Honors Chemistry 2/AP Chemistry Summer Assignment
(for school year 2020-2021)

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Room 307
Remind Class: 2020_2021_HChem2_APChem
Remind Class Code: apwwhschem

Utilize internet resources to complete the following questions. Much of this material is review from your Chemistry 1 course so it should be familiar and I know it is very searchable. Finding resources that work for you is an underlying part of this assignment. I have included a couple of links to get you started:
https://apstudents.collegeboard.org/courses/ap-chemistry
https://www.youtube.com/user/IsaacsTEACH

The non-sequential question numbers are intentional – not a mistake. Please label the questions with the numbers given in this document and do not renumber them.

Work must be show for any problem requiring mathematical processes.

Completed summer assignments, with work shown, should be submitted the first day of school. Failure to complete the assignment by the first day of school will not allow you to simply drop the course – you will still be required to complete the assignment but on top of new assignments as we begin our journey together. You may email me, or send me a Remind message, with any questions – I will be checking both frequently. I want you to be comfortable with the skills and knowledge that these questions require. Zoom sessions are always an option!

I am so looking forward to working with you this coming school year!!! I know things are a bit uncertain because of the COVID19 pandemic but we will have a fun year filled with lots of labs and lots of brainteasing activities!!

1. Write the **most common guidelines** to determine significant figures (digits) with an example?

2. Use **factor labeling** method to convert the following:
   a. 200 meters = ___ miles.
   b. 650 in = ____ meters
   c. 4 years= _____ seconds.
   d. 200 liters = _____ ml

4. Most laboratory experiments are performed at room temperature at 75°C. Express this temperature in:
   a. °F B. Kelvin

5. A cylinder rod formed from silicon is 46.0 cm long and has a mass of 3.00 kg. The density of silicon is 2.33 g/cm^3. What is the diameter of the cylinder? (the volume of cylinder is given by $\pi r^2 h$, where r is the radius and h is the length)

6. How many **significant figures** are in each of the following?
   a. 1.9200 mm b. 0.0301001 kJ c. 6.022 x10^{23} atoms
   g. 460.000 L e. 0.000036 cm^3 f. 10000 g.1001 h. 0.001345
   i. 0.0101 J. 3.02 x 10^4 k. 3.21 x 10^{-2}

8. Calculate the following to the **correct number** of significant figures.
   a. 1.270 g / 5.296 cm^3
   b. 12.235 g / 1.010 L
   c. 12 g + 0.38 g
   d. 170g + 2.785 g
   e. 2.100 x 3.2102
   f. 200.1 x 120
   g. 17.6 + 2.838 + 2.3 + 200
   h. 2.35- 0.4 – 1.23 =

11. A solid white substance A is heated strongly in the absence of air. It decomposes to form a new white substance B and a gas C. The gas has exactly the same properties as the product obtained when carbon is burned in an excess of oxygen. Based on these observations, can we determine whether solids A and B and the gas C are elements or compounds? Explain your conclusions for each substance.

12. Label each of the following as either a **physical process** or a **chemical process**.
   a. Corrosion of aluminum metal.
   b. Melting of ice.
   c. Pulverizing an aspirin.
   d. Digesting a candy bar.
   e. Explosion of nitroglycerin.
   f. Milk turning sour.
   g. Burning of paper.
   h. Forming of frost on a cold night.
   i. Bleaching of hair with hydrogen peroxide.
   j. A copper wire is hammered flat.

14. Dalton assumed that all atoms of the same element were identical in all their properties. Explain why this assumption is not valid.

15. Why do we call $Ba(NO_3)_2$ barium nitrate, but we call $Fe(NO_3)_2$ iron(II) nitrate?

16. Calculate the mass of O_2 produced if 3.450 g potassium chlorate is completely decomposed by heating in presence of a catalyst (Manganese dioxide).

19. Define the words: **atomic number, atomic mass, mass number, molecular formula, structural formula, empirical formula, isotopes, cation, anion, metalloid, and allotrope.**

20. Determine **number of protons and neutrons** in each of the following.

a. K_{19}^{39} b. $^{23}_{11}Na.$ c. $^{208}_{82}Pb$ d. $^{33}_{15}P$

21. White gold is an alloy that typically contains 45.0% by mass gold and the remainder is platinum. If **154 g** of gold are available, how many grams of platinum are required to combine with the gold to form this alloy?

22. What is the empirical formula of a compound that contains 53.73% Fe and 46.27% of S ?

24. List the following has diatomic molecule, molecular compound, ionic compound, Atomic element.

a. F_2 b. Cl_2 c. C d. NaCl e. KF f. CO_2 g. H_2 h. Ag
i. Rust (Fe_2O_3) j. MgO k. O_2 l. I_2 m.CO n. K_2CO_3

25. State the contribution of the following chemist in one line.

a. Democritus b. Mendeleev c. Henry Becquerel d. Roentgen e. J.J Thompson

f.Faraday g. Chadwick h. Millikan i. Proust j. Cavendish k. Madam Curie

29. In an experiment, a student gently heated a hydrated copper compound to remove the water of hydration. The following data was recorded:

1. Mass of crucible, cover, and contents before heating 23.4 g.
2. mass of empty crucible and cover 18.82 g.
3. mass of crucible, cover, and contents after heating to constant mass 20.94 g.

Calculate the experimental percent of water in the compound.

30. How do you distinguish: Use a specific example to show the difference?

a. An element from a compound.
b. An element from a mixture.
c. A true solution from a heterogeneous mixture.
d. Distillation from filtration.
e. Chromatography from crystallization

31. An **extensive property** is one that depends on the amount of the sample. Which of the following properties are extensive?

a. volume b. density c. temperature d. energy e. melting point. F. pressure

32.A hydrated compound has an analysis of 18.29% Ca, 32.37% Cl, and 49.34% water. What is its Empirical formula?

34. Define an Arrhenius Acid, Arrhenius base and salt? Give some examples of each.

35. What mass of Iron is required to replace silver from 8.00g of silver nitrate dissolved in water?

$Fe(s) + AgNO_3 \rightarrow Cu(NO_3)_2 + Ag.$

b. Draw a particle diagram to represent the reacton.

38.Strontium consists of four isotopes with masses and their percent abundance of 83.9134 amu (0.5%), 85.9094 amu (9.9%) , 86.9089 amu (7.0 %) , and 87.9056 amu (82.6 %). Calculate the atomic mass of Sr ?

39.Nitrogen has two isotopes, N-14 and N-15, with atomic masses of 14.00031 amu and 15.001 amu, respectively. What is the percent abundance of N-15?

43.The molecular formula of morphine, a pain-killing narcotic, is $C_{17}H_{19}NO_3$.

a.What is the molar mass?

b.What fraction of atoms in morphine is accounted for by carbon?

c.Which element contributes least to the molar mass?

49.Washing soda is a hydrate of sodium carbonate. Its formula is $Na_2CO_3 . x H_2O$. A 2.714 g Sample of washing soda is heated until a constant mass of 1.006 g of Na_2CO_3 is reached. What is x ?

44.Determine the **formula weight** for the following:

a. N_2O_5 b. $CuSO_4$ C. $Ca(HCO_3)_2$ d. $CaSO_4 . 2 H_2O$

45. Calculate the percentage by mass of the following compounds:

a. SO_3 b. CH_3COOCH_3 c. Ammonium Nitrate.

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50. Explain heat and temperature. Use an example .

51.Determine the empirical and molecular formula of each of the following substances:

a.Ibufuren, a headache remedy contains 75.6 % C, 8.80 % H , and 15.5 % O by mass and has a molar mass about 206 g/mol.

b.Epinerphine(adrenaline) a hormone secreted into the bloodstream in times of danger or stress contains 59% C, 7.1% H, 26.2% O, and 7.7% N by mass, its MW is about 180 amu.

52.Write balanced chemical equations for the reactions of **sodium** with the following nonmetals to form ionic solids.

a. Nitrogen b. Oxygen c. Sulfur d. Bromine

53.Write a **balanced equation** for the following:

a.Reaction of boron trifluoride gas with water to give liquid hydrogen fluoride and solid boric acid,(H_3BO_3).

b.Reaction of magnesium Oxide with Iron to form Iron (III) Oxide and Magnesium.

c.The decomposition of dinitrogen Oxide gas to its elements.

d.The reaction of Calcium Carbide solid with water to form calcium hydroxide and acetylene (C_2H_2) gas.

e.The reaction of solid calcium cyan amide ($CaCN_2$) with water to from calcium carbonate and ammonia gas.

f.Ethane burns in air (Oxygen).

g.Hydrogen reacts with oxygen to from Water.

h.Nitrogen gas reacts with Hydrogen to form Ammonia.

j.Hydrogen reacts with Iodine gas to form Hydrogen Iodide.

k. Sodium reacts with Iodine gas to form Sodium Iodide.

l.Sodium Oxide reacts with water to form sodium hydroxide and hydrogen.

m.Carbon dioxide combines with water to form carbonic acid.

n.Magnesium and nitrogen gas combine to form magnesium nitride.

o.Conc. Hydrochloric acid reacts with Conc. Sodium hydroxide to form sodium chloride and water.

54. DEFINE limiting reagent, theoretical yield , and actual yield?

55.Sodium hydroxide reacts with carbondioxide as follows:

$2\ NaOH(s) + CO_2(g) \rightarrow Na_2CO_3(s) + H_2O(l)$

Which reagent is the limiting reactant when 1.85 mol of sodium hydroxide and 1.00 mol carbondixide are allowed to react? How many moles of sodium carbonate can be produced? How many moles of the excess reactant remain after the completion of the reaction?

56. WHEN benzene (C_6H_6) reacts with bromine (Br_2) bromobenzene(C_6H_5Br) is obtained:

$C_6H_6 + Br_2 \rightarrow C_6H_5Br + HBr$

a.What is the theoretical yield of bromobenzene in this reaction when 30.0g of benzene reacts with 65.0 g of bromine?

b. If the actual yield of bromobenzene was 56.7 g what was the percentage yield?

60.A 2.0g sample of SX_6 (g) has a volume of 329.5 cm^3 at 1.00 atm and 20°C. Identify the element 'X'. Name the compound.

62.Hydrogen cyanide, HCN is a poisonous gas. It can be formed by the reaction:

$NaCN(s) + H^+(aq) \text{ ---------> } HCN(g) + Na^+(aq)$

what mass of sodium cyanide is required to make 12.0 Liter of Hydrogen Cynaide at 20^0C and 745 mm Hg?

63.A gaseous mixture contains 5.78 g of methane, 2.15 g of neon, and 6.8 g of sulfur dioxide. What pressure is exerted by the mixture inside a 75.0 L cylinder at 85^0C and 751 mm Hg?

65.Define solubility. Prepare a list of solubility rules for ionic compounds in water. (online resources) (IMPORTANT)

68.Define **Oxidation number**. Find the **Oxidation number** of

a. Cl in $HClO_4$

b.Sulfur in H_2SO_4.

c.Phosphorus in PO_4^{3-}

d.Manganese in MnO_4^{2-}

69.Which of the following statements are always true? Never true? Not always true?

a.A compound wit the molecular formula C_6H_6 has the same simplest formula.

b.The mass percent of copper in CuO is less than in Cu_2O.

c.The limiting reactant is the one present in the smallest number of grams.

d.Since $C_3H_6O_3$ and $C_6H_{12}O_6$ reduce to the same formula, they represent the same compound.

74.On a warm day, an amusement park balloon is filled with 47.8 g He. The temperature is 33˚C and the pressure in the balloon is 2.25 atm. Calculate the volume of the balloon.

76.Calculate the densities of the following gases at 27˚C and 763 mmHg

a.Carbon monoxide

b.Chlorine

77. Define strong electrolyte, weak electrolyte, precipitation reactions and solubility?

78. What is an **Activity series** of metal? How does it help us in studying properties of elements?

79. A volatile liquid (one that evaporates) is put into a jar and the Jar is then sealed. Does the mass of the sealed jar and its contents change upon the vaporization of the liquid?

80. Identify each of the following as being most like an **observation, a law, or a theory**.

a. All coastal areas experience two high tides and two low tides each day.

b. The tides in Earth's oceans are caused mainly by the gravitational attraction of the moon.

c. Yesterday, high tide in San Francisco Bay occurred at 2.43 a.m. and 3.07 P.m.

d. Tides are higher at the full moon and ne moon than at other times of the month.

81. Define the terms: Exothermic, endothermic reactions? How much heat is required to raise the temperature of 100 grams of water from 25^0C to 82^0C?

82. A piece of unknown metal with mass 30 g is heated to 110^0C and dropped into 100.0 g of water at 20^0C. The final temperature of the system is 25 degree Celsius. What is the specific heat of the metal?

83.What is a solute and solvent? Define Molarity, Molality, mole-fraction and Mass percent of a solution?

85. Calculate the molarity of a solution that contains 20.0grams of sodium hydroxide i 200ml?

86. How many grams of solute are present in 50.0 ml of 0.360 M sodium chloride?

88. DDT, an insecticide harmful to fish, birds, and humans, is produced by the following reaction:

$$2C_6H_5Cl + C_2HOCl_3 \rightarrow C_{14}H_9Cl_5 + H_2O$$

Chloro benzene Choral DDT

If 1142 g of chlorobenzene is reacted with 485 g of chloral.

a. What mass of DDT is formed?
b. Which reactant is limiting? Which is in excess?
c. What mass of excess reactant is left over?
d. If the actual yield of DDT is 200.0 g, what is the percent yield?

90. What volume of 0.100 M HCl solution is needed to neutralize 50.0 ml of 0.350 M KOH?

91. Differentiate between what happens when the following are dissolved in water. Use a particular example

a. Polar solute Vs non polar solute.
b. Ionic Vs Molecular

92. Write net Ionic reactions for the following by predicting the products? Assume the reactions are in solution. Use Solubility Rules to figure out the net ionic equation and write the spectator ions.

a. Hydrochloric acid reacts with lithium Hydroxide
b. Barium Chloride reacts with magnesium sulfate ..
c. Aluminium Chloride reacts with silver nitrate
d. Calcium Iodide reacts with sodium carbonate solution.
e. Iron(III) sulfate reacts with sodium sulfide