

Review Guide for Post-Assessment

Name Key
Date _____ Per _____

1. Scientific notation - Put each of the following numbers into scientific OR standard notation.

- a. 43900 4.39×10^4
 b. 0.000004370 4.370×10^{-6}
 c. 9.2×10^8 920,000,000
 d. 3.7×10^{-4} 0.00037

2. Counting significant figures - How many sig figs are in each of the following numbers.

- a. 10.0 3
 b. 89000 2
 c. 0.003280 4
 d. 12.30 4

3. Rounding to the correct number of significant figures in calculations

- a. $18.32 + 2.1 = 20.4$
 b. $12.32 \times 9.3 = 110$

4. Dimensional analysis (one step, multi step, two units)

- a. Convert 54.7 kg to ounces (1 kg = 1000 g) (454 g = 1 lb) (16 oz = 1 lb)

$$\frac{54.7 \text{ kg} \left| \frac{1000 \text{ g}}{1 \text{ kg}} \right| \frac{1 \text{ lb}}{454 \text{ g}} \left| \frac{16 \text{ oz}}{1 \text{ lb}} \right|}{1} = 1930 \text{ oz}$$

- b. Convert 13970 cm to miles (12 in = 1 ft) (5280 ft = 1 mile) (2.54 cm = 1 in)

$$\frac{13970 \text{ cm} \left| \frac{1 \text{ in}}{2.54 \text{ cm}} \right| \frac{1 \text{ ft}}{12 \text{ in}} \left| \frac{1 \text{ mi}}{5280 \text{ ft}} \right|}{1} = .08681 \text{ mi}$$

5. Metric conversions and units

- a. Convert 32.9 km to meters

$$\frac{32.9 \text{ km} \left| \frac{1000 \text{ m}}{1 \text{ km}} \right|}{1} = 32,900 \text{ m}$$

- b. Convert 0.9813 mL to L

$$\frac{.9813 \text{ mL} \left| \frac{1 \text{ L}}{1000 \text{ mL}} \right|}{1} = 9.813 \times 10^{-4} \text{ L}$$

6. Density (calculations and comparison of substances behaviors based off of density)

- a. What is the density of a piece of metal that has a mass of 19.54 g and a volume of 2.38 mL?

$$d = \frac{m}{V} = \frac{19.54 \text{ g}}{2.38 \text{ mL}} = 8.21 \text{ g/mL}$$

- b. A marble is dropped into a graduated cylinder filled with water. The water level goes from 25.0 mL to 26.4 mL. The mass of the marble is 32.7 g. What is the density of the marble?

$$d = \frac{32.7 \text{ g}}{1.4 \text{ mL}} = 23.4 \text{ g/mL}$$

- c. Why would something float when in another substance? Why would something sink?

float = less dense
sink = more dense

7. Calculating percent error

- a. Experimental value = 21.87 kg and Actual value = 18.73 kg. Calculate the percent error.

$$\% \text{ error} = \frac{21.87 - 18.73}{18.73} \times 100 = 16.8\% \text{ error}$$

8. Separation of mixture techniques

- a. Define filtration

Separate heterozygous mixture through straining

- b. Define distillation

Separate homogeneous mixtures through diff. in b.p.

- c. Define solubility

Ability of a substance to dissolve

9. Mixtures vs substances (heterogeneous, homogeneous, elements, and compounds)

- a. What is the difference between a pure substance and a mixture?

↓
cannot be physically broken down

- b. What is another name for a heterogeneous mixture?

↓
suspension

- c. What is another name for a homogeneous mixture?

↓
soln

- d. What is the difference between a heterogeneous and homogeneous mixture?

↓
uniform throughout

- e. What is the difference between a compound and an element?

↓
can be chemically broken down

10. Chemical vs physical changes/properties

- a. Rusting C
- b. Burning C
- c. Ripping P

11. Subatomic particles (characteristics and history of protons, electrons, and neutrons)

- a. What are the differences between electrons, neutrons, and protons.
- | | | |
|----------------|------------------|-------------------|
| neg no mass | neutral 1 amu | positive 1 amu |
|----------------|------------------|-------------------|

12. Mass number, atomic number, # of protons, # of neutrons, and # of electrons in a specific atom

- a. What is the mass number? p + n
- b. What is the atomic number? p
- c. How can you determine the number of electrons in an atom? p + e = charge
- d. How can you determine the number of neutrons in an atom? mass - p

13. Symbols for elements and isotopes

- a. Write the symbol for potassium-39. K_{19}^{39}
- b. How many protons, neutrons, and electrons are in the isotope, $^{52}_{24}Cr$?
 protons → 24 $52 - 24 = 28$ neutrons
 no charge ∴ $p^+ = e^- = 24$
- c. What would the symbols look like for the isotopes phosphorus-31 and phosphorus-33?



14. Accuracy vs. Precision

- a. Describe the following set of measurements knowing that the actual value is 8.39 g.
 2.35 g, 2.36 g, 2.35 g, 2.35 g, 2.34 g, 2.36 g

precise, but not accurate

15. Calculating atomic mass using isotopes

| | Mass | % abundance |
|---------------|------------|-------------|
| element x-182 | 182.04 amu | 3.0 % |
| element x-181 | 181.13 amu | 6.0 % |
| element x-184 | 184.09 amu | 91.0 % |

W

What is element x?

$$.03(182.04) + .06(181.13) + .91(184.09) = 183.85 \text{ amu}$$

16. Converting between °C and K

Remember that a change of 1°C is the same as a change of 1K and 0°C=273K.

- If the temperature changes by 25 °C, by how much does it change in K? 25 K
- If the temperature is -5 °C, what is the temperature expressed in K? 268 K

2nd 9 weeks

Organization of the Periodic Table

- What is a period? \leftrightarrow
- What is a group? \updownarrow
- What are the 3 main categories elements are put into and what are the common properties for each category of elements?
metal
metalloid
nonmetal
- Name two elements that should have chemical properties similar to fluorine. Br, I
- What is the group name for the following groups:
 - 1A alkali metals
 - 2A alkaline earth metals
 - 7A halogens
 - 8A noble gases

Electron Configurations

- What are the shapes of the *s* and *p* orbitals?
0 ∞
- What are the three rules that govern the filling of atomic orbitals by electrons?
Hund's
Aufbau
- What is the maximum number of electrons that can go into each of the following sublevels?
 - 2p 6
 - 4s 2
 - 3d 10
 - 5f 14
- Use the periodic table to write electron configurations for:
 - oxygen $1s^2 2s^2 2p^4$
 - silver $[Kr] 5s^2 4d^9$
 - iron $[Ar] 4s^2 3d^6$
 - strontium $[Kr] 5s^2$

10. What types of orbitals are present in the following energy levels:

a. 2nd energy level *s and p*

b. 4th energy level *s p d f*

11. Describe the electron configuration of a stable element that won't react with other elements.

filled s and p sublevels

12. Name the element that matches the following description:

a. one that has 5 outer electrons on the third period of the periodic table

P

b. one with a $4s^23d^{10}4p^5$ electron configuration *Br*

c. the 4th period Group 6A element *Se*

Electromagnetic Spectrum

13. Calculate the wavelength or frequency for the following waves:
and $c = \lambda\nu$

(don't forget $c = 2.998 \times 10^8$ m/s)

a. wavelength = 3.2×10^{-7} m; what is the frequency?

$$c = \lambda\nu \quad \nu = \frac{c}{\lambda} = \frac{2.998 \times 10^8 \text{ m/s}}{3.2 \times 10^{-7} \text{ m}} = 9.4 \times 10^{14} \text{ s}^{-1}$$

b. frequency = 7.8×10^{21} s⁻¹; what is the wavelength?

$$c = \lambda\nu \quad \lambda = \frac{c}{\nu} = \frac{2.998 \times 10^8 \text{ m/s}}{7.8 \times 10^{21} \text{ s}^{-1}} = 3.8 \times 10^{-14} \text{ m}$$

14. What is the order for the electromagnetic spectrum? *Radio Micro Infrared Visible Ultraviolet X-ray Gamma*

ROYGBIV

15. What color has the highest frequency? *violet*

16. What type of electromagnetic wave has the longest wavelength? *Radio*

Periodic Trends

17. Name the group number in which the elements form ions with the following charges:

a. 1+ *1A*

b. 2+ *2A*

c. 3+ *3A*

d. 3- *5A*

e. 2- *6A*

f. 1- *7A*

18. Explain how the radius of an atom changes when it becomes an anion.

anions are bigger than their parent atom

19. Explain how the radius of an atom changes when it becomes a cation.

cations are smaller than their parent atom

20. What type of ion loses electrons and what will the charge be? *cation, positive*
21. What type of ion gains electrons and what will the charge be? *anion, negative*
22. Finish the following statement: "Elements in the same column/group/family will have similar physical and chemical characteristics."

3rd Nine Weeks Naming Compounds

For each of the following compounds, FIRST determine whether the compound is ionic, covalent, or an acid, THEN name it appropriately.

- | | | |
|--|----------|----------------------------------|
| 1. CO ₂ | <u>C</u> | <u>carbon dioxide</u> |
| 2. Al ₂ S ₃ | <u>I</u> | <u>aluminum sulfide</u> |
| 3. Mn ₃ (PO ₄) ₂ | <u>I</u> | <u>manganese (III) phosphate</u> |
| 4. HCl | <u>A</u> | <u>hydrochloric acid</u> |
| 5. HClO ₃ | <u>A</u> | <u>chloric acid</u> |
| 6. Si ₂ F ₆ | <u>C</u> | <u>disilicon hexafluoride</u> |

For each of the following compounds, FIRST determine whether the compound is ionic, covalent, or an acid, THEN write the correct formula.

- | | | |
|----------------------------|----------|---|
| 7. Magnesium bromide | <u>I</u> | <u>MgBr₂</u> |
| 8. Diphosphorous pentoxide | <u>C</u> | <u>P₂O₅</u> |
| 9. Lead(II) phosphate | <u>I</u> | <u>Pb₃(PO₄)₂</u> |
| 10. Sulfurous acid | <u>A</u> | <u>H₂SO₃</u> |
| 11. Nitrous acid | <u>A</u> | <u>HNO₂</u> |
| 12. Hydrosulfuric acid | <u>A</u> | <u>H₂S</u> |

13. How do you know (based on the formula) that something is a base?

ends in OH

14. How do you know (based on the formula) that something is an acid?

starts w/ H

15. List the diatomic elements.

H₂ N₂ O₂ F₂ Cl₂ Br₂ I₂

16. What is the molar mass of chlorine? *Cl₂ → 70.9 g/mol*

Mole Conversions

17. How many atoms are contained in 12.5 grams of platinum, Pt?

$$\frac{12.5 \text{ g Pt}}{195.08 \text{ g}} \times \frac{1 \text{ mol Pt}}{1 \text{ mol Pt}} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol Pt}} = 3.86 \times 10^{22} \text{ atoms Pt}$$

18. What is the mass, in grams, of 49.5 L of CO₂ at STP?

$$\frac{49.5 \text{ L CO}_2}{22.4 \text{ L}} \times \frac{1 \text{ mol CO}_2}{1 \text{ mol CO}_2} \times \frac{44.01 \text{ g CO}_2}{1 \text{ mol CO}_2} = 97.3 \text{ g CO}_2$$

19. What is the molarity of a 0.39 L solution containing 0.50 mol of NaCl?

$$\frac{0.50 \text{ mol}}{0.39 \text{ L}} = 1.3 \text{ M NaCl}$$

Percent Composition and Empirical vs. Molecular Formulas

20. What is the percent composition of acetone, C₃H₆O?

$$\% \text{ C} : \frac{3(12.01)}{58.09} \times 100 = 62\% \text{ C}$$

$$\% \text{ H} : \frac{6(1.01)}{58.09} \times 100 = 10\% \text{ H}$$

$$\% \text{ O} : \frac{16}{58.09} \times 100 = 28\% \text{ O}$$

$$\begin{array}{r} 3(12.01) \\ 6(1.01) \\ 16 \\ \hline 58.09 \text{ g total} \end{array}$$

21. What is the mass of hydrogen in 64.0 g of acetone, C₃H₆O?

From prev. problem, we know acetone is 10% H.

$$64.0 \text{ g} \times \underset{\substack{\uparrow \\ 10\% \text{ H}}}{.10} = 6.4 \text{ g H}$$

22. Glycerol is a thick, sweet liquid obtained as a byproduct of the manufacture of soap. Its percent composition is 39.12% carbon, 8.75% hydrogen, and 52.12% oxygen. The molar mass is 92.09 g/mol. Find the empirical formula and molecular formula for glycerol. (4 points)

Emp Form.

$$\boxed{\text{EF} = \text{C}_3\text{H}_8\text{O}_3}$$

Molec. Form.

$$\frac{39.12 \text{ g C}}{12.01 \text{ g}} \times \frac{1 \text{ mol C}}{1 \text{ mol C}} = \frac{3.26 \text{ mol C}}{3.26 \text{ mol}} \Rightarrow 1 \text{ C} \times 3 \Rightarrow 3 \text{ C}$$

$$\frac{8.75 \text{ g H}}{1.01 \text{ g}} \times \frac{1 \text{ mol H}}{1 \text{ mol H}} = \frac{8.66 \text{ mol H}}{3.26 \text{ mol}} \Rightarrow 2.66 \text{ H} \times 3 \Rightarrow 8 \text{ H}$$

$$\frac{52.12 \text{ g O}}{16 \text{ g}} \times \frac{1 \text{ mol O}}{1 \text{ mol O}} = \frac{3.26 \text{ mol O}}{3.26 \text{ mol}} \Rightarrow 1 \text{ O} \times 3 \Rightarrow 3 \text{ O}$$

$$\text{EF}_{\text{mass}} = 92.11 \text{ g/mol}$$

$$\frac{\text{MF}_{\text{mass}}}{\text{EF}_{\text{mass}}} = \frac{92.09 \text{ g/mol}}{92.11 \text{ g/mol}}$$

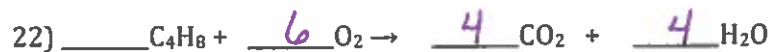
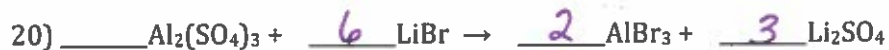
$$\sim 1$$

$$(\text{C}_3\text{H}_8\text{O}_3)_1$$

$$\boxed{\text{MF} = \text{C}_3\text{H}_8\text{O}_3}$$

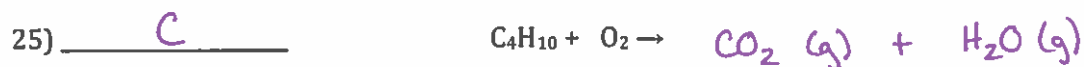
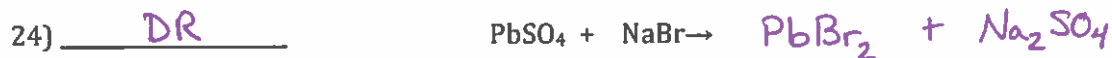
Balancing

Balance the following equations.



Types of Reactions

Finish the following reactions and put the type of reaction on the line that is occurring. You DO NOT have to balance.



Activity Series of Metals and Halogens

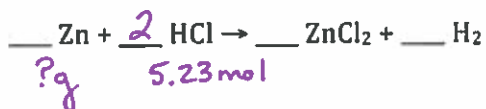
| | |
|----|----|
| Li | F |
| K | Cl |
| Ca | Br |
| Na | I |
| Mg | |
| Al | |
| Zn | |
| Fe | |
| Pb | |
| H | |
| Cu | |
| Hg | |
| Ag | |

Stoichiometry

Answer the following questions in the space provided. Show all work to receive full credit.

28) Given the following reaction:

a) How many grams of zinc are required to react with 5.23 moles of hydrochloric acid (HCl)?



$$\frac{5.23 \text{ mol HCl} \left| \begin{array}{l} 1 \text{ mol Zn} \\ 2 \text{ mol HCl} \end{array} \right| \begin{array}{l} 65.39 \text{ g Zn} \\ 1 \text{ mol Zn} \end{array}}{1} =$$

b) Using the reaction above, how many liters of hydrogen gas will be produced by 2.78 g of zinc and 5.86 g of HCl assuming STP?

$$\frac{2.78 \text{ g Zn} \left| \begin{array}{l} 1 \text{ mol Zn} \\ 65.39 \text{ g Zn} \end{array} \right| \begin{array}{l} 1 \text{ mol H}_2 \\ 1 \text{ mol Zn} \end{array} \left| \begin{array}{l} 22.4 \text{ L H}_2 \\ 1 \text{ mol H}_2 \end{array} \right.}{1} = 0.952 \text{ L H}_2$$

$$\frac{5.86 \text{ g HCl} \left| \begin{array}{l} 1 \text{ mol HCl} \\ 36.45 \text{ g HCl} \end{array} \right| \begin{array}{l} 1 \text{ mol H}_2 \\ 2 \text{ mol HCl} \end{array} \left| \begin{array}{l} 22.4 \text{ L H}_2 \\ 1 \text{ mol H}_2 \end{array} \right.}{1} = 1.80 \text{ L H}_2$$

This rxn is limited by how much Zn we have. Therefore, the Zn will be used up and there will be some HCl left after the rxn. Only 0.952 L H₂ will be formed before we run out of Zn.

