THE USE OF DIAGONAL SIMILARITY LAWS IN THE COMPARATIVE STUDY OF THE PROPERTIES OF CHEMICAL ELEMENTS

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Abstract:

This article examines the role of comparative study, analysis of the properties of chemical elements in the teaching of chemistry. He focuses on analyzing the diagonal similarity of the elements. This approach is based on the promotion of scientific literacy of students.

Keywords: diagonal similarity, horizontal similarity, vertical similarity, comparative analysis, competence in the field of scientific awareness, predictive approach, creative thinking, creative thinking, Poling scale.

Introduction

The preservation of a high level of fundamental education in the field of Natural Sciences, reforms in the educational system, an increase in the volume of data in Chemical Science, changes in the requirements for the abilities, skills, assessment criteria of learners, priority not on the size of the information base, but now on the possibilities of knowledge to be able to apply in life situations. The transfer of new knowledge to the field of Education requires not only a favorable level of presentation of theoretical material, but also the presentation of Chemistry at the level of a modern, scientific style. The development of chemistry predetermines the directions for the use of chemical elements and their compounds in many respects. It makes it possible to analyze periodicity in elements and their compounds, properties of elements in accordance with their place in the periodic table, similarities and differences, basic and additional laws, private properties arising in some elements, to make them scientifically substantiated and scientific predictions [1].

Activities such as obtaining inorganic compounds at high temperatures (Nb_3Ge, 23.2 °K; $Tl_2Ba_2Ca_2Cu_3O_{10}$, 122 °K), the superconductivity of compounds, the study of their structure and properties, the production of nanomaterials using unique properties, the creation of multicomponent optical electronic devices are all carried out on the foundations of knowledge about chemical laws.

The comparative analysis of elements and their compounds and the prognostic approach are also important in the history of chemistry in its future.

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In the study of the course of general and inorganic chemistry, research on the occurrence of chemical elements in their nature, on the disclosure of commonalities and differences in physical, chemical properties, their causes, differences in elements belonging to one group, or vice versa, similarity in representatives of different groups, conducting small studies will help develop the abilities of educators in comparative, critical, creative thinking.

In the theoretical field of inorganic chemistry, the existence of periodic system laws is discussed as an important issue. The systematization and generalization of a large number of experiments is based on grouping by the nature of chemical elements, according to their location in the periodic table.

In the periodic table, the similarity between elements is manifested mainly in three directions:

1) in the horizontal direction: this similarity occurs in elements of a large period, in elements of the order lanthanides and Actinides. For example: some properties of Cu are similar to Ni.

2) in the vertical direction: the elements of the Periodic Table, located in the vertical direction (in one group), are mutually identical.

3) in the Diagonal direction: in the periodic table, some elements that are located diagonally between themselves exhibit mutual similarity. Similarities in most properties are observed in triads of elements such as Li, Mg, Sc; Be, Al, Ti; B, Si, V, located diagonally between them.

In the process of Chemistry Education, a lot of information is given on the similarities of elements in the horizontal and vertical directions according to their position in the periodic table, as well as on the laws that underlie them (similarities in electronic structure, uniformity of the number of electrons in the outer layer). The Diagonal similarity and the coverage of its causes are not sufficiently focused.

Diagonal similarity refers to the repetition of elements ' properties of simple substances and compounds along the diagonals of a periodic system. This is mainly explained by the fact that as the periodic table goes from left to right and in groups from bottom to top, the atomic radii of the elements become smaller, as a result, the atomic radii of the elements located in the diagonal position remain very close to each other.

Diagonal similarity should not be understood as absolute similarity of atomic, molecular, thermodynamic and other properties.

Some properties are similar diagonals Li and Mg, Be and Al, C and P, amphoteric diagonals Be – Al – Ge – Sb – Po. The manifestation of diagonal similarities in the properties of elements is also associated with the ion potential, electromanficity, the value of Ionic radii.

The Ion potential is the ratio of the nuclear charge to the volume of atoms (cation F= Z^+ /r). For monatomic cations, Li^+ - Mg^{2+}, Be^{2+} - Al^{3+} has very close ion potentials:

Ion potentials of monoatomic cations:

E^+	F, nm^{-1}		E^+	F, nm^{-1}		E^+	F, nm^{-1}
Li^+	17	↘	Be^{2+}	64	↘	B^{3+}	150
Na^+	10		Mg^{2+}	31		Al^{3+}	60
K^+	8		Ca^{2+}	20		Ga^{3+}	48

Diagonal similarity elements have similar electromagnetism values.

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The following table gives the values of electromantism on the Poling scale;

	Group							
Period	I	II	III	IV	V	VI	VII	VIII
2	Li	Be	B	C	N	O	F	Ne
Em	0,98	1,57	2,04	2,55	3,04	3,44	3,98	
3	Na	Mg	Al	Si	P	S	Cl	Ar
Em	0,93	1,31	1,61	1,90	2,19	2,58	3,16	
4	K	Ca	Ga	Ge	As	Se	Br	Kr
Em	0,82	1,0	1,81	2,01	2,18	2,55	2,96	3,0

The table below analyzes the similarities of certain properties of elements located diagonally [2]:

Li – Mg

	Na	Li	Mg	Be
Ion radius to charge ratio	10,5	**16,7**	**24,4**	45,4
The nature of hydroxide	Strong base	**Moderately strong base**	**Moderately strong base**	amphoterus
Combustion product in the air	peroxide	**oxide**	**oxide**	oxide

Be – Al

	Mg	Be	Al	B
Ion radius to charge ratio	24,4	**45,5**	**41,7**	85,7
The nature of hydroxide	Moderately strong base	**Amphoteric hydroxide**	**Amphoteric hydroxide**	Weak base
Crystal lattice of chlorides	ion	**Molecular**	**Molecular**	Molecular
Hydride structure	Ion grill	**Polymer**	**Polymer**	Dimer

Elements diagonally located in the periodic table of chemical elements show similarities not only in their physical aspect, but also in their chemical properties.

Of the elements of the group I A of the periodic table, only Li reacts with N_2 under normal conditions. Of the elements of Group II A, only Mg, and from the third Group B, Sc interacts with N_2 under certain conditions to form metal nitrides:

$6Li + N_2 = 2Li_3N$ (goes slowly at room temperature, 350 °C)

$3Mg + N_2 = Mg_3N_2$ (650 °C)

$$2Sc + N_2 = 2ScN \quad (600\ °C\ above)$$

In chemical properties, beryllium is mostly similar to aluminum and is a typical amphoteric element. The protective oxide curtain prevents beryllium from interacting with water. But like aluminum, beryllium interacts with water in the presence of solvents and alkalis:

$$Be + 2H_2O + 2OH^- = [Be(OH)_4]^{2-} + H_2$$
$$Al + 6H_2O + 2OH^- = [Al(OH)_4]^- + 3H_2$$
$$Be + 4H_2O + 2H^+ = [Be(H_2O)_4]^{2+} + H_2$$
$$Al + 6H_2O + 2H^+ = [Al(H_2O)_4]^+ + H_2$$

Boron and Silicon hydrides are volatile and spontaneously ignite in air. It undergoes hydrolysis with water. Boron and Silicon halides are easily hydrolyzed to form the corresponding cislarodic acids:

$$BCl_3 + 3H_2O = H_3BO_3 + 3HCl$$
$$SiCl_4 + 3H_2O = H_2SiO_3 + 4HCl$$

The most important is boron, and Silicon salts are derivatives of isopoly acids. The OXO acids of these elements are considered very weak [3].

The properties of substances in the teaching of chemistry, proving that the phenomena and processes associated with them occur on the basis of certain laws, are related to their structure, provoking scientific interpretation, the formation of correct concepts about cause-and-effect relationships in educators, as well as the development of competencies of scientific awareness in them.

References

1. Реми Г. Курс неорганической химии. т. 1. М., Издательство иностранной литературы, 1963.
2. “курс общей химии” Н. В. Коровина, Москва “Высшая школа” 1990
3. Asamovich, K. M. (2022). ORGANIZING LABORATORY WORK IN THE VIEW OF A DIDACTIC GAME. European International Journal of Multidisciplinary Research and Management Studies, 2(12), 403-406.
4. Asamovich, K. M. (2023). POSSIBILITIES OF WIDE USE OF PRACTICAL METHODS IN CHEMISTRY EDUCATION. In Proceedings of International Conference on Educational Discoveries and Humanities (Vol. 2, No. 1, pp. 44-47).
5. Asamovich, K. M. (2023). The Role of Logical Approaches in the Integrated Development of Scientific Literacy and Practical Skills in Chemistry. EUROPEAN JOURNAL OF INNOVATION IN NONFORMAL EDUCATION, 3(10), 6-9.
6. Asamovich, K. M. (2023, January). ТАЪЛИМДА ОБЪЕКТ ВА СУБЪЕКТЛАР ОРАСИДАГИ МУНОСАБАТЛАРНИНГ ФАОЛЛИК ДАРАЖАСИГА КЎРА ҚЎЛЛАНИЛАДИГАН МЕТОД ШАКЛЛАРИ. In Proceedings of Scientific Conference on Multidisciplinary Studies (Vol. 2, No. 1, pp. 165-168).umanities (Vol. 2, No. 1, pp. 44-47).
7. Asamovich, K. M., & Karimovna, H. T. (2022). POSSIBILITIES OF WIDE USE OF PRACTICAL METHODS OF TEACHING CHEMISTRY FOR ORGANIZING QUALITY EDUCATION. Conferencea, 140-143.

8. Bakhromovna D. G., Asamovish K. M. The Needs of Interdisciplinary Integration in the Educational System //Eurasian Scientific Herald. – 2022. – T. 10. – C. 41-44.
9. Isakovna, M. N., Ibodullayevna, I. M., Ibragimovna, K. N., & Asamovich, K. M. (2023). Case Method and Its Use in Chemistry. Journal of Advanced Zoology, 44(S5), 1502-1506.
10. Kuchkarov, M. (2023). KIMYODAN NAZARIY BILIMLAR VA AMALIY KO‘NIKMALARNI SHAKLLANTIRISHDA TURLI MANTIQIY YONDASHUVLARDAN FOYDALANISH. Theoretical and experimental chemistry and modern problems of chemical technology, 1(01).
11. Kuchkarov, M. (2023). THE USE OF MNEMONIC METHODS IN CHEMICAL EDUCATION. Theoretical and experimental chemistry and modern problems of chemical technology, 1(01).
12. Kuchkarov, M. A. (2022). POSSIBILITIES OF USING A CHEMICAL EXPERIMENT ON THE FORMATION OF STUDENTS’CRITICAL THINKING COMPETENCIES. European International Journal of Multidisciplinary Research and Management Studies, 2(04), 108-112.
13. Sharipovna N. M., Asamovish K. M. TEACHING THE SECTION OF OXYGEN-CONTAINING ORGANIC COMPOUNDS ON THE BASIS OF MODULE EDUCATIONAL TECHNOLOGIES //Berlin Studies Transnational Journal of Science and Humanities. – 2022. – T. 2. – №. 1.5 Pedagogical sciences.
14. Yuldashevich, I. A., Asamovich, K. M., & Ergashovich, S. I. (2023). EKSPERIMENTAL TAJRIBALAR YORDAMIDA O‘QUVCHILARDA TADQIQOTCHILIK, AMALIY VA TABIIY-ILMIY SAVODXONLIGINI SHAKLLANTIRISH. Innovation: The journal of Social Sciences and Researches, 1(5), 59-67.
15. Кучкаров М. А. ИСПОЛЬЗОВАНИЕ ЕСТЕСТВЕННой ПРОДУКЦИИ В ХИМИЧЕСКОМ ЭКСПЕРИМЕНТЕ //Педагогические науки. – 2010. – №. 4. – С. 27-28.
16. Кучкаров М. А. Об использовании электронной таблицы в химических вычислениях //Химия в школе. – 2011. – №. 4. – С. 53-54.
17. Кучкаров М. А., Махкамов М. Ё. РОЛЬ КОМПЬЮТЕРНЫХ ИГР ВО ВРЕМЯ ОЗНАКОМЛЕНИЯ С ХИМИЧЕСКой ПОСУДой И ПРИБОРАМИ //Вопросы гуманитарных наук. – 2011. – №. 3. – С. 96-97.
18. Кучкаров М. А., Холикова Д. Д., Хайдарова Д. Б. КОМПЬЮТЕРНАЯ ИГРА "СБОРКА ПРИБОРОВ ДЛЯ ХИМИЧЕСКОГО ЭКСПЕРИМЕНТА" //Вопросы гуманитарных наук. – 2011. – №. 3. – С. 98-99.
19. Кучкаров, М. А. (2022, December). КИМЁВИЙ ЭКСПЕРИМЕНТ-ЎҚУВЧИЛАРНИНГ ТАНҚИДИЙ-ИЖОДИЙ ФИКРЛАШ ҚОБИЛИЯТИНИ ШАКЛЛАНТИРУВЧИ ВОСИТА СИФАТИДА. In Proceedings of International Educators Conference (Vol. 1, No. 3, pp. 313-317).