

Name: KEY **Chemistry TAKS Review****Periodic Table**

The Periodic Table of Elements is an organized table of all of the known element in the universe.

The Periodic Table is organized by **ATOMIC NUMBER**

14
Si
28.086
Silicon

The Atomic Number tells us how many protons are in an element

(+) Protons have a POSITIVE charge. (+)

How many protons are in the following elements?

Boron 5 Barium 56 Lead 82 Chromium 24

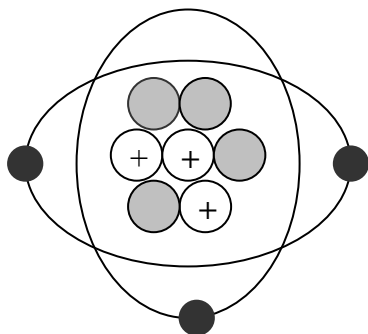
What element has the following number of protons?

11 protons **SODIUM**

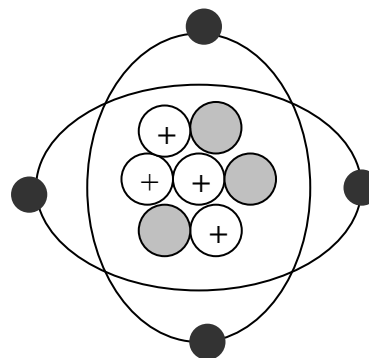
27 protons **COBALT**

78 protons **PLATINUM**

19 protons **POTASSIUM**



This picture shows a model of which element?
LITHIUM



This picture shows a model of which element?
BERYLLIUM

Each element has it's own physical and chemical properties.

Elements **CAN'T** be physically or chemically separated into simpler substances.

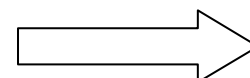
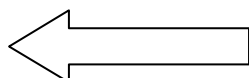
On the periodic table there is a jagged line that separates the metals from the non-metals.



Metals are on the **LEFT**



Non-Metals are on the **RIGHT**



The columns on the periodic table are known as GROUPS.

Decide whether the following groups
contain mostly *metals* or mostly *non-metals*:

Group 1 METALS
Group 16 NON-METALS

Group 7 METALS
Group 18 NON-METALS

Elements that are in the same group (or column) have similar
PHYSICAL and CHEMICAL properties.
(This means that they look the same physically and act the same chemically.)

G
R
O
U
P
S

IMPORTANT FACTS:

Metals will most likely react with NON-METALS.

The Elements of Group 18 are known as the Noble Gases.

These elements are completely unreactive!

(This means that they won't form compounds with any other elements.)

Find Group 18 on your periodic table and write this fact down as a reminder.

1. An unknown silvery powder has a constant melting point and does not chemically or physically separate into other substances. The unknown substance can be classified as -

- A an element
- B a compound
- C a mixture
- D an alloy

2. The elements of which of these groups on the periodic table are most resistant to forming compounds?

- A Group 1
- B Group 9
- C Group 14
- D Group 18

3. Which of the following groups contains members with similar chemical reactivity?

- A Li, Be, C
- B Be, Mg, Sr
- C Sc, Y, Zr
- D C, N, O

4. The elements from which of the following groups are most likely to react with potassium (K)?

- A Group 2
- B Group 7
- C Group 13
- D Group 17

5. An unidentified element has many of the same physical and chemical properties as magnesium and strontium but has a lower atomic mass than either of these elements. What is the most likely identity of this element?

- A Sodium
- B Beryllium
- C Calcium
- D Rubidium

6. The elements in Group 2 are most likely to react with which of the following elements?

- A Group 1
- B Group 6
- C Group 10
- D Group 16

Test Taking Trick: When you are asked about groups and how they react, label each of the answer choices as metals or non-metals. **The answer will become obvious!**

Compounds

When more than one element join together, they create a COMPOUND.
Molecules are created when more than one NON-METAL join together.

When metals and non-metals react to form compounds:



Metals LOSE electrons and carry a POSITIVE charge.
(Group 1 is the most willing to lose electrons)



Non-metals GAIN electrons and carry a NEGATIVE charge.
(Group 17 is the most willing to gain electrons)

1. Oxygen (O₂) is an example of -

- A an alloy
- B** a molecule
- C a salt
- D a mixture

2. Elements in Group 16 of the periodic table usually -

- A form large molecules
- B** gain electrons when bonding
- C act like metals
- D solidify at room temperature

3. According to the periodic table, which element most readily accepts electrons?

- A** Fluorine
- B Nitrogen
- C Arsenic
- D Aluminum

Writing Chemical Formulas

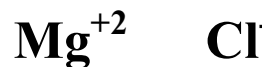
Al⁺³ → The numbers on top are the charges. They show how much charge an ion has and whether the charge is positive or negative. (**Don't be confused by ions with more than one element in them. These are called polyatomic ions.**)

CaBr₂ → The numbers on the bottom tell us how many of each atom or ion have joined together to form the compound. If you do not see a number, then there is only one. Here we see that there is 1 Ca and 2 Br.

Here is an easy method to writing formulas:

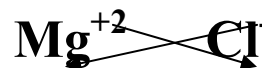
Step #1: Find the number on each charge.

Remember: If you don't see a number, than it is a one (1).



Step #2: Switch the numbers on the elements.

Remember: How many you need goes on the bottom.

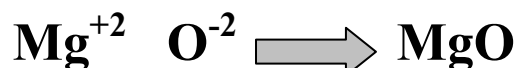


Step#3: Write your formula.

Remember: + & - signs go away.

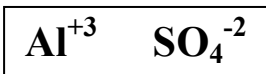


There is one catch! If the charges have the same magnitude, then they will cancel out, and you will only need one of each of them.



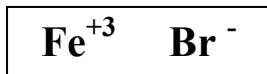
4. The chemical formula for calcium chloride is –

- A Ca₂Cl
- B CaCl
- C** CaCl₂
- D Ca₂Cl₃



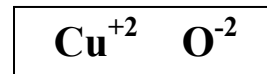
5. According to this information, what is the chemical formula for aluminum sulfate?

- A AlSO₄
- B** Al₂(SO₄)₃
- C Al₃(SO₄)₂
- D Al₆SO₄



6. According to this information, what is the chemical formula for iron (III) bromide?

- A Fe₃Br
- B Fe₂Br₃
- C** FeBr₃
- D Fe₄Br₇



7. According to this information, what is the chemical formula for copper (II) oxide?

- A Cu₂O₂
- B Cu₂O₃
- C Cu₄O₄
- D** CuO

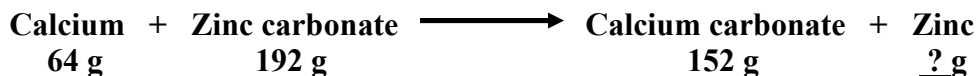
The Law of Conservation of Mass

The Law of Conservation of Mass states that mass cannot be CREATED or DESTROYED.

Therefore, in a chemical reaction:

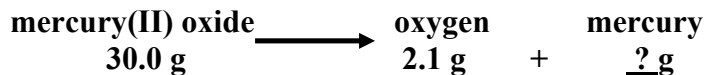
Sum of the masses of the reactants = Sum of the masses of the products

(When you add up the masses on the left side of the reaction, they will equal the masses that you add up on the right side of the reaction.)



1. According to the law of conservation of mass, how much zinc was present in the zinc carbonate?

- A 40 g
- B 88 g
- C** 104 g
- D 256 g



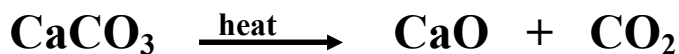
2. According to the law of conservation of mass, how much mercury was present in the mercury (II) oxide?

- A 30 g
- B 32.1 g
- C** 27.9 g
- D 63 g



3. When 127 g of copper reacts with 32 g of oxygen gas to form copper (II) oxide, no copper or oxygen is left over. How much copper (II) oxide is produced?

- A 32 g
- B 95 g
- C 127 g
- D** 159g



4. The chemical equation shows CaCO_3 being heated. Which of these statements best describes the mass of the products if 100 g of CaCO_3 is heated?

- A The difference in the products' masses is equal to the mass of the CaCO_3 .
- B The sum of the products' masses is less than the mass of the CaCO_3 .
- C The mass of the each product is equal to the mass of the CaCO_3 .
- D** The sum of the products' masses equals the mass of the CaCO_3 .

Balancing Equations

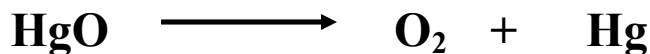
Because of the Law of Conservation of Mass, we are forced to balance chemical equations.

In order for an equation to be balanced, you must have the same number of each element on both sides of the chemical equation. (If you have 2 oxygen on the right side of the equation, then you must also have to have 2 oxygen on the left side.)

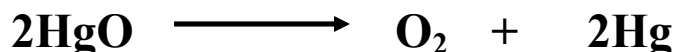


To do this, you must add COEFFICIENTS.

You may NOT change any subscripts. You can ONLY add coefficients.



Here I see that I have 1 Hg on the reactants' side, and 1 Hg on the products' side. However, I have only 1 oxygen on the reactants' side and 2 oxygen on the products' side. This is a problem!



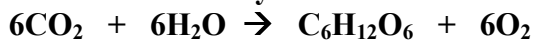
Just like in Algebra, the coefficients multiply through to the entire compound.

Placing a 2 in front of HgO show 2 Hg AND 2 O.

Test Taking Tip: Always go back and check your answers. Once you think that a chemical equation is balanced, go back and add up how many of each element is on both sides. This will allow you to catch any mistake that you might have made.

1. Which chemical equation supports the law of conservation of mass?
- A $2\text{H}_2\text{O}(l) \rightarrow \text{H}_2(g) + \text{O}_2(g)$
 - B $\text{Zn}(s) + \text{HCl}(aq) \rightarrow \text{ZnCl}_2(aq) + \text{H}_2(g)$
 - C $\text{Al}_4\text{C}_3(s) + \text{H}_2\text{O}(l) \rightarrow \text{CH}_4(g) + \text{Al}(\text{OH})_3(s)$
 - D** $\text{CH}_4(g) + 2\text{O}_2(g) \rightarrow \text{CO}_2(g) + 2\text{H}_2\text{O}(g)$

Photosynthesis:

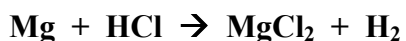


2. To produce 4 molecules of sugar, a plant needs –

- A 6 molecules of hydrogen
- B 12 molecules of ATP
- C 18 molecules of water
- D** 24 molecules of carbon dioxide

The equation is already balanced. Use the ratios in the balanced equation to figure out the answer.





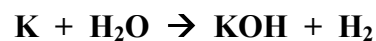
3. When the above equation is balanced, the coefficient for magnesium chloride is -

- A 0
 B 1
 C 2
 D 4



4. What are the coefficients that will balance this chemical equation?

- A 2, 1, 1
 B 3, 4, 2
 C 2, 2, 1
 D 4, 3, 2



5. What is the coefficient for H₂O when the above equation is balanced?

- A 1
 B 2
 C 3
 D 4

Physical and Chemical Changes

Physical Change:

If all it did was break, dissolve, or change between solid, liquid and gas, than it was a physical change. (This means that melting, evaporating, condensing and freezing are all physical changes.)

Chemical Change:

If it states that a new substance was formed **OR** it says that any kind of chemical reaction took place, than it was a chemical change.

1. Which of the following is an example of a chemical change?

- A Ice cracking
 B Sugar dissolving
 C Milk souring
 D Lead melting

2. In the rock cycle, which of these is a chemical change involved with the formation of igneous rocks?

- A Compression of sediments
 B Heat loss from lava
 C Subduction of plates
 D Formation of minerals

3. Which of these changes in rocks is a physical change?

- A Acid rain damaging marble
 B Iron in rock combining with oxygen to form hematite
 C Carbonic acid weathering limestone
 D An ice wedge shattering a slab of shale

4. Which of the following processes is an example of a physical change associated with an oak tree?

- A Decomposition of bark by bracket fungi
 B Starches and sugars being broken down during energy production
 C Water and carbon dioxide being converted to glucose
 D Evaporation of water from the surfaces of leaves

Label the following as physical (P) or chemical (C) changes:

- C Wood burning in a fire
C Iron rusting to produce iron (III) oxide
P Water vapor condensing to form rain clouds
P Sugar dissolving in Kool-Aid

_____ Breaking a piece of glass

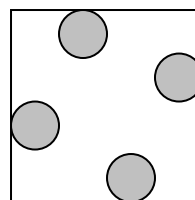
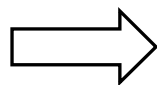
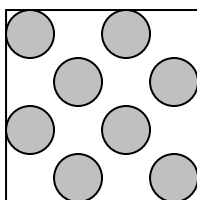
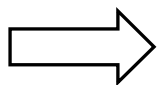
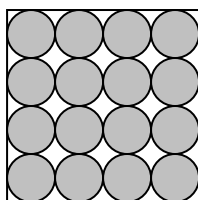
Density

Density is the mass (in grams) of a substance that fits inside of a certain volume (a milliliter).

The density of a solid is the same all of the way through it.

(This means that a small piece of a substance has the same density as a large piece of the same substance.)

The density of a substance changes as it goes from solid to liquid to gas.



Solids usually have the greatest density.

Liquids are less dense than solids.

Gases have the lowest density of all.



Water is an exception to this rule!

Ice is less dense than water.
(solid H₂O) (liquid H₂O)

**When a solid is placed into a liquid:**

If the solid has a greater density than the liquid, it will **SINK**.

If the solid has a lower density than the liquid, it will **FLOAT**.

Since ice is **less** dense than water, ice will **FLOAT**.

1. Compared to 250 g of gaseous nitrogen, 250 g of liquid nitrogen has greater -

- A volume
- B temperature
- C mass
- D density**

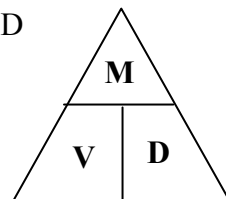
2. A block of maple wood with a volume of 405 cubic centimeters and a density of 0.67 g/cm³ is sawed in half. The density of the two smaller blocks is now -

- A one-fourth the original density
- B one-half the original density
- C two times the original density
- D the same as the original density**

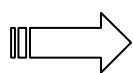
3. Swimmers find that they can float more easily in the ocean than in a freshwater pond. The most likely reason for this phenomenon is that the -

- A viscosity of pond water is greater than that of ocean water.
- B density of ocean water is higher than that of pond water**
- C temperature of pond water is lower than that of ocean water
- D mass of ocean water is greater than that of pond water

Important Fact: $1 \text{ mL} = 1 \text{ cm}^3$



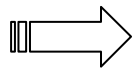
The density of an object can be calculated using a simple equation.



To find the mass of an object,
we use a scale or a **BALANCE**.

Density equation:

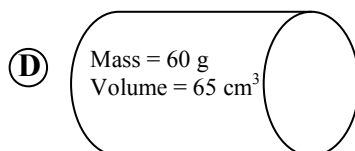
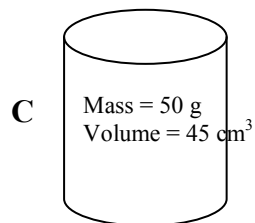
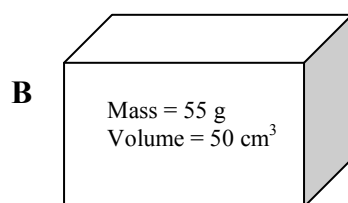
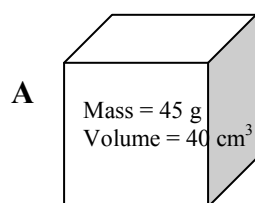
$$D = M \times V$$



To find the volume of an object,
we use a **GRADUATED CYLINDER**.

Test Taking Tip: Density questions will often tell you the temperature of a liquid. This is extra information. It is there to distract you, so just ignore it.

4. Which of the following objects will float on water?



5. Which procedure is best to use when determining the density of a rock?

A Place the rock in a water-filled beaker and find the height at which the rock floats above the water.

B Use a ruler to measure the rock's dimensions and then find its mass using an analytical balance.

C Measure the mass of the rock on a balance and then find the volume of water it displaces in a graduated cylinder.

D Place the rock in three liquids with different known densities and observe which liquid the rock floats in.

6. What is the density at 20°C of 12.0 milliliters of a liquid that has a mass of 4.05 grams?

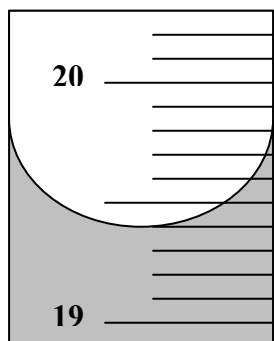
- A** 0.338 g/mL
B 2.96 g/mL
C 16.1 g/mL
D 48.6 g/mL

7. What is the mass of a 500.00 mL sample of seawater with a density of 1.025 g/mL?

- A** 487.8 g
B 500.0 g
C 512.5 g
D 625.0 g

8. A sample of an element has a volume of 78.0 mL and a density of 1.85 g/mL. What is the mass in grams of the sample? Record your answer in the boxes below.

	1	4	4	.	3	
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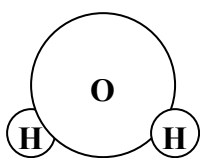


9. This pipette is filled with a 20% NaOH solution. The solution is at 20°C and has a density of 1.23 g/mL. According to this information, what is the mass of this NaOH solution?

- A 3.88 g
- B 15.7 g
- C 23.9 g**
- D 24.6 g

10. What is the density of a solid cube that has a mass of 52.0 grams and volume of 24.5 cm³?

- A 0.471 g/cm³
- B 4.52 g/cm³
- C 2.12 g/cm³**
- D 0.843 g/cm³



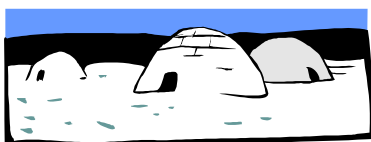
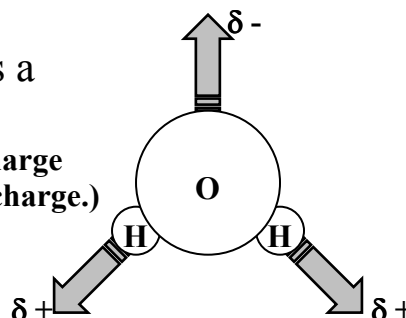
Water

Water is H₂O (2 hydrogen: 1 oxygen). It is ALWAYS H₂O.
If the ratio of hydrogen to oxygen changes, it is no longer water.

Water is a very effective SOLVENT.
It can dissolve a large variety of compounds.



It can do this because it is a
POLAR compound.
 (Part of it has a partial positive charge
 and part of it has a partial negative charge.)



Ice is an INSULATOR.
 (It holds on to heat very well.)
**This is why Eskimos build igloos out of ice –
 Ice keeps them warm inside.**

1. Fish survive through severe winters because of the property of water that allows water to -

- A form chemical bonds as it freezes, raising the water temperature below the ice.
- B increase in density while it freezes, dissolving more oxygen from the air
- C expand when it freezes, creating a floating and insulating layer of ice**
- D precipitate vital nutrients when it freezes, increasing the food supply

2. What characteristic of water remains the same no matter what is dissolved in it?

- A** The ratio of hydrogen to oxygen
- B The ability to refract light
- C The hydroxide ion concentration
- D The freezing temperature

3. Which factor makes water an effective solvent?

- A The presence of molecular oxygen
- B Its covalent bonds
- C** The polar nature of its molecules
- D Its abundance on Earth's surface

Solutions

Temperature has a different affect on the solubility of solids and gases.

Solids

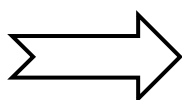
Increasing the temperature increases the solubility of solids.

This is why you heat up water to make tea – so the tea will dissolve.

Gases

Decreasing the temperature increases the solubility of gases.

This is why you keep carbonated drinks cold - so they don't go flat.



Pressure has an affect on the solubility of GASES.
(Pressure has virtually no effect on the solubility of solids.)

Increasing the pressure **INCREASES** the solubility of a gas.

Decreasing the pressure **DECREASES** the solubility of a gas.

VERY IMPORTANT FACT:



Particle size has an affect on how fast SOLIDS dissolve.
The smaller the crystals, the **FASTER** they will dissolve.



Water is NOT a good conductor of electricity. Electricity can pass through water easily only after there have been minerals dissolved in the water. These minerals are known as ELECTROLYTES.



Acids and Bases

Acidic solutions have a pH lower than 7.
(They have a high concentration of H^+ ions)

Basic solutions have a pH higher than 7.
(They have a high concentration of OH^- ions)

You can determine the pH of a solution by using a pH meter or litmus paper.

Here is a poem to help you remember what colors litmus paper turns in the different pH ranges.

Acids are Red.

Bases are Blue.

Don't know why this matters,

But they might ask you.

Safety rule: When you are diluting acids, always pour the acid into the water slowly while you stir.

1. The safest way to dilute concentrated sulfuric acid is to add –

- A a series of small volumes of water to the acid while stirring
- (B)** the acid to water slowly while stirring constantly
- C the acid to a small volume of water and then add more water
- D dilute sulfuric to a small volume of concentrated acid

2. A 0.2 g crystal of gypsum dissolves very slowly in 100 ml of water while the water is stirred. Which of these would cause the gypsum to dissolve faster?

- A Decreasing the water temperature
- B Stopping the stirring
- C Lowering the air pressure
- D Crushing the crystal

3. As a scuba diver goes underwater, the diver must be aware that the increased pressure affects the human body by increasing the –

- A body's temperature
- B amount of dissolved gases in the body
- C amount of suspended solids in the body
- D concentration of minerals in the body

4. A certain commercial product used for cleaning ovens must be handled with rubber gloves. The product is slippery and turns litmus paper blue. It probably contains –

- A an acid
- B a base
- C a salt
- D an isotope

5. All of these can affect the rate at which a solid dissolves in water except –

- A decreasing air pressure
- B stirring the water
- C increasing the temperature of the water
- D using larger crystals of the solid

6. Bathwater normally has electrolytic behaviors even though distilled water does not. This is because bathwater -

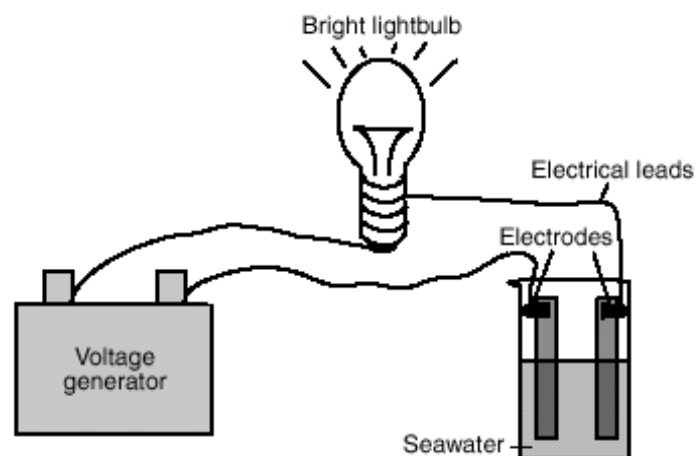
- A contains isotopes of hydrogen
- B has been heated
- C is separated into H^+ and OH^- ions
- D contains dissolved minerals

7. Pain medications can be made as powders or tablets. The powders tend to work faster than tablets with the same ingredients because powder –

- A dissolves faster in solution than a single tablet
- B has more total mass than a single tablet
- C travels through the bloodstream more easily than a tablet
- D is easier to swallow than tablets

8. Over time an open soft drink will lose carbonation (dissolved CO_2). Which of these allows the CO_2 to remain in solution the longest?

- A Reduced air pressure
- B Exposure to direct sunlight
- C Increased air currents
- D Cooler temperatures



9. In this apparatus, the seawater is an example of a –

- A strong electrolyte
- B weak acid
- C nonelectrolyte
- D strong base