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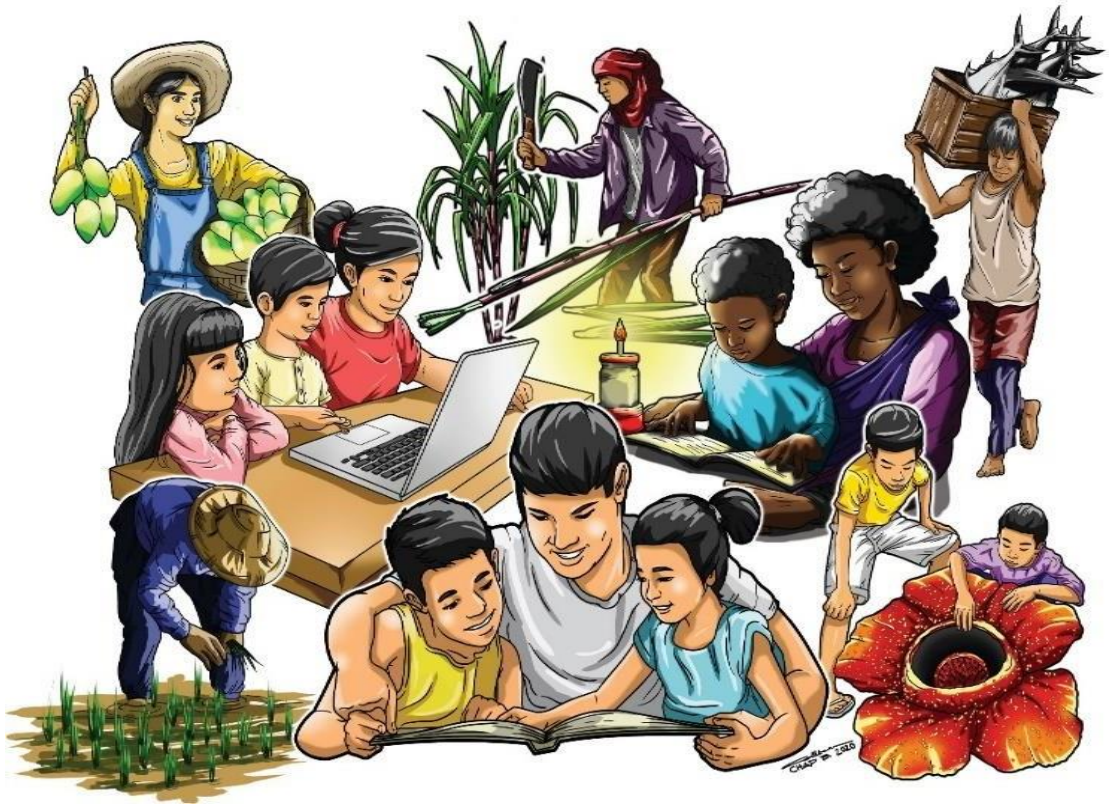
DepED
DEPARTMENT OF EDUCATION

Science Activity Sheet
Quarter 2 – MELC 1
Week 1

Quantum Mechanical Model of Atom



REGION VI – WESTERN VISAYAS

Science 9
Activity Sheet No. 1 Quantum Mechanical Model of Atom
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Introductory Message

Welcome to Science 9!

The **Learning Activity Sheet** is a product of the collaborative efforts of the Schools Division of Escalante City and DepEd Regional Office VI - Western Visayas through the Curriculum and Learning Management Division (CLMD). This is developed to guide the learning facilitators (teachers, parents and responsible adults) in helping the learners meet the standards set by the K to 12 Basic Education Curriculum.

The **Learning Activity Sheet** is self-directed instructional materials aimed to guide the learners in accomplishing activities at their own pace and time using the contextualized resources in the community. This will also assist the learners in acquiring the lifelong learning skills, knowledge and attitudes for productivity and employment.

For learning facilitator:

The **Science 9 Activity Sheet** will help you facilitate the leaching-learning activities specified in each Most Essential Learning Competency (MELC) with minimal or no face-to-face encounter between you and learner. This will be made available to the learners with the references/links to ease the independent learning.

For the learner:

The **Science 9 Activity Sheet** is developed to help you continue learning even if you are not in school. This learning material provides you with meaningful and engaging activities for independent learning. Being an active learner, carefully read and understand the instructions then perform the activities and answer the assessments. This will be returned to your facilitator on the agreed schedule.

Name of Learner:_____
Grade and Section: _____Date: _____

SCIENCE 9 ACTIVITY SHEET No. 1
Quantum Mechanical Model of Atom

I. Learning Competency with Code

Explain how the Quantum Mechanical Model of the atom describes the energies and positions of the electrons

II. Background Information for Learners

Do you know what scientists believed about the structure of the atom? They believed that electrons are like hyperactive bees buzzing around the nucleus. This is the idea of Erwin Schrodinger and his colleagues which led them to propose an atomic model called the Quantum Mechanical Model. Scientists believed that this is the most plausible atomic model ever made. Imagine that you just took a continuous shot of hyperactive bees buzzing around a beehive. You would probably get different sketches or pictures of it. The same also with atoms, according to Schrodinger, they have various shapes. They are not only the typical circles we found in our old science textbooks and on the internet. Sometimes, atoms look like two teardrops next to each other. Interesting, right? Let's learn more about the Quantum Mechanical Model of the atom by reading the texts found in your Learning Material on pp. 105 to 109 right after Activity 2.

III. Accompanying DepEd Textbook and Educational Sites

Department of Education. (2014). K-12 Basic Education Curriculum, Science 9 Learner's Material (pp. 105-109). Pasig City, Philippines

IV. Activity Proper

Exercise 1

Directions: Refer to Table 2 in Science 9 Learner's Module, p. 107 and answer the guide question. Write your answer on a separate sheet of paper.

Guide Questions

Q1. What do you notice with the number of principal energy level and the number of sublevels? Are they equal or not?
Q2. How many types of orbitals are there in principal energy level four (4)?
Q3. How many atomic orbitals are there in the highest sublevel of principal energy level four (4)?
Q4. What formula did we use to get the maximum number of electrons in each principal energy level?

Exercise 2

Directions: Refer to Activity 3 in Science 9 Learner's Module, p. 108-109.

Guide Questions

Q1. Do you see the patterns in the distribution of the electrons? If yes, what are these patterns?

Q2. What do you think are the rules that apply in filling up the orbitals of the elements from atomic number 1 to 18?

V. Reflection

How can you relate the different energy levels of electron to your feelings?

_____
_____
_____

VI. Answer Keys

Exercise 1

Principal energy level, n	Number of Sublevels	Type of Sublevel and number of atomic orbitals	Maximum number of electrons Formula: $2n^2$
1	1	1s (1 orbital)	2
2	2	2s (1 orbital), 2p (3 orbitals)	8
3	3	3s (1 orbital), 3p (3 orbitals), 3d (5 orbitals)	18
4	4	4s (1 orbital), 4p (3 orbitals), 4d (5 orbitals), 4f (7 orbitals)	32
5	5	5s (1 orbital), 5p (3 orbitals), 5d (5 orbitals), 5f (7 orbitals), 5g (9 orbitals)	50

A1. Yes, they are equal.
A2. 4 types of orbitals: s, p, d, and f
A3. 7 atomic orbitals
A4. $2n^2$

Exercise 2

Symbol		O	R	B	I	T	A	L		Electron Configuration
	1s	2s	$2p_x$	$2p_y$	$2p_z$	3s	$3p_x$	$2p_y$	$2p_z$	
$_{11}Na$	↑↓	↑↓	↑↓	↑↓	↑↓	↑				$1s^22s^22p_x^22p_y^22p_z^23s^1$
$_{12}Mg$	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓				$1s^22s^22p_x^22p_y^22p_z^23s^2$
$_{13}Al$	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑			$1s^22s^22p_x^22p_y^22p_z^23s^23\ p_x^13p_y\ 3p_z$
$_{14}Si$	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑		$1s^22s^22p_x^22p_y^22p_z^23s^2\ 3p_x^13p_y^13p_z$
$_{15}P$	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑	↑	$1s^22s^22p_x^22p_y^22p_z^23s^2\ 3p_x^13p_y^13p_z^1$
$_{16}S$	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	↑	$1s^22s^22p_x^22p_y^22p_z^23s^2\ 3p_x^23p_y^13p_z^1$
$_{17}Cl$	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑	$1s^22s^22p_x^22p_y^22p_z^23s^2\ 3p_x^23p_y^23p_z^1$
$_{18}Ar$	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	↑↓	$1s^22s^22p_x^22p_y^22p_z^23s^23p_x^23p_y^23p_z^2$

A1. Yes, some patterns are:

1. An orbital has a maximum of two opposite spins.
2. An orbital in the same sublevel is filled with one spin before pairing.
3. Filling the orbitals with electron starts from the lowest energy level to the highest energy level. (1s 2s 2p 3s 3p 4s 3d 4p 5s 4d 5p…)
4. The total number of electrons on the outermost energy level is the same as the group number in the periodic table of elements.

A2. Some rules are:

1. An electron can be represented by a spin.
2. In filling the orbitals with electron, it should start with the lowest energy level.
3. An orbital in the same sublevel should be filled with one electron before pairing.
4. An orbital has a maximum number of two electrons.