

### CH301 Worksheet 1 Answer Key: High School Chemistry Questions.

For each problem, identify the kind of question BEFORE answering it.

1. A 25 kg ball has a kinetic energy of 225 J. What is the speed of the ball?  
**What kind of question is this? energy**  
3 m/s
2. How many molecules of water are there in 100 mL of water? (The density of water = 1.000 g/mL.)  
**What kind of question is this? stoichiometry**  
 $3.34 \times 10^{24}$  molecules
3. Given that the atomic mass of carbon is given as 12.0107 g/mol, what are the approximate relative abundances of the two isotopes  $^{12}\text{C}$  and  $^{13}\text{C}$ ? **What kind of question is this? isotopes**  
98.93%  $^{12}\text{C}$ , 1.07%  $^{13}\text{C}$
4. In the electrolysis of  $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ , how many atom of O in  $\text{O}_2$  are made from 4 g of  $\text{H}_2\text{O}$ ?  
**What kind of question is this? stoichiometry**  
 $1.34 \times 10^{23}$  molecules
5. What are the most likely ionic forms of (a) sodium and (b) calcium?  
**What kind of question is this? periodic trends**  
(a)  $\text{Na}^+$ ; (b)  $\text{Ca}^{2+}$
6. What is the product of a reaction between metallic lithium and oxygen,  $\text{O}_2$ ?  
**What kind of question is this? oxidation numbers**  
 $\text{Li}_2\text{O}$
7. Name the following species: (a)  $\text{Cl}^-$ , (b)  $\text{NO}_3^-$ , (c)  $\text{C}_3\text{H}_8$ . **What kind of question is this? naming**  
(a) chloride; (b) nitrate; (c) propane
8. The combustion of ethanol has the following equation:  $\text{C}_2\text{H}_5\text{OH} + 3 \text{O}_2 \rightarrow 2 \text{CO}_2 + 2 \text{H}_2\text{O}$   
What mass of  $\text{CO}_2$  is formed from 1 kg of ethanol? **What kind of question is this? stoichiometry**  
1.913 kg
9. Vitamin K contains 78.95% C, 3.95% H, and 21.05% O by mass. What is its empirical formula?  
**What kind of question is this? empirical formula calculation**  
 $\text{C}_5\text{H}_3\text{O}$
10. Given that vitamin K (see question 9) has molecular weight of 158.15 g/mol, what is its molecular formula? **What kind of question is this? molecular formula calculation**  
 $\text{C}_{10}\text{H}_6\text{O}_2$

11. When sand is stirred up in a glass of water a (homogeneous of heterogeneous?) mixture is formed.

**What kind of question is this? Types of mixtures**

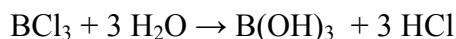
heterogeneous

12. If 10.0 g of hydrochloric acid is dissolved in enough water to make 1.00 liter of solution, what is the molarity of the solution? **What kind of question is this? concentration**

0.274M

13. Balance the following chemical equation:  $\underline{\quad} \text{BCl}_3 + \underline{\quad} \text{H}_2\text{O} \rightarrow \underline{\quad} \text{B(OH)}_3 + \underline{\quad} \text{HCl}$

**What kind of question is this? equation-balancing**



14. A microwave oven used radiation at a frequency of 2450 MHz to vibrationally excite water molecules in food. What is the wavelength of this radiation? **What kind of question is this? electromagnetic radiation**

12.24 cm

15. How many protons, neutrons, and electrons are in the most common atomic form of chlorine?

**What kind of question is this? subatomic particles**

17 protons, 18 neutrons, 17 electrons

16. If 75 mL of water is added to 25 mL of 1 M  $\text{H}_2\text{SO}_4$  in water, what is the new concentration of  $\text{H}_2\text{SO}_4$ ?

**What kind of question is this? dilution**

0.25 M

17. Classify the following properties of matter as physical or chemical: (a) color, (b) flammability, (c) density. **What kind of question is this? properties of matter**

(a) physical; (b) chemical; (c) physical

18. Rank the following four forms of electromagnetic radiation in terms of decreasing energy:

*Microwave, X-ray, radiofrequency, yellow light.* **What kind of question is this? electromagnetic radiation**

X-ray > yellow light > microwave > radiofrequency

19. Which of the following is **not** a strong acid: HI,  $\text{H}_2\text{SO}_4$ , HCl, or  $\text{HNO}_2$ ?

**What kind of question is this? strong acids**

$\text{HNO}_2$ , nitrous acid

20. What is the oxidation number of nitrogen in nitrate?

**What kind of question is this? oxidation numbers**

+5