Honors Chemistry
Semester 1 Final Exam Review Answers:

1.
Element: A substance that can't be separated into simpler substances by chemical means. A single type of atom.
Compound: A substance composed of atoms of two or more different elements chemically united (bonded) in fixed proportions.
Mixture: A combination of two or more substances in which the substances retain their identities. They can be separated by physical means and do not combine in specific ratios.

2.
Chemical Change: A change in which the chemical identity of a substance is altered through a chemical reaction.
Physical Change: A change to a substance in which its chemical properties are retained (such as a change of state).

3.
a. 1.040g/mL (1kg / 1,000g)(2.205lbs / 1kg)(1,000mL / 1L)(3.7854L / 1gal) = **8.68lbs/gal**

b. 1.040g/mL (1,000mL / 1L) = **1040.g/L**

4. Circumference of CD is C = πD = π(4.72in)
530rev/min(4.72πin/rev)(1ft / 12in) (1mi / 5,280ft) (60min / 1hr) = **7.4mi/hr**

5.
Precision is how well experimental results agree with one another. Accuracy is how well experimental results agree with accepted, published values. The student's results would be considered precise but not accurate based on the definition given above.

6. a. Fe_2O_3 b. SnS_2 c. As_4O_{10} d. H_2SO_4 e. $CuSO_4$

7. a. barium sulfate b. tetraiodine nonoxide c. potassium phosphate
d. ammonium acetate e. iron(III)carbonate (or ferric carbonate)

8. 78.9183(X) + 80.9163(1-X) = 79.904
78.9183X + 80.9163 – 80.9163X = 79.904
-1.998X = -1.0123 X = .507
Br-79 = 50.7% Br-81 = 49.3%

9.
1.14g O / 16.00g/mol = .0713mol O .0713mol O (1mol X / 2mol O) = .0357mol X in 1.00g
a. molar mass X = 1.00g / .0357mol = 28.01g/mol = **28.01u/atom X**
b. .0357mol X (4mol Y / 1mol X) = .1428mol Y in 5.07g
5.07g Y / .1428mol Y = 35.50g/mol = **35.50u/ atom Y**

10.
a. 0.200mol Na_2CO_3 means 0.200mol C (12.01g/mol) = 2.402g C
b. mass % C = 72.06g C / 86.172g C_6H_{14} = .8362
(25.0g)(.8362) = **20.91g C**

11. Moles tartaric acid = 12.0g / 150.09g/mol = .0800mol acid
.0800mol tartaric acid (2mol KOH / 1mol acid) = .160mol KOH needed
.160mol KOH (56.106g/mol) = 8.97g needed.
x(.050) = 8.97g x = 179g solution required
179g soln ($1cm^3$ / 1.045g) = 171.7 = **172mL**

12.
a. $3AgNO_3 + FeCl_3 \rightarrow 3AgCl + Fe(NO_3)_3$
b. mol $AgNO_3$ = 18.0g $AgNO_3$ / 169.87g/mol = .106mol $AgNO_3$
mol $FeCl_3$ = 32.4g / 162.2g/mol = .200mol $FeCl_3$
Since the mole ratio of silver nitrate to iron(III)chloride is 3:1 the **$AgNO_3$ limits**
c. mol AgCl = .106mol $AgNO_3$ (3mol AgCl / 3mol $AgNO_3$) = **.106mol AgCl**
d. .106mol AgCl (143.32g/mol) = **15.2g AgCl**
e. Mole $FeCl_3$ used = .106mol $AgNO_3$ (1mol $FeCl_3$ / 3mol $AgNO_3$) = .035mol $FeCl_3$
Mol $FeCl_3$ in excess = .200mol - .035mol = .165mol $FeCl_3$
Mass $FeCl_3$ = .165mol (162.2g/mol) = **26.8g $FeCl_3$**

13.
The formula for copper(I) oxide is Cu_2O, which has a mass of 143.1g/mol
% composition of O = (16.00/143.1)x100 = **11.18%**

14.
Moles NH_3 = 26g/17.034g/mol = 1.526mol NH_3
1.526mol NH_3 / .100 L = **15.26 or about 15 molar**

15.
a. **$2Na_3PO_{4(aq)} + 3Ca(NO_3)_{2(aq)} \rightarrow Ca_3(PO_4)_{2(s)} + 6NaNO_{3(aq)}$**
b. Mol $Ca(NO_3)_2$ = (.0484L)(0.212M) = .0103mol $Ca(NO_3)_2$
Mol Na_3PO_4 required = .0103mol $Ca(NO_3)_2$ (2mol Na_3PO_4 / 3mol $Ca(NO_3)_2$
= .00687mol Na_3PO_4 / 0.328mol/L = .0209L = **20.9mL Na_3PO_4**

16.
[(.250 L)(.0025 M) + (.600 L)(.0035 M)] / (.250 L + .600 L) = .003205 = **$3.21x10^{-3}M$**
The molarity of the **25mL sample would be the same** b/c the ratio of moles to volume remains constant.

17.
a. Combustion (redox) b. Single replacement (redox) c. Double displacement (precipitation)
d. Acid-base neutralization

18.
Rubidium hydroxide (RbOH) and permanganic acid ($HMnO_4$)

$RbOH + HMnO_4 \rightarrow RbMnO_4 + H_2O$ (Base + Acid → Salt + Water)

19.
$CuSO_{4(aq)} + BaCl_{2(aq)} \rightarrow BaSO_{4(s)} + CuCl_{2(aq)}$
The precipitate is $BaSO_4$ and the spectator ions are $Cu^{2+}_{(aq)}$ and $Cl^-_{(aq)}$

20.
Potassium sulfate is K_2SO_4 the oxidation numbers are $\overset{+1}{K_2}\overset{+6}{S}\overset{-2}{O_4}$
The sulfur has an oxidation number of +6

21.
$\overset{0}{Cu} + 2\overset{+1}{H_2}\overset{+6}{S}\overset{-2}{O_4} \rightarrow \overset{+2}{Cu}\overset{+6}{S}\overset{-2}{O_4} + \overset{+4}{S}\overset{-2}{O_2} + 2\overset{+1}{H_2}\overset{-2}{O}$
Some of the **sulfur is reduced from +6 to +4** (The copper is oxidized from 0 to +2)

22.
$6H^+ + SeO_3^{2-} + 4e^- \rightarrow Se + 3H_2O$

$(2I^- \rightarrow I_2 + 2e^-) \times 2$

$6H^+ + SeO_3^{2-} + 4I^- \rightarrow Se + 3H_2O + 2I_2$

23.
a. **$Mg_{(s)} + 2AgNO_{3(aq)} \rightarrow 2Ag_{(s)} + Mg(NO_3)_{2(aq)}$**
b. **$Mg_{(s)} + 2Ag^+_{(aq)} \rightarrow 2Ag_{(s)} + Mg^{2+}_{(aq)}$**
c. The magnesium is the substance that begins with an oxidation number of zero (0 → +2)
Moles $AgNO_3$ = MV = (.250M)(.0500L) = .0125mol $AgNO_3$
.0125mol $AgNO_3$ (1mol Mg / 2mol $AgNO_3$) = .00625mol Mg
.00625mol Mg (24.31g/mol) = **.152g Mg**
d. Magnesium is more active than silver. This is a single replacement reaction. If the magnesium can "reduce" the silver ions down to their elemental form, then the magnesium must be the more active metal.

24.
n = MV = (.300M)(.0455L) = .01365mol NaCl
.01365mol NaCl (58.44g/mol) = .797706 = **.798g NaCl**
M = (.0455L)(.300M) / (.200L) = .06825 = **.0683M**

25.
a. heterogeneous mixture (contains various compounds in nonspecific ratios. Difference in types of particles is distinguishable)
b. Element and molecule
c. Compound (not a molecule because it is an ionic compound. Molecules must have covalent bonds as in nonmetal-nonmetal bonds)
d. Homogeneous mixture (uniform mixture of acetic acid, water and various other soluble compounds)
e. Compound and molecule f. Compound and molecule