

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. $1.040\text{g/mL} (1\text{kg} / 1,000\text{g})(2.205\text{lbs} / 1\text{kg})(1,000\text{mL} / 1\text{L})(3.7854\text{L} / 1\text{gal}) = \mathbf{8.68\text{lbs/gal}}$

b. $1.040\text{g/mL} (1,000\text{mL} / 1\text{L}) = \mathbf{1040.\text{g/L}}$

4. Circumference of CD is $C = \pi D = \pi(4.72\text{in})$

$530\text{rev/min}(4.72\pi\text{in/rev})(1\text{ft} / 12\text{in}) (1\text{mi} / 5,280\text{ft}) (60\text{min} / 1\text{hr}) = \mathbf{7.4\text{mi/hr}}$

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. $78.9183(X) + 80.9163(1-X) = 79.904$

$78.9183X + 80.9163 - 80.9163X = 79.904$

$-1.998X = -1.0123 \quad X = .507$

Br-79 = 50.7% Br-81 = 49.3%

9.

$1.14\text{g O} / 16.00\text{g/mol} = .0713\text{mol O} \quad .0713\text{mol O} (1\text{mol X} / 2\text{mol O}) = .0357\text{mol X in } 1.00\text{g}$

a. molar mass X = $1.00\text{g} / .0357\text{mol} = 28.01\text{g/mol} = \mathbf{28.01\text{u/atom X}}$

b. $.0357\text{mol X} (4\text{mol Y} / 1\text{mol X}) = .1428\text{mol Y in } 5.07\text{g}$

$5.07\text{g Y} / .1428\text{mol Y} = 35.50\text{g/mol} = \mathbf{35.50\text{u/atom Y}}$

10.

a. $0.200\text{mol Na}_2\text{CO}_3$ means 0.200mol C (12.01g/mol) = 2.402g C

b. mass % C = $72.06\text{g C} / 86.172\text{g C}_6\text{H}_{14}$ = $.8362$

$(25.0\text{g})(.8362)$ = **20.91g C**

11. Moles tartaric acid = $12.0\text{g} / 150.09\text{g/mol}$ = $.0800\text{mol acid}$

$.0800\text{mol tartaric acid}$ ($2\text{mol KOH} / 1\text{mol acid}$) = $.160\text{mol KOH}$ needed

$.160\text{mol KOH}$ (56.106g/mol) = 8.97g needed.

$x(.050)$ = 8.97g x = 179g solution required

179g soln ($1\text{cm}^3 / 1.045\text{g}$) = 171.7 = **172mL**

12.

a. $3\text{AgNO}_3 + \text{FeCl}_3 \rightarrow 3\text{AgCl} + \text{Fe}(\text{NO}_3)_3$

b. mol AgNO_3 = $18.0\text{g AgNO}_3 / 169.87\text{g/mol}$ = $.106\text{mol AgNO}_3$

mol FeCl_3 = $32.4\text{g} / 162.2\text{g/mol}$ = $.200\text{mol FeCl}_3$

Since the mole ratio of silver nitrate to iron(III)chloride is 3:1 the **AgNO₃ limits**

c. mol AgCl = $.106\text{mol AgNO}_3$ ($3\text{mol AgCl} / 3\text{mol AgNO}_3$) = **.106mol AgCl**

d. $.106\text{mol AgCl}$ (143.32g/mol) = **15.2g AgCl**

e. Mole FeCl_3 used = $.106\text{mol AgNO}_3$ ($1\text{mol FeCl}_3 / 3\text{mol AgNO}_3$) = $.035\text{mol FeCl}_3$

Mol FeCl_3 in excess = $.200\text{mol} - .035\text{mol}$ = $.165\text{mol FeCl}_3$

Mass FeCl_3 = $.165\text{mol}$ (162.2g/mol) = **26.8g FeCl₃**

13.

The formula for copper(I) oxide is Cu_2O , which has a mass of 143.1g/mol

% composition of O = $(16.00/143.1)\times 100$ = **11.18%**

14.

Moles NH_3 = $26\text{g}/17.034\text{g/mol}$ = 1.526mol NH_3

$1.526\text{mol NH}_3 / .100\text{ L}$ = **15.26 or about 15 molar**

15.

a. **$2\text{Na}_3\text{PO}_4(\text{aq}) + 3\text{Ca}(\text{NO}_3)_2(\text{aq}) \rightarrow \text{Ca}_3(\text{PO}_4)_2(\text{s}) + 6\text{NaNO}_3(\text{aq})$**

b. Mol $\text{Ca}(\text{NO}_3)_2$ = $(.0484\text{L})(0.212\text{M})$ = $.0103\text{mol Ca}(\text{NO}_3)_2$

Mol Na_3PO_4 required = $.0103\text{mol Ca}(\text{NO}_3)_2$ ($2\text{mol Na}_3\text{PO}_4 / 3\text{mol Ca}(\text{NO}_3)_2$)

= $.00687\text{mol Na}_3\text{PO}_4 / 0.328\text{mol/L}$ = $.0209\text{L}$ = **20.9mL Na₃PO₄**

16.

$[(.250\text{ L})(.0025\text{ M}) + (.600\text{ L})(.0035\text{ M})] / (.250\text{ L} + .600\text{ L})$ = $.003205$ = **$3.21\times 10^{-3}\text{M}$**

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)

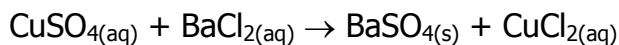
d. Acid-base neutralization

18.

Rubidium hydroxide (RbOH) and permanganic acid (HMnO₄)



19.

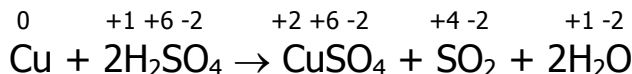


The precipitate is BaSO₄ and the spectator ions are Cu²⁺_(aq) and Cl⁻_(aq)

20.

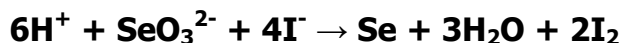
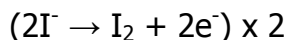
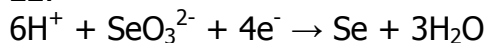
Potassium sulfate is K₂SO₄ the oxidation numbers are $\overset{+1}{\text{K}}_2\overset{+6}{\text{S}}\overset{-2}{\text{O}}_4$
The sulfur has an oxidation number of +6

21.

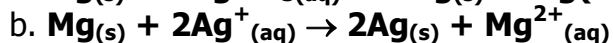
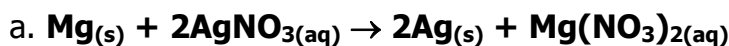


Some of the **sulfur is reduced from +6 to +4** (The copper is oxidized from 0 to +2)

22.



23.



c. The magnesium is the substance that begins with an oxidation number of zero (0 → +2)

$$\text{Moles AgNO}_3 = MV = (.250\text{M})(.0500\text{L}) = .0125\text{mol AgNO}_3$$

$$.0125\text{mol AgNO}_3 (1\text{mol Mg} / 2\text{mol AgNO}_3) = .00625\text{mol Mg}$$

$$.00625\text{mol Mg} (24.31\text{g/mol}) = \mathbf{.152\text{g Mg}}$$

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.

$$n = MV = (.300\text{M})(.0455\text{L}) = .01365\text{mol NaCl}$$

$$.01365\text{mol NaCl} (58.44\text{g/mol}) = .797706 = \mathbf{.798\text{g NaCl}}$$

$$M = (.0455\text{L})(.300\text{M}) / (.200\text{L}) = .06825 = \mathbf{.0683\text{M}}$$

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