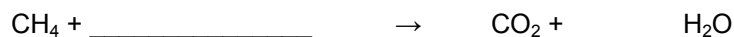


TEST 1 (of 3)

Show all of your work. Students should use significant figures and express their answers in scientific notation.

1. Give one example of an element and one example of a compound.
2. Complete and balance the following chemical equation for the combustion of methane in air:



3. Categorize the following as either a physical (P) or chemical (C) property.
 - (a) Copper can be easily shaped into sheets (malleable) and wires (ductile).
 - (b) Copper reacts with sulfuric acid to produce copper sulfate.
 - (c) Copper can be melted and mixed with zinc to form brass.
 - (d) When added to nitric acid, brown fumes of a toxic gas are produced.
4.
 - (a) Write down a conversion factor (CF) ratio for converting milliliters (mL) to cubic centimeters (cm^3).

 - (b) Write down a conversion factor (CF) ratio for converting milligrams to grams.

 - (c) The density of water at 21.2 °C is 0.997948 g/cm^3 .
Calculate the volume of water (mL) in 2.49×10^3 mg.

(SHOW ALL YOUR WORK)

5. Lithium has two stable isotopes: ${}^6\text{Li}$ and ${}^7\text{Li}$. One of them has an abundance of 92.5 %, and the other has an abundance of 7.5 %. Knowing that the atomic mass of lithium is 6.941 which is the more abundant isotope? (circle your answer)

6. (a) How many electrons are there in a sodium atom?
- (b) Does an atom of sodium gain or lose electrons when forming an ion?
- (c) How many electrons are gained or lost by the atom?
- (d) Write down the chemical reaction showing the formation of a sodium ion.
7. Calculate the molar mass (g/mol) of calcium carbonate (CaCO_3) to 3 significant figures.
8. Match the symbol provided with each of the following ions:
- (a) nitrate ion (b) nitrite ion
- (c) nitride ion (d) ammonium ion
- Choices: NO^- , N^{2-} , N^{3-} , NO_2^- , NH_4^+ , NO_3^-
9. Give the formulas of the following compounds:
- (a) Tin (II) chloride (b) Copper (II) nitrate
- (c) Hydrochloric acid (d) Sodium hydroxide
10. Name the following compounds and classify them as either molecular or ionic:
- (a) $\text{Pb}(\text{CO}_3)_2$ (b) H_2O
- (c) CaSO_4 (d) CO_2

BONUS PROBLEMS:

Chose one from the two bonus problems below. DO NOT DO BOTH!!!

BONUS:

Nitrous oxide (dinitrogen monoxide) is a potent greenhouse gas. It enters the atmosphere from fertilizer breakdown, car exhausts, and many other sources. Some studies have shown that the isotope ratios of ^{15}N to ^{14}N and of ^{18}O to ^{16}O in nitrous oxide depend on the source. Thus, measuring the relative abundance of molecular masses in a sample of the gas can help determine the source.

- (a) What different molecular masses are possible for nitrous oxide?
- (b) The percent abundance of ^{14}N is 99.6 %, and that of ^{16}O is 99.8 %. Which molecular mass of nitrous oxide is least common, and which is most common?

BONUS2:

At 25 °C the density of water is 0.997 g/cm³, whereas the density of ice at -10 °C is 0.917 g/cm³.

- (a) If a soft drink can (volume = 250. mL) is filled completely with water and then frozen, what volume does the solid occupy?
- (b) Can the ice be contained within the can? Explain your answer.