Complete the following problems to help prepare for the test.

Objective 1: Students will know the different types of bonds.

- Which subatomic particle allows chemical bonding to occur? Valence Electrons
- 2. Give the definition for the following types of bonds:
 - Ionic Bond between a metal and a nonmetal, atoms give up or take valence electrons
 - Covalent Bond between two nonmetals, atoms share valence electrons
 - Metallic Bond metals share a sea of electrons
- 3. What are the differences between and ionic and a covalent bond?

Ionic Bonds	Covalent Bonds
form between metals and nonmetals	form between nonmetals
give or take valence electrons	share valence electrons

- 4. What type of bonds do the following compounds have:
 - Fe₂O₃ lonic Bond
 - CH₄ Covalent Bond
 - Mg, Metallic Bond
 - 5. Identify the type of bond that HCl is (see example below). Give an explanation of how the electrons are exchanged in this type of bond and this example.



Covalent bond since it is between two nonmetals, hydrogen wants to have 2 valence electrons, chlorine wants to have 8 valence electrons, and the two atoms share each other's valence electrons in order to achieve this.

6. Identify the type of bond that KBr is (see example below). Give an explanation of how the electrons are exchanged in this type of bond and this example.



Ionic bond since potassium is a metal and bromine is a nonmetal, potassium and bromine would each like to have 8 valence electrons, bromine is going to take potassium's 1, however, because in ionic bonds, the nonmetal always steals electrons from the metal. After bromine takes potassium's 1 valence electron, each element's atom changes charge. Since potassium got rid of an electron, it has a +1 charge and bromine gained an extra electron so it has a -1 charge overall. **Objective 2:** Students will understand The Law of Conservation of Mass and why balancing chemical equations is important.

- 1. The Law of Conservation of Mass states that matter cannot be created or destroyed.
- 2. A student placed an unknown amount of HCl into a beaker and then added 5 g of salt. He stirred the HCl and salt until the salt dissolved and then measured the mass again. The final mass was 47g. Using the Law of Conservation of Mass explain what the mass of the HCl that was added should be and why.

The mass of the HCl should be 42g. The law of conservation of mass states that the matter cannot be created or destroyed, which means that the mass of the reactants must equal the mass of the products. (The type of atoms must also be the same on the reactant side of a chemical equation and the product side of the chemical equation.)

3. A student has measured out 400 mL of water and placed it in a beaker on top of a Bunsen burner. The water has a mass of 400g. While waiting for the water to boil he sits down and begins working on his science questions. He becomes so caught up in his work that 30 minutes has passed. He removes the beaker from the Bunsen burner with his tongs and notices that much of the water has "disappeared"; he is confused until he remembers something his teacher told him... Matter cannot be created or destroyed. He begins to think – where has it gone? Help this student – where has the water gone? Explain using the law of conservation of mass.

Since matter cannot be created or destroyed, the water that was in the beaker could not have just "disappeared." The atoms that made up the "missing" water were turned in to water vapor/steam as it heated up and boiled. Those atoms just ended up in the air.

4. Are the following chemical equation balanced or not? Show us by creating a T-chart of the number of atoms for each element in the reactants and the products.

$CH_4 + 2O_2 \rightarrow$	$CO_2 + 2H_2O$	2HCl + 2Na \rightarrow	$2NaCl + H_2$
C 1	C 1	H 2	H 2
H 4	H 4	Cl 2	Cl 2
O 4	04	Na 2	Na 2

BALANCED

BALANCED

$2AIBr_3 + 3K_2SO_4 \rightarrow 6KBr + AI_2(SO_4)_3$		$HNO_3 + NaHCO_3 \rightarrow NaNO_3 + H_2O + CO_2$	
AI 2	AI 2	H 2	H 2
Br 6	Br 6	N 1	N 1
К 6	K 6	O 6	O 6
S 3	S 3	Na 1	Na 1
O 12	0 12	C 1	C 1
BALANCED		BALANCED	

5. Explain why it is necessary to balance chemical equations?

Since matter cannot be created or destroyed, the number of atoms of each element that goes into a chemical reaction (the reactants) has to equal the number of atoms of each element that are produced by the chemical reaction (the products).

Objective 3: Students will know the evidence that a chemical reaction has occurred and will know whether it is an endothermic or exothermic reaction.

- 1. Does an endothermic reaction require or give off heat? requires heat (heat is absorbed in the chemical reaction)
- 2. What happens to the surrounding air temperature when an endothermic reaction takes place? surroundings get cooler
- 3. Does an exothermic reaction require or give off heat? gives off heat (heat is released in the chemical reaction)
- 4. What happens to the surrounding air temperature when an exothermic reaction takes place? surroundings get warmer
- 5. List the five pieces of evidence that a chemical reaction has taken place.
 - Gas bubbles
 - Change in temperature
 - Change in color
 - Formation of a precipitate
 - Odor

From the following list, state which are examples of evidence of chemical reactions and which ones are not examples of evidence of chemical reactions.

- 6. Burning toast in the toaster chemical reaction
- 7. Chopping up firewood **not a chemical reaction**
- 8. Mixing red and blue paint together in order to get purple **not a chemical reaction**
- 9. Blowing bubbles through a straw in a glass of chocolate milk not a chemical reaction
- 10. Crystals forming when making rock candy chemical reaction
- 11. Adding ice cubes to hot chocolate so it cools down faster **not a chemical reaction**
- 12. The smell that is given off from a stink bomb chemical reaction
- 13. Using the 5 indicators of chemical reactions explain how you can determine whether a chemical reaction has taken place or not in the scenario below:

A scientist poured chemical X, which is a clear liquid into a beaker with chemical Y, which is a yellow liquid and waited approximately 15 seconds. At the end of the 15 seconds, the liquid in the beaker turned bright orange and the beaker was cool to touch. A chemical reaction had taken place.

there is a color change after the reaction took place

there is a change in the temperature after the reaction took place

Classify each of the following reactions as either exothermic or endothermic.

14. $2CH_3COOH + Na_2CO_3 + Energy \rightarrow 2CH_3COONa + H_2O + CO_2$ endothermic (because heat is being absorbed in the chemical reaction)

15. $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O + Energy$ exothermic (because heat is being released from the chemical reaction)

Decide whether each of these reactions is exothermic or endothermic:

- 16. When two chemicals mix their temperature rises: endothermic
- 17. A solid burns brightly and releases heat, light and sound: exothermic
- 18. When two chemicals are mixed their temperature drops: exothermic
- 19. Plants take in light energy for photosynthesis: endothermic
- 20. Evaporation: endothermic
- 21. The combustion reaction in a car engine: exothermic
- 22. Digestion of food: **exothermic**

23. Condensation: exothermic

24. Draw an endothermic reaction graph. Label the reactants, products, x axis, y axis. Give a brief explanation of the exchange of heat (is it being absorbed or released). State whether the surrounding get cooler or warmer when this type of reaction occurs. Heat is being absorbed in this reaction. The surroundings get cooler during this type of reaction.

See Graph A Below.

25. Draw an exothermic reaction graph. Label the reactants, products, x axis, y axis. Give a brief explanation of the exchange of heat (is it being absorbed or released). State whether the surrounding get cooler or warmer when this type of reaction occurs. Heat is being released in this reaction. The surroundings get warmer during this type of reaction.

See Graph B Below.



26. Give an example of a time when there is evidence that a chemical reaction has occurred, but a chemical reaction has not actually taken place.

27. Give an actual example of when the same type of evidence is actually caused by a chemical reaction.