

Name: _____
 Period: _____

Physical Science-Chemistry Final Review

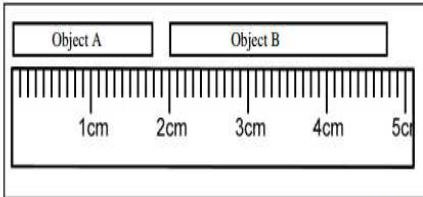
Can this statement be supported by the scientific method?
 "I chocolate chip is the best ice cream flavor."
 Why?

Use the Scientific Method to figure out if a substance is a liquid or solid. (The first step is done for you.)
Step 1: Observe; the substance changes shape.
Step 2:
Step 3:
Step 4:

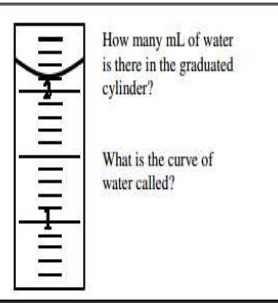
Liquid	Color	Burns?	Volume	Reacts with Baking Soda?
A	Clear	No	35 mL	Yes
B	Clear	Yes	12 mL	No
C	Clear	No	46 mL	Yes
D	Clear	No	88 mL	No

Make a reasonable conclusion from the above data table.

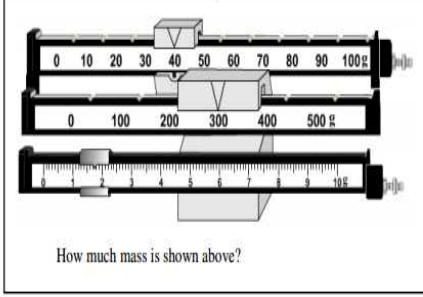
How is a solid different from a liquid?	How is a liquid similar to (like) a gas?	The temperature at which a solid turns to liquid is called:
How is a solid similar to (like) a liquid?	What causes a substance to change phase?	The temperature at which a liquid turns to a gas is called:
How is a liquid different from a gas?	When a substance changes phase, is this a physical or chemical change?	The temperature at which a gas turns to liquid:
		The temperature at which a liquid turns to a solid:
		When a solid turns straight to a gas is called:
		At what temperature does water melt?
		At what temperature does water boil?



How many millimeters is object A? _____ How many millimeters is object B? _____
 How many centimeters is object A? _____ How many centimeters is object B? _____
 How many meters is object A? _____ How many meters is object B? _____



How many mL of water is there in the graduated cylinder?
 What is the curve of water called?



How much mass is shown above?

Which object is the less dense?
 Why?
 Object A: 50 g
 Object B: 50 g

Which object is the less dense?
 Why?
 Object A: 50 g
 Object B: 80 g

Which of the two cylinders above is more precise?
 Why?

What unit do you use to measure the following?

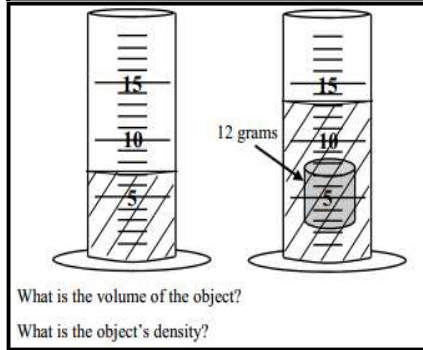
Length _____
 Mass _____
 Volume _____
 Density _____

Mixture (M) or Substance (S) (non-mixture)?	1. Substance or non-mixture	a. Made up of two types of matter that can be physically separated. b. Two samples might not be the same. c. Two samples will have the same makeup. d. Has only one kind of atom in the sample. e. Contains two kinds of atoms that <i>cannot</i> be physically separated. f. Cannot be separated by physical means. g. A classification of anything that has mass and takes up space.
Salt Water _____ Chicken Soup _____	2. Mixture	
Water _____ Salt _____	3. Heterogeneous Mixture	
Silver _____ Chex Mix _____	4. Matter	
Homogenous (Ho) or Heterogenous (He) Mixture?	5. Element	
Salt Water _____ Chicken Soup _____	6. Homogeneous Mixture	
Tomato Soup _____ Plain Jello _____	7. Compound	
Jello with Fruit _____ Chex Mix _____		
What do we call things that can be felt and seen, but we cannot touch and has no mass?		Anything that takes up space and has mass (you can touch it, feel it, see it, etc):

Draw the metric prefixes chart here:

What is the correct order shortest to longest? Kilogram milligram Megagram gram centimeter microgram _____	Convert the following 3.2 kilometers = _____ meters 0.23 centimeters = _____ micrometers 0.12 liter = _____ milliliters 2500 milliliters = _____ liters 4500 grams = _____ kilograms 9 kilograms = _____ grams
Which is bigger? Mega- or kilo-? Centi- or milli-? Micro- or milli-? Centi- or micro-? Kilograms or grams?	How Big Are They Really? A centimeter is the width of: The size of a liter is: A meter is how many feet? A gram is about: A millimeter is the width of:

A 15 g object has a volume of 30 cm³. Find its density.
 A 12 g object has a volume of 6 mL. Find its density.
 A 35 mL object has a density of 2 g/mL. Find its mass.



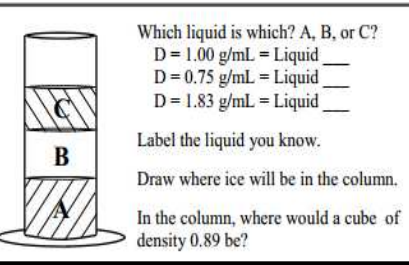
What is the volume of the object?
 What is the object's density?

How do you measure the mass of a liquid?
 How do you measure the volume of a floating object?

Which is more dense: liquid iron or solid iron?
 Which is more dense: gaseous CO₂ or liquid CO₂?
 Which is more dense: liquid water or solid water?

A 200 g object displaces 150 g of water. Float or sink?
 A 300 g object displaces 350 g of water. Float or sink?

A 250 g object displaces 300 g of water. How much cargo can it hold?

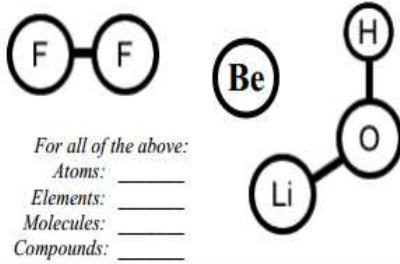


1. Isotope	A. An average of all the isotopes; the mass of average atom.
2. Atomic mass	B. An atom with an equal number of electrons and protons.
3. Atomic #	C. An atom with more or less electrons than protons.
4. Neutral atom	D. A variation of an element with a different number of neutrons.
5. Ion	E. Total number of protons and neutrons in the nucleus.
6. Mass #	F. Number of protons; determines the element.
Metal or Non-metal?	
___ Titanium (___)	___ Neon (___)
___ Sodium (___)	___ Hydrogen (___)
___ Chlorine (___)	___ Nickel (___)

1. Transition Metals	A. Become positive ions.
2. Noble Gases	B. Gain electrons, becoming negative ions
3. Metals	C. Compounds formed when electrons are shared.
4. Nonmetals	D. Do not have consistent oxidation numbers.
5. Ionic	E. Do not combine into compounds.
6. Covalent	F. Compounds formed between positively and negatively charged atoms.

8 protons and 10 electrons. *Neutral atom or ion?*
 16 protons and 18 electrons. *Neutral atom or ion?*
 20 protons and electrons. *Neutral atom or ion?*

Give the element abbreviation and charge.
 16 protons and 18 electrons: Element: ___ Charge: ____
 35 protons and 36 electrons: Element: ___ Charge: ____
 Nitrogen with 10 electrons. Charge: _____.



How many valence electrons?

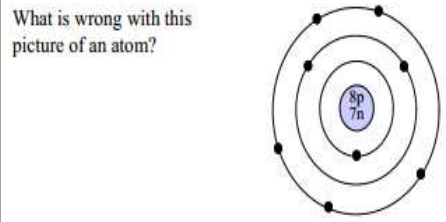
Helium () _____ Lithium () _____
 Calcium () _____ Aluminum () _____
 Sulfur () _____ Nitrogen () _____

Calcium and _____ have the same reactivity.
 Oxygen and _____ have the same reactivity.
 Helium and _____ have the same reactivity.

1. Bohr	A. Discovered that atoms have a nucleus.
2. Dalton	B. Realized that there was a smallest part of matter.
3. Democritus	C. Discovered that electrons are in distinct orbits.
4. Rutherford	D. Discovered the electron.
5. Thompson	E. Theorized that atoms cannot be changed chemically.

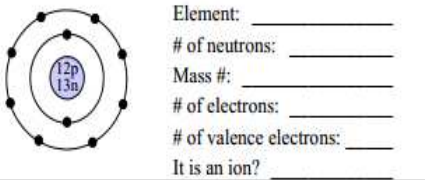
Give the symbol and atomic number of these elements.

Oxygen (O) 8 Boron () _____
 Nitrogen () _____ Bromine () _____
 Helium () _____ Iron () _____
 Sodium () _____ Mercury () _____



Give the symbol and number of protons for these elements.

Aluminum (Al) 13 Lithium () _____
 Phosphorus () _____ Magnesium _____
 Argon () _____ Silver () _____
 Copper () _____ Gold () _____



"Atoms are solid." Respond and give reasons for your response.

How many Aluminums in Al₂O₃? _____
 How many Magnesiums in MgCl₂? _____
 How many Sodiums in Na₃N? _____
 How many Oxygens in Li(NO₃)? _____

- | | |
|----------------------|---|
| 1. Oxidation #s | A. Tells you that atoms are more stable with 8 valence electrons. |
| 2. Octet Rule | B. A molecule of two atoms of the same element. |
| 3. Diatomic Molecule | C. When dissolved in water, a compound that allows electricity to pass. |
| 4. Electrolyte | D. How many electrons are gained or lost. |
| 5. Valence Electrons | E. Outermost electrons of an atom. |

Are these different elements?
 Element A: 17 protons; 18 electrons; 16 neutrons.
 Element B: 18 protons; 18 electrons; 18 neutrons.
Why?

Are these different isotopes of one another?
 Element A: 12 protons; 11 electrons; 13 neutrons.
 Element B: 12 protons; 12 electrons; 14 neutrons.
Why?

Are these different isotopes of one another?
 Element A: 18 protons; 18 electrons; 18 neutrons.
 Element B: 19 protons; 18 electrons; 19 neutrons.
Why?

How many electrons are gained or lost?

K¹⁺ Lost 1 Fe²⁺ _____
 B³⁺ _____ F¹⁻ _____
 S²⁻ _____ N³⁻ _____
 He⁰ _____ Si⁴⁺ _____

Give symbols and number of valence electrons for these:

Aluminum (Al) 13 Beryllium () _____
 Neon () _____ Sodium () _____
 Chlorine () _____ Calcium () _____
 Boron () _____ Sulfur () _____

Calcium () is in row _____. Calcium has _____ complete electron levels and _____ valence electrons in level _____.

Sulfur () is in row _____. Argon has _____ complete electron levels and _____ valence electrons in level _____.

Draw the Lewis Dot Diagrams for the following.

Carbon	Lithium	Sulfur	Argon
Aluminum	Nitrogen	Magnesium	Chlorine

Give these elements with oxidation # in ion notation

Oxygen O²⁻ Boron _____
 Nitrogen _____ Bromine _____
 Helium _____ Potassium _____
 Carbon _____ Hydrogen _____

How many total atoms in Al₂O₃? _____
 How many total atoms in MgCl₂? _____
 How many total atoms in Na₃N? _____
 How many total atoms in Li(NO₃)? _____

Draw 3 different Lewis Dot Diagrams for Aluminum.

How many electrons will be gained or lost by:

K Lost 1 Ar _____
 Al _____ Br _____
 O _____ Ca _____
 Be _____ H _____

Use Electron Arrows to Combine Magnesium and Fluorine

	<i>Ionic, Covalent, or Polyatomic?</i>	<i>Use Prefixes?</i>	<i>Compound Name</i>	<i>Metal or Non-metal?</i>						
1. Al ₂ O ₃	<u>Ionic</u>	<u>No</u>	<u>Aluminum Oxide</u>	___ Cobalt (___)	1. Products	A. Chemicals are mixed and get hot.	1. Coefficient	A. Correct way to smell chemicals		
2. O ₂ F ₂	_____	_____	_____	___ Sodium (___)	2. Exothermic	B. The chemicals before the reaction.	2. Wafting	B. Tells you the number of molecules.		
3. BeF ₂	_____	_____	_____	___ Fluorine (___)	3. Physical change	C. When chemical bonds are broken and new substances are formed.	3. Ammonia	C. Should never be combined with Chlorine bleach.		
4. K ₂ (CO ₃)	_____	_____	_____	___ Argon (___)	4. Chemical reaction	D. A chemical reaction that gets cold.	4. Arrow	D. Means "produces" or "creates".		
5. N ₂ F ₃	_____	_____	_____	___ Magnesium (___)	5. Endothermic	E. The result of a chemical reaction.	5. Precipitate	E. Tells you the number of atoms in a chemical formula.		
6. SF ₆	_____	_____	_____	___ Nickel (___)	6. Reactants	F. No new chemicals are formed.	6. Subscript	F. When a liquid turns cloudy. Means a solid was formed.		
7. Al ₂ (CrO ₄) ₃	_____	_____	_____	<i>Give the total charge</i>				<i>Chemical or Physical Change?</i>		
8. P ₂ S ₃	_____	_____	_____	Ca ₃ ²⁺	+6 _____				___ Bubbles are formed.	___ Evaporation
9. NaN ₃	_____	_____	_____	Ca ₂ ²⁺ O ²⁻	_____				___ Melting	___ Ripping
10. MgO	_____	_____	_____	Mg ²⁺ F ¹⁻	_____				___ Gets cold	___ Photosynthesis
1. PF ₃	_____	_____	_____	Na ¹⁺ F ¹⁻	_____				___ Color changes	___ Gets hot
2. CO ₂	_____	_____	_____	Al ³⁺ S ₂ ²⁻	_____				___ Boiling	___ Changes smell
				Al ³⁺ O ₂ ²⁻	_____				___ Digestion	___ Dissolving Salt
				O ₃ ²⁻	_____				___ Changes temperature	___ Combustion
				Mg ²⁺ (NO ₃) ¹⁻	_____				___ Chewing	___ Changes taste

Write the balanced ionic compounds for the following:

Li²⁺ and O²⁻: _____ K¹⁺ and S²⁻: _____

Na¹⁺ and N³⁻: _____ Li¹⁺ and F¹⁻: _____

Al³⁺ and O¹⁻: _____ Ca²⁺ and P³⁻: _____

Mg²⁺ and Cl¹⁻: _____ Al³⁺ and (NO₃)¹⁻: _____

Write the balanced ionic formulas for the following:

Li and Cl: _____

Mg and O: _____

Al and S: _____

Mg and N: _____

K and (CrO₄): _____

Endothermic or Exothermic Reaction?

___ Two chemicals are mixed and get hot?

___ Heat goes into the reaction?

___ An activated cold pack?

___ Two chemicals are mixed and get cold?

___ Combustion?

___ Heat comes out of a reaction?

___ An activated heat pack?

Find the atomic masses for the following elements

A. Lithium = _____ E. Aluminum = _____

B. Helium = _____ F. Bromine = _____

C. Iron = _____ G. Uranium = _____

D. Silver = _____ H. Nickel = _____

Find the molecular mass of the following compounds.

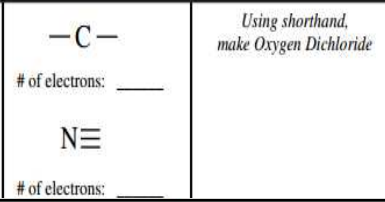
Cl₂

Li₂O

Na(NO₃)

Draw the Lewis Dot Diagram for molecular Fluorine (F₂).

Short hand



Using shorthand, make Oxygen Dichloride


Products are on the _____ side of a chemical reaction.

Reactants are on the _____ side of a chemical reaction.

The arrow points to the _____.

C₆H₁₂O₆ + 6O₂ → 6CO₂ + 6H₂O + energy

Circle the first reactant: _____

 Open or closed reaction?

Will the mass of his products be greater than, less than, or equal to his reactants?

Why?

What does this set up allow us to prove?

Type of Reaction

Balance these reactions:

___ K₃N + ___ Ca(CrO₄) → ___ Ca₃N₂ + ___ K₂(CrO₄)

___ Fe + ___ O₂ → ___ Fe₂O₃

___ NH₃ → ___ N₂ + ___ H₂

___ NH₃ + ___ O₂ → ___ NO + ___ H₂O

___ Mg + ___ Ag(NO₃) → ___ Mg(NO₃)₂ + ___ Ag

Name the first product: _____

How many hydrogen atoms on the product side? _____

How many oxygen atoms on the reactant side? _____

Is this respiration or photosynthesis? _____

What kind of reaction is it? _____

Endothermic or exothermic? _____

Write the following reaction, being sure to use the correct ionic formulas (balanced ionic compounds).

"Magnesium Bromide reacts with Lithium Oxide to produce Magnesium Oxide and Lithium Bromide"

Expand out these compounds.

3NaCl = _____

4MgO = _____

(OH)₂ = _____

Write the following in reaction notation.

2BeCl₂ = _____ Li₂O = _____

4Na = _____ 6K₂S = _____

3Al₂O₃ = _____ 7H₂O = _____

1. Molecular Mass	A. When the reactants equal the products.
2. Closed System	B. When the reaction is closed and gases can't escape.
3. The Law of Conservation of Mass	C. How heavy a compound or molecule is.
4. Open System	D. When gases aren't caught by the experimental setup.
5. Atomic Mass	E. In a closed reaction mass cannot be lost.
6. Balanced Reaction	F. The decimal numbers on the periodic table.

4Li + O₂ → 2Li₂O If 10 g of Lithium reacts with 10g + 12g ? g 12 g of molecular Oxygen, how much Lithium Oxide is produced?

Mg + Cl₂ → MgCl₂ If 9 g of Magnesium reacts with Chlorine to produce 35 g of Magnesium Chloride, how much Chlorine was used in the reaction?

2NaF + K₂O → Na₂O + 2KF Using the numbers given, find how much Na₂O was produced in the reaction.

8g + 9g ? g 11 g

Why do we balance chemical reactions?

PRACTICE QUIZ-TAKE THIS AS A TEST AND GRADE YOURSELF

- 1 Alice wrote down four ideas about earthworm behavior that she wanted to test. Which idea can be tested experimentally?
- Earthworms like the taste of dirt better than sand.
 - Earthworms are happier in black dirt than red dirt.
 - Earthworms exist to decompose decaying materials.
 - Earthworms will move away from direct light sources.

- 2 Which tool did the student use to measure the mass of each metal ball?
- ruler
 - timer
 - digital scale
 - graduated cylinder

- 3 The figure below shows a tree and flowers growing in the sunlight and in the shade.



What is the best hypothesis that can be developed based on the figure?

- Flowers like to grow near trees.
- Flowers grow taller in the sunlight.
- Flowers smell better when they are taller.
- Flowers grow in groups of four when in the shade.

- 4 One of these is NOT a unit of distance. Which one?
- Mile
 - Inch
 - Newton
 - Meter

- 5 The unit of length that most nearly matches the width of your finger is the:
- nanometer.
 - millimeter.
 - centimeter.
 - meter.

- 6 Which of the following are in the correct order from smallest to largest?
- Millimeter, meter, centimeter, kilometer
 - Millimeter, centimeter, meter, kilometer
 - Centimeter, millimeter, meter, kilometer
 - Meter, millimeter, centimeter, kilometer

- 7 How many centimeters are there in a stick 3 meters long?
- 0.3 cm
 - 30 cm
 - 300 cm
 - 3,000 cm

- 8 There are many different ways to classify matter, but one way is to use only two categories for ALL matter. All matter can be classified as either:
- solids or liquids.
 - mixtures or substances.
 - atoms or molecules.
 - elements or compounds.

- 9 A substance made of two or more elements that cannot be separated by physical means is called a:
- compound.
 - homogeneous mixture.
 - heterogeneous mixture.
 - multi-element.

- 10 One of the following is correctly termed a substance, and the others are mixtures. The substance is:
- milk
 - copper
 - granite
 - chicken noodle soup

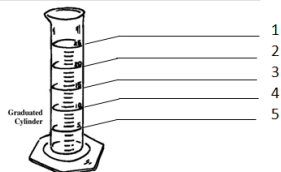
- 11 Evaporation occurs when:
- a solid changes to a gas.
 - a gas changes to a liquid.
 - a liquid changes to a solid.
 - a liquid changes to a gas.

- 12 List the phases of water in order, from the phase with the slowest molecular movement to the phase with the fastest molecular movement.
- Gas-Liquid-Solid
 - Liquid-Solid-Gas
 - Solid-Liquid-Gas
 - Gas-Solid-Liquid

From the chart below, place the liquids and solids in the order they would be layered in the graduated cylinder.

Table: Density Values

Liquids (g/ml)	Solids (g/cm ³)
Ethylalcohol 0.789	
Glycerin 1.26	Cork 0.24
Isopropylalcohol 0.870	
Corn syrup 1.37	



- 13

- 14 Silver (Ag) has 47 protons in each atom. Based on this information, which of the following also describes an atom of silver?
- It has no neutrons.
 - It has 47 electrons.
 - It has 23 neutrons and 24 electrons.
 - It has a total of 94 neutrons and electrons.

- 15 Which of the following is found farthest from the center of an atom?
- nucleus
 - proton
 - neutron
 - electron

- 16 The table below shows the atomic mass of four stable calcium (Ca) isotopes.

Isotope	Atomic Mass
Ca-40	40
Ca-42	42
Ca-43	43
Ca-44	44

What characteristic is different in each isotope?

- the position in the periodic table of the elements
- the net charge of the nucleus
- the mass of the protons in the nucleus
- the number of neutrons in the nucleus

- 17 A common isotope of Carbon has a mass number of 13. The total number of subatomic particles in the nucleus would be:

- 19
- 13
- 12
- 6

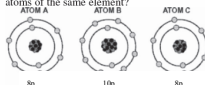
The periodic table notation for nitrogen (N) is shown below. An atom of nitrogen has how many electrons?

7
N
Nitrogen
14.01

- 7
- 7 or 8
- 14 or 15
- Cannot be determined with the information given.

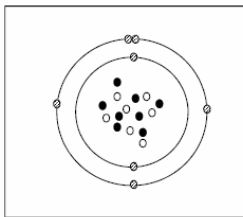
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Do any of the atom diagrams below represent atoms of the same element?



- No, they are all different elements.
- Yes, atom A and atom B are the same element.
- Yes, all of the atoms are the same element.
- Yes, atom A and atom C are the same element.

Given the following Bohr diagram of an atom, answer the following questions:



- =Electron
- =Neutron
- =Proton

- How many Protons?
- How many Neutrons?
- How many Electrons?
- What is the Atomic Mass?
- What is the Atomic Number?
- What is the Chemical Name of this Atom? (Example) Silicon30 (no spaces)
- What is the Chemical Symbol of the Atom?(Example) ³⁰Si (no spaces)

- 34 A common isotope of Carbon has a mass number of 13. The total number of subatomic particles in the nucleus would be:
- 19
 - 13
 - 12
 - 6

- 35 The _____ is one kind of particle that makes up the atom and carries a positive charge. The neutron makes up for "missing mass" and is found in the nucleus. The third kind of particle carries a _____ charge and has almost no mass.
- electron, negative
 - proton, negative
 - proton, neutral
 - proton, positive

- 36 Atoms with the same atomic number but different atomic mass are called:
- prototypes.
 - subtypes.
 - isotopes.
 - ions.

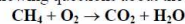
- 37 The noble gases, such as helium and xenon, are non-reactive because:
- they have completely filled outer electron shells.
 - they are chemically unstable.
 - they are unusually large atoms.
 - they have been around longest on the earth.

- 38 Elements in the same column on the periodic table have similar chemical reactivity because:
- they contain similar amounts of energy.
 - they have the same number of valence shell electrons.
 - atoms prefer to have completely full or completely empty valence shells.
 - they have similar numbers of isotopes.

- 20 Elements in the first column of the periodic table are known as alkali metals. These elements, when ionized, have in common:
- an oxidation number of 1+
 - an oxidation number of 1-
 - an oxidation number of 2-
 - an oxidation number of 2+
- 21 Which of the following is TRUE? Covalent bonding occurs:
- in salts like NaCl.
 - when electrons are shared between two atoms.
 - only when electrons are shared between two identical atoms.
 - when electrons are transferred from one atom to another.

- 22 In which of the following situations does water undergo a change in physical properties?
- The bathroom fills with steam when you take a hot shower.
 - The neighbor's pond freezes over in winter.
 - Water is broken down to yield H₂ and O₂.
 - (a) and (b) only.

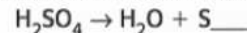
Answer the following questions about the chemical reaction for the combustion of methane gas:



- 23 Identify the reactants.
- CO₂ and H₂O
 - CH₄ and O₂
 - O₂ and H₂O
 - CH₄ and CO₂

- 24 Identify the products.
- CO₂ and H₂O
 - CH₄ and O₂
 - O₂ and H₂O
 - CH₄ and CO₂

- 25 When heated, sulfuric acid breaks down into sulfur trioxide and water. From the equation below, which answer shows the equation as balanced?



- O₃
- O₂
- O₄
- O₅

The following equations represent chemical reactions.

Chemical Reactions

1	2Na + 2H ₂ O → NaOH + H ₂
2	H ₂ + O ₂ → H ₂ O
3	Mg + Cl ₂ → MgCl ₂
4	NaOH + MgCl ₂ → NaCl + MgOH

Which equation shows that the total mass during a chemical reaction stays the same?

- 1
- 2
- 3
- 4

ANSWER KEY

32.Nitrogen15 33.(NO) 34.B 35.B 36.C 37.A 38.B 39.B
24.A 25.A 26.C 27.(L) 28.(L) 29.(L) 30.(S) 31.(L)
14.B 15.D 16.D 17.B 18.A 19.B 20.B 21.B 22.D 23.B
13.CORK.EHTYTLISOPROPYL.CORN SYRUP
1.D 2.C 3.B 4.C 5.C 6.C 7.C 8.B 9.A 10.B 11.D 12.C

The table below shows a chemical equation.

Mass of Reactants	Mass of Products
Methane + Oxygen	Carbon Dioxide + Water
50.0 g + 200.0 g	137.5 g + ?

What is the mass of the water produced?

- 62.5 g
- 112.5 g
- 250.0 g
- 387.5 g