



# The GED Science Test

*Chemistry*



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California Distance Learning Project  
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# GED

## Video Partner



### #25 Passing the GED Science Test

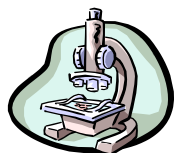
You are 87% water; the other 13% keeps you from drowning.

P. E. Morris

Video 25 Focus: how everything you see around you is matter and that chemistry is the study of this matter.

#### You Will Learn From Video 25:

- The three different states of matter: solid, liquid and gas.
- The structure of the atom.
- Why and how chemistry is important in our daily lives.
- What chemical reactions are.
- About the periodic table.



#### Words You Need to Know:

While viewing the video, put the letter of the meaning by the correct vocabulary word. Answers are on page 17.

- |                        |  |
|------------------------|--|
| _____ 1. matter        | a. two or more elements that are chemically combined                                       |
| _____ 2. compound      | b. everything that takes up space and has weight   |
| _____ 3. atomic number | c. a substance composed of atoms with identical atomic numbers                             |
| _____ 4. element       | d. number of protons an atom contains within its nucleus                                   |
| _____ 5. atom          | e. the smallest particle of an element that retains the chemical properties of the element |

#### Points to Remember:

- You are not required to know a lot of facts, but you do need to understand the basic concepts of chemistry.
- You must be able to read charts and graphs.
- Matter is made up of elements, and elements are made up of atoms. Atoms are made up of protons, electrons, and neutrons.

Change is all around us. People grow older. Plants grow larger. Steel rusts. Food is cooked and eaten. However, before we can understand how and why these changes occur, we must familiarize ourselves with matter and how it is organized.

**Matter** is anything that takes up space and has mass. **Mass** is the physical volume or bulk of a solid body. Matter is the material of the universe.

Look around you and what you see is matter. Matter can be a solid such as steel, a liquid such as water, or a gas such as air.



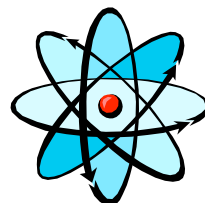
## Structure of Matter



The ancient Greeks were one of the first people to really explore the question of how small can we go? Their answer was the **atom**. An atom is the smallest possible particle of a substance. For example, if you envision a beach made up of only sand, an atom would be one grain of sand. Yet, are atoms the smallest objects known to humans? The answer is no, because even though atoms are the smallest particle of a substance that still acts like that substance, atoms too are made up of particles. Those particles are: protons, neutrons, and electrons.

### The Atom

An atom is commonly drawn like the picture to the right consisting of a central nucleus and a surrounding electron field. Many people imagine moons orbiting a planet when seeing this picture; however, these are actually electrons moving “randomly” around the nucleus, creating an electron cloud. Just like the force of gravity holding a moon in orbit around a planet, electrons are held close to the nucleus by a force called electric force. How does it do this? Well, if you have ever heard the phrase “opposites attract,” this is it! Particles, which have opposite electrical charges, are attracted to each other causing the particles of the atom to stay together



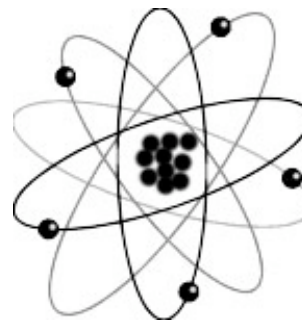
- Protons have a positive charge. “+”
- Electrons have a negative charge. “-“
- Neutrons do not have a charge at all. They are electrically neutral.

Neutral atoms will have the same number of protons as electrons.

### Test Your Knowledge:

Study the “neutral” atom on the right, follow the instructions and answer the questions below. The answers are on page 17.

- 1) Place a “-“ next to all of the electrons.
- 2) Place a “+” next to at least one proton.
- 3) The atom shown has \_\_\_\_\_ electrons.
- 4) This would mean that it has \_\_\_\_\_ protons.



For more information you may want to visit the following websites:

<http://www.miamisci.org/af/sln/phantom/spectroscope.html> and

<http://www.miamisci.org/af/sln/phantom/papercutting.html> or

<http://www.pbs.org/wgbh/aso/tryit/atom/>

## Elements

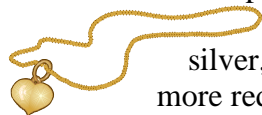
Now that you understand what an atom is made of, and that substances are composed of these atoms, what happens when you mix different atoms together? First, if you combine atoms of the same type, unmixed with anything else, you get what is called an **element**. An element is a



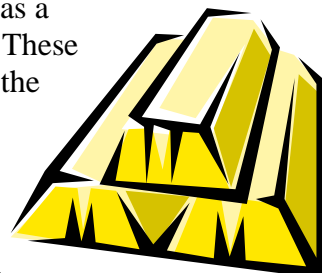
substance composed of similar atoms, or in other words, atoms having an identical number of protons in each nucleus. For example, a pure silver coin will only contain atoms of silver in it. Each separate element has a distinct number of protons. Hydrogen has one, while helium has two. An element's **atomic number** is the number of protons in an atomic nucleus.

What about electrons though? Well, electrons do play a large part in the world. First of all, if an element has the same number of electrons as protons they are considered electrically “neutral.” If it has more electrons than it does protons it can be called a negative ion. If it has less electrons than protons it can be called a positive ion. An **ion** is an atom or molecule that has either lost or gained electrons. As you will see later, these positive and negative charges will be important.

All matter in the universe consists of elements, either in a pure form or as a combination of elements such as hydrogen and oxygen forming water. These combinations are called either mixtures or compounds. Most matter in the world are mixtures and compounds, rather than made up of just one element. For example, a 14k gold necklace is not pure gold. Gold is



mixed with combinations of two other elements; silver, to make it more green and copper, to make it more red. In fact even 18k gold consists of only 75% gold.



Can you guess what elements you are made of? You might guess that we are made of 30 or 40 different types of elements. In actuality, humans are made up of just a few common elements. In fact, 99% of our bodies are made by only 6 common elements and the top three are; oxygen being the most common at 65%, followed by carbon at 18% and hydrogen at 10%. However, breaking down the human body in terms of elemental make-up does not do us justice. As Hermann Muller put it, "To say that a man is made up of certain chemical elements is a satisfactory description only for those who intend to use him as a fertilizer."



## Mixtures



A **mixture** is matter that contains more than one pure substance. Some common mixtures are wood, gasoline, air, and lemonade. However, have you ever tasted lemonade that was too sweet or too sour? To create lemonade you would usually combine, lemon juice, water and sugar. Too much sugar and its too sweet. Too much lemon juice and its too sour. Mixtures can have any amount of a variety of elements, and they are just “mixed” together. You can vary the amount of any of the elements but it will still be that substance. Add more sugar to your lemonade and it will still be lemonade!

A key fact about mixtures is that they can be broken down into pure substances by physical means such as boiling. For example, sea water is not pure. It consists of pure water plus many different minerals, one of them being salt. By boiling the water, steam will rise and can be collected. Once this steam is cooled, you will be left with pure water. What happened to all of the extra minerals? They were all left in your pot. Have you ever boiled water and then forgot about it? When you returned to find that all of your water has evaporated into steam, did you notice any small amounts of a white substance leftover in the pot? You just discovered how “pure” your tap water was. However, do **not** try this at home!



## Compounds

Now that you have pure water, how would you break it down any further? You cannot do this by physical means such as boiling or freezing, because pure water is a compound. A **compound** has 2 or more elements that are chemically combined and has a constant composition. Pure water is made of the 2 elements, hydrogen and oxygen. In a molecule of water, there is always one oxygen atom combined with two hydrogen atoms. You cannot change that ratio without changing the entire substance. So something that has 2 atoms of hydrogen and 2 atoms of oxygen is not water.

Also, compounds can only be separated by chemical means. For example, pure water can be separated by electrolysis. **Electrolysis** is where an electric current is passed through water, which will break it down into its two elements.

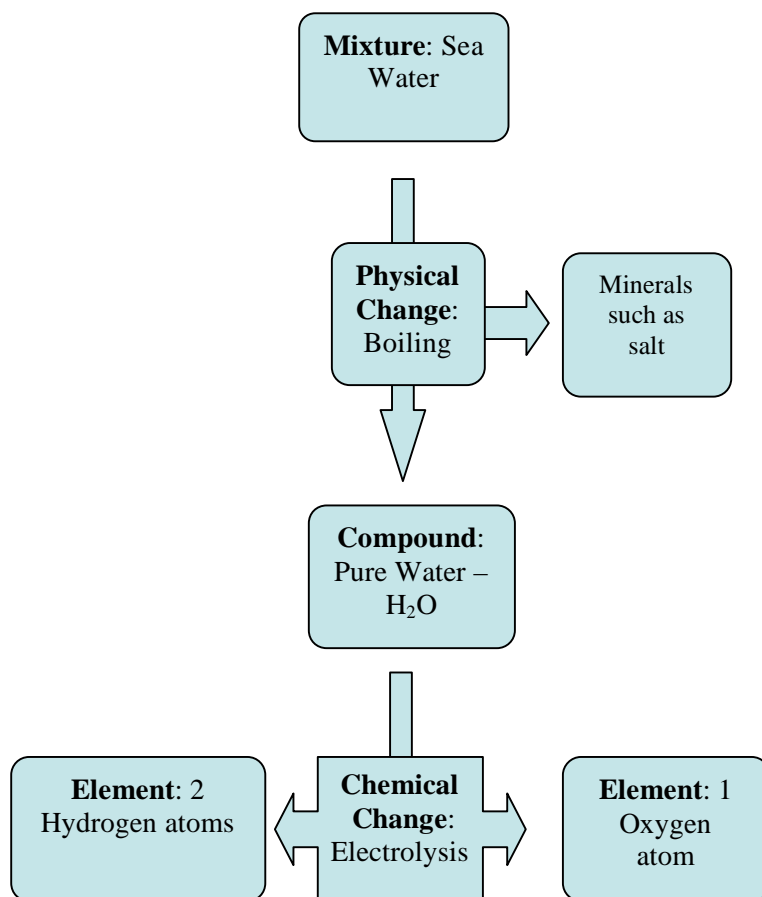
### Test Your Knowledge:

True or False: Please write down “True” next to the statement if you believe it is a true statement. If you believe it is a false statement, please write “False” next to it.

Answers can be found on Page 17.

- 5) \_\_\_\_\_ A 14k gold necklace contains only the element gold.
- 6) \_\_\_\_\_ Lemonade is a mixture.
- 7) \_\_\_\_\_ Pure water can be broken down into hydrogen and oxygen by boiling.
- 8) \_\_\_\_\_ The human body consists mostly of oxygen.

The following chart describes how matter can be broken down into smaller parts.



## The Periodic Table

Throughout this workbook we have spoken about the elements and how they are often combined to form matter. Each element has certain properties that separate it from the other elements. Some obvious ones might be its color, or whether it is a gas or solid at room temperature. Some other properties might be at what temperature the element will melt at, or how many protons it has. Since chemists must know these properties, they have combined all of the elements into a chart called the **periodic table**. In a room where chemistry is taught or practiced, a periodic table is bound to be hanging on the wall. Think of it as a handy guide to the elements, however for the GED Science test, you will not need to memorize the periodic table, but you should know what it is and how it is used. Take a look at the periodic table on the following page.

# Periodic Table of the Elements

GROUP  
IA

PERIOD	1	2	3	4	5	6	7	8	9	10	11	12							
	IA	IIA	IIIA	IVA	VA	VIA	VIIA	VIIIA	IB	IIB	IIIB	IVB	VB	VIB	VIB	VIII			
1	<b>H</b> Hydrogen 1.00794															<b>He</b> Helium 4.00260			
2	<b>Li</b> Lithium 6.941	<b>Be</b> Beryllium 9.01218									<b>B</b> Boron 10.811	<b>C</b> Carbon 12.0107	<b>N</b> Nitrogen 14.00674	<b>O</b> Oxygen 15.9994	<b>F</b> Fluorine 18.99840	<b>Ne</b> Neon 20.1797			
3	<b>Na</b> Sodium 22.98977	<b>Mg</b> Magnesium 24.3050									<b>Al</b> Aluminum 26.98154	<b>Si</b> Silicon 28.0855	<b>P</b> Phosphorus 30.97376	<b>S</b> Sulfur 32.066	<b>Cl</b> Chlorine 35.4527	<b>Ar</b> Argon 39.948			
4	<b>K</b> Potassium 39.0983	<b>Ca</b> Calcium 40.078	<b>Sc</b> Scandium 44.95591	<b>Ti</b> Titanium 47.867	<b>V</b> Vanadium 50.9415	<b>Cr</b> Chromium 51.9961	<b>Mn</b> Manganese 54.93805	<b>Fe</b> Iron 55.845	<b>Co</b> Cobalt 58.93320	<b>Ni</b> Nickel 58.6934	<b>Cu</b> Copper 63.546	<b>Zn</b> Zinc 65.39	<b>Ga</b> Gallium 69.723	<b>Ge</b> Germanium 72.61	<b>As</b> Arsenic 74.92160	<b>Se</b> Selenium 78.95	<b>Br</b> Bromine 79.904	<b>Kr</b> Krypton 83.80	
5	<b>Rb</b> Rubidium 85.4678	<b>Sr</b> Strontium 87.62	<b>Y</b> Yttrium 88.90585	<b>Zr</b> Zirconium 91.224	<b>Nb</b> Niobium 92.90638	<b>Mo</b> Molybdenum 95.94	<b>Tc</b> Technetium (98)	<b>Ru</b> Ruthenium 101.07	<b>Rh</b> Rhodium 102.90550	<b>Pd</b> Palladium 106.42	<b>Ag</b> Silver 107.8682	<b>Cd</b> Cadmium 112.411	<b>In</b> Indium 114.818	<b>Sn</b> Tin 118.710	<b>Sb</b> Antimony 121.760	<b>Te</b> Tellurium 127.60	<b>I</b> Iodine 126.90447	<b>Xe</b> Xenon 131.29	
6	<b>Cs</b> Cesium 132.90545	<b>Ba</b> Barium 137.327		<b>Hf</b> Hafnium 178.49	<b>Ta</b> Tantalum 180.9479	<b>W</b> Tungsten 183.84	<b>Re</b> Rhenium 186.207	<b>Os</b> Osmium 190.23	<b>Ir</b> Iridium 192.217	<b>Pt</b> Platinum 195.078	<b>Au</b> Gold 196.96655	<b>Hg</b> Mercury 200.59	<b>Tl</b> Thallium 204.3833	<b>Pb</b> Lead 207.2	<b>Bi</b> Bismuth 208.98038	<b>Po</b> Polonium (209)	<b>At</b> Astatine (210)	<b>Rn</b> Radon (222)	
7	<b>Fr</b> Francium (223)	<b>Ra</b> Radium (226)		<b>Rf</b> Rutherfordium (261)	<b>Db</b> Dubnium (262)	<b>Sg</b> Seaborgium (263)	<b>Bh</b> Bohrium (264)	<b>Hs</b> Hassium (265)	<b>Mt</b> Meitnerium (266)	<b>Uun</b> Ununium (269)	<b>Uuu</b> Ununium (272)	<b>Uub</b> Ununium (272)							
				<b>La</b> Lanthanum 138.9055	<b>Ce</b> Cerium 140.116	<b>Pr</b> Praseodymium 140.90765	<b>Nd</b> Neodymium 144.24	<b>Pm</b> Promethium (145)	<b>Sm</b> Samarium 150.36	<b>Eu</b> Europium 151.964	<b>Gd</b> Gadolinium 157.25	<b>Tb</b> Terbium 158.92534	<b>Dy</b> Dysprosium 162.50	<b>Ho</b> Holmium 164.93032	<b>Er</b> Erbium 167.26	<b>Tm</b> Thulium 168.93421	<b>Yb</b> Ytterbium 173.04	<b>Lu</b> Lutetium 174.967	
				<b>Ac</b> Actinium (227)	<b>Th</b> Thorium 232.0381	<b>Pa</b> Protactinium 231.03588	<b>U</b> Uranium 238.0289	<b>Np</b> Neptunium (237)	<b>Pu</b> Plutonium (244)	<b>Am</b> Americium (243)	<b>Cm</b> Curium (247)	<b>Bk</b> Berkelium (247)	<b>Cf</b> Californium (251)	<b>Es</b> Einsteinium (252)	<b>Fm</b> Fermium (257)	<b>Md</b> Mendelevium (258)	<b>No</b> Nobelium (259)	<b>Lr</b> Lawrencium (262)	

Atomic Number	26
Symbol	Fe
Name	Hydrogen
Atomic Weight	1.0079

Solids  
 Liquids  
 Gases  
 Artificially Prepared

The periodic table is a chart that will display an arrangement of the elements according to increasing atomic number and shows relationships between element properties. You can see that the first element hydrogen has the atomic number one. That means it contains only one proton. How many protons does helium contain?

In the periodic table, scientists have grouped all elements by their properties, as well as

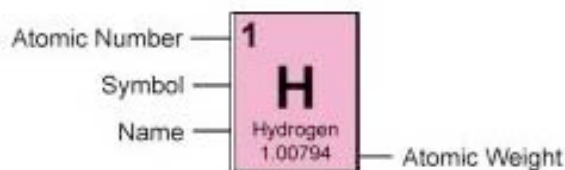


organizing them by atomic number. Earlier, we spoke of the atomic number and how it equals the number of protons. This is significant because it answers the question, “If all atoms consist of protons, neutrons, and electrons, why do atoms of different elements look and behave so differently?” The answer is that no two elements will have the same combination of protons, electrons and neutrons. This is what separates oxygen from silver and calcium from iron. Once you understand how to read the periodic table, you will see how certain groups of elements all have some similarities, even though they have differing numbers of protons, neutrons and electrons.

You can also notice how the elements are often grouped by their properties. That is why helium is not right next to lithium on the chart, even though they are separated by just one proton. Helium is placed on the right hand side because that is where all of the gases are. While lithium is a solid at room temperature. Take a look at the key in the top center of the table. What color is used to symbolize the gases? Gases are colored pink, while liquids are in blue and metals are white.

### How to Read the Periodic Table

The image to the right is an example of one element on the periodic table. The number in the upper left hand corner tells us how many protons the element contains, and again this is called the **atomic number**. The letter in the middle gives us the symbol of the element.



Each element has been given a symbol to represent it, kind of like the initials of your name. Right below that is the element’s full name. Lastly, the atomic weight, sometimes called atomic mass, is listed below the name. The atomic weight of an element is the sum of the protons and neutrons located in the nucleus. To find the number of neutrons, one just has to subtract the atomic number from the atomic weight, since a single neutron or proton is given a value of 1.

For example: The atomic number, or the number of protons, for helium is equal to 2.

The atomic weight, or protons + neutrons, for helium can be rounded off to 4.

So, the number of neutrons in hydrogen is equal to 2.



As for reading the entire table, one must know that each horizontal row is called a **period**, and is arranged by atomic number. There are seven rows in the periodic table. Also, each vertical column of elements is called a **group**, there are sixteen groups in the periodic table. The elements in each group have similar physical and chemical characteristics. For example, the elements in the last group, column VIII, are called the noble gases. These are all gases that do not react, or combine, with any of the other elements. Also, notice how most of the gases, except for hydrogen, are located near each other on the right hand side, while the solids are in the middle or left hand side. You can see how the number of protons and electrons really do influence how an element will look and act in nature.



Some people might ask why hydrogen and helium are on opposite sides of the periodic table when the only difference is that helium has an extra proton and electron. The reason is that the first electron shell can only hold 2 electrons before the 2<sup>nd</sup> shell starts to fill. This means that hydrogen has only one electron in its last shell just like the other elements in the first group. Helium's last shell is completely filled, thus it typically does not react with other elements, similar to the other noble gases in that group. However, some periodic tables place hydrogen separately because it acts differently than any other element. This is because hydrogen's single electron configuration makes it unique. Hydrogen can lose the electron to form H<sup>+</sup>, or it can gain an electron to become H<sup>-</sup>. Hydrogen is the most abundant element in the Universe, making up 75% of its mass.

### Test Your Knowledge:

Directions: Circle the best answer to each question. Answers can be found on Page 17.

- 9) Most elements are
  - a) gases.
  - b) solids.
  - c) liquids.
  
- 10) Atomic number stands for the
  - a) number of protons.
  - b) number of electrons.
  - c) number of neutrons.
  
- 11) How many protons does an atom of carbon have?
  - a) 4
  - b) 6
  - c) 8
  
- 12) Which group does neon belong to?
  - a) IA
  - b) VIB
  - c) VIII

For more interesting information regarding the periodic table, you may want to visit the following websites:

The Periodic Table of Comic Books at <http://www.uky.edu/Projects/Chemcomics/> and a pictorial periodic table at <http://chemlab.pc.maricopa.edu/periodic/periodic.html>

## Chemical Bonds

Most atoms can bond with other atoms. When atoms bond, they either transfer or share electrons. If they transfer electrons, one atom is giving up an electron while another is gaining one. Think of it as letting a friend borrow an old TV set from you. The atom that has gained an electron now has one extra electron. Remember that electrons are negative. This means that that atom now carries a negative charge. The atom that has lost the electron now has a positive charge, because it has one more proton than it does electrons. These new atoms are called **ions**.

Why do atoms transfer or share electrons? Here's an example. Looking at the periodic table, you can see that some atomic numbers are extremely high. For instance, iodine has 53 protons, meaning that it should also have 53 electrons. That is a lot of electrons flying around. Imagine if there were 53 airplanes orbiting an airport all at the same height. What a disaster! It just would not work. An air traffic controller tells each plane at what altitude they should be as they fly to prevent collisions.



Some planes will be lower, some will be higher. Electrons do a similar thing. They orbit at different levels, called shells. Once a shell meets its limit of electrons, any extra electrons will fall into a shell farther away from the nucleus.

Now focus on all of the elements in Group 1A. Starting with hydrogen at the top and ending with francium at the bottom, all of these elements have one electron orbiting at its highest shell. That lonely electron will often decide to leave and find another atom that is looking for an extra electron to fill up a shell. If this happens though, it will give the first atom a positive charge, and the second atom a negative charge. Thus, creating ions!

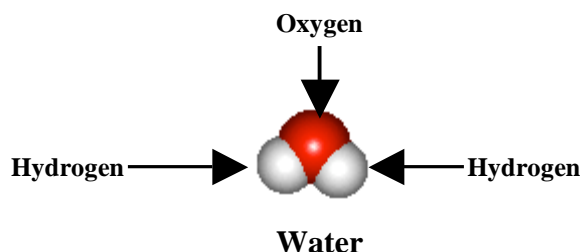
Now how do these ions interact with each other? Remember opposites attract so, when an atom has a positive charge, it will want to bind with an atom with a negative charge and that's what occurs. When those two atoms meet, they form what is called an **ionic bond**. Elements in Group 1A often lose their last electron and elements in Group VIIB often want to gain an electron, which is why they commonly form ionic bonds together.

## Chemical Reactions

Chemists spend a majority of their time working with chemical reactions, since often this knowledge can produce new objects and materials. How would your life be different without the use of plastics or stainless steel? How would you get around without any gasoline? All of these things deal with chemical reactions.

However, in the study of chemistry, chemists need to be able to write down their findings and be able to describe how a reaction takes place. In order to accomplish this in a more efficient way, they use symbols and chemical equations. A **chemical equation** is a compact notation for describing a chemical change.

For example,  $H_2 + O = H_2O$  indicates that 2 atoms of hydrogen combine with one atom of oxygen to produce pure water ( $H_2O$ ).



When dealing with ions, chemists often add a “+” sign or a “-“ sign to indicate if it is a positive or negative ion. Hydrogen and chlorine often form an ionic bond and become hydrochloric acid.

The chemical equation is written as:



Salt also does something similar. Salt is made up primarily of sodium and chlorine. The sodium,  $Na^+$ , and the chlorine,  $Cl^-$ , form an ionic bond to produce  $NaCl$ .

The symbol for Sodium is  $Na^+$ .

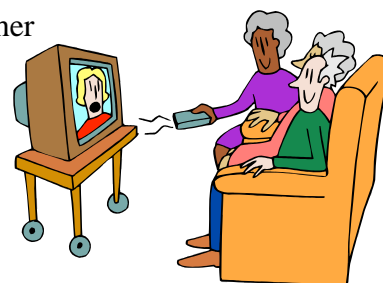
The symbol for Chlorine is  $Cl^-$ .



As you can see, elements in groups IA and VIIB commonly form ionic bonds with each other. Strangely enough, neutral atoms and their ions often behave very differently; in fact, Na reacts very violently with water, while  $Na^+$  just dissolves in it.

The elements in Group VIII are called noble gases because they do not commonly form bonds with the other elements. This is because all of their electron shells are filled to capacity. They do not want to lose any electrons or gain any.

The elements in the middle of the Periodic Table tend to form another type of bond called **covalent bonds**. A covalent bond is a very strong attraction between two or more atoms that are sharing their electrons. Think of this bond as if you and your friend were sharing something together. So, instead of loaning your friend your TV, you are both sitting and watching it at the same time. That is covalent bonding, and it is a much stronger bond than the ionic bond.



## Test Your Knowledge:

Directions: Circle the best answer to each question. Answers can be found on Page 17.

- 13) Which bond is usually stronger?  
a) Covalent  
b) Ionic
- 14) A plus “+” sign is used in an equation to show that an element has  
a) Gained an electron  
b) Lost an electron
- 15) Which bond transfers an electron from one atom to another?  
a) Covalent  
b) Ionic

## Physical and Chemical Reactions

Change! It is everywhere. Nature is constantly changing objects: consider,



freezing a lake, to igniting a forest fire. In our everyday lives, we create many physical and chemical reactions that can either change the physical state of a substance such as ice cubes melting in a drink, or ones that can create a new substance such as heating sugar until it forms caramel. A physical change only changes the color, shape, state, or size of a substance. A chemical change actually creates a new substance. Sugar is made up of one compound called sucrose, and just by being heated, it will form into several compounds, smell different, change into a rich brown liquid, and become a new substance called caramel. In fact, cooking is the most common way everyone practices chemistry.



Take a look below for some more examples of chemical and physical changes.

### Chemical change:

- rusting iron
- burning gasoline
- cooking eggs
- souring milk
- sun-tanning skin



### Physical change :

- whipping egg whites
- boiling water
- dissolving sugar in water
- slicing carrots

For more information, you may want to visit the following website:

<http://www.miamisci.org/af/sln/phantom/mightymolecules.html>

## Behavior of Matter

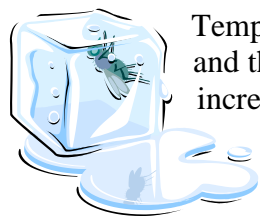
From the previous examples, you have seen how many substances can be changed from one state, such as a solid, into another state, such as a liquid. Of course, we can all give examples of a solid, liquid, or gas, but how would a chemist define what each one is?

A **solid** is rigid and has a fixed volume, and a definite shape. The volume is the amount of space occupied by a three-dimensional object or region of space. The molecules of a solid are packed close together and vibrate around a fixed position rather than move freely. A TV remote control, a shovel, a pencil are examples of solids, and no matter which way you turn them, they will not change their shape or size.

A **liquid** has a definite volume or size, but its shape will change to “fit” the shape of the container. Pour 1/2 a cup of water into a bowl, and it will still measure 1/2 a cup, but it will take the shape of the bowl.

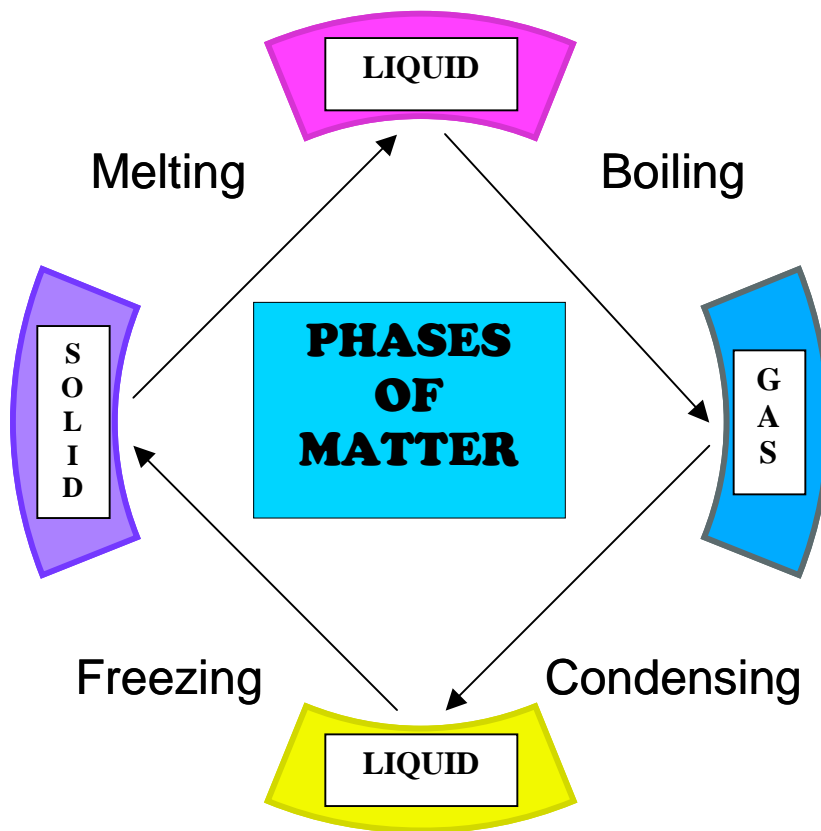
A **gas** has volume and shape that can easily be changed. You can compress a gas so that its volume decreases, and you can add a gas to a container, and the gas will take the shape of the container. Gas molecules move very freely and are found far apart.

Can you think of an example of matter that is commonly used in all three states? Many people would suggest water which is typically found in its liquid state. In fact 75% of the human body, even though we would say is a solid, is made up of water. Now, wait a second, if the human body is 75% water, then why are we not oozing out of our own shape and spreading out across the floor right now? Well, it's the other 25% holding us together. For example, have you ever seen a mummy? That is what we would look like if all our liquids have been taken out of our body. Water can also easily be found in its solid state, ice, and its gaseous state, steam or water vapor. How many uses for each state of water can you come up with?



Temperature affects the state a substance is in. Heat will cause molecules to vibrate and then move around each other more and more. So, when starting with a solid, increasing the heat will cause a solid to become a liquid through a process called **melting**. Applying even more heat will cause those molecules to move even faster and farther away from each other, eventually causing the liquid to **boil**, thus changing it into a gas. Now, how does a gas become a liquid and a liquid become a solid? The process of **condensing** causes a gas to become a liquid and the most obvious example is when taking a shower. When steam hits a mirror, it is cooled significantly enough that the mirror will fog up, and water droplets will appear. Obviously, that leaves us with **freezing**, where a liquid's molecules are cooled down to a temperature where they start to move closer together and remain in a set position

Cooking allows all of us to become “practical chemists” where we can see all of the phases of a substance, as well as physical and chemical reactions creating mixtures and compounds.



**Test Your Knowledge:**

Directions: Circle the best answer to each question. Answers can be found on Page 17.

16) Which process would you use to produce water vapor, or steam?

- a) Freezing
- b) Condensing
- c) Boiling
- d) Melting

17) Going from a gas to a liquid you would need to do which of the following?

- a) Freezing
- b) Condensing
- c) Boiling
- d) Melting

To learn more about the phases of matter you may want to visit the following website:  
<http://www.miamisci.org/af/sln/phases/index.html>

## Review Questions

Directions: Circle the best answer to each question. Answers can be found on Page 17.

- 1) All matter has mass and
  - a) occupies space.
  - b) is solid.
  - c) color.
  - d) odor.
- 2) All atoms contain electrons and
  - a) protons.
  - b) other atoms.
  - c) ions.
  - d) covalent bonds.
- 3) Chopping wood is an example of a
  - a) chemical change.
  - b) physical change.
  - c) chemical reaction.
  - d) ionic bonds.
- 4) Out of the following processes, which one best represents water vapor forming on a cold mirror while you take a hot shower?
  - a) Melting
  - b) Boiling
  - c) Condensing
  - d) Freezing
- 5) What would the atomic number for an atom containing 20 protons, 21 neutrons and 20 electrons be?
  - a) 20
  - b) 21
  - c) 40
  - d) 41
- 6) Looking at the periodic table, which one of the following elements is a liquid at room temperature?
  - a) Mercury
  - b) Iodine
  - c) Oxygen
  - d) Platinum
- 7) What is the most abundant element in the Universe?
  - a) Oxygen
  - b) Helium
  - c) Carbon
  - d) Hydrogen
- 8) True or False? Atoms weigh more going down a group?
  - a) True
  - b) False
- 9) True or False? Moving across a period, the number of protons becomes less?
  - a) True
  - b) False

## GED Practice Exercise

Directions: Circle the best answer to each question. Answers can be found on Page 17.

1. Chlorine (Cl) has an atomic number of 17 and an atomic weight of 35. Which of the following describes the nucleus of chlorine?
  - 1.) 17 protons, 18 neutrons
  - 2.) 17 protons, 35 neutrons
  - 3.) 18 protons, 17 neutrons
  - 4.) 35 protons, 35 neutrons
  - 5.) 52 protons, 35 neutrons
  
2. The element oxygen (O) has 8 protons, 8 electrons, and 8 neutrons. What is its atomic number?
  - 1.) 0
  - 2.) 4
  - 3.) 8
  - 4.) 16
  - 5.) 24
  
3. Potassium (K) is a soft metal that has a melting point of about 64 °C and a boiling point at 774 °C. Which of the following statements is not true concerning the element potassium?
  - 1.) At 50°C potassium would be in a solid state
  - 2.) At 80°C potassium would be in a gaseous state
  - 3.) At 80°C potassium would be in a liquid state
  - 4.) At 500°C potassium would be in a liquid state
  - 5.) At 800°C potassium would be in a gaseous state
  
4. You want to recover salt that you accidentally added to a pot of water. Which of the following ways would be the most effective method of extracting salt from the salt water solution?
  - 1.) Pouring the solution through a cloth.
  - 2.) Pouring the solution through a coffee filter.
  - 3.) Boiling away the water.
  - 4.) Spinning the solution in a mixer.
  - 5.) Freezing the solution.



5. An electrolyte is a substance that conducts electricity when dissolved in water due to the ions found within the solution, such as a salt (NaCl) and water solution. The salt will dissolve in the water, thus separating NaCl into  $\text{Na}^+$  and  $\text{Cl}^-$ . There are basically three types of electrolytes; acids, bases, and salts. Acids are often sour tasting and a common one is hydrochloric acid, HCl. Bases are often soapy feeling and a common one is NaOH. When you combine an acid and a base it will form a salt and water. If the acid HCl and the base NaOH reacted what would they form?
- 1.) NaH and ClOH
  - 2.) NaH and water
  - 3.) HCl and water
  - 4.) NaOH and water
  - 5.) NaCl and water
6. Carbon is an important element of which all living things contain. Even once living things, such as dinosaurs, contained carbon and it is their carbon that gives the fossil fuels, such as coal and oil. The structure of a carbon atom makes it special in that it can combine with as many as four other atoms of any element, including itself. For example, the hardest substance found in nature is a diamond and again it is carbon's ability to tightly bond with 4 other carbon atoms forming a tight pyramid shape that gives it its hardness. From the information in this passage which of the following statements is not true?
- 1.) Carbon can combine with as many as four other atoms.
  - 2.) Coal is an example of a fossil fuel.
  - 3.) A diamond is the hardest known substance found in nature.
  - 4.) A diamond is a living thing.
  - 5.) Dinosaurs contained carbon.

## Answers & Explanations

Page 1: Words You Need To Know

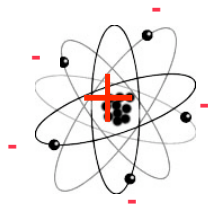
- 1) b
- 2) a
- 3) d
- 4) c
- 5) e

Pages 15-16: GED Practice Exercises

- 1) 1
- 2) 3
- 3) 2
- 4) 3
- 5) 5
- 6) 4

Pages 2-13: Test Your Knowledge

1. Plus sign in the center
2. Minus sign on the outer black balls



3. 5
4. 5
5. False
6. True
7. False
8. True
9. b
10. a
11. b
12. c
13. a
14. b
15. b
16. c
17. b

Page 14: Review Exercises

- 1) a
- 2) a
- 3) b
- 4) c
- 5) a
- 6) a
- 7) d
- 8) a
- 9) b