Worksheet 11 electronic structure of atoms answers

I'm not robot!

Teacher Notes

Name **Key** Class ______ Date ____________

Atomic Structure

Subatomic Particles in Neutral Atoms

The table below contains information about several isotopes. Use the information given to fill in the blanks. Assume all atoms are neutral.

Isotope Name	Nuclear Symbol	Atomic Number	Mass Number	# of Protons	# of Neutrons	# of Electrons
1. calcium-40	$^{40}_{20}Ca$	20	40	20	20	20
2. iron-56	$^{56}_{26}Fe$	26	56	26	30	26
3. oxygen-18	$^{18}_{8}O$	8	18	8	10	8
4. gold-197	$^{197}_{79}Au$	79	197	79	118	79

Subatomic Particles in Ions

The table below contains information about several ions. Use the information given to fill in the blanks.

Element Name	Ion Symbol	Atomic Number	Mass Number	# of Protons	# of Neutrons	# of Electrons
5. chlorine	Cl^{-}	17	35	17	18	18
6. silver	Ag^{+}	47	107	47	60	46
7. oxygen	O^{2-}	8	16	8	8	10
8. aluminum	Al^{3+}	13	27	13	14	10

Average Atomic Mass

9. Calculate the average atomic mass for neon if its abundance in nature is 90.5% neon-20, 0.3% neon-21, and 9.2% neon-22.

$$\frac{(90.5)(20\text{ amu}) + (0.3)(21\text{ amu}) + (9.2)(22\text{ amu})}{100} = 20.18\text{ amu}$$

10. Calculate the average atomic mass of silver if 13 out of 25 atoms are silver-107 and 12 out of 25 atoms are silver-109.

$$\frac{(13)(107\text{ amu}) + (12)(109\text{ amu})}{25} = 107.96\text{ amu}$$

Name: ______________________ Period: ____ Date: ______________ ID: A

Chapter 6 Electronic Structure of Atoms: Worksheet #2

Multiple Choice
Identify the choice that best completes the statement or answers the question.

1) At what speed (m/s) must a 10.0 mg object be moving to have a de Broglie wavelength of 3.3×10^{-41} m?
Ⓐ 4.1
Ⓑ 1.9×10^{-11}
Ⓒ 2.0×10^{12}
Ⓓ 3.3×10^{-42}
Ⓔ 1.9×10^{13}

2) The ________ quantum number defines the shape of an orbital.
Ⓐ spin
Ⓑ magnetic
Ⓒ principal
Ⓓ azimuthal
Ⓔ psi

3) There are ________ orbitals in the third shell.
Ⓐ 25
Ⓑ 4
Ⓒ 9
Ⓓ 16
Ⓔ 1

4) The ________ subshell contains only one orbital.
Ⓐ 5d
Ⓑ 6f
Ⓒ 4s
Ⓓ 3d
Ⓔ 1p

5) The n = 1 shell contains ________ p orbitals. All the other shells contain ________ p orbitals.
Ⓐ 3, 6
Ⓑ 0, 3
Ⓒ 6, 2
Ⓓ 3, 3
Ⓔ 0, 6

6) The lowest energy shell that contains f orbitals is the shell with n = ________.
Ⓐ 3
Ⓑ 2
Ⓒ 4
Ⓓ 1
Ⓔ 5

7) The total number of orbitals in a shell is given by ________.
Ⓐ l^2
Ⓑ n^2
Ⓒ 2n
Ⓓ 2n + 1
Ⓔ 2l + 1

8) In a hydrogen atom, an electron in a ________ orbital can absorb a photon, but cannot emit a photon.
Ⓐ 3s
Ⓑ 2s
Ⓒ 3p
Ⓓ 1s
Ⓔ 3f

9) How many quantum numbers are necessary to designate a particular electron in an atom?
Ⓐ 3
Ⓑ 4
Ⓒ 2
Ⓓ 1
Ⓔ 5

10) A ________ orbital is degenerate with a $5d_{z^2}$ in a many-electron atom.
Ⓐ $5p_z$
Ⓑ $4d_{z^2}$
Ⓒ 5s
Ⓓ $5d_{xy}$
Ⓔ $4d_{xy}$

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Name Grover
Period ___ Date ___/___/___

8 • Electron Configurations & Periodicity

VALENCE ELECTRONS

The electrons that spend their time farthest from the nucleus (those with the largest value of "n") are very important. These are the electrons that actually "bump into" each other when atoms interact. These are called the valence electrons.

Because of the way the energy levels overlap (for instance, 4s and 3d), the outermost electrons are not always the highest energy electrons.

Valence electrons: The outermost electrons. These are ALWAYS electrons in the "s" and "p" orbitals.

How many electrons in an arsenic, As, atom? 33

Draw the orbital diagram for As.

Draw a box around those electrons that would be called "valence electrons".

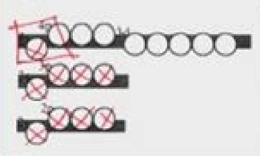
How many valence electrons in As? 5

How many electrons in an ~~arsenic~~ copper, Cu, atom? 29

Draw the orbital diagram for Cu.*

Draw a box around those electrons that would be called "valence electrons".

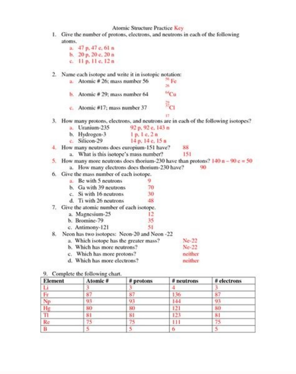
How many valence electrons in Cu? 1 *



How many electrons in an ~~arsenic~~ calcium, Ca, atom? 20

Draw the orbital diagram for Ca.

Draw a box around those electrons that would be called "valence electrons".



Electronic structure of atoms worksheet answers.

A set of four quantum numbers specifies each wave function. What information is given by each quantum number? What does the specified wave function describe? List two pieces of evidence to support the statement that electrons have a spin. The periodic table is divided into blocks. Identify each block and explain the principle behind the divisions. Which quantum number distinguishes the horizontal rows? Identify the element with each ground state electron configuration. [He]2s22p3 [Ar]4s23d1 [Kr]5s24d105p3 [Xe]6s24f 6 Identify the element with each ground state electron configuration. [He]2s22p1 [Ar]4s23d8 [Kr]5s24d105p4 [Xe]6s2 Propose an explanation as to why the noble gases are inert. How many magnetic quantum numbers are possible for a 4p subshell? A 3d subshell? How many orbitals are in these subshells? How many magnetic quantum numbers are possible for a 6s subshell? A 4f subshell? How many orbitals does each subshell contain? If l = 2 and ml = 2, give all the allowed combinations of the four quantum numbers (n, l, ml, ms) for electrons in the corresponding 3d subshell. Give all the allowed combinations of the four quantum numbers (n, l, ml, ms) for electrons in a 4d subshell. How many electrons can the 4d orbital accommodate? How would this differ from a situation in which there were only three quantum numbers (n, l, m)? Given the following sets of quantum numbers (n, l, ml, ms), identify each principal shell and subshell. 1, 0, 0, ½ 2, 1, 0, ½ 3, 2, 0, ½ 4, 3, 3, ½ Is each set of quantum numbers allowed? Explain your answers. n = 2; l = 1; ml = 2; ms = +½ n = 3, l = 0; ml = −1; ms = −½ n = 2; l = 2; ml = 1; ms = +½ n = 3; l = 2; ml = 2; ms = +½ List the set of quantum numbers for each electron in the valence shell of each element. beryllium xenon lithium fluorine List the set of quantum numbers for each electron in the valence shell of each element. carbon magnesium bromine sulfur Sketch the shape of the periodic table if there were three possible values of ms for each electron (+½, −½, and 0); assume that the Pauli principle is still valid. Predict the shape of the periodic table if eight electrons could occupy the p subshell. If the electron could only have spin +½, what would the periodic table look like? If three electrons could occupy each s orbital, what would be the electron configuration of each species? sodium titanium fluorine calcium If Hund's rule were not followed and maximum pairing occurred, how many unpaired electrons would each species have? How do these numbers compare with the number found using Hund's rule? phosphorus iodine manganese Write the electron configuration for each element in the ground state. aluminum calcium sulfur tin nickel tungsten neodymium americium Write the electron configuration for each element in the ground state. boron rubidium bromine germanium vanadium palladium bismuth europium Give the complete electron configuration for each element. magnesium potassium titanium selenium iodine uranium germanium Give the complete electron configuration for each element. tin copper fluorine hydrogen thorium yttrium bismuth Write the valence electron configuration for each element: samarium praseodymium boron cobalt Using the Pauli exclusion principle and Hund's rule, draw valence orbital diagrams for each element. Using the Pauli exclusion principle and Hund's rule, draw valence orbital diagrams for each element. chlorine silicon scandium How many unpaired electrons does each species contain? lead cesium copper silicon selenium How many unpaired electrons does each species contain? helium oxygen bismuth silver boron For each element, give the complete electron configuration, draw the valence electron configuration, and give the number of unpaired electrons present. lithium magnesium silicon cesium lead Use an orbital diagram to illustrate the aufbau principle, the Pauli exclusion principle, and Hund's rule for each element. For a 4p subshell, n = 4 and l = 1. The allowed values of the magnetic quantum number, ml, are therefore +1, 0, −1, corresponding to three 4p orbitals. For a 3d subshell, n = 3 and l = 2. The allowed values of the magnetic quantum number, ml, are therefore +2, +1, 0, −1, −2, corresponding to five 3d orbitals. Page 2 List all the allowed combinations of the four quantum numbers (n, l, ml, ms) for electrons in a 2p orbital and predict the maximum number of electrons the 2p subshell can accommodate. Given: orbital Asked for: allowed quantum numbers and maximum number of electrons in orbital Strategy: List the quantum numbers (n, l, ml) that correspond to an n = 2p orbital. List all allowed combinations of (n, l, ml). Build on these combinations to list all the allowed combinations of (n, l, ml, ms). Add together the number of combinations to predict the maximum number of electrons the 2p subshell can accommodate. Solution: A For a 2p orbital, we know that n = 2, l = n − 1 = 1, and ml = −l, (−l +1),..., (l − 1), l. There are only three possible combinations of (n, l, ml): (2, 1, 1), (2, 1, 0), and (2, 1, −1). B Because ms is independent of the other quantum numbers and can have values of only +½ and −½, there are six possible combinations of (n, l, ml, ms): (2, 1, 1, +½), (2, 1, 1, −½), (2, 1, 0, +½), (2, 1, 0, −½), (2, 1, −1, +½), and (2, 1, −1, −½). C Hence the 2p subshell, which consists of three 2p orbitals (2px, 2py, and 2pz), can contain a total of six electrons, two in each orbital. Thank you for your participation! Worksheet 11 - Electronic Structure of Atoms - PDF Download Free 4MB Sizes 95 Downloads 6 Views Learning Goal: How does the structure of the atom explain how elements behave and react in a predictable manner? Concept 1: Determining the number of protons, electrons, and neutrons in different isotopes and ions.Concept 2: Calculating molar mass of a mixture of isotopes.Concept 3: Compare and contrast each model of the atom from Dalton to the Modern ModelConcept 4: Connect the placement of elements on the Periodic Table each elements electronic structureConcept 5: Writing the full and core electronic configurations of elements and ions.Concept 6: Determining the number of valance electrons using electronic configurations.Concept 7: Relating atom size, electronegativity, and ionization energy to families, periods, and chemical bonding.Concept 8: Writing Lewis Structures for Ionic Compounds, Covalent Compounds, and Polyatomic Ions.Student Log - Unit - Atoms Week 1: Intro to Atomic Theory - Exploring the inner workings of the building block of all things!During the first week students will be given time to review concepts originally introduced in Science 10. If not already completed, students should complete the two worksheets linked below, and check their work with the answer keys provided, read the 2 chapters of A Short History of Nearly Everything found on my website, answer questions related to the readings on a google form assigned on Google Classroom, download and print the Student Log (linked above), and complete Quiz 1 (linked below), assess and reflect in their Student Logs. Tasks that were to be completed over Spring Break: Atomic Theory Gr10 Review + Review of Atomic Structure and Isotopic Abundance + Short History of Near Everything Readings/Audio FilesNew Tasks for Week 1: Quiz on Atomic Structure, Isotopic Abundance + Models of the Atom + Complete Google Form Questions for Short History of Nearly Everything ReadingsConcept 1: Determining the number of protons, electrons, and neutrons in different isotopes and ions.Concept 2: Calculating molar mass of a mixture of isotopes.Concept 3: Compare and contrast each model of the atom from Dalton to the Modern Model. EXTRA PRACTICE: Atomic Theory and Structure with KEYWeek 2: Models of the Atom - How did our understanding of atomic structure come to be? Explore both the structure of the atomic and the path humanity took to get there!During the 2nd week students will switch their focus to explore the historical and culture history of the models of the atom. Students must complete and submit simulation (see below) on Google Classrooms as well as watch Part 1 of BBC Atom - Class of the Titans. After watching the video students must submit answers to questions (on Google Classroom) relating to their viewing.Learning Targets for Week 2:Concept 1: Determining the number of protons, electrons, and neutrons in different isotopes and ions.Concept 3: Compare and contrast each model of the atom from Dalton to the Modern Model.Link to Atomic Structure Simulation Google Doc can be found on Google Classroom (see below for simulation)VIDEO Assignment: BBC Atom - Class of the Titans - Can be found on Google Classroom!Link to BBC Atom - Class of the Titans Week 3: Intro to Quantized Energy States... Quantum Chemistry!?! RUN!During the 3rd week students will switch their focus to explore on one specific subatomic particle.... The ELECTRON. Unfortunately not everything you have learned has been true! Electrons do not exist in circular orbits around the nucleus... The Truth is much more complicated.Learning Targets for Week 3:Concept 4: Connect the placement of elements on the Periodic Table each elements electronic structure Week 4: Orbital Diagrams (Placing Electrons around a nucleus!)In Week 4 we will continue to explore the mysterious yet at it's core negative electron!Learning Targets for Week 4:Concept 4: Connect the placement of elements on the Periodic Table each elements electronic structure Week 5: Electronic Configuration Day I (Finding Atomic Addresses for each electron in an atom!)In Week 5 we will place each electron in an atom and begin to explore the implications (properties and reactivity) for each atoms unique electron configuration. Learning Targets for Week 5:Concept 4: Connect the placement of elements on the Periodic Table each elements electronic structureConcept 5: Writing the full and core electronic configurations of elements and ions.Concept 6: Determining the number of valance electrons using electronic configurations. Week 6: Electronic Configuration Day II (note you will need to know the energy levels, both core and regular notation and the exceptions to the rule) In Week 6 we will place each electron in an atom and begin to explore the implications (properties and reactivity) for each atoms unique electron configuration. Learning Targets for Week 6:Concept 4: Connect the placement of elements on the Periodic Table each elements electronic structureConcept 5: Writing the full and core electronic configurations of elements and ions.Concept 6: Determining the number of valance electrons using electronic configurations. OPTIONAL: Atomic Theory Kahoot Thursday May 14th @ 11 am! (See google Classroom for Details)Extra Practice: (IF needed optional activity) Week 7: Periodic Trends/ Properties In Week 7 we will shift our focus towards exploring Periodic Properties and the infinitely amazing connections provided by the most important scientific document ever created... The Periodic Table.Learning Goals: Determine and explain Periodic Trends across and down the Periodic Table. Develop Google Sheets skills by Graphing Periodic Trends across and down the Periodic Table. Hebden Periodic Trends Review Note: do NOT do everything... focus on areas of weakness and spend time on thosePeriodic Families: p. 162 Q 31Ionization Energy: p. 168 Q's 48-51Trends Summary: p. 170 Q's 53-56 + p. 182 Q's 80,82Electronegativity: p. 173 Q's 58-61Atomic Size (ions): p. 176 Q's 65-67Lewis Structures: p. 188 Q 86 Week 8: Lewis Structures In Week 8 we will connect our understanding of the valence (outer) electron configuration of elements to understanding how and why atoms bond to form molecules.Learning Goals: Draws Lewis Structures for atoms, ions, ionic and covalent compounds. EXTRA: Week 9: Types of Bonds In Week 9 we will focus the nature of types of bonds (Covalent, Polar Covalent, and Ionic) based on the elements involved within the bonds!Learning Goal(s): Re-Define electronegativity. Determine the type of bond based on the electronegativity of the elements involved in bond. Week 10: Review Week! Week 10 will focus on reviewing the various concepts covered so far in the Atoms unit.Socrative Review - AtomsComplete and hand in Student LogsComplete and Submit Unit Quiz! Week 11: Assess understanding of Unit 6: Atoms In Week 11 you will work in groups to create summative assessments for Unit 6: Atoms!