

TEST 3 (of 3)

Show all of your work. Student's should make use of the conversion factor method throughout and express their answers in scientific notation.

1.
 - (a) How did Mendeleev arrange the elements in his periodic table?

 - (b) Why did Mendeleev leave gaps in his periodic table?

2. Complete the following:
 - (a) Iodine sublimates when heated. What does this mean?

 - (b) Give the name of the only nonmetallic liquid element at room temperature.

 - (c) Describe the expected reactivity of the Group IA metals sodium and potassium in water and in mineral oil.

3. Compare the sizes of the following atoms and ions. In each case explain why one is larger than the other.
 - (a) A potassium atom and a potassium ion.

 - (b) A bromine atom and a bromide ion.

 - (c) A sodium ion and a fluoride ion.

4. Write a complete chemical equation to represent the ionization of a chlorine atom to a chloride ion using Lewis electron-dot symbols. Is this oxidation or reduction? Explain.

5. Explain why hydrogen bromide, HBr, readily dissolves in water, but the liquid element bromine, Br₂, is only slightly soluble in water. Draw Lewis structures to illustrate your points.

6. Draw Lewis structures **and** determine the shape of:
- (a) Water (H_2O) (b) Carbon tetrachloride (CCl_4)
7. (a) An unknown white crystalline substance is a solid at room temperature. It dissolves in water to give a solution that conducts electricity. Was the bonding of this unknown ionic, polar covalent, nonpolar covalent or metallic? Explain.
- (b) Battery acid is a solution of H_2SO_4 in water. It is a good conductor of electricity. What does this tell us about the bonding of H_2SO_4 when the acid is dissolved in water? Explain.
8. (a) Calculate the molar mass of lead sulfide (PbS).
- (b) For each 10.0 kg of PbS ore mined how many kg of Pb can be obtained?
9. How many grams of potassium nitrate (KNO_3) are needed to prepare 500. mL of a 0.100 mol/L solution? (Hint: concentration = number moles / volume)
10. Complete and balance a chemical reaction for the following redox reactions. Also identify the **reactants** that are oxidized and reduced.
- (a) Copper reacts with chlorine gas to produce copper (II) chloride.
- (b) Copper metal reacts with oxygen and forms copper (I) oxide.
- (c) Fe_2O_3 reacts with carbon to produce iron metal and a gas.
- (d) Magnesium reacts with silver ions to produce silver metal and magnesium ions.

BONUS:

11. Which of the following metals will react with a solution of $\text{Zn}(\text{NO}_3)_2$?
- (a) K
(b) Ag
(c) Mg
(d) Au