

Part B  
Part A

1. Copper is an element because \_\_\_\_\_  
\_\_\_\_\_
2. You have three test tubes. One has hydrogen gas in it, one has oxygen gas in it, and one has carbon dioxide in it. How could you work out which is which?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. Write the balanced symbol equation for the reaction that occurs when hydrogen burns.  
\_\_\_\_\_
4. Describe two ways of collecting gases produced by a chemical reaction. Draw diagrams to help illustrate your answer.  
(a) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
(b) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
5. In chemical reactions, atoms are not created or destroyed. What does happen in chemical reactions?  
\_\_\_\_\_  
\_\_\_\_\_
6. How did the discovery of hydrogen gas lead to the discovery that water is not an element?  
\_\_\_\_\_  
\_\_\_\_\_
7. Why is helium used in modern airships instead of hydrogen?  
\_\_\_\_\_  
\_\_\_\_\_

Part C

8. When magnesium metal (Mg) is heated slowly, it chemically reacts with oxygen (O<sub>2</sub>) to produce magnesium oxide (MgO). Write this information as a chemical equation.  
(Word Equation) \_\_\_\_\_  
(Balanced Symbol Equation) \_\_\_\_\_
9. (a) Lavoisier did not use magnesium. He used mercury. When mercury (Hg) is heated slowly, it chemically reacts with oxygen (O<sub>2</sub>) to produce mercury oxide (HgO). Write this information as a chemical equation.  
(Word Equation) \_\_\_\_\_  
(Balanced Symbol Equation) \_\_\_\_\_  
(b) When Lavoisier heated mercury oxide really strongly, it broke back down into mercury metal and oxygen gas. Write this information as a chemical equation.  
(Word Equation) \_\_\_\_\_  
(Balanced Symbol Equation) \_\_\_\_\_

10. If you slowly heat a fixed amount of magnesium, the magnesium oxide powder that is formed is heavier than the original amount of magnesium. Why?

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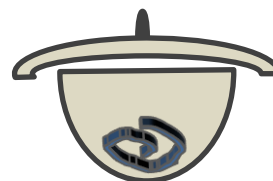


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11. **Data-Analysis Exercise:**

A student heats up exactly 0.200 grams of magnesium in a crucible, and it eventually turns into magnesium oxide, a white powder. The student keeps the lid on the crucible for most of the experiment to ensure that no smoke escapes. Below are the results that were obtained.

(a) Fill in the missing values.



- Mass of magnesium strip: 0.200grams
- Mass of crucible + lid: 23.800grams
- Mass of crucible + lid + magnesium strip: \_\_\_\_\_
- Mass of crucible + lid + magnesium oxide: 24.132grams

Overall increase in mass: \_\_\_\_\_ grams (which comes as a result of the oxygen that reacted with the magnesium)

Mass of the magnesium oxide that formed: \_\_\_\_\_ grams

The chemical equation:

\_\_\_\_\_ grams magnesium + \_\_\_\_\_ grams oxygen → \_\_\_\_\_ grams magnesium oxide

(b) Why is it better to calculate the mass of the magnesium oxide that was produced rather than scraping out the magnesium oxide onto the electronic scales?

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12. When Antoine Lavoisier heated his sample of mercury in an enclosed container (which had air in it), he noticed that about 80% of the air in the container did not chemically react with the mercury, but about 20% did. Explain this set of results.

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13. Fill in the tables below.

Atmospheric Composition	
Gas	Amount (%)
nitrogen (N <sub>2</sub> )	
oxygen (O <sub>2</sub> )	
argon (Ar)	
carbon dioxide (CO <sub>2</sub> )	
other gases	

% Composition of Inhaled and Exhaled Air		
Gas	inhaled air (atmospheric air)	exhaled air
nitrogen (N <sub>2</sub> )		
oxygen (O <sub>2</sub> )		
carbon dioxide (CO <sub>2</sub> )		
other gases		

14. What happens to the nitrogen (N<sub>2</sub>) we inhale?

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15. What happens to the oxygen (O<sub>2</sub>) we inhale?

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16. Where does the carbon dioxide (CO<sub>2</sub>) in the air we exhale come from?

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Part D

17. Place the following substances into the correct column.

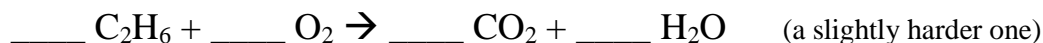
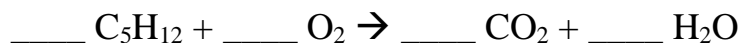
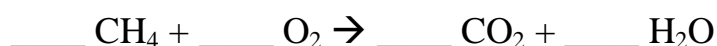
carbon (C), oxygen (O), carbon dioxide (CO<sub>2</sub>), sea water, hydrogen (H), water (H<sub>2</sub>O), nitrogen (N), wood, carbon monoxide (CO), bread, magnesium (Mg), concrete, magnesium oxide (MgO), Zinc (Zn), copper (Cu), salt (NaCl), the atmosphere.

Elements	Compounds	Mixtures

### Skill-Building Exercises

18. Balance the following equations:

(it's usually best to just work in order; balance the Cs first, then the Hs and then the Os)  
(you don't need to write a "1" if, for example, you need only 1 CH<sub>4</sub>)



19. Balance the following equations:

