Section 3 electron configuration worksheet answers

Electron Configurations

Name ___________________________

PART A – ORBITAL DIAGRAMS & LONGHAND ELECTRON CONFIGURATION

Use the patterns within the periodic table to draw orbital diagrams and write longhand electron configurations for the following atoms.

	Symbol	# e⁻	Orbital Diagram and Longhand Electron Configuration
1.	Mg		__ __ __ __ __ __ __ __ __ __ __ __ __ __ __ 1s 2s 2p 3s 3p 4s 3d Electron configuration:
2.	P		__ __ __ __ __ __ __ __ __ __ __ __ __ __ __ 1s 2s 2p 3s 3p 4s 3d Electron configuration:
3.	V		__ __ __ __ __ __ __ __ __ __ __ __ __ __ __ 1s 2s 2p 3s 3p 4s 3d Electron configuration:
4.	Ge		__ __ __ __ __ __ __ __ __ __ __ __ __ __ __ 1s 2s 2p 3s 3p 4s 3d Electron configuration:
5.	Kr		__ __ __ __ __ __ __ __ __ __ __ __ __ __ __ 1s 2s 2p 3s 3p 4s 3d Electron configuration:
6.	Sb		__ __ __ __ __ __ __ __ __ __ __ __ __ __ __ 1s 2s 2p 3s 3p 4s 3d Electron configuration:

Name__________________________ Role:_________________ Date:_____________

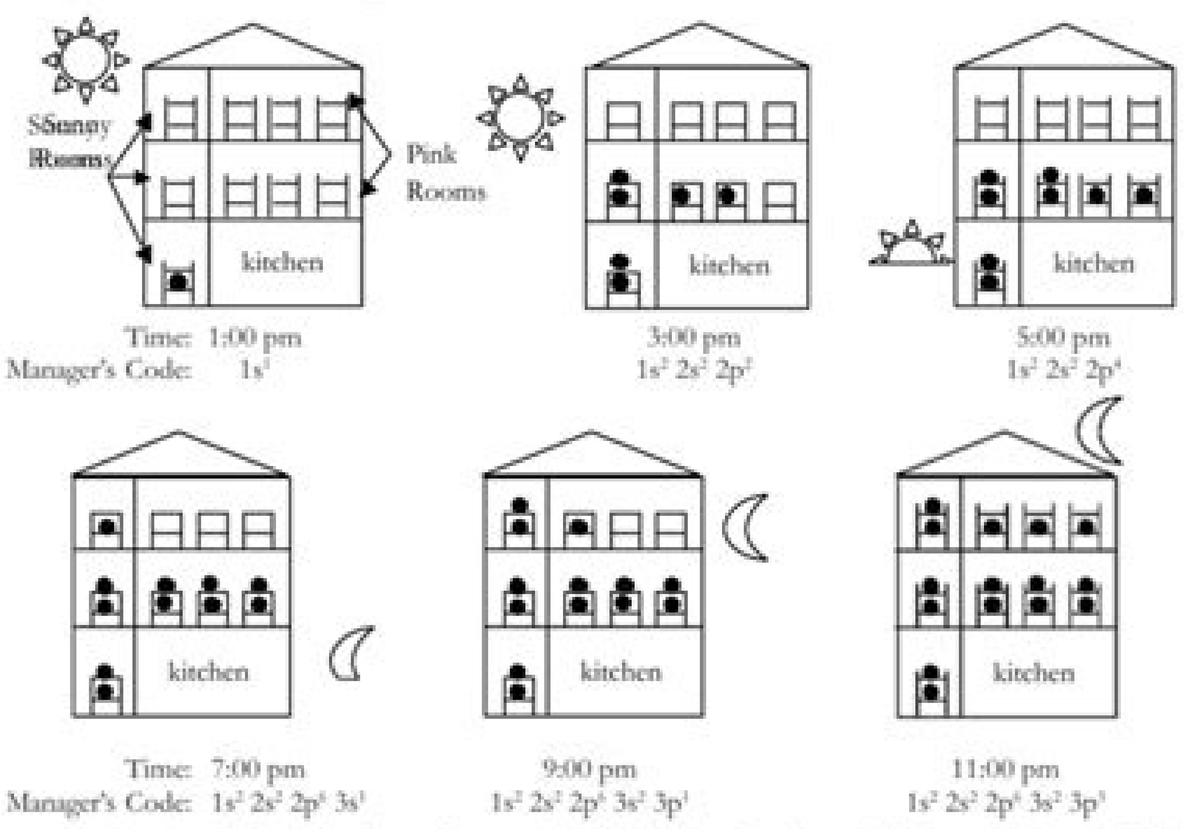
Electron Configurations

What is the electron structure in an atom?

Why?

The electron structure of an atom is very important. Scientists use the electronic structure of atoms to predict bonding in molecules, the charge(s) an atom might have, and the physical properties of elements. In order for scientists to describe the electron structure in an atom, they give the electrons "addresses." Just like your address might include your house number, street, city, and state, an electron's "address" has multiple parts. In this activity, you will learn how the electrons fill up the available spaces in an atom and how their "addresses" or configurations are assigned.

Model 1 – The Boarding House



1. Examine the boarding house diagrams in Model 1. Match each symbol below with its most likely meaning.

   ____*a.* ● I. Bunk bed for boarders

   ____*b.*  II. Manager's code for the number of boarders in the house and their room assignments.

   ____*c.* $1s^2\ 2s^2\ 2p^6\ 3s^1$ III. Boarder

Name ______________________ Date __________ Class __________

CHAPTER 13 REVIEW ACTIVITY — Text Reference: Section 13-10

Writing Electron Configurations

The filling order for electrons in energy sublevels is:

1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d,
5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, 7p

Each *s* sublevel contains 1 orbital; each *p* contains 3; each *d* contains 5; and each *f* contains 7. Each orbital can contain at most 2 electrons.

An electron configuration can be written out by assigning electrons to the sublevels in the order listed, until the number of electrons assigned equals the atomic number *(N)* of the atom.

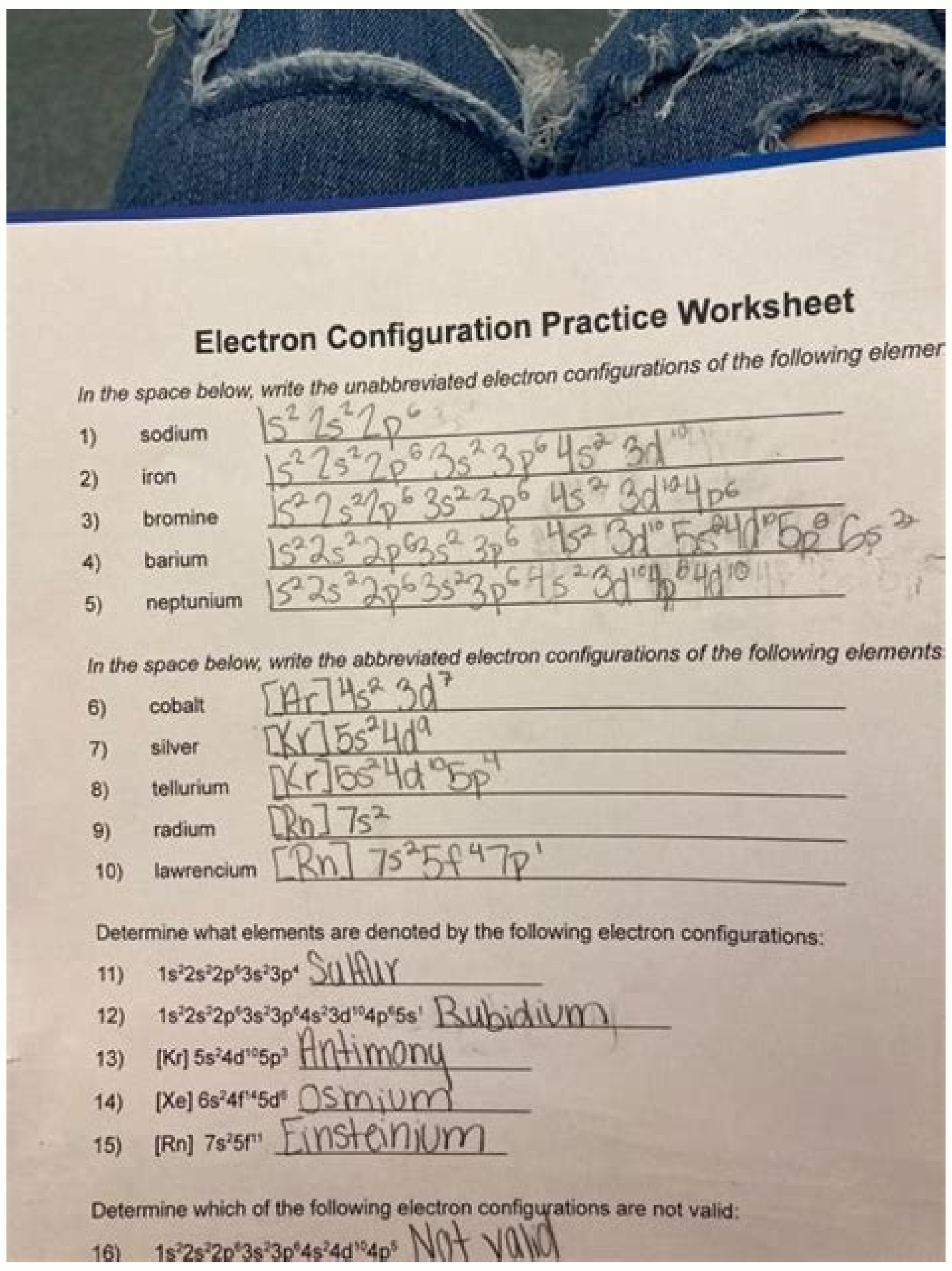
Examples

Determine the configurations of these elements.

Beryllium (N = 4)	$1s^22s^2$
Aluminum (N = 13)	$1s^22s^22p^63s^23p^1$
Bromine (N = 35)	$1s^22s^22p^63s^23p^64s^23d^{10}4p^5$

Write the electron configuration for each of the following elements.

1. Calcium (N = 20) 1. ______________________
2. Lithium (N = 3) 2. ______________________
3. Argon (N = 18) 3. ______________________
4. Iron (N = 26) 4. ______________________
5. Sodium (N = 11) 5. ______________________
6. Oxygen (N = 8) 6. ______________________
7. Iodine (N = 53) 7. ______________________
8. Dysprosium (N = 66) 8. ______________________
9. Radium (N = 88) 9. ______________________
10. Fermium (N = 100) 10. ______________________



Electron Configuration Practice Worksheet

In the space below, write the unabbreviated electron configurations of the following elemen

1) sodium
2) iron
3) bromine
4) barium
5) neptunium

In the space below, write the abbreviated electron configurations of the following elements:

6) cobalt [Ar] $4s^2 3d^7$
7) silver [Kr] $5s^2 4d^9$
8) tellurium [Kr] $5s^2 4d^{10} 5p^4$
9) radium [Rn] $7s^2$
10) lawrencium [Rn] $7s^2 5f^{14} 7p^1$

Determine what elements are denoted by the following electron configurations:

11) $1s^22s^22p^63s^23p^4$ Sulfur
12) $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^1$ Rubidium
13) [Kr] $5s^24d^{10}5p^3$ Antimony
14) [Xe] $6s^24f^{14}5d^6$ Osmium
15) [Rn] $7s^25f^{11}$ Einsteinium

Determine which of the following electron configurations are not valid:

16) $1s^22s^22p^63s^23p^64s^24d^{10}4p^5$ Not valid

Name: Key Date: ______

Electron Configuration Practice

1. What is the electron configuration for Vanadium?
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$
2. What is the electron configuration for Platinum?
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^8$
3. Which element has electron configuration $1s^22s^22p^63s^23p^3$?
P
4. Which element has electron configuration $1s^22s^22p^63s^23p^64s^2$?
Ca
5. What is the electron configuration for Iridium?
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^7$
6. What is the shorthand configuration for Iridium?
[Xe] $6s^2 4f^{14} 5d^7$
7. What is the shorthand configuration for Helium?
[He]
8. What is the shorthand configuration for Platinum?
[Xe] $6s^2 4f^{14} 5d^8$
9. What is the electron configuration for Xenon with a charge of -2?
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$
10. What is the electron configuration for Gallium with a charge of +1?
$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$

Skills to Develop Give the name and location of specific groups on the periodic table, including alkali metals, alkaline earth metals, noble gases, halogens, and transition metals. Explain the relationship between the chemical behavior of families in the periodic table and their electron configurations. Identify elements that will have the most similar properties to a given element. The chemical behavior of atoms is controlled by their electron configuration. Since the families of elements were organized by their chemical behavior, it is predictable that the individual members of each chemical family will have similar electron configurations. Remember that Mendeleev arranged the periodic table so that elements with the most similar properties were placed in the same group. A group is a vertical column of the periodic table. All of the 1A elements have one valence electron. This is what causes these elements to react in the same ways as the other members of the family. The elements in 1A are all very reactive and form compounds in the same ratios with similar properties with other elements. Because of their similarities in their chemical properties, Mendeleev put these elements into the same group. Group 1A is also known as the alkali metals. Although most metals tend to be very hard, these metals are actually soft and can be easily cut. Group 2A is also called the alkaline earth metals. Once again, because of their similarities in electron configurations, these elements have similar properties to each other. The same pattern is true of other groups on the periodic table. Remember, Mendeleev arranged the table so that elements with the most similar properties were in the same group on the periodic table. It is important to recognize a couple of other important groups on the periodic table by their group name. Group 7A (or 17) elements are also called halogens. This group contains very reactive nonmetal elements. The noble gases are in group 8A. These elements also have similar properties to each other, the most significant property being that they are extremely unreactive, rarely forming compounds. We will learn the reason for this later, when we discuss how compounds form. The elements in this group are also gases at room temperature. An alternate numbering system numbers all of the \(s\), \(p\), and \(d\) block elements from 1-18. In this numbering system, group 1A is group 1; group 2A is group 2; the halogens (7A) are group 17; and the noble gases (8A) are group 18. You will come across periodic tables with both numbering systems. It is important to recognize which numbering system is being used and to be able to find the number of valence electrons in the main block elements regardless of which numbering system is being used. If you can locate an element on the Periodic Table, you can use the element's position to figure out the energy level of the element's valence electrons. A period is a horizontal row of elements on the periodic table. For example, the elements sodium (\(\ce{Na}\)) and magnesium (\(\ce{Mg}\)) are both in period 3. The elements astatine (\(\ce{At}\)) and radon (\(\ce{Rn}\)) are both in period 6. Summary The vertical columns on the periodic table are called groups or families because of their similar chemical behavior. All the members of a family of elements have the same number of valence electrons and similar chemical properties. The horizontal rows on the periodic table are called periods. Vocabulary Group (family): A vertical column in the periodic table. Alkali metals: Group 1A of the periodic table. Alkaline earth metals: Group 2A of the periodic table. Halogens: Group 7A of the periodic table. Noble gases: Group 8A of the periodic table. Transition elements: Groups 3 to 12 of the periodic table. Contributors Transcript : (Promo)You're listening to Chemistry in its element brought to you by Chemistry World, the magazine of the Royal Society of Chemistry.(End promo)Chris SmithHello! And welcome to Chemistry in its element, where we take a look at the stories behind the elements that make up the world around us. I'm Chris Smith. This week, we are continuing our tour of the periodic table with a lung full of a gas that we can't do without. It protects us from solar radiation, it keeps us alive and by helping things to burn, it also keeps us warm. It is of course oxygen. And to tell its story, here's Mark Peplow.Mark PeplowLittle did those humble cyanobacteria realize what they were doing when two and a half billion years ago, they started to build up their own reserves of energy-rich chemicals, by combining water and carbon dioxide. Powered by sunlight, they spent the next two billion years terraforming our entire planet with the waste products of their photosynthesis, a rather toxic gas called oxygen. In fact, those industrious bugs are ultimately responsible for the diversity of life, we see around us today. Oxygen accounts for about 23% of the atmosphere's mass with pairs of oxygen atoms stuck together to make dioxygen molecules, but it's not just in the air, we breathe. Overall, it's the most abundant element on the earth's surface and the third most abundant in the universe after hydrogen and helium. Our planet's rocks are about 46% oxygen by weight, much of it in the form of silicon dioxide, which we know most commonly as sand. And many of the metals we mine from the Earth's crust are also found as their oxides, aluminium in bauxite or iron in hematite, while carbonates such as limestone are also largely made of oxygen and the oceans are of course about 86% oxygen, connected to hydrogen as good old H2O, just about the most perfect solvent you can imagine for biochemistry. Oxygen is also in virtually every molecule in your body including fats, carbohydrates and DNA. In particular, it's the atom that links together the phosphate groups in the energy-carrying molecule ATP. Oxygen is obviously pretty useful for keeping us going, but is also widely used in industry as an oxidant, where it can give up some of that solar energy captured by plant and those cyanobacteria. A stream of oxygen can push the temperature of a blast furnace over 2000 degrees and it allows an oxyacetylene torch to cut straight through metal. The space shuttle is carried into space on an incredible force produced when liquid oxygen and liquid hydrogen combine to make water.So who first noticed this ubiquitous stuff? There's certainly some debate about who first identified oxygen as an element, partly because at the time the precise definition of an element still hadn't really been pinned down. English chemist, Joseph Priestley certainly isolated oxygen gas in the 1770s, although he tried to define it as dephlogisticated air. Phlogiston was then thought to be some kind of primordial substance that was the root cause of combustion. Swedish chemist, Carl Wilhelm Scheele was a fan of phlogiston too and probably discovered oxygen before Priestly did. But it was Antoine Lavoisier, sometimes called the father of modern chemistry, who was the first to truly identify oxygen as an element and in doing so, he really helped to firm up the definition that an element is something that cannot be broken down by any kind of chemical analysis. This also helped him to kill off the phlogiston theory, which was a crucial step in the evolution of chemistry. Oxygen isn't only about the dioxygen molecules that sustain us. There is another form, trioxygen, also known as ozone and it's also pretty important in the upper reaches of the atmosphere, is responsible for filtering out harmful ultraviolet rays, but unfortunately, ozone is also pretty toxic. So it's bad news that tons of the gas are produced by the reactions between hydrocarbons and nitrogen oxides churned out by cars every day. If only we could transplant the stuff, straight up into the stratosphere! Now ozone is normally spread so thinly in the air, that you can't see its pale blue colour and oxygen gas is colourless unless you liquefy it, but there is one place where you can see the gas in all its glory. The aurora or polar lights, where particles from the solar wind slam into oxygen molecules in the upper atmosphere to produce the swirling green and red colours that have entranced humans for millennia.Chris SmithSo why life is a gas, that was Mark Peplow revealing the secrets of the element that we can't live without. Next time on Chemistry in its element, Johnny Ball joins us to tell the story of a chemical that's craved by Olympic athletes, makes good hi-five connectors and is also a favourite for fillings. And that's in teeth, not pies.Johnny BallToday one gram can be beaten into a square meter sheet just 230 atoms thick, one cubic centimetre would make a sheet 18 square meters, 1 gram could be drawn out to make 165 meters of wire just 1/200th of a millimetre thick. The gold colour in Buckingham Palace fence is actually gold; gold covered because it lasts 30 years; whereas gold paint which actually contains no gold at all lasts in tip-top condition only a year or so.Chris SmithSo all that glitters isn't gold, but some is, and you can find out why on next week's Chemistry in its element. I'm Chris Smith, thanks for listening. See you next time.(Promo)(End promo)

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