Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ch. 1 Chemistry Foundations- Mastery Questions

**Elements or Compounds**

Classify each of the following particulate level illustrations as a representation of either an **element** or a **compound**.

|  |  |  |
| --- | --- | --- |
| http://cxp.cengage.com/contentservice/assets/T=1461696755282/owms01h/mediaarchives/GenChem/Image/NH3(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461696755282/owms01h/mediaarchives/GenChem/Image/N2(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461696755282/owms01h/mediaarchives/GenChem/Image/NO(g)box.gif |

Classify each of the following particulate level illustrations as a representation of either an **element** or a **compound**.

|  |  |  |
| --- | --- | --- |
| http://cxp.cengage.com/contentservice/assets/T=1461696755282/owms01h/mediaarchives/GenChem/Image/CO2(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461696755282/owms01h/mediaarchives/GenChem/Image/O3(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461696755282/owms01h/mediaarchives/GenChem/Image/H2O(g)box.gif |

**Elements and compounds: Macroscopic**

Classify each of the following pure substances as either an **element** or a **compound**:

P4 C12H22O11 Rn

sodium chloride tin polyethylene

**Significant Figures in Calculations**

When 74.82 is added to 89.7, the result should be reported with how many digits after the decimal point? \_\_\_\_\_\_\_

When 88.034 is subtracted from 98.5, the result should be reported with how many digits after the decimal point? \_\_\_\_\_\_\_\_\_\_

When 74.82 is multiplied by 89.7, the answer should be reported to how many significant digits? \_\_\_\_\_\_\_\_\_\_

When 98.5 is divided by 88.034, the answer should be reported to how many significant digits? \_\_\_\_\_\_\_\_\_\_

When 23.8 and 49.36 are multiplied, how many significant digits should the answer be reported to? \_\_\_\_\_\_\_\_\_\_

What is the result of this calculation (when reported to the correct number of significant figures)? 23.8 × 49.36 = \_\_\_\_\_\_\_\_\_\_\_\_

How many digits after the decimal point should the sum of 23.8 and 49.36 be reported to? \_\_\_\_\_\_\_\_\_\_\_

What is the result of this calculation (when reported to the correct number of decimal places)? 2.57 + 2.5 = \_\_\_\_\_\_\_\_\_\_\_\_

**Unit conversions: Metric use dimensional analysis or King Henry died….**

A dime is found to have a mass of 2.19 grams. What the mass of this dime is in kilograms.

A calculator is found to have a volume of 157 milliliters. What the volume of the calculator is in liters.

**Liquid solid gas**

At room temperature and pressure, classify each of the following macroscopic samples as solid, liquid or gas:

air oil gold coins

The following illustrations represent different states of the substance **water**, **H2O**, at the particulate level. Classify each as solid, liquid, or gas:

|  |  |  |
| --- | --- | --- |
| http://cxp.cengage.com/contentservice/assets/T=1461697460135/owms01h/mediaarchives/GenChem/Image/H2O(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461697460135/owms01h/mediaarchives/GenChem/Image/H2O(l)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461697460135/owms01h/mediaarchives/GenChem/Image/H2O(s)box.gif |

**Mixtures and pure substances**

Classify each of the following particulate level illustrations as a representation of either a **pure substance** or a **mixture**.

|  |  |  |
| --- | --- | --- |
| http://cxp.cengage.com/contentservice/assets/T=1461697570244/owms01h/mediaarchives/GenChem/Image/C_O2(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461697570244/owms01h/mediaarchives/GenChem/Image/CO2(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461697570244/owms01h/mediaarchives/GenChem/Image/Ne(g)box.gif |

Classify each of the following particulate level illustrations as a representation of either a **pure substance**, a **homogeneous** mixture, or a **heterogeneous** mixture.

|  |  |  |
| --- | --- | --- |
| http://cxp.cengage.com/contentservice/assets/T=1461697570244/owms01h/mediaarchives/GenChem/Image/N2_H2(hetero)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461697570244/owms01h/mediaarchives/GenChem/Image/HI(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461697570244/owms01h/mediaarchives/GenChem/Image/N2_O2(g)box.gif |

**Chemical and Physical Change**

Is the change represented by the following illustration best categorized as a **chemical** change or a **physical** change?

**In the illustration, H is color-coded as light blue and I is color-coded as purple.**

|  |  |  |
| --- | --- | --- |
| http://cxp.cengage.com/contentservice/assets/T=1461697714163/owms01h/mediaarchives/GenChem/Image/HI(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461697714163/owms01h/mediaarchives/GenChem/Image/arrow2-1.gif | http://cxp.cengage.com/contentservice/assets/T=1461697714163/owms01h/mediaarchives/GenChem/Image/HI(s)box.gif |

Is the change represented by the following illustration best categorized as a **chemical** change or a **physical** change?

**In the illustration, N is color-coded as purple and O is color-coded as red.**

|  |  |  |
| --- | --- | --- |
| http://cxp.cengage.com/contentservice/assets/T=1461697714163/owms01h/mediaarchives/GenChem/Image/N2_O2(g)box.gif | http://cxp.cengage.com/contentservice/assets/T=1461697714163/owms01h/mediaarchives/GenChem/Image/arrow2-1.gif | http://cxp.cengage.com/contentservice/assets/T=1461697714163/owms01h/mediaarchives/GenChem/Image/NO(s)box.gif |

Classify each of the following **changes** as chemical or physical:

rusting of iron whipping cream ripening of bananas

Classify each of the following **properties** as chemical or physical:

Basicity stability coarseness

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ch. 2 Atom, Molecules, Ions- Mastery Questions

**Ions: Protons and Electrons**

An ion from a given element has **13** protons and **10** electrons. What is the charge and symbol on the ion?

An ion from a given element has **53** protons and **54** electrons. What is the charge and symbol on the ion?

**Monatomic Ions: Name and Formula**

The element **fluorine**:

Forms a cation/anion (circle one). The symbol and charge \_\_\_\_\_\_\_\_\_\_\_\_for this ion.

The name for this ion is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ The number of electrons in this ion is \_\_\_\_\_\_\_\_

The element **magnesium**:

Forms a cation/anion (circle one). The symbol and charge \_\_\_\_\_\_\_\_\_\_\_\_for this ion.

The name for this ion is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ The number of electrons in this ion is \_\_\_\_\_\_\_\_

**Monatomic Ions: Write formation**

Write an equation that shows the formation of a **barium ion** from a neutral **barium** atom.

Write an equation that shows the formation of a **iron(III) ion** from a neutral **iron** atom.

**Binary Ionic compounds: Name and Formula**

What is the name of the compound with the formula **CaI2** ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the name of the compound with the formula **MgBr2** ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the name of the compound with the formula **K2O** ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the formula for **potassium iodide** ?  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the formula for **aluminum chloride** ?  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the formula for **magnesium bromide** ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Binary Ionic compounds with multiple oxidation states**

What is the name of the compound with the formula **MnO** ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the name of the compound with the formula **PbI2** ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the name of the compound with the formula **ZnBr2** ?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the name of the compound with the formula **Cr2S3** ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
What is the name of the compound with the formula **FeCl3** ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the name of the compound with the formula **MnF2** ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Ionic Compounds: Formula from ions**

Provide the formula from the combination of the following ions.

Cu+ and O2- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pb2+ and F- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Zn2+ and Br- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

K+ and CH3COO- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Na+ and NO3- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Mg2+ and NO2- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Ionic Compounds: Ions from formulas**

The compound **MgCl2** is an ionic compound. What are the ions of which it is composed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The compound **NiS** is an ionic compound. What are the ions of which it is composed? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Interpreting Formulas**

Provide the number of each element in this compound **sodium sulfate**.

Provide the number of each element in this compound **ammonium phosphate**.

**Ionic compounds- ate**

Provide the formula for the following?

 magnesium chromate\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ potassium phosphate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ aluminum acetate\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Provide the name for the following.

KNO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Al2(SO4)3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Mg(CH3COO)2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Ionic compounds: -ites, per and hypo**

Provide the name for the following.

Ba(NO2)2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_MgSO3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Provide the formula for the following.

potassium sulfite **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** magnesium nitrite \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Ionic Compounds OH-, CN-, HCO3-, HSO4-**

Provide the name for the following.

Al(CN)3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ KHCO3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Al(OH)3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_KHSO4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Ionic Compound NH4+**

Provide the name for the following.

NH4Cl\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (NH4)2S \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ NH4Br \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Provide the formula for the following.

ammonium sulfite \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ammonium sulfide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ammonium fluoride\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Covalent Compounds: Name and Formula**

Provide the name for the following.

BBr3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ CO2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ S2F10\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Provide the formula for the following

nitrogen dioxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ phosphorus trichloride\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Sulfur tetrafluoride\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Ionic, Covalent Compounds: Mixed**

Provide the name for the following. .

SO2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Cu(NO2)2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Al(NO2)3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ P4O10 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Provide the formula for the following

cobalt(III) nitrate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nitrogen monoxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

barium sulfite\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Diphosphorous tetrafluoride \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ch. 3 Stoichiometry- Mastery Questions

**Average atomic weight**

A certain element consists of two stable isotopes.

The first has a mass of **138** amu and a percent natural abundance of **8.90×10-2** %.
The second has a mass of **139** amu and a percent natural abundance of **99.9** %.

What is the atomic weight of the element?

The element **copper** has an atomic weight of **63.5** and consists of two stable isotopes **copper-63** and **copper-65**.

The isotope **copper-63** has a mass of **62.9** amu and a percent natural abundance of **69.1** %.
The isotope **copper-65** has a percent natural abundance of **30.9** %.

What is the mass of **copper-65**?

**Elements: Atoms/Mol conversion SHOW WORK**

How many moles of **V** are there in a sample of **V** that contains **2.81×1024** atoms?

How many **S** atoms are there in **4.08** moles of **S**?

**Elements: Gram/Mole Conversion SHOW WORK**

How many moles of **Hg** are there in **98.0** grams of **Hg**? How many grams of **Li** are there in **0.948** moles of **Li**?

**Gram/Atom conversion SHOW WORK**

How many **Pb** atoms are there in a **67.4** gram sample of **Pb** ?

How many grams of **Xe** are there in a sample of **Xe** that contains **1.07×1024** atoms?

**Compounds: Calculate Molar mass SHOW WORK**

barium bromide . carbon tetrafluoride.

**Compounds: Mol/Mass Calculations SHOW WORK**

How many grams are in the following?

4.17 moles of copper(II) sulfide 4.94 moles of boron trifluoride

How many moles are in the following?

3.32 grams of copper(II) sulfide 1.70 grams of boron trifluoride

**Compounds: Mol/Number conversion SHOW WORK**

How many ATOMS of phosphorus are present in 4.57 moles of phosphorus trichloride ?

How many MOLES of chlorine are present in 3.37×1022 molecules of phosphorus trichloride ?

How many MOLECULES of boron trifluoride are present in 1.72 moles of this compound ?

How many MOLES of boron trifluoride are present in 1.19×1022 molecules of this compound ?

**Compounds Mass/number calculation SHOW WORK**

How many molecules are in the following?

9.02 grams of of phosphorus pentachloride 2.52 grams of boron trichloride

How many grams are in the following?

1.05×1023 molecules of phosphorus pentachloride 8.27×1022 molecules of boron trichloride

**Compound: Mass to Mass SHOW WORK**

How many grams of sulfur are in 1.13 grams in SCl2 ? How many grams of chlorine are in 1.11 grams of SCl2 ?

How many grams of magnesium are in 2.10 grams Mg(NO2)2? How many grams of nitrogen are in 2.13 grams of Mg(NO2)2?

**Formula to percent Composition SHOW WORK**

What is % by mass of chromium(III) in Cr2O3 ? What is % by mass of chlorine in C2H5Cl?

**Balancing equations SHOW WORK**

Provide the balanced equation for the following.

sodium chloride (aq) + silver nitrate (aq) 🡪 silver chloride (s) + sodium nitrate (aq)

bromine (g) + chlorine (g) 🡪 bromine monochloride (g)

**Equations: Mol/Mol calculation SHOW WORK**

According to the following reaction, how many moles of **hydrogen gas** will be formed upon the complete reaction of **0.840** moles **water**? **water** (**l**) **hydrogen** (**g**) + **oxygen** (**g**)

According to the following reaction, how many moles of **potassium sulfate** will be formed upon the complete reaction of **0.226** moles **potassium hydrogen sulfate** with excess **potassium hydroxide**?
**potassium hydrogen sulfate** (**aq**) + **potassium hydroxide** (**aq**) **potassium sulfate** (**aq**) + **water** (**l**)

**Equations: Mass/Mol calculation SHOW WORK**

According to the following reaction, how many grams of **hydrobromic acid** are necessary to form **0.811** moles **bromine**?
hydrobromic acid (aq) hydrogen (g) + bromine (l)

According to the following reaction, how many moles of **calcium sulfate** will be formed upon the complete reaction of 32.8 grams of sulfuric acid with excess calcium hydroxide?
sulfuric acid (aq) + calcium hydroxide (s) calcium sulfate (s) + water (l)

**Equation Mass/Mass Calculation SHOW WORK**

According to the following reaction, how many grams of **iodine** are required for the complete reaction of 21.6 grams of **hydrogen gas**? hydrogen (g) + iodine (s) hydrogen iodide (g)

According to the following reaction, how many grams of **dinitrogen monoxide** will be formed upon the complete reaction of 25.8 grams of **ammonium nitrate**? ammonium nitrate (aq) dinitrogen monoxide (g) + water (l)

**Limiting Reactants: Molecular Level**



**Limiting Reactants comparing Reactants SHOW WORK**

For the following reaction, 0.794 grams of hydrogen gas are allowed to react with 15.2 grams of ethylene (C2H4) .
 hydrogen(g) + ethylene (C2H4)(g) ethane (C2H6)(g)

What is the theoretical yield of **ethane (C2H6)** that can be formed? Identify the limiting reactant\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What mass of the excess reagent remains after the reaction is complete?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

For the following reaction, 41.9 grams of aluminum oxide are allowed to react with 108 grams of sulfuric acid .
 aluminum oxide(s) + sulfuric acid(aq) aluminum sulfate(aq) + water(l)

What is the theoretical yield of **aluminum sulfate** that can be formed? Identify the limiting reactant\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What mass of the excess reagent remains after the reaction is complete?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Percent Yield**

"In our bodies, sugar is broken down with oxygen to produce water and carbon dioxide."

For the following reaction, 4.41 grams of glucose (C6H12O6) are mixed with excess oxygen gas. The reaction yields 4.40 grams of carbon dioxide.

glucose (C6H12O6) (s) + oxygen (g) carbon dioxide (g) + water (l)

What is the theoretical yield (in grams) of carbon dioxide?

What is the percent yield of carbon dioxide ?

For the following reaction, 5.48 grams of sulfur dioxide are mixed with excess water . The reaction yields 5.99 grams of sulfurous acid (H2SO3) .

sulfur dioxide ( g ) + water ( l ) sulfurous acid (H2SO3) ( g )

What is the theoretical yield of sulfurous acid (H2SO3) ?

What is the percent yield of carbon dioxide ?