

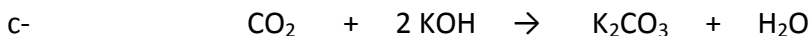
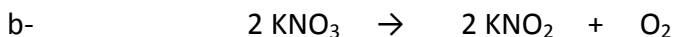
Review for particle model, balancing equations, neutralization and combustion test

Particle model, Balancing Equations and Mass

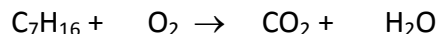
1. Represent the following with symbols.

	Symbol		Symbol
CO ₂		2 Na ₂ SO ₄	
6 Na		2 Mg(OH) ₂	
3 O ₃		CH ₃ COOH	

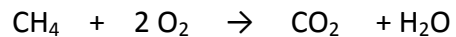
2. Represent each equation using the particle model.



3. The combustion of heptane, C₇H₁₆, produces carbon dioxide, CO₂, and water vapour, H₂O, as indicated in the following unbalanced equation. Balance this equation.

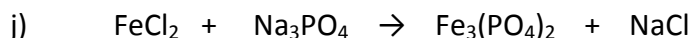
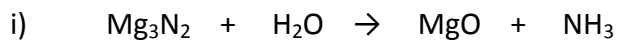
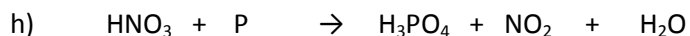
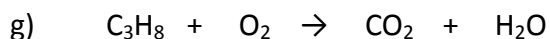
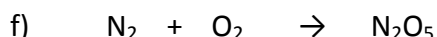
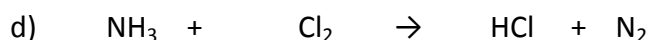
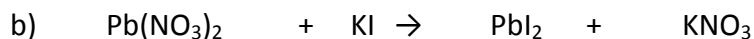


4. A certain amount of methane (CH₄) reacts completely with 320 g of oxygen gas (O₂) to produce 220 g of carbon dioxide (CO₂) and 180 g of water (H₂O). This combustion reaction is described by the following balanced equation:



What is the total mass of the reactants involved in this combustion reaction?

5. Balance the equations below:



6. Reaction 1 is the balanced equation for a neutralization reaction.



If 3.65 kg of HCl reacts with 4.00 kg of NaOH, this produces 1.80 kg of H₂O and a certain amount of NaCl.

Reaction 2 is the balanced equation for the electrolysis of sodium chloride.



Then all the NaCl from reaction 1 is used in reaction 2 to produce 2.30 kg of Na and a certain amount of Cl₂. What is the mass of Cl₂ obtained after reaction 2?

7. The reaction caused by the burning of butane in air is represented by the following equation:

$$2 \text{C}_4\text{H}_{10(g)} + 13 \text{O}_{2(g)} \rightarrow 8 \text{CO}_{2(g)} + 10 \text{H}_2\text{O}_{(g)} + \text{Energy}$$

During a laboratory experiment, you react 29 g of butane (C₄H₁₀) in the presence of oxygen (O₂). You observe that 88 g of carbon dioxide (CO₂) and 45 g of water vapour (H₂O) form. What mass of oxygen did you use in this experiment?

A) 59 g

B) 104 g

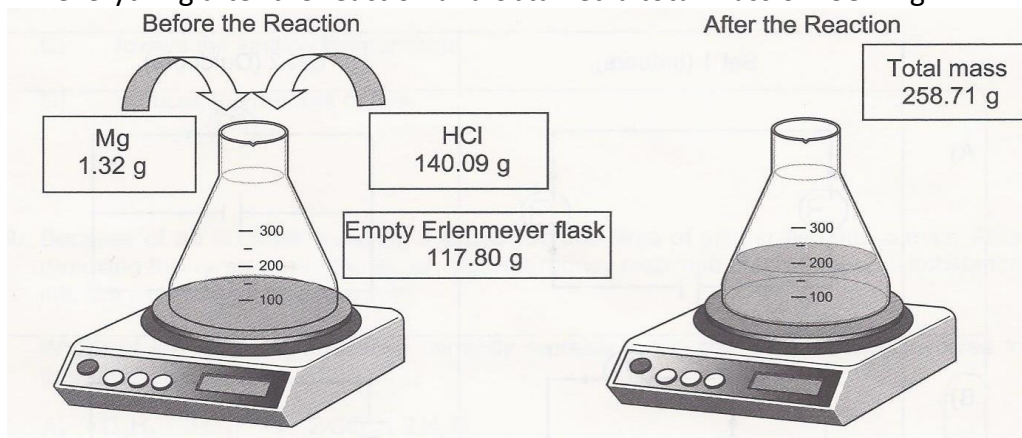
C) 133 g

D) 162 g

8. When 2 grams of methane CH_4 , is burned in 8 grams of oxygen, 5.5 g of carbon dioxide, CO_2 , and a certain amount of water are produced. Which of the following shows the balanced equation for this reaction, and an equation representing the masses of the reactants and the products involved?

Balanced Equation	Equation
A) $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$	$2 \text{ g} + 8 \text{ g} = 5.5 \text{ g} + 4.5 \text{ g}$
B) $\text{CH}_4 + 2 \text{ O}_2 \rightarrow \text{CO}_2 + 2 \text{ H}_2\text{O}$	$2 \text{ g} + 16 \text{ g} = 5.5 \text{ g} + 14.5 \text{ g}$
C) $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$	$2 \text{ g} + 16 \text{ g} = 5.5 \text{ g} + 14.5 \text{ g}$
D) $\text{CH}_4 + 2 \text{ O}_2 \rightarrow \text{CO}_2 + 2 \text{ H}_2\text{O}$	$2 \text{ g} + 8 \text{ g} = 5.5 \text{ g} + 4.5 \text{ g}$

9. You conducted the following experiment in the laboratory. In an Erlenmeyer flask which has a mass of 117.80 g, you combined a small amount, 1.32 g of magnesium (Mg) with 140.09 g of a weak solution of hydrochloric acid (HCl). A reaction occurred. You weighed everything after the reaction and obtained a total mass of 258.71 g.



Four students have different procedures of what they could have done differently to ensure that the mass remained the same during the reaction.

Which student's procedure would have ensured the mass remain the same?

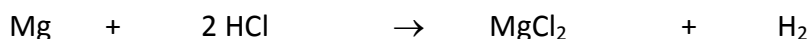
- A) Paul thought he could have stirred the mixture while the reaction was taking place.
- B) Carol thought she could have used more concentrated acidic solution.
- C) Sandra thought she could have sealed the Erlenmeyer flask after adding the reactants.
- D) Bob thought he could have increased the amount of magnesium used.

10. Some rocket engines use hydrogen (H_2) as fuel. The reaction which is produced is shown in the equation below. $2 \text{ H}_2 + \text{O}_2 \rightarrow 2 \text{ H}_2\text{O}$

What mass of water will be produced during the launch of the rocket if 80 kg of hydrogen (H_2) burn along with 640 kg of oxygen (O_2)?

- A) 680 kg
- B) 720 kg
- C) 1 440 kg
- D) 1 600 kg

11. The reaction involving magnesium (Mg) and hydrochloric acid (HCl) produces magnesium chloride (MgCl₂) and hydrogen gas (H₂). The balanced equation for this reaction is as follows:

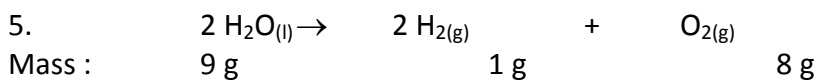
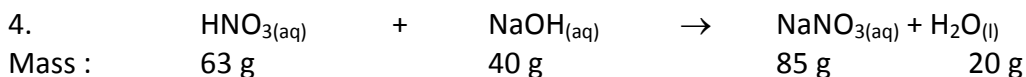
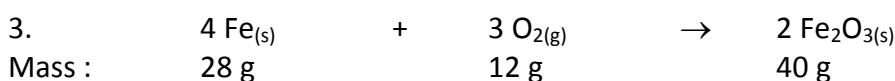


In the laboratory, 6.00 g of magnesium (Mg) reacts with a certain amount of hydrochloric acid (HCl) to form 23.75 g of magnesium chloride (MgCl₂) and 0.50 g of hydrogen gas (H₂).

What mass of hydrochloric acid (HCl) is needed for this reaction to occur?

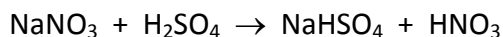
- A) 9.13 g B) 18.25 g C) 24.25 g D) 48.50 g
12. Which of the following newspaper items contradicts the law of conservation of matter?
- A) Three tonnes of a miracle fuel combines with eight tonnes of oxygen to form one tonne of greenhouse gas and ten tonnes of water vapour."
 B) "Scientists have finally compressed four kilograms of lead into three kilograms of gold."
 C) "Yesterday, two water molecules were converted into two hydrogen molecules and one oxygen molecule."
 D) "Local high school students discovered that adding 25 kJ of energy to 10 g of ice produces 10 g of water vapour."

13. Which of the following sets of results can be used to verify the Law of Conservation of Mass?



- A) 1, 3, 4 and 5 B) 2, 3, 4 and 5 C) 1, 2, 3 and 4 D) 1, 2, 3 and 5

14. The balanced equation for a particular chemical reaction is



In the laboratory, you react 8.5 g of NaNO_3 with 9.8 g of H_2SO_4 and obtain 12.0 g of NaHSO_4 and a certain quantity of HNO_3 . What is this quantity of HNO_3 ?

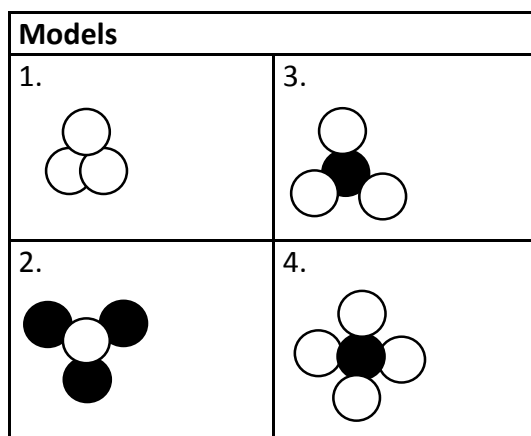
15. The molecular models below are constructed using the following symbols:



: Aluminum



: Chlorine



Which of the above models correctly represents the structure of a molecule of aluminum chloride (AlCl_3)?

A) Model 1

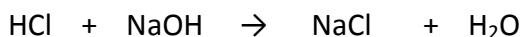
B) Model 2

C) Model 3

D) Model 4

Neutralization

1. What type of reaction is seen below? How do you know?

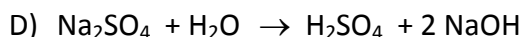
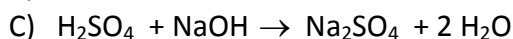


2. The following equation represents the reaction that occurs when a solution of hydrogen bromide is combined with a solution of lithium hydroxide :



The products are not identified in the above equation. Identify these products.

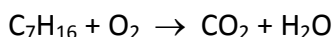
3. In neutralizing sulfuric acid, H_2SO_4 , with caustic soda, NaOH , sodium sulfate, Na_2SO_4 , and water are produced. Which equation represents this chemical reaction?



4. You find a bottle containing an unidentified liquid. By using universal indicator paper, you determine that the pH of this liquid is 11. Therefore you have to neutralize it before disposing of it. Which of the following methods can be used to neutralize the liquid?
- A) Add a solution of NaOH.
 B) Add distilled water.
 C) Add a solution whose pH is 5.
 D) Add a solution whose pH is 8.
5. The following equation : $HI_{(aq)} + KOH_{(aq)} \rightarrow KI_{(aq)} + H_2O_{(l)}$
 Which reaction is represented?
- A) Synthesis B) Oxidation C) Precipitation D) Neutralization
5. Because of an accident involving a truck, 150 000 litres of acid spilled into a river. After removing the vehicle from the water, the emergency response team dumped a substance to neutralize the acid. Which of the following equations correctly represents the chemical reaction involved in this situation?
- A) $C_2H_4 + 3 O_2 \rightarrow 2 CO_2 + 2 H_2O$
 B) $Ca(OH)_2 + 2 HF \rightarrow CaF_2 + 2 H_2O$
 C) $NaOH + KCl \rightarrow NaCl + KOH$
 D) $HBr + KI \rightarrow HI + KBr$

Combustion

1. What type of chemical reaction is seen below? How do you know?



2. Combustion is a chemical reaction that occurs under certain conditions.

The fire triangle below



illustrates the conditions required for

combustion to occur

Ignition temperature

A friend shows you the three conclusions she arrived at after doing her research on forest fires: Justify each of the conclusions by using the fire triangle.

- a) If the wind increases, the forest fire will also increase.
- b) Forest fires are more common in summer, when it is hot and dry, than in autumn, when it is cold and wet.
- c) Forest fires are more likely to occur in mature forests than in young forests.

3. For each combustion reaction, state whether it is an example of spontaneous, rapid or slow combustion
 - a) A fire starts because of a gasoline soaked rug
 - b) A scratched bike has rust on it
 - c) A family is roasting marshmallows on a camp fire
 - d) Stacks of hay start to burn on a hot summer day.
 - e) A half-eaten apple starts to turn brown after you have left it on a table for 40 minutes.
 - f) A candle's wick burning
 - g) a propane barbeque lights up when the gas is ignited

4. Which part of the fire triangle are firefighters tackling in each of the following situations? Explain your answers.
 - a) Firefighters at an airport pour foam onto a pool of flammable liquid spilled by an airplane in distress.

 - b) Firefighters spray water onto the roofs and sides of two houses next to a blaze.

 - c) A bulldozer moves trees out of the way of a forest fire.

5. On a hot and dry afternoon, some hay in a barn caught fire, but there were no external causes involved. Water was used to put out the fire. Spraying the fire with water affected one of the fire triangle components in particular. Which statement indicates both the type of combustion that caused the fire triangle component that the water affected?
 - A) Slow combustion and the water affected the fuel.
 - B) Slow combustion and the water affected the oxidizer.
 - C) Spontaneous combustion and the water affected the ignition temperature.
 - D) Spontaneous combustion and the water affected the fuel.

6. When oil catches fire in a sauce pan, it should be covered with its lid to put out the fire. Why?
 - A) the lid limits the amount of oxidizing agent.
 - B) the lid increases the activation energy
 - C) the lid lowers the ignition temperature
 - D) the lid reduces the amount of fuel

7. Each year, forest fires reduce a significant area of land in Quebec to cinders. Sometimes these fires are the results of human activity but most often, they are caused by lightning strikes. The environmental impact of this phenomenon, which is part of the life cycle of the Boreal Forests, is often widespread. What does the combustion of trees lead to?
- A) The release of oxygen and water in the atmosphere
 - B) The release of carbon dioxide and water in the atmosphere
 - C) The release of oxygen and energy in the atmosphere
 - D) The release of carbon dioxide and glucose in the atmosphere

8. The following two actions bring about or speed up combustion.

Action 1 – Use a magnifying glass to focus the sun’s ray’s on a surface.

Action 2 - Revive a campfire by blowing on the glowing pieces of wood.

Which of the following choices (A, B, C or D) correctly matches the fire triangle component with each action?

	Action 1	Action 2
A	Fuel	Fuel
B	Fuel	Oxidizing agent
C	Ignition temperature	Fuel
D	Ignition temperature	Oxidizing agent

9. Arthur brings a burning match close to a piece of paper to light a campfire. Which of the following triangles correctly represents the situation?

A)

B)

C)

D)