**LEARNING ACTIVITY SHEET IN SCIENCE 9**

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| Name of Learner; | John Russel A. Jandonero | Score: |  |
| Grade and Section: | 9-ALL | Week & Date: | **Week 1 – Jan. 6, 2021** |

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| **Title of the Topic:** | **Atomic Development theory** | | |
| **Most Essential Learning Competency:** | | **Code:** | **S9MTIIa-13** |
| * Explain how the Quantum Mechanical Model of the atom describes the energies and positions of the electrons | | | |
| **I. Concept Notes: (30 points)** *(Contents needed for the learners to understand the topic. Brief discussion of the lesson, if possible cite examples)* | | | |
| Contains the following topics:   * Atom, History of atomic development and its structure, atomic theory * Highlights in the atomic discovery, radioactivity discovery, Modern atomic theory, * Energy levels, orbitals and quantum numbers * Electronic configuration   The History of the Atom – Theories and Models – Compound Interest   * In the fifth century BC, Leucippus and Democritus argued that all matter was composed of small, finite particles that they called atomos, a term derived from the Greek word for “indivisible.” They thought of atoms as moving particles that differed in shape and size, and which could join together. Later, Aristotle and others came to the conclusion that matter consisted of various combinations of the four “elements”—fire, earth, air, and water—and could be infinitely divided. Interestingly, these philosophers thought about atoms and “elements” as philosophical concepts, but apparently never considered performing experiments to test their ideas. * Matter is composed of exceedingly small particles called atoms. An atom is the smallest unit of an element that can participate in a chemical change. * An element consists of only one type of atom, which has a mass that is characteristic of the element and is the same for all atoms of that element .A macroscopic sample of an element contains an incredibly large number of atoms, all of which have identical chemical properties. * Atoms of one element differ in properties from atoms of all other elements. * A compound consists of atoms of two or more elements combined in a small, whole-number ratio. In a given compound, the numbers of atoms of each of its elements are always present in the same ratiocopy languag. * Atoms are neither created nor destroyed during a chemical change, but are instead rearranged to yield substances that are different from those present before the change .     In **atomic** theory and quantum mechanics, an **atomic orbital** is a mathematical function describing the location and wave-like behavior of an electron in an **atom**. This function can be used to calculate the probability of finding any electron of an **atom** in any specific region around the **atom's** nucleus.  Orbital | chemistry and physics | Britannica  In chemistry and quantum physics, quantum numbers describe values of conserved quantities in the dynamics of a quantum system.  Quantum Numbers - YouTube  In atomic physics and quantum chemistry, the electron configuration is the distribution of electrons of an atom or molecule in atomic or molecular orbitals. For example, the electron configuration of the neon atom is 1s² 2s² 2p⁶ | | | |
| **II. Learning Activities:** | | | |
| 1. Learning Activity 1:   **1A: Who am I? (15 points)**  **Objectives:** Familiarize the scientist who contributed in the development of atomic theory.  **Directions:** Identify who is the scientist describe in the following scientific contributions.   |  |  |  | | --- | --- | --- | | WERNER HEISENBERG |  | Uncertainty Principle | | J.J. THOMSON |  | Discovery of Electrons and plum pudding model | | ERNEST RUTHERFORD |  | Nuclear Model and Gold Foil Experiment | | NIELS BOHR |  | Planetarium Model of Atom | | ARISTOTLE |  | Believe that all substances are made of four elements: air, earth, fire and water. | | JOHN DALTON |  | Solid Sphere model of an atom and Atomic theory | | DEMOCRITUS |  | Proposed that everything is made of a very small bit of matter called atom. | | LUIGI GALVANI |  | He is an Italian physicist who broadened the study of electrolysis. | | ERNEST RUTHERFORD |  | Discover Protons | | MAX PLANCK |  | He stated that energy is radiated in small, discrete units, which he called Quanta. | | JAMES CHADWICK |  | Discover neutrons | | WOLFGANG ERNST PAULI |  | He stated that an orbital can hold a maximum of 2 electrons | | ERWIN SCHRODINGER |  | Electron Cloud Model | | ANTOINE LAVOISIER |  | Father of Modern chemistry | | JAMES CLERK MAXWELL |  | Formulated the Electromagnetic Theory and showed that electric and magnetic fields were propagated together and that their speed is identical with the speed of light. |   **1C: Flame test (10 points)**  **Objectives:** • Explain how the Quantum Mechanical Model of the atom describes the energies and positions of the electrons through flame test.  **Directions:** Identify the color of the following elements.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Yellow |  | Na | Blue-green  to  Pale Green |  | Zi | | Red |  | Li | Green |  | Ba | | Lilac |  | K | Blue-Green |  | Cu | | Orange-Red |  | Ca | Gold |  | Fe | | Red |  | Sr | Yellowish Green |  | Mn |   **1C: Concept Map (15 points)**  **Objective:** Illustrate through concept map the development of atomic structure and theory.  **Direction:** Complete the concept map below that shows the development of atomic structure.  C:\Users\Administrator\Downloads\reyna download\atomic model concept map.png  Spin  Orientation  Orientation  Of Orbital  Shape of  Orbital  Energy Level  Hund’s Rule  Pauli  Principle  Aufbau  Principle  Elements  Periodic Table  Electron  Ernest  Rutherford  Rutherford  Atomic Model  Nucleus  Neutron  Particles | | | |
| 1. Learning Activity 2:   **2A: Electronic configuration (20 points)**  **Objective:** Identify the electronic configuration of an element.  **Direction:** Give the short and longhand electronic configuration of the following element.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Symbol** | **Element** | **Atomic number** | **Short-hand** | **Long-hand** | | *As* | Arsenic | 33 | [Ar] 3d¹⁰ 4s² 4p³ |  | | *Tc* | Technetium | 43 |  |  | | *Tl* | Thallium | 81 |  |  | | *Pr* | Praseodymium | 59 |  |  | | *Rg* | Roentgenium | 111 |  |  |   **2B: Real life Application! (25 points)**  **Objectives:** Relate Uncertainty principle to everyday life.  **Directions:** Write a three paragraphs with 4 sentences each that relates to one of your everyday experiences where Heisenberg’s Uncertainty Principle can be applied.  ***Rubrics:***  ***Concept: 15 points***  ***Originality: 5 points***  ***Skills: 5 points***  Heisenberg's Uncertainty Principle states that there is inherent uncertainty in the act of measuring a variable of a particle. Commonly applied to the position and momentum of a particle, the principle states that the more precisely the position is known the more uncertain the momentum is and vice versa. This is contrary to classical Newtonian physics which holds all variables of particles to be measurable to an arbitrary uncertainty given good enough equipment. The Heisenberg Uncertainty Principle is a fundamental theory in quantum mechanics that defines why a scientist cannot measure multiple quantum variables simultaneously.  It is hard to imagine not being able to know exactly where a particle is at a given moment. It seems intuitive that if a particle exists in space, then we can point to where it is; however, the Heisenberg Uncertainty Principle clearly shows otherwise. This is because of the wave-like nature of a particle. A particle is spread out over space so that there simply is not a precise location that it occupies, but instead occupies a range of positions.  One example that can be used is a glass of water in a cup holder inside a moving car. This glass of water has multiple water molecules each consisting of electrons. The water in the glass is a macroscopic object and can be viewed with the naked eye. The electrons however occupy the same space as the water, but cannot be seen and therefore must be measured microscopically. As stated above in the introduction, the effect of measuring a tiny particle causes a change in its momentum and time in space, but this is not the case for the larger object. | | | |
| 1. Learning Activity 3:   **3A: Analogy (30 points)**  **Objective:** Make an analogy that shows the understanding to the three rules of filling the electron orbitals.  **Instruction:** Use the Apartment House Analogy to present the application of the three rules in filling the electron orbitals. Imagine you are the landlord of a very strange apartment building. Your job is to fill the apartments in the building in the most efficient way possible. You are required by the owner of the building to fill the rooms in a certain way. Use and fill out the table below to present the analogy.   |  |  | | --- | --- | | Apartment House Rules | Electron Rules | | From the Bottom Up: The Rooms from the lowest floor must be full before you can put more things to the upper floor | **Aufbau Principle: The electrons are making the lowest energy level and orbitals filled up first** | | Singles First: All P orbital rooms must be occupied by a single tenant before you can double up | **Hund’s Rule: The electrons do not pair together until each orbital has one electron** | | Opposite Gender only: Rooms can only be occupied by tenants of the opposite gender. No same gender tenants in the same room | **Pauli Exclusion Principle: Electrons must have an opposite spin in order to occupy the same orbital** |   **3B: Solve me (15 points)**  **Objectives: C**ompute for the quantum numbers.  **Instruction:** Give the maximum number of electrons in an atom that can have the following quantum numbers.  **(2points) (a) n = 4**  **(2points) (b) n = 5, mℓ = +1**  **(2points) (c) n = 5, ms = +½**  **(2points) (d) n = 3, ℓ = 2**  **(2points) (e) n = 1, ℓ = 0, mℓ = 0**  **Explain your answer: (5 points)**   1. n = 4 → 4s² 4p6 4d10 4f14 → 2 + 6 + 10 + 14 = 32   *Answer: 32 electrons*   1. Each Number Circled Contains 2 Electrons,   4 x 2 = 8  *Answer = 8 Electrons*   1. n = 5 → 5s² 5p6 5d10 5f14 5g18 → 2 + 6 + 10 + 14 + 18 = 50 → 50/2     *Answer = 25 electrons*     1. n = 3 and l = 2, therefore 3d10   *Answer = 10 electrons*   1. Each number circled contains 2 electrons, so 1 x 2 = 2   *Answer = 2 electrons* | | | |
| **III. Reflection: (20 points)** | | | |
| The Atom is everywhere, each solid, liquid, gas, and plasma are composed of impartial or ionized atoms. Atoms have their personal records similar to the entirety else. It has its personal levels. It became first observed with the aid of using Democritus, however became forgotten till 2000 years later in which it became re-observed with the aid of using John Dalton. After Dalton, there has been J.J. Thompson who observed electrons and the truth that it had terrible charge. That caused him coming across the Plum Pudding. Next level became while Ernest Rutherford observed the nuclear version after he carried out a test with a beam of definitely charged alpha particles. And then Niels Bohr changed Rutherford’s Nuclear version and proposed that the electrons can most effective journey alongside sure pathways which made him find out the orbitals. This version became referred to as the Planetary Model. And lastly, the version referred to as Planetary Model with neutrons. This version became observed with the aid of using James Chadwick. He proposed this while he additionally observed the neutron.  All of the things you can see are made of atoms, as time passes by people are starting to discover new things. People learn from books or even online about certain things. | | | |

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