

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) Which group of elements in the periodic table has the greatest atomic size?
 - (b) Which group of elements in the periodic table has the smallest atomic size?
 - (c) Compare the sizes of a magnesium atom and a magnesium ion. Explain the size differences.
 - (d) Compare the sizes of a sulfide ion, S^{2-} , and a chloride ion, Cl^- . Explain the size differences.

2.
 - (a) On what basis did Mendeleev arrange the elements in his periodic table?
 - (b) On what basis are the elements arranged in the modern periodic table?
 - (c) Give the group number and the number of valence electrons for the element with atomic symbol F.
 - (d) Give one example of an **ion** that is isoelectronic with F^- .

3. Answer any TWO of the following:
 - (a) Which two ions from Group IIA are common in hard water and are responsible for white crystalline deposits around faucets?
 - (b) What element is used in galvanizing? Why is this done?
 - (c) How are iron and steel different?
 - (d) Iodine sublimates when heated, what does this mean?
 - (e) What element can be extracted from bauxite? Why is the extraction expensive?

4. Use Lewis dot symbols to represent the overall reaction of magnesium with sulfur to form magnesium ions, Mg^{2+} , and sulfide ions, S^{2-} .
 - (a) Half-reaction for magnesium:
 - (b) Half-reaction for sulfur:
 - (c) Combined:
 - (d) Identify which element is being oxidized and which is being reduced.

5. Predict the form of bonding in the following compounds:
 - (a) Br_2 liquid
 - (b) KI solid
 - (c) HI gas
 - (d) SO_2 gas

6. Draw Lewis structures **and** determine the shape of:
- (a) Bromine (Br_2) (b) Carbon dioxide (CO_2) (b) Sulfur dioxide (SO_2)
7. (a) Unknown C was a solid with a silvery shine. It did conduct an electric current, but the solid could not be melted in Bunsen burner. The unknown did not dissolve in water or lighter fluid, but it did react with an acid. Was the bonding of unknown C ionic, polar covalent, nonpolar covalent or metallic?
- (b) Unknown B was a white crystalline solid at room temperature. It dissolved in water to give a solution that conducted an electric current. Was the bonding of unknown D ionic, polar covalent, nonpolar covalent or metallic?
8. Use the following relationships to solve the questions below:
- no. moles (mols) = mass (g) / molar mass (g/mol), $n = m / M$
- no. moles (mols) = concentration (mols/L) x Volume (L), $n = c V$
- The symbol M means moles per liter.
- (a) Write down the chemical formula for copper (II) sulfate.
- (b) How many moles of copper sulfate are there in one liter of a 0.100 M solution?
- (c) Calculate the molar mass of copper sulfate to 2 decimal places (g/mol).
- (d) How many grams of copper (II) sulfate are needed to prepare 250 mL of a 0.100 M solution?

9. Magnesium carbonate can be produced by the reaction of carbonic acid (H_2CO_3) with magnesium hydroxide.
- (a) Write the balanced equation for the reaction.
- (b) Identify the acid, base, and salt.
Acid: _____, Base: _____, Salt: _____
- (c) Write the net ionic equation for the reaction.
- (d) List the spectator ions.
10. Complete and balance following REDOX reactions. Identify the elements being oxidized and the elements being reduced.
- (a) Potassium metal reacts with water to form explosive hydrogen gas and a basic solution of potassium hydroxide.
- (b) Zinc reacts with hydrochloric acid.
- (c) Magnesium metal reacts with a solution of copper (II) nitrate, $\text{Cu}(\text{NO}_3)_2$.
- (d) Copper metal reacts with a solution of magnesium nitrate, $\text{Mg}(\text{NO}_3)_2$.

BONUS:

11. Draw Lewis electron dot structures of the following compounds.
- (a) Carbonate ion (CO_3^{2-})
- (b) Aluminum chloride (AlCl_3)