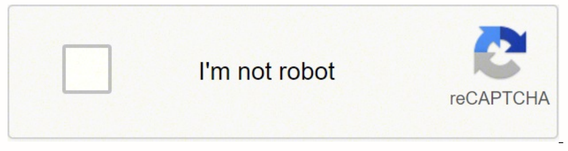

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2825459943 32225237.525 31085805.704918 57491796.882353 52380311232 13551350.545455 32848075.9 14265070.764706 50650087.166667 22234498.746479 188896452 15480434.776119 43003108.883721 59809.631578947 11576809.052632 62445925.387097 171043625271 51513923100 153123676020 119876747.4 7832187 6215081.4090909 42513608.765957 109129014.33333 8010375922 26747551.128571 7664530.5555556 56392027 825121.62222222

Covalent bonding worksheet 2.4.2 answers answer keys 1 2

Chemistry 12
Worksheet 4-4
Ka and Kb Calculations

Name KEY

Due Date _____

Correct and Hand In by _____

37

NOTE: For this worksheet, you must show all of your steps in each calculation. State any assumptions clearly. Make sure your answer is in the correct number of significant digits as justified by the data and make sure your answer has the correct unit. You are allowed one set of corrections.

1. Calculate the $[H_3O^+]$ in a 0.45 M solution of hydrogen sulphide (H_2S). (3 marks)

$H_2S + H_2O \rightleftharpoons H_3O^+ + HS^-$

	H_2S	H_2O	H_3O^+	HS^-
I	0.45		0	0
C	−x		+x	+x
E	0.45−x		x	x

$K_a = \frac{[H_3O^+][HS^-]}{[H_2S]} = \frac{x^2}{0.45-x}$ assume $0.45-x \cong 0.45$

$K_a \cong \frac{x^2}{0.45} \Rightarrow x^2 = 0.45\,K_a \Rightarrow [H_3O^+] = x = \sqrt{0.45(9.1\times10^{-8})} = 2.0236\times10^{-4}\,M$

3

Answer $[H_3O^+] = 2.0\times10^{-4}\,M$

2. Calculate the pH in a 0.60 M solution of ammonium chloride (NH_4Cl). (4 marks)

NH_4^+ Cl^- spectator

$NH_4^+ + H_2O \rightleftharpoons H_3O^+ + NH_3$

	NH_4^+	H_2O	H_3O^+	NH_3
I	0.60		0	0
C	−x		+x	+x
E	0.60−x		x	x

$K_a = \frac{[H_3O^+][NH_3]}{[NH_4^+]} = \frac{x^2}{0.60-x}$ assume $0.60-x \cong 0.60$

$K_a \cong \frac{x^2}{0.60} \Rightarrow x^2 = 0.60\,K_a$

$[H_3O^+] = x = \sqrt{0.60(5.6\times10^{-10})}$

$[H_3O^+] = 1.833\times10^{-5}\,M$

$pH = 4.74$

4

7

Answer $pH = 4.74$

TYPES OF CHEMICAL REACTIONS LAB PART#1

I. Purpose: To view the actual chemical reactions, write the correct balanced chemical equations, and type of chemical reaction.

Connection to Business: Businesses utilize many types of chemical reactions to produce, maintain, and sterilize their product so to prevent pollution.

II. Materials: burner, test tube, metal tongs (only…no rubber ends), microspatula, evaporating dish, wood splints
Chemicals: copper (wire), magnesium (ribbon), copper (II) carbonate
SAFETY GOGGLES!

III. Procedure: Part #1

1. Obtain materials.
2. Use the fine sandpaper to clean a piece of copper wire until shiny.
3. Set up a Bunsen burner.
4. Using tongs, hold the wire in the hottest part of the burner flame for 1-2 minutes. Record your observation of the wire's appearance afterwards.
5. Place an evaporating dish near the Bunsen burner and repeat step #4 except place the remaining magnesium into the evaporating dish.
   (WARNING: AVOID LOOKING DIRECTLY AT THE FLAME)
6. Place 2 heaping microspatulas of copper (II) carbonate into a clean, dry test tube.
7. Using a test tube holder, hold the test tube (at a 45° angle pointed away from people) over the Bunsen burner flame for 3 minutes or until completely black.
   (Allow this to cool slightly before placing into the wood test tube holder.)
8. Light a wood splint and place inside the test tube. Record your observations.
9. Dispose of all the metals and burnt powders in a zip-lock bag and place in the trash.
10. Clean and return all lab equipment.

IV. Data/Questions: Part #1 Data Table

Sample	Appearance Before Reaction	Appearance After Reaction
1. Copper	*Answer: shiny, reddish brown*	*Answer: black, powder coating*
2. Magnesium	*Answer: silver, metal*	*Answer: Most white, bright light*
3. Mercury (II) Oxide (will not perform experiment)	*Reddish powder*	*Liquid mercury formed; flame burned brighter when placed in the test tube*
4. Copper (II) Carbonate	*Answer: green powder*	*Answer: decomposes into gas CO_2 and black residue*

Mars Periodic Table

Use the following clues to put the elements in their proper places on the periodic table. These symbols have absolutely no relationship to our symbols. ("O", for example, does not necessarily represent Oxygen here).

The symbols are: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, @, #, $, %.

The most reactive metal is X.
The lightest halogen is I.
The noble gases are S, L, W and J. S is the lightest of these. W is the heaviest of these and L is in period 2.
The lightest element on the periodic table is A.
The following elements all have three electrons shells: %, H, K, M, O, Y and Z. % is an alkali metal. H can form +4 or -4 charges. K belongs in the same family as I. M forms -3 charges. O forms -2 charges. Y is a metalloid by location but actually acts more like a light metal. Z is an alkaline earth metal.
G has 7 total electrons but only 5 valence electrons.
C has an average atomic mass of approximately 7 amu.
Q has 4 electron shells and only 1 electron in that outer shell.
The E family is made up of the elements E, #, R, and Y. E is a metalloid. # is in the same period as X.
$ has the greatest atomic mass of all the elements on the periodic table.
F is in period 5 and D is in period 2. They are both in the same family as E.
F has an atomic number of 6. H is in the same family as R, T and $
When saltwater is distilled (salt is removed), it produces the liquid pure A@.
V is a halogen. @ is an alkaline earth metal. S is a metalloid. U is in period 4.

1	2	13	14	15	16	17	18
A							B
C	D	E	F	G	N	I	L
%	Z	V	H	M	O	K	J
Q	@	R	T	N	E	Y	W
X	F	#	$				

Chapter 9 Chemical Bonding I: Lewis Theory

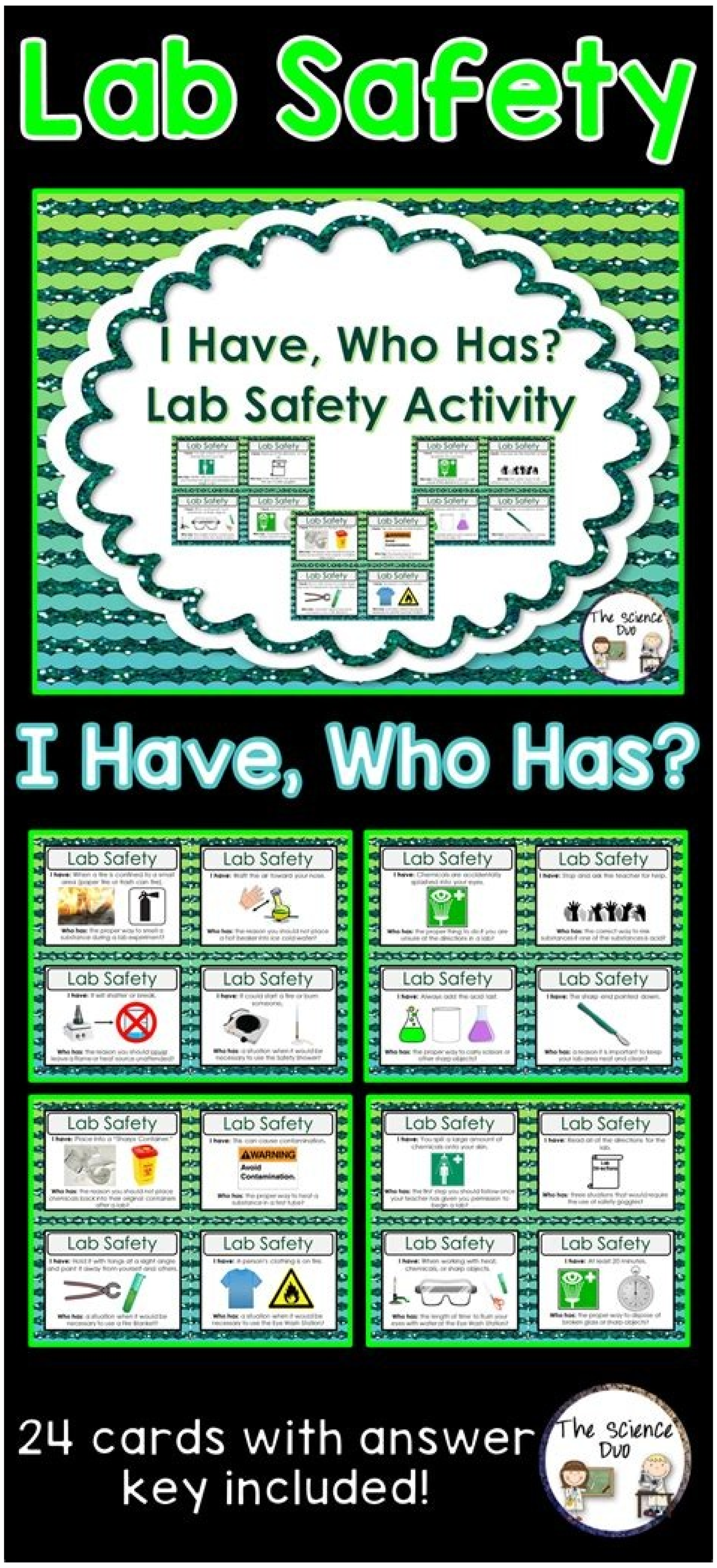
1) Which of the following represents the Lewis structure for 'O'
A) O
B) O
C) O
D) O
E) O
Answer: A

2) Which of the following represents the Lewis structure for Cl?
A) Cl
B) Cl
C) Cl
D) Cl
E) Cl
Answer: B

3) Which of the following represents the Lewis structure for Mg?
A) Mg
B) Mg
C) Mg
D) Mg
E) Mg
Answer: C

4) Which of the following represents the Lewis structure for Br^-?
A) Br^-
B) Br^-
C) Br^-
D) Br^-
E) Br^-
Answer: D

5) Which of the following represents the Lewis structure for Ca^{2+}?
A) Ca^{2+}
B) Ca
C) Ca^{2+}
D) Ca^{2+}
E) Ca^{2+}
Answer: E



However, you need to do some research to get the best deals. In the case of Cr and Cu, we find that half-filled and completely filled subshells apparently represent conditions of preferred stability. (d) Fe: 1s22s22p63s23p64s23d6. Beginning with the transition metal scandium (atomic number 21), additional electrons are added successively to the 3d subshell. What does the author most likely want to convey through the use of the phrase “ready consent to terms and a couple of coins flung upon the table"? The other is interest rate risk, the chance that overall interest rates rise significantly and make the coupon worthless. The arrow leads through each subshell in the appropriate filling order for electron configurations. [latex]\begin{array}{l} \text{Li}: [\text{He}] \;2s^1 \\ \text{Na}: [\text{Ne}] \;3s^1 \end{array}[/latex] The alkaline earth metal magnesium (atomic number 12), with its 12 electrons in a [Ne]3s2 configuration, is analogous to its family member beryllium, [He]2s2. The valence electrons (those added after the last noble gas configuration) in these elements include the ns and (n – 1) d electrons. It is the loss, gain, or sharing of valence electrons that defines how elements react. Carbon (atomic number 6) has six electrons. The helium atom contains two protons and two electrons. Quantum Numbers and Electron Configurations What is the electron configuration and orbital diagram for a phosphorus atom? satiric B. These three electrons have unpaired spins. Each added electron occupies the subshell of lowest energy available (in the order shown in Figure 1), subject to the limitations imposed by the allowed quantum numbers according to the Pauli exclusion principle. Both atoms have a filled s subshell outside their filled inner shells. B. Thus, potassium has an electron configuration of [Ar]4s1. Hence, potassium corresponds to Li and Na in its valence shell configuration. The diagram of an electron configuration specifies the subshell (n and l value, with letter symbol) and superscript number of electrons. As the principal quantum number, n, increases, the size of the orbital increases and the electrons spend more time farther from the nucleus. The order of filling of the energy levels is 1s, 2s, 2p, 3s, 3p, 4s, . The specific arrangement of electrons in orbitals of an atom determines many of the chemical properties of that atom. We will discuss methods for remembering the observed order. What are the four quantum numbers for the last electron added? Check Your Learning Identify the atoms from the electron configurations given: (a) [Ar]4s23d5 (b) [Kr]5s24d105p6 The periodic table can be a powerful tool in predicting the electron configuration of an element. Experimentally, we observe that its ground-state electron configuration is actually [Kr]5s14d4. Which emotion is the author most likely trying to rouse from his reader after reading this text? 5. This category includes all the nonmetallic elements, as well as many metals and the intermediate semimetallic elements. As with corporate bonds, there are short-term and long-term options. A. Such overlaps continue to occur frequently as we move up the chart. depression The correct choice is C. The 15 electrons of the phosphorus atom will fill up to the 3p orbital, which will contain three electrons: The last electron added is a 3p electron. reproachful D. Understand the Terminology Bonds come with a lot of lingo you need to understand. What tone is the author most likely trying to convey with the sentence, "It is a truth universally acknowledged, that a single man in possession of a good fortune must be in want of a wife." A. Of course, short-term bond rates are lower because the risk is lower. The valence shells of the inner transition elements consist of the (n – 2)f, the (n – 1)d, and the ns subshells. Because they are in the outer shells of an atom, valence electrons play the most important role in chemical reactions. The best interest bonds are usually corporate bonds, which have better rates than government bonds. The electron configuration and the orbital diagram are: Following hydrogen is the noble gas helium, which has an atomic number of 2. Yes, we know it's because he's uncomfortable, but the phrases indicate speed. 2. And he wasn't trying to terrify the reader in this scene, either. Samarium trication loses three electrons. astonished by the notion D. A lot of bond information isn’t publicized, and it can be easy to overpay. We now have a choice of filling one of the 2p orbitals and pairing the electrons or of leaving the electrons unpaired in two different, but degenerate, p orbitals. Four of them fill the 1s and 2s orbitals. The similarity in chemical properties among elements of the same group occurs because they have the same number of valence electrons. The first two will be lost from the 6s orbital, and the final one is removed from the 4f orbital. He would've used scarier content instead of relying on the dark, depressing words and phrases he does. Valence electrons are also the determining factor in some physical properties of the elements. The energy of atomic orbitals increases as the principal quantum number, n, increases. In general, such exceptions involve subshells with very similar energy, and small effects can lead to changes in the order of filling. Transition elements or transition metals. If not, go back, answer the questions and then head back here and find out what you've gotten right and what you may have missed. If you're curious about what author's tone really is and wondering how to figure it out, here are three of the tricks you can use to determine the author's tone when you don't have a clue. The electrons occupying the outermost shell orbital(s) (highest value of n) are called valence electrons, and those occupying the inner shell orbitals are called core electrons (Figure 5). Well-established companies that issue bonds have one rate, while unstable companies have a much higher coupon. You can also buy and sell bonds before they reach maturity. Figure 3. If he were trying to make the reader feel depressed, he would have spoken to something more personal. The correct answer is B. The stranger is desperate for warmth. However, you have to pay federal taxes on the income. I couldn't get at the heart of my displeasure. So, if two identical nonmetals (e.g., two hydrogen atoms) bond together, they will form a pure covalent bond. The second electron also goes into the 1s orbital and fills that orbital. Check Your Learning Which ion with a +2 charge has the electron configuration 1s22s22p63s23p63d104s24p64d5? The second electron has the same n, l, and ml quantum numbers, but must have the opposite spin quantum number, [latex]m_s = - \frac{1}{2}[/latex]. Most bond returns are low to modest due to low risk, so you don’t want a lot of fees stealing your profits. Municipal bonds and treasury bonds are examples. The valence electrons for main group elements are those with the highest n level. Remember electrons are negatively charged, so ions with a positive charge have lost an electron. An anion (negatively charged ion) forms when one or more electrons are added to a parent atom. How to Buy Bonds You can buy bonds directly from the issuer, but that’s only a good idea if you have significant capital to invest unless you’re buying treasuries. In addition, it takes a lot of research to make sure you’re getting a good price. Oxygen (atomic number 8) has a pair of electrons in any one of the 2p orbitals (the electrons have opposite spins) and a single electron in each of the other two. The stranger's discomfort. Therefore, n = 3 and, for a p-type orbital, l = 1. Aluminum (atomic number 13), with 13 electrons and the electron configuration [Ne]3s23p1, is analogous to its family member boron, [He]2s22p1. One is the default risk, the chance the company or entity that borrowed the money goes under before paying it back. Now we can understand why the periodic table has the arrangement it has—the arrangement puts elements whose atoms have the same number of valence electrons in the same group. The orbitals are filled as described by Hund’s rule: the lowest-energy configuration for an atom with electrons within a set of degenerate orbitals is that having the maximum number of unpaired electrons. The arrangement of electrons in the orbitals of an atom is called the electron configuration of the atom. Sodium cation loses one electron, so Na+: 1s22s22p63s1 = Na+: 1s22s22p6. (e). This subshell is filled to its capacity with 10 electrons (remember that for l = 2 [d orbitals], there are 2l + 1 = 5 values of ml, meaning that there are five d orbitals that have a combined capacity of 10 electrons). Electrons enter higher-energy subshells only after lower-energy subshells have been filled to capacity. Within each shell, as the value of l increases, the electrons are less penetrating (meaning there is less electron density found close to the nucleus), in the order s > p > d > f. However, all available chemical and physical evidence indicates that potassium is like lithium and sodium, and that the next electron is not added to the 3d level but is, instead, added to the 4s level (Figure 6). Corporate bonds sometimes offer a better interest rate than a simple savings account, but they are most useful for the coupon, which can provide consistent income each month. You can also sign up for electronic bond trading sites to buy bonds online, but you want to proceed carefully. However, this pattern does not hold for larger atoms. The next electron is added to complete the 4s subshell and calcium has an electron configuration of [Ar]4s2. Finally, draw diagonal lines from top to bottom as shown. The stranger's lack of manners and thoughtfulness. Orbital diagrams are pictorial representations of the electron configuration, showing the individual orbitals and the pairing arrangement of electrons. Figure 3 illustrates the traditional way to remember the filling order for atomic orbitals. The solution defied me. This version of the periodic table shows the outer-shell electron configuration of each element. When drawing orbital diagrams, we include empty boxes to depict any empty orbitals in the same subshell that we are filling. This is in accord with the Pauli exclusion principle: No two electrons in the same atom can have the same set of four quantum numbers. Bond rates vary significantly, depending on the risk of the company issuing it. Even if we read nothing beyond the first line, we'd get the sense that the author was slightly amused by the subject matter. Figure 1. For orbital diagrams, this means two arrows go in each box (representing two electrons in each orbital) and the arrows must point in opposite directions (representing paired spins). The words used by Poe are complicated, as is his sentence structure. For transition metals and inner transition metals, however, electrons in the s orbital are easier to remove than the d or f electrons, and so the highest ns electrons are lost, and then the (n – 1)d or (n – 2)f electrons are removed. Since the arrangement of the periodic table is based on the electron configurations, Figure 4 provides an alternative method for determining the electron configuration. PCl3 - phosphorus trichlorideCH3CH2OH - ethanolO3 - ozoneH2 - hydrogenH2O - waterHCl - hydrogen chlorideCH4 - methaneNH3 - ammoniaCO2 - carbon dioxide So, for example, you would not expect to find covalent bonds in a metal or alloy, such as silver, steel, or brass. Thus, the attraction to the nucleus is weaker and the energy associated with the orbital is higher (less stabilized). D. C. A cation (positively charged ion) forms when one or more electrons are removed from a parent atom. Phosphorus trianion gains three electrons, so P3−: 1s22s22p63s23p6. Which of the following choices provides the best answer to the author's final question posed in the text, while maintaining the tone of the article? Sm3+: 1s22s22p63s23p64s23d104p65s24d105p66s24f6 = 1s22s22p63s23p64s23d104p65s24d105p64f5. But this is not the only effect we have to take into account. Iron(II) loses two electrons and, since it is a transition metal, they are removed from the 4s orbital Fe2+: 1s22s22p63s23p64s23d6 = 1s22s22p63s23p63d6. Bennet brings it up. The next atom is the alkali metal lithium with an atomic number of 3. When we come to the next element in the periodic table, the alkali metal potassium (atomic number 19), we might expect that we would begin to add electrons to the 3d subshell. This procedure is called the Aufbau principle, from the German word Aufbau (“to build up”). For example, after filling the 3p block up to Ar, we see the orbital will be 4s (K, Ca), followed by the 3d orbitals. Although the character feels depression upon viewing the house, Poe is trying to make the reader feel apprehension in the scene. Figure 5. Organic compounds, such as carbohydrates, lipids, proteins, and nucleic acids, are all examples of molecular compounds. The filling order is based on observed experimental results, and has been confirmed by theoretical calculations. Which ion with a +3 charge has this configuration? When two dissimilar nonmetals form bonds (e.g., hydrogen and oxygen), they will form a covalent bond, but the electrons will spend more time closer to one type of atom than the other, producing a polar covalent bond. If you want an investment that earns money but generally carries less risk than investing in the stock market, the bond market might be perfect for you. The completely filled d orbitals count as core, not valence, electrons. C. We describe an electron configuration with a symbol that contains three pieces of information (Figure 2): The number of the principal quantum shell, n, The letter that designates the orbital type (the subshell, l), and A superscript number that designates the number of electrons in that particular subshell. . Government Bonds Government bonds are considered very stable and low risk, so they don’t offer a very high coupon. The author's attitude toward mothers trying to arrange marriages for their daughters could best be described as: A. So even though we know he is uncomfortable, the correct answer is NOT D. Here, the answer must closely mirror the language in the text. We know that because he's covered in snow and asks for human charity, which we can only assume is because he's cold. The author uses the words "ready consent," which means "eager or quickly willing" consent and coins "flung" upon the table to indicate a hurried pace. If she were accepting of the idea, then she probably wouldn't have written about it in a witty way. Sm: 1s22s22p63s23p64s23d104p65s24d105p66s24f6. This is the amount you earn in exchange for letting the company or government use your money. The electron configurations and orbital diagrams of these four elements are: The alkali metal sodium (atomic number 11) has one more electron than the neon atom. For main group elements, the electrons that were added last are the first electrons removed. It was a mystery I couldn't solve; nor could I grapple with the shadowy fancies that crowded upon me as I pondered. The correct choice is D. The electron configurations of silicon (14 electrons), phosphorus (15 electrons), sulfur (16 electrons), chlorine (17 electrons), and argon (18 electrons) are analogous in the electron configurations of their outer shells to their corresponding family members carbon, nitrogen, oxygen, fluorine, and neon, respectively, except that the principal quantum number of the outer shell of the heavier elements has increased by one to n = 3. Consider using a reputable current bond price calculator. When their electron configurations are added to the table (Figure 6), we also see a periodic recurrence of similar electron configurations in the outer shells of these elements. By “building up” from hydrogen, this table can be used to determine the electron configuration for any atom on the periodic table. The added electrons fill in the order predicted by the Aufbau principle. We will now construct the ground-state electron configuration and orbital diagram for a selection of atoms in the first and second periods of the periodic table. The author further makes the scene amusing by pitting a complacent husband against his busybody wife. (b) P: 1s22s22p63s23p3. Figure 4. There are two inner transition series: The lanthanide series: lanthanide (La) through lutetium (Lu) The actinide series: actinide (Ac) through lawrencium (Lr) Lanthanum and actinium, because of their similarities to the other members of the series, are included and used to name the series, even though they are transition metals with no f electrons. Other exceptions also occur. Solution The atomic number of phosphorus is 15. weary The correct answer is A. accepting of the notion B. There are three degenerate 2p orbitals (ml = −1, 0, +1) and the electron can occupy any one of these p orbitals. The 4p subshell fills next. (a) Na: 1s22s22p63s1. Since the core electron shells correspond to noble gas electron configurations, we can abbreviate electron configurations by writing the noble gas that matches the core electron configuration, along with the valence electrons in a condensed format. The remaining electron must occupy the orbital of next lowest energy, the 2s orbital (Figure 3 or Figure 4). Nothing about the house itself was particularly depressing. However, the term is frequently used to refer to the entire d block (colored yellow in Figure 6), and we will adopt this usage in this textbook. This electron must go into the lowest-energy subshell available, the 3s orbital, giving a 1s22s22p63s1 configuration. This chart is straightforward to construct. Once you know the issuer, the coupon and the maturity, you have the information you need to find the fair price of the bond. For transition metals, the last s orbital loses an electron before the d orbitals. Writing the configurations in this way emphasizes the similarity of the configurations of lithium and sodium. Feel free to use these free printable pdf files for your own educational use, too: Author's Tone Worksheet 1 | Author's Tone Worksheet 1 Answer Key 1. Repeat for p, d, and f. For two series, lanthanum (La) through lutetium (Lu) and actinium (Ac) through lawrencium (Lr), 14 f electrons (l = 3, 2l + 1 = 7 ml values; thus, seven orbitals with a combined capacity of 14 electrons) are successively added to the (n – 2) shell to bring that shell from 18 electrons to a total of 32 electrons. terror C. Beginning with hydrogen, and continuing across the periods of the periodic table, we add one proton at a time to the nucleus and one electron to the proper subshell until we have described the electron configurations of all the elements. For small orbitals (1s through 3p), the increase in energy due to n is more significant than the increase due to l; however, for larger orbitals the two trends are comparable and cannot be simply predicted. Your broker may tell you the purchase is “commission free,” but that’s only because the company is charging you a markup. These classifications determine which orbitals are counted in the valence shell, or highest energy level orbitals of an atom. You would find ionic rather than covalent bonds in a salt, such as sodium chloride. Thus, the electron configuration and orbital diagram of lithium are: An atom of the alkaline earth metal beryllium, with an atomic number of 4, contains four protons in the nucleus and four electrons surrounding the nucleus. MORE FROM ASKMONEY.COM Stop! Before you read on, have you completed the Author's Tone Worksheet 1, first? For instance, the electron configurations (shown in Figure 6) of the transition metals chromium (Cr; atomic number 24) and copper (Cu; atomic number 29), among others, are not those we would expect. Figure 1 depicts how these two trends in increasing energy relate. We have chosen to show the full, unabbreviated configurations to provide more practice for students who want it, but listing the core-abbreviated electron configurations is also acceptable. The remaining two electrons occupy the 2p subshell. The higher interest rate compensates you for greater risk that the company could go out of business before repaying you. Figure 6. And Choice A is completely off! Hence, Choice C is the best answer. Having introduced the basics of atomic structure and quantum mechanics, we can use our understanding of quantum numbers to determine how atomic orbitals relate to one another. For example, niobium (Nb, atomic number 41) is predicted to have the electron configuration [Kr]5s24d3. For example, gallium (Ga, atomic number 31) has the electron configuration [Ar]4s23d104p1, which contains three valence electrons (underlined). Hence, Choice D is the best bet. 3. Figure 2. All of the electrons in the noble gas neon (atomic number 10) are paired, and all of the orbitals in the n = 1 and the n = 2 shells are filled. This allows us to determine which orbitals are occupied by electrons in each atom. Main group elements (sometimes called representative elements) are those in which the last electron added enters an s or a p orbital in the outermost shell, shown in blue and red in Figure 6. When interest rates go up, new bonds have better rates. Electrons in successive atoms on the periodic table tend to fill low-energy orbitals first. 4. It could be that I'd fallen into a nightmare without knowing it. B. Covalent bonds form when two nonmetallic atoms have the same or similar electronegativity values. Why Buy Corporate Bonds? They are shown in green in Figure 6. One of the benefits of some government bonds is that the interest payments aren’t subject to state taxes. The official IUPAC definition of transition elements specifies those with partially filled d orbitals. These are examples of covalent bonds and covalent compounds. As discussed previously, the 3d orbital with no radial nodes is higher in energy because it is less penetrating and more shielded from the nucleus than the 4s, which has three radial nodes. If Austen were irritated by the idea, she'd make the mother more unlikable. Thus, many students find it confusing that, for example, the 5p orbitals fill immediately after the 4d, and immediately before the 6s. The stranger's greediness in bartering. This phenomenon is called shielding and will be discussed in more detail in the next section. The three p orbitals are degenerate, so any of these ml values is correct. The 3d orbital is higher in energy than the 4s orbital. It had to be the dreariness of the day. At maturity, the full amount of the bond is paid back. Thus, a phosphorus atom contains 15 electrons. As described earlier, the periodic table arranges atoms based on increasing atomic number so that elements with the same chemical properties recur periodically. Referring to Figure 3 or Figure 4, we would expect to find the electron in the 1s orbital. The electron configuration and orbital diagram for carbon are: Nitrogen (atomic number 7) fills the 1s and 2s subshells and has one electron in each of the three 2p orbitals, in accordance with Hund’s rule. Electrons in orbitals that experience more shielding are less stabilized and thus higher in energy. scornful C. The colored sections of Figure 6 show the three categories of elements classified by the orbitals being filled: main group, transition, and inner transition elements. For instance, the bond’s issuer is the company that borrows the money. Here’s what you need to know. In any atom with two or more electrons, the repulsion between the electrons makes energies of subshells with different values of l differ so that the energy of the orbitals increases within a shell in the order s < p < d < f. They essentially use bonds to borrow money and pay interest until the bond matures. irritated with the notion C. Thus, the elements with completely filled orbitals (Zn, Cd, Hg, as well as Cu, Ag, and Au in Figure 6) are not technically transition elements. You can research corporate bond prices online. A. The bond is issued for a predetermined amount of time, known as maturity, and the bond’s par value is the face value of the bond, generally $1,000. Elements in any one group (or column) have the same number of valence electrons; the alkali metals lithium and sodium each have only one valence electron, the alkaline earth metals beryllium and magnesium each have two, and the halogens fluorine and chlorine each have seven valence electrons. Simply make a column for all the s orbitals with each n shell on a separate row. Be sure to only include orbitals allowed by the quantum numbers (no 1p or 2d, and so forth). The notation 3d8 (read “three–d–eight”) indicates eight electrons in the d subshell (i.e., l = 2) of the principal shell for which n = 3. The price you could sell the previous bond at would go down, making it less valuable. This periodic table shows the electron configuration for each subshell. For unpaired electrons, convention assigns the value of [latex]+\frac{1}{2}[/latex] for the spin quantum number; thus, [latex]m_s = +\frac{1}{2}[/latex]. Predicting Electron Configurations of Ions What is the electron configuration and orbital diagram of: (a) Na+ (b) P3– (c) Al2+ (d) Fe2+ (e) Sm3+ Solution First, write out the electron configuration for each parent atom. We have seen that ions are formed when atoms gain or lose electrons. Choice B and D's sentence structure is too simple and Choice B's answer is incorrect based on the text. The interest you’re paid periodically is called the coupon. This stability is such that an electron shifts from the 4s into the 3d orbital to gain the extra stability of a half-filled 3d subshell (in Cr) or a filled 3d subshell (in Cu). apprehension D. Inner transition elements are metallic elements in which the last electron added occupies an f orbital. The fourth electron fills the remaining space in the 2s orbital. Buying into bond funds can be a better alternative as long as the fees are low. hatred B. For main group elements, the last orbital gains or loses the electron. Bonds can be a great way to diversify your portfolio or establish a steady income. This gives calcium an outer-shell electron configuration corresponding to that of beryllium and magnesium. We start with a single hydrogen atom (atomic number 1), which consists of one proton and one electron. There is no simple method to predict the exceptions for atoms where the magnitude of the repulsions between electrons is greater than the small differences in energy between subshells. (c) Al: 1s22s22p63s23p1. It is important to remember that the periodic table was developed on the basis of the chemical behavior of the elements, well before any idea of their atomic structure was available. To determine the electron configuration for any particular atom, we can “build” the structures in the order of atomic numbers. What's going to come up? This speaks to the tone of the excerpt as a whole. Next, determine whether an electron is gained or lost. If she were astonished by the idea, then she'd make the husband act aghast when Mrs. Choice A seems logical until you place it up against Choice D, which uses a complex structure and language similar to that already in the text. Additionally, other types of safe investments could pay higher interest than the bond. The electron configuration and orbital diagram of helium are: The n = 1 shell is completely filled in a helium atom. The outer electrons have the highest energy of the electrons in an atom and are more easily lost or shared than the core electrons. The n = 1 shell is filled with two electrons and three electrons will occupy the n = 2 shell. Generalized energy-level diagram for atomic orbitals in an atom with two or more electrons (not to scale). The 1s orbital at the bottom of the diagram is the orbital with electrons of lowest energy. amused by the notion The correct answer is D. For our sodium example, the symbol [Ne] represents core electrons, (1s22s22p6) and our abbreviated or condensed configuration is [Ne]3s1. Similarly, the abbreviated configuration of lithium can be represented as [He]2s1, where [He] represents the configuration of the helium atom, which is identical to that of the filled inner shell of lithium. The first electron has the same four quantum numbers as the hydrogen atom electron (n = 1, l = 0, ml = 0, [latex]m_s = + \frac{1}{2}[/latex]). Note that for three series of elements, scandium (Sc) through copper (Cu), yttrium (Y) through silver (Ag), and lutetium (Lu) through gold (Au), a total of 10 d electrons are successively added to the (n – 1) shell next to the n shell to bring that (n – 1) shell from 8 to 18 electrons. She's sarcastic about society's notion of marrying young women off to wealthy men. The ml value could be –1, 0, or +1. The energy increases as we move up to the 2s and then 2p, 3s, and 3p orbitals, showing that the increasing n value has more influence on energy than the increasing l value for small atoms. It’s a challenging spot to be in, which is why many people choose to invest in short-term bonds to avoid it. Aluminum dication loses two electrons Al2+: 1s22s22p63s23p1 = Al2+: 1s22s22p63s1. The stranger's desire to quickly get to his room. Thus, the two electrons in the carbon 2p orbitals have identical n, l, and ms quantum numbers and differ in their ml quantum number (in accord with the Pauli exclusion principle). Her overreaching statement, "a truth universally acknowledged" is an example of hyperbole, which is an exaggerated statement not meant to be taken literally." And although she may personally be reproachful or scornful of the idea, her tone does not convey it in this satire. Both atoms, which are in the alkali metal family, have only one electron in a valence s subshell outside a filled set of inner shells. A core-abbreviated electron configuration (right) replaces the core electrons with the noble gas symbol whose configuration matches the core electron configuration of the other element. For example, the notation 2p4 (read “two–p–four”) indicates four electrons in a p subshell (l = 1) with a principal quantum number (n) of 2. However, we do find exceptions to the order of filling of orbitals that are shown in Figure 3 or Figure 4. Figure 6 shows the lowest energy, or ground-state, electron configuration for these elements as well as that for atoms of each of the known elements. Austen depicts the mother as meddling, gossiping, and impatient. An atom of boron (atomic number 5) contains five electrons. Note that down each group, the configuration is often similar. A bond is a debt issued by a company or a government. Fluorine (atomic number 9) has only one 2p orbital containing an unpaired electron. Electrons that are closer to the nucleus slightly repel electrons that are farther out, offsetting the more dominant electron–nucleus attractions slightly (recall that all electrons have −1 charges, but nuclei have +Z charges). D. The filling order simply begins at hydrogen and includes each subshell as you proceed in increasing Z order. We can rationalize this observation by saying that the electron–electron repulsions experienced by pairing the electrons in the 5s orbital are larger than the gap in energy between the 5s and 4d orbitals. These are metallic elements in which the last electron added enters a d orbital. You can recognize these compounds because they consist of nonmetals bonded to each other. This arrangement is emphasized in Figure 6, which shows in periodic-table form the electron configuration of the last subshell to be filled by the Aufbau principle. Because any s subshell can contain only two

electrons, the fifth electron must occupy the next energy level, which will be a 2p orbital. The Risks of Bonds Two types of risk exist for any bond. Covalent compounds also are known as molecular compounds. The first two electrons in lithium fill the 1s orbital and have the same sets of four quantum numbers as the two electrons in helium. You can look up municipal bond rates by state. By convention, the [latex]m_s = + \frac{1}{2}[/latex] value is usually filled first.

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