

1. A tentative explanation for a set of observations that can be tested by further experimentation is referred to as
 - A) a hypothesis.
 - B) a law.
 - C) a theory.
 - D) none of the above.

2. Identify the following as a *physical* or *chemical* change: Hydrogen gas and nitrogen gas are combined to form ammonia gas.

3. An organic liquid has a density of 1.2 g/cm^3 . What is the mass of a 35.0 cm^3 sample of this liquid?

4. An American engineer who had been transferred to Europe was asked to build bridge pilings exactly as he had in the United States. Each piling required 20.0 cubic yards of concrete in the United States. How many cubic meters of concrete are required for each piling? Given: $1 \text{ yd} = 0.914 \text{ m}$.

5. What will be the cost of gasoline for a 3,700-mile trip in a car that gets 23 miles per gallon, if the average price of gas is \$3.90 per gallon?

6. How many electrons, protons, and neutrons does an iron-55 atom have?

7. What are *isotopes*?

8. Calculate the molar mass, in g/mol, of $\text{Fe}_2(\text{CO}_3)_3$.

9. How many ICl_3 molecules are present in 1.75 kg of ICl_3 ?

10. A compound with a percent composition by mass of 87.5% N and 12.5% H was recently discovered. What is the empirical formula for this compound?

11. If 0.66 mole of a substance has a mass of 99 g, what is the molecular mass of the substance?

12. A 0.600 g sample of a compound of arsenic and oxygen was found to contain 0.454 g of arsenic. What is the empirical formula of the compound?
13. Refer to the (unbalanced) equation $\text{CS}_2 + \text{CaO} \rightarrow \text{CO}_2 + \text{CaS}$. How many grams of CaS are produced if 53 g of CO_2 are produced?
14. What is the minimum mass of oxygen gas necessary to produce 200. g of sulfuric acid in the following reaction?

$$2\text{SO}_2 + \text{O}_2 + 2 \text{H}_2\text{O} \rightarrow 2\text{H}_2\text{SO}_4$$
15. Phosphorus reacts with iodine as shown in the chemical reaction below. What is the percent yield of the reaction if 28.2 g PI_3 is obtained from the reaction of 48.0 g of I_2 with excess phosphorus?

$$2\text{P}(\text{s}) + 3\text{I}_2(\text{s}) \rightarrow 2\text{PI}_3(\text{s})$$
16. What is the limiting reagent when 27.0 g of P and 68.0 g of I_2 react according to the following chemical equation?

$$2\text{P}(\text{s}) + 3\text{I}_2(\text{s}) \rightarrow 2\text{PI}_3(\text{s})$$
17. Determine the number of moles of water produced by the reaction of 155 g of ammonia and 356 g of oxygen.

$$4\text{NH}_3 + 5\text{O}_2 \rightarrow 4\text{NO} + 6\text{H}_2\text{O}$$

Answer Key

1. A
2. Chemical
3. 42 g
4. 15.3 m^3
5. \$630
6. 26 electrons, 26 protons, and 29 neutrons
7. Atoms of the same element that have the same atomic number but different mass numbers.
8. 291.73 g/mol
9. 4.52×10^{24}
10. NH_2
11. 150 g
12. As_2O_3
13. 170 g
14. 32.6 g
15. 54.3%
16. I_2
17. 13.4 moles