mol\,Cu}{2\,mol\,Cr} \times \frac{63.55\,g\,Cu}{1\,mol\,Cu} = \boxed{90.71\,g\,Cu}$

44.) $.125\,L \times \frac{.75\,mol\,CuSO_4}{1\,L} \times \frac{2\,mol\,Cr}{3\,mol\,CuSO_4} \times \frac{52\,g\,Cr}{1\,mol} = \boxed{3.25\,g\,Cr}$

45.) limiting reagents $4Li + O_2 \rightarrow 2Li_2O$

$6.45\,g\,Li \times \frac{1\,mol\,Li}{6.94\,g} \times \frac{2\,mol\,Li_2O}{4\,mol\,Li} \times \frac{29.88\,g\,Li_2O}{1\,mol\,Li_2O} = 96.9\,g\,Li_2O$

$9.20\,g\,O_2 \times \frac{1\,mol\,O_2}{32\,g} \times \frac{2\,mol\,Li_2O}{1\,mol\,O_2} \times \frac{29.88\,g\,Li_2O}{1\,mol\,Li_2O} = \boxed{17.2\,g\,Li_2O}$

46.) LR = O_2 excess = Li

47.) $\% = \frac{12.5}{17.2} \times 100 = \boxed{72.7\%}$

Solutions:

48.) unsaturated - raises concentration closer to solubility level, dissolves to that point
saturated - no more solute will dissolve
supersaturated - no more solute will dissolve

49.) Solid dissolved in liquid - solubility increases at high temp, not affected by
Gas dissolved in liquid - solubility increases at low temp and high pressure

50) $\frac{4.23g}{4.23+145g} \times 100 = 2.83\%\ NaCl$

51) $\frac{2.25m}{.03kg} = \frac{x}{}$

$x = .0675mol\ AlCl_3 \times \frac{133.33g\ AlCl_3}{1mol} = \boxed{9.00g\ AlCl_3}$

52) $M_1V_1 = M_2V_2$

$(12)(V_1) = (.2)(250)$

$\boxed{V_1 = 4.2mL}$

Thermodynamics:

53) $IF_5 \rightarrow IF + 2F_2$ $\quad \Delta H = +745kJ$

$+\ IF + F_2 \rightarrow IF_3$ $\quad \Delta H = -390kJ$

$IF_5 \rightarrow IF_3 + F_2$ $\quad \boxed{\Delta H = +355kJ}$ (A)

54) $q = m\,s\,\Delta T$

$487.5 = 25(s)(75 - 25)$

$\boxed{s = \frac{0.39J}{g \cdot °C}}$

55) $E = q + w$

$E = +32kJ + -40kJ = -8kJ$