

Unit 2 – Bonding and Reactions

1. Define Ionic and Covalent Bonding. List the typical physical properties of ionic & covalent compounds?

	Definition	Physical Properties
Ionic Bonding		
Covalent Bonding		

2. Based on the type of elements identify each as ionic or covalent:

a) CO₂, _____

b) NaCl, _____

c) FeCl₂, _____

d) CCl₄, _____

e) Al₂SO₃, _____

3. Using difference in electronegativities ($\Delta E.N.$). Classify as ionic, non-polar covalent, or polar covalent.

	($\Delta E.N.$)	Type of bond
H ₂		
CH ₄		
LiF		
H ₂ O		

3. Illustrate the ionic bonding between **Mg** and **P** using both Lewis diagrams.

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4. Use Lewis diagrams and structures to show the **covalent bonding** between O + Cl, P + H, N + N. Indicate on your drawings if any of the bonds are polar.

Element involved in bond	Structural Diagram	Type of Bonding
Ex. Carbon and oxygen	Formula: Name:	
O + Cl	Formula: Name:	
P + H,	Formula: Name:	
N + N	Formula: Name:	

More Mixed Naming Fun!

Name these compounds. They may be either ionic or covalent.

- 1) LiOH _____
- 2) PBr₃ _____
- 3) Na₂SO₄ _____
- 4) (NH₄)₂S _____
- 5) CaCO₃ _____
- 6) CF₄ _____
- 7) NaNO₃ _____
- 8) P₂S₃ _____
- 9) Al(NO₃)₃ _____
- 10) Mg(OH)₂ _____

Write the formulas for the following compounds. Remember, they may be either ionic or covalent compounds, so make sure you use the right method!

- 11) potassium oxide _____
- 12) phosphorus tribromide _____
- 13) calcium hydroxide _____
- 14) dinitrogen sulfide _____
- 15) carbon monoxide _____
- 16) diboron tetrahydride _____
- 17) phosphorus pentabromide _____
- 18) sulfur dichloride _____
- 19) sodium carbonate _____
- 20) aluminum acetate _____

Worksheet: Writing Equations

Write equations for the following reactions:

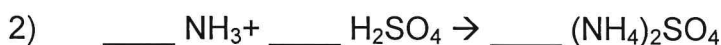
- 1) The reaction of ammonia with iodine to form nitrogen triiodide (NI_3) and hydrogen gas.
- 2) The combustion of propane (C_3H_8).
- 3) The incomplete combustion of propane.
- 4) The reaction of nitric acid with potassium hydroxide.
- 5) The reaction of copper (II) oxide with hydrogen to form copper metal and water.
- 6) The reaction of iron metal with oxygen.
- 7) The complete combustion of 2,2-dimethylpropane (C_4H_{10}) in oxygen.
- 8) The reaction of AlBr_3 with $\text{Mg}(\text{OH})_2$.
- 9) The decomposition of hydrogen peroxide to form water and oxygen.
- 10) The reaction of ammonia with sulfuric acid.

Six Types of Chemical Reaction Worksheet

Balance the following reactions and indicate which of the six types of chemical reaction are being represented:



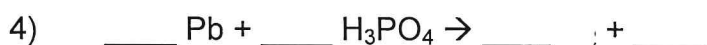
Type of reaction: _____



Type of reaction: _____



Type of reaction: _____



Type of reaction: _____



Type of reaction: _____



Type of reaction: _____

7) What's the main difference between a double displacement reaction and an acid-base reaction?

8) Combustion reactions always result in the formation of water. What other types of chemical reaction may result in the formation of water? Write examples of these reactions on the opposite side of this paper.

Unit 2: Bonding / Reaction Review – Application and Communication

1. Ms. Warner discovers a blue solid under an old cupboard in the chemistry lab. As a responsible chemist, she simply cannot throw it out. The identity of the substance needs to be known before it can be disposed – correctly, so she decides to do some tests on it.

Test	Observation
1. (a) hits substance with hammer	-breaks into smaller crystals; hard little pieces
2. (b) places solid into H ₂ O	-dissolves into the solution; able to conduct electricity (solution turns light bulb on)
3. (c) heats solid in test tube with flame	-changes colour (blackens) and releases a gas; gas makes limewater turn milky
	-has a very high melting point, >500 ^o C

- From the observations made, indicate one chemical and one physical property that were discovered about the solid.
- From the observations, what type of substance was the blue solid? Defend your choice. Be as specific as possible.
- Explain what allows this compound to act as an electrolyte when dissolved in solution.

Unit 2: Bonding / Reaction Review – Application and Communication

2. Complete Table 1.

Table 1. Compounds formed between lithium and the halogens

Compound	Melting point	Difference in electronegativity
LiF		
LiCl		
LiBr		
LiI		

a) Explain the trend in melting point for these compounds. What does this indicate about the strength of the ionic bond?

b) How does the strength of the ionic bond relate to the difference in electronegativity between the elements forming the bond?

3. Even though coal-burning power plants have survived through the years with many objections, the environmental problems that they are responsible for are real. Coal contains sulfur compounds, meaning the combustion of coal produces sulfur dioxide, $\text{SO}_2(\text{g})$.

a. Sulfur dioxide released to the atmosphere reacts further with oxygen to form sulfur trioxide gas. Give the balanced equation for this reaction. Indicate the type of chemical reaction.

b. Sulfur trioxide gas reacts with water vapour producing sulfuric acid. Give the balanced equation for this reaction. Indicate the type of chemical reaction.

c. Explain why the burning of coal has been an environmental concern.

Unit 2: Bonding / Reaction Review – Application and Communication

4. Two inert electrodes have been immersed into an aqueous solution containing copper(II) chloride. The electrodes are then connected to a power supply and the apparatus is moved into a fume hood. As the power supply is steadily increased, bubbles begin to form at one of the electrodes creating an unpleasant odour. The other electrode has a brownish-pink solid forming on it, and over time the blue colour of the solution fades.
- Write a word equation representing the reaction that is taking place.
 - Give the balanced chemical equation for the reaction. Indicate the type of chemical reaction.
5. A clear, colourless solution was left in an unlabeled beaker on the chemistry bench from the previous day's experiment. The classes had used two solutions yesterday: aqueous hydrochloric acid and aqueous silver nitrate. The identity of the solution would be determined through simple diagnostic tests. The solution turned blue litmus paper red and when a piece of zinc was placed in a test tube with the solution, bubbles began to form on the surface of the metal. The gas that formed was then exposed to a lit splint and created a small 'pop' noise.
- List one physical property of the solution and one chemical property of the solution.
 - Write a word equation representing the reaction of the solution with zinc.
 - Give the balanced chemical equation for the reaction. Indicate the type of chemical reaction.
 - What results would have been expected from the diagnostic tests if the identity of the solution was actually aqueous silver nitrate?