


Daily *warm-ups*



CHEMISTRY

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The *Daily Warm-Ups series* is a wonderful way to turn extra classroom minutes into valuable learning time. The 180 quick activities—one for each day of the school year—review, practice, and teach chemistry topics. These daily activities may be used at the very beginning of class to get students into learning mode, near the end of class to make good educational use of that transitional time, in the middle of class to shift gears between lessons—or whenever else you have minutes that now go unused. In addition to providing students with fascinating chemistry activities, they are a natural path to other classroom activities involving critical thinking.

Daily Warm-Ups are easy-to-use reproducibles—simply photocopy the day’s activity and distribute it. Or make a transparency of the activity and project it on the board. You may want to use the activities for extra-credit points or as a check on critical-thinking skills and problem-solving skills.

However you choose to use them, *Daily Warm-Ups* are a convenient and useful supplement to your regular lesson plans. Make every minute of your class time count!



Daily Warm-Ups: Chemistry

Intro to Chemistry

The world around you is made up of trillions of particles that are too small to see. These bits of matter follow rules and laws that allow us to identify them and to predict how they will interact with one another. It has often been said that chemistry is the study of matter, its properties, and its behavior. Because we are surrounded by matter, chemistry is one of the most important sciences in that it allows us to observe and then *change* our environment. The question remains, however: How much should we change our environment, and can we predict the results before we do so?

Name either 10 items that you could find in a typical household that are a direct result of people studying chemistry, or 10 ways that chemistry has changed the life of the average person, for better or for worse.



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All That Matters

There are many ways to classify the materials we see around us every day. Is it a solid, liquid, gas, or plasma? Is it an element or a compound? Is it a pure substance or a mixture? The answers to these questions allow us to identify the things we see. For example, we learn to tell the difference between an apple and a banana, or either of those from a ham sandwich. All of these items are food, they all have nutrients, like vitamins and minerals, but they are not identical. Without the ability to observe the environment and identify what we are seeing, we would be unable to respond to and use the materials around us.

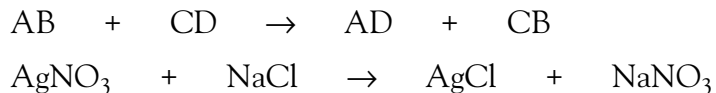


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Name some properties that you would use to tell the difference between a banana and a ham sandwich. Try to think of properties that could be used to tell *any* banana from *any* ham sandwich.

Double Up

A *double-replacement reaction* is a reaction in which two ionic compounds exchange ions to create two new ionic compounds. Such reactions often take place when the reactants are in the form of an aqueous solution. In some cases, one or more of the resulting products is insoluble in water and settles out as a solid called a precipitate. For example:



Complete the following double-replacement reactions.

- a. $BaCl_2 + K_2SO_4 \rightarrow \quad +$
- b. $NaOH + HCl \rightarrow \quad +$
- c. $NH_4Cl + NaOH \rightarrow \quad +$





Daily Warm-Ups: Chemistry

Acids and Bases

Although there is some disagreement on the exact definition of an acid or a base, there are some general qualities that help define them. An acid is a) a substance that can be a proton donor, b) a substance that can act as an electron acceptor, and c) a substance that produces hydronium ions (H_3O^{1+}) when dissolved in water. On the other hand, a base is a) a substance that can be a proton acceptor, b) a substance that can act as an electron donor, and c) a substance that produces hydroxyl ions (OH^{1-}) when dissolved in water.

Identify each of the following as an acid or a base.

- H_2SO_4 _____
- NaOH _____
- HCl _____
- HClO_4 _____
- KOH _____
- $\text{Ca}(\text{OH})_2$ _____

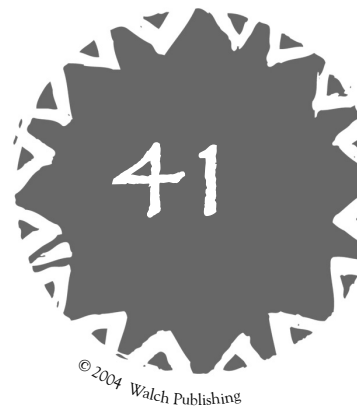




Orbitals

In the quantum mechanical model, an *orbital* describes an area of space in an atom where there is a high probability of finding an electron. The principal quantum number represents the number of different energy levels in an electron and is defined by whole counting numbers from 1 to n , where n represents whole counting numbers like 2, 3, and 4. There are almost always electrons in the levels below the highest energy level of an atom.

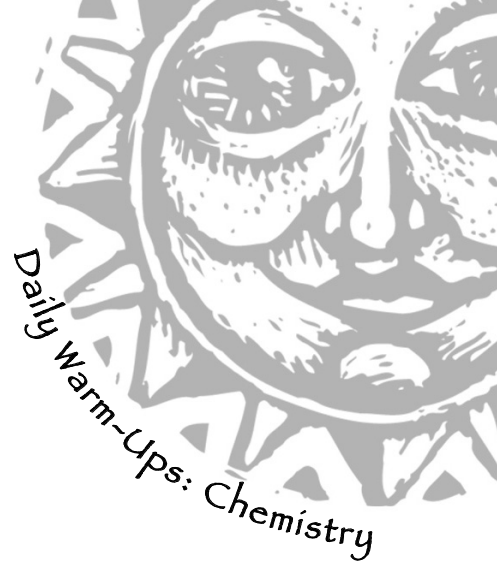
For an atom with a principal quantum number of 5, list all of the levels that would most likely contain electrons.



s,p,d,f

The azimuthal quantum number denotes how many sublevels are in an atom, and it is represented by the letter l . The sublevels are further represented by the letters s, p, d, and f, and have 2, 6, 10, and 14 electrons as the maximum allowed in each level, respectively.

How many electrons would be in the fourth energy level of an atom if the 4s, 4p, 4d, and 4f orbitals were all full?





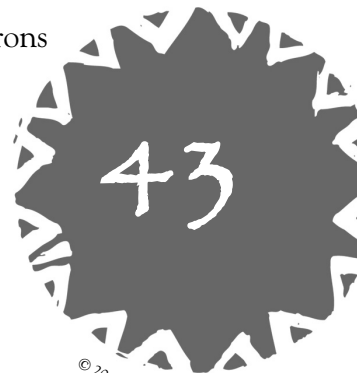
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Electron Segregation

There are certain areas inside of every atom where electrons may be found. These areas, called orbitals, obey an idea called the *Pauli exclusion principle*. This principle says the only way two electrons can be in the same orbital is if they have opposite spins. Spin refers to the actual motion of the electron, which is not unlike the rotation of the earth on its axis. A box represents a single orbital, and arrows placed in the box represent the spin of the electron. Two electrons in an s orbital box would be represented as below.



What would the p orbital shown here look like with four electrons in it?





Common-Ion Effect

The *common-ion effect* is seen when more than one compound is dissolved into the same solution. One of the compounds must be a slightly soluble ionic compound and another must be a readily soluble ionic compound. The slightly soluble compound and the readily soluble compound must have one ion in common. The presence of the ions from the highly soluble compound makes it harder for the slightly soluble compound to dissolve.

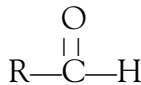
$\text{CuI}(s)$ is slightly soluble in water, and NaI is highly soluble in water. How would the addition of NaI to a solution of CuI affect the equilibrium of the CuI ?



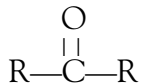
Carbonyl Functional Groups

Carbonyl is a group of atoms that consists of a carbon double bonded to an oxygen. It makes up the backbone of four major organic families—the aldehydes, the ketones, the carboxylic acids (organic acids), and the esters. The general formulas for each are below.

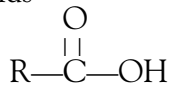
Aldehydes



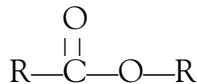
Ketones



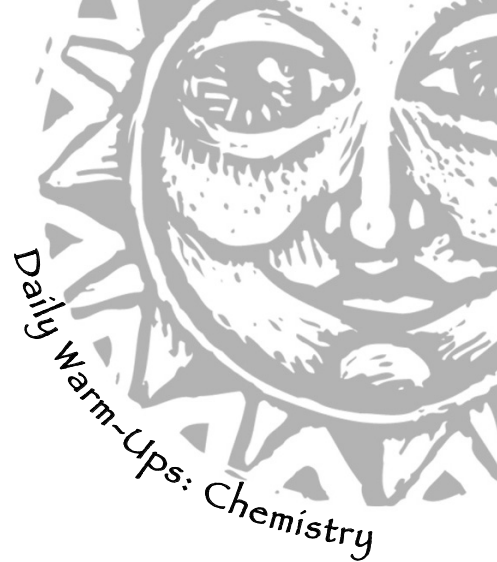
Carboxylic acids



Esters



Is there any special stability afforded to these molecules because of their structure?





Daily Warm-Ups: Chemistry

Bio Comes Next

Biochemistry is the study of chemicals and chemical reactions that are inside living organisms. Many of the molecules studied in biochemistry are quite large and have to be built piece by piece from much smaller compounds found in the environment of living organisms. A lot of energy is needed to accomplish this feat, and the majority of the energy comes from the sun. This means that the organisms that have the ability to use energy directly from the sun, particularly in the form of photosynthesis, have an advantage over organisms that must acquire this energy in other ways.

How do animals get energy from the sun so that their bodies can create the large molecules often studied in biochemistry?

