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Fen ve Sosyal Bilimler Öğretmen Adaylarının Atom Kavramı Hakkındaki Açıklamalarının "Animism" ve "Antropomorfizm" Kapsamında Nicel Olarak Karşılaştırılması

Quantitative Comparison Responses of Pre-Service Teachers in Social and Science Education according to Anthropomorphism and Animism about Atomic Concept

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Öz. Bu araştırmada; fen bilgisi ve sosyal bilimler öğretmen adaylarının atom kavramına ilişkin bilgilerinin ve günlük yaşamda dilsel olarak kullanım ifadelerinin "insana özgül dil (Anthropomorphism)" ve "canlılık (Animism)" özellikleri kapsamında nicel olarak karşılaştırılması amaçlanmıştır. Araştırma, 2014-2015 eğitim yılında 4. sınıf fen bilgisi (n:117) ve sosyal bilimler öğretmen adaylarının (n:60) katılımıyla yapılmıştır. Araştırmada nicel araştırma yöntemlerinden betimsel tarama tekniği kullanılmıştır. Veriler, Nakiboğlu ve Poyraz'ın (2006) ve Taber'in (1996) yaptığı araştırmaların yöntem ve bulgularına dayandırılarak oluşturulan altı seçenekli 25 maddelik bir ölçme aracıyla toplanmıştır. Altı seçeneğin üçü "insana özgül dil"; diğer üçü "canlılıkla" ilgilidir. Test maddeleri, önerme cümlesinde yüklem yerlerinin boş bırakıldığı bilimsel önerme cümlelerinden oluşmaktadır. Bu ölçme aracında, öğrencilerden 6 seçenekten kendilerine uygun olan ilk üç seçeneği sıralamaları istenmiştir. Sonuç olarak, fen bilgisi ve sosyal bilimler öğretmen adaylarının atom kavramlarını "insana özgü dil" ve "canlılık" ölçütüne göre açıklamaları karşılaştırıldığında, fen öğretmen adaylarının "insana özgü dil", sosyal bilimler öğretmen adaylarınınsa "canlılık" kullanımı tercih ettikleri görülmüştür. Böyle bir farklılık öğrencilerin konuya olan ilgi ve bilgi düzeylerinden kaynaklanabilir. Cinsiyet çeşitliliği göz önüne alındığında, erkek ve kız öğrenciler arasında neredeyse hiç fark bulunmadığı ortaya çıkmıştır.
Anahtar Kelimeler: İnsana özgül dil, Canlılık, Atom kavramı

Abstract. The aim of this study is to compare the information about the atomic concept of **P**re-service **Sci**ence **T**eachers (PSciT) and **P**re-service **Soc**ial Science **T**eachers (PSocT) in the context of "Anthropomorphism" and "Animism" characteristics of language use quantitively in everyday life. The research was carried out with the participation of 4th grade PSciT (n: 117) and PSocT (n: 60) in 2014-2015 education year. In the study, descriptive scanning technique was used as quantitative research method. The data was collected by means of a measurement tool consisting of 25 items based on the methods and findings of the researches carried out by Nakiboğlu and Poyraz (2006) and Taber (1996). Three of the six options are anthropomorphism; the other three ones are about animism. The test items consist of scientific propositions in which the predicate places are left empty in the propositional clause. Through this measurement, students are asked to rank the first three options out of six that are appropriate for them. As a result, when comparing the concepts of "PSciT" and "PSocT" atomic concepts "Anthropomorhism" and "Animism", it is seen that PSciT is preferred "Anthropomorhism" in the use of language and PSocT is preferred in the use of "Animism". It is thought that such a difference is caused by the level of interest and knowledge of the students. When comparing gender diversity, it was found that there was almost no difference between male and female students.
Keywords: Animism, Anthropomorphism, Atomic concept

Introduction

The interaction of language, thought and the expression of thought cover an important part in human life. Words are the basic elements for the development of thoughts. It is also emphasized that words are the signs of richness in the concept pointing out the wisdom in the thinking process and the wealth of ideas (Budak, 2000). Vygotsky, who supports the influence of language education to mental thinking ability of a person expresses that the word is identified by the form of an object which gained a functional meaning. Vygotsky also expresses that the language environment has a big influence on a child's thinking capacity. Vygotsky also defends that verbal thought can be understood by analyzing the study of primitive, self-centered language processes (Erdener, 2009). To make the students learn the target concepts of science meaningfully and permanently, there shouldn't be inconsistency between the concept of science that students already know and the concepts that they have just learned. This point is directly connected to finding out the existing concepts of students and the verification of these concepts (Yağbasan and Gülçiçek, 2003). The theories and ideas about the Animism or Anthropomorphism influence the former knowledge, education, experience and expectation. It has been thought that the reflection of thoughts and aspects of the scientists to the scientific knowledge at the Animism or Anthropomorphism thinking way could make great differences at the level of concept of teaching and conceptual understanding.

It has been stated in some researches that Anthropomorphism and Animism have been widely used by different age groups of students and teachers in science (Treagust, Chittleborough & Thapelo, 2003; Kallery & Psillos, 2004). Animism is the expression of lifeless objects as living things (Kallery & Psillos, 2004). Anthropomorphism has been defined as the loading of human feelings and wishes to the natural events and the non-human objects (Taber & Watts, 1996; Kallery & Psillos, 2004). In childhood, the approach of anthropomorphism or animism plays an important role in the concept of learning and in the conceptualization of ideas. For this reason, to examine both forms of use for all age groups may be important in terms of curriculum in the researches of conceptual teaching and misconception.

It is useful to study the emergence of anthropomorphism, animism and the educational reflections etymologically. The word "-Anima-" is derived from the soul word in the Latin language. "Anemus" in Greek, "Animus" and "Anima" in Latin are used to mean wind and air. For this reason, the word "animism" is based on soul, wind and air (Yaşa, 2016). Anthropomorphism is the conceptual intermingling of human beings and the distinctions of human beings from other creatures. Especially within the scope of belief, this concept is widely used within the scope of belief that God has human likeness. Unlike anthropomorphism, Animism is the belief that all living and inanimate entities in the world have a spirit. (Oruç, Tecim and Özyürek, 2011; Oruç, 2013). To sum up, it can be said that the objects of Animism are the efforts of animation and humanization.

Animism is the belief that there are spiritual beings in the Ontology. Animism is the origin of all religions and is accepted as the religious belief of primitive societies. It is believed that there are beliefs of primitive societies and numerous bad and good spiritual beings in the world. The belief that vitality for animals and plants is provided by good and bad spirits exists (Uncu, 2013; Yaşa, 2016; Zengin, 2017). Today's way of belief in all societies have difficult stages. Beliefs such as worshiping the sun, the saint, the animal, the Moon, or supernatural events have been seen in all societies. The belief in supernatural events is based on the idea of Animism (Eroğlu and Kılıç, 2005; Yaşa, 2016). Totemism, Animism, Naturism can be exemplified as primitive beliefs (Eroğlu and Kılıç, 2005). Animism is a religious belief that accepts spirits similar to the human spirit in nature. In animism, it is believed that there are connections between living and inanimate beings. It is accepted that all animate and inanimate beings in Animism have a soul (Altuntuğ, 2013). Even though scientific developments are now considered, there have been cases where animism-based explanations have been confronted with metaphysical situations that are either incomprehensible or unexplained. This can be explained by the fact that believes and cultures embracing animism or antroporphism are moderator of daily talk. This moderator can be seen in all age groups from childhood to adulthood.

It can be said that the belief schemes in children's minds are shaped by the approach of Anthropomorphism and Animism thought. Generally, the form of the idea of Animism is seen in the early childhood. It can be argued that the occurrence of animism in early childhood is not due to the inadequacy of the child's thinking, but it is because of the lack of sociological development (Yıldız, 2012). At the Abstract Operations Stage, children form and apply concepts to the objects and later they exemplify these objects in their minds. Talking to animals, acting like people to animals and talking to toys are obvious behaviors. Even the greatest examples of animism are the narration of tale based on animal figures and the presentation of cartoon characters talking with animal figures during this age. This type of childhood experience can be found in the appropriate attitude to the approach of Animism thought during adulthood.

This has been a debate in science at the point of the benefits of anthropomorphism analogy in education. It has been observed that children (Looft & Bartz, 1969; Laurendeau & Pinard, 1962) and teenagers (Jungwirth, 1975; Gilbert, Watts and Osborne, 1982; Taber and Watts, 1996) connect the anthropomorphism and theological explanations such as “wishes and perceptions” as part of an intuition to the scientific mind. In the scientific resources (Dorion, 2011; Taber, 1996) it has been stated that science instructors besides linguists use anthropomorphism. In this study, Lemke transferred that science has serious and a set of accurate formal rules; and the dedication to these rules firmly is definitely necessary for the speeches to be scientific (Kallert & Psillos, 2004). These rules avoid the kind of colloquial speech, usage of continuous technical terms, containing dignified and serious expressions without emotions. It also uses the reasonal form of explanation without making up a story (Kallert & Psillos, 2004). Treagust, Chittleborough & Thapelo (2003) has identified that there have been misunderstandings in the explanations including the anthropomorphism. As a result, misconceptions have been formed.

Griffiths and Preston (1992) stated that students have conceptual misconceptions that are appropriate to the idea of Animism thought in terms of atom structure and size. It is necessary to go into the depths of the misconceptions that are thought to prevent learning. The use of an anthropomorphism language may lead to misconception or the use of an animism language may lead to misconception. In this context, anthropomorphism and animism language usage should be included and evaluated together in the concept of learning process (Astolfi & Peterfalvi, 1993). For example, the belief that microbes have organs such as arms, feet, and heads similar to human beings is an anthropomorphism misconception. Such examples can be reproduced. The sources causing the use of anthropomorphism can be further exemplified (Eser, Çetin, Özarslan and Işı, 2015). In this context, evaluating and comparing the use of Anthropomorphism and Animism use within individuals trained in different branches of science can represent interesting findings. For this reason, PSciT and PSocT who have different study fields including the scope of the study. In addition, both PSciT and PSocT will work in elementary schools. For this reason, PST having different ideas of thinking such as Anthropomorphism or Animism may cause some problems in the concept of teaching. In this context, it should be possible to give direction to investigate the insights of Anthropomorphism and Animism in different areas.

Today, many people may have etymological effects of theological, anthropomorphism and animism trends in the origins of language and scientific concepts that they use. The influence of Alchemy as the etymological origin, especially when considering the emergence and development of the science of chemistry throughout history, is an indisputable fact. In the past, Alchemy tried to define the functioning of the objects with the concepts of love and hatred, death and vitality. With these contrasts, the origins of modern chemistry have begun to be built. Examples of these contrasts include chemical concepts such as acid-base and proton-electron. There is an antropormorphic effort to understand these abstract contrasts (Talanquer, 2007). The Atom concept is also a structure that holds the contrasts. Anthropomorphism, animism and theological philosophical considerations can be the basis of concepts such as Proton-Electron, Positive-Negative, Push-Pull or the etymological origin of anthropomorphism uses may also be caused by the contradictions underlying Alchemy's philosophy.

In this context, it may be important to investigate the use of anthropomorphism language in the Atom concept and to examine the linguistic development in the future studies.

It has been observed that the studies, which have been done for the last twenty years, have moved from the form of anthropomorphism to anthropomorphism analogies (Dorion, 2011). Zoher and Ginossor identified that the positive contributions of anthropomorphism analogies in their studies applied to high-school biology students. Hellden (2005) who reached the effective results to support this study made inferences that his students applied to biology from 9 to 15 years old. This points out that the idea of anthropomorphism does not hinder learning. On the other hand, there have been negative approaches to the explanations related to anthropomorphism. In Mccoy's (2003) study, there is a relation between anthropomorphism and analogies used in biology; even though there have been many benefits of analogies, contribution of Anthropomorphism and Animism to the explanations which cause negativity. Tamir and Zoher (1991) have concluded that there is no need for the formulas generated from anthropomorphism. There has also been a trouble in the eye of children while configuring the difference between the real reason of events and explanations related to animism.

In the world of science, the thought of animism isn't identified by the modern science. Although the drawbacks in the use have been indicated, the studies reveal that the use of anthropomorphism and animism can be helpful to students in understanding and learning science (Nicoll, 2001; Kallery & Psillos, 2004; Nakiboğlu and Poyraz, 2006; Özdemir, 2012). When the students have been considered, scientists cannot meet at a single point about anthropomorphism and animism; It is thought that anthropomorphism covers an essential part of education in many studies. It is difficult for the lower age groups to understand the abstract concepts in science. Thus, some studies reveal that the expression such as animism help them to comprehend the issues. Nakiboğlu and Poyraz (2006) have put forth that students often use the verbs related to anthropomorphism and animism such as "need, desire, study and catch" similar to atoms and electrons in literature and also it has been indicated that ignoring this point is impossible. Watts and Bentley (1994) indicate that scientists definitely refuse the use of this language but younger learners and adults use logical expressions with daily expressions in everyday use of language.

The concept of subjectivity is one of the important dimensions in the Nature Education of Science and the NSTA (2000) report. In this study, the concept of subjectivity is included in the scope of this research because it includes peer descriptions with the concept of animism. In the aspect of subjectivity, it is thought that scientific knowledge is influenced by the researcher's experience in the process of questioning and giving direction to research. The concept of subjectivity is a difficult concept to understand in the role of scientific knowledge in inquiry (McComas and Olson, 2000). Science is like a living being. It is in constant change and development. This development is not alone, but with the environment, culture and history. Scientific knowledge can always be affected by cultural and historical developments. This influence is, of course, within language. The dimension of subjectivity is defined in the nature education of science which should be taught to the students correctly. In the cases where it is not properly understood, the scientific concepts cannot be constructed epistemologically (Yeşiloğlu, Demiröğen and Köseoğlu, 2010). The dimension of subjectivity which is defined in the nature education of science should not be evaluated only in science. The concept of science has a complex implicit structure that embraces social, cultural, and historical compounds (McComas et al., 1998). It is important that the dimension of subjectivity, which has an implicit domain in the dimensions defined in the nature education of science, is not only within the sciences but also in areas where experimental testing is not possible, such as social sciences.

In this study, Nakiboğlu and Poyraz (2006) and Taber (1996) developed a quantitative measuring instrument based on the findings as a result of their studies. With this instrument, PSciT and PSocT, have examined the "concept of atom" within anthropomorphism and animism when the studies in the literature have been examined, it has been observed that qualitative measuring instruments have been used and the samples used in the studies have been limited with the science field. It is thought that with the study we have done, knowing the level of animism or anthropomorphist point of view that PSciT and PSocT, are putting forward the reasons of these that

will be useful in the progress of science. It has been concluded that PST will be aware of the importance of language education with the results in the light of this study. They will be completing the missing parts of the future studies and also will enlighten these studies.

Purpose and research questions

In this study, the knowledge about the concept of atom at chemistry lessons studied by Pre-Service Teachers in the field of science education (PSciT) and Pre-Service Teachers in the field of science education of social education (PSocT); and the daily use of the following expressions "Anthropomorphism" and "Animism" linguistically have been aimed to compare quantitatively.

In accordance with this purpose, two research questions have been analyzed:

1. Is there a significant difference between the PSciT and PSocT within dimension of "Anthropomorphism" and "Animism"?
2. Is there a significant difference in accordance with gender variable of PST within dimension of "Anthropomorphism" and "Animism"

Method

In this study, descriptive research, which is one of the quantitative research technique, has been used. This technique has been accepted as a research approach, putting forth a case in the past or still existing (Karasar, 2005). The purpose of this research technique is to reveal the nature and the features of cases, organizations, communities, and objects systematically (Mcmillan and Schumacher, 2001). In the studies, based on descriptive research model, the sample survey research has the feature of generalizing for the population that has been represented in the light of the other samples (Cohen, Monion and Morrison, 2007). In this research, a quantitative data instrument has been developed identifying the views of PSciT and PSocT on the concepts of "Anthropomorphism" and "Animism" by applying the descriptive research model. Also, the view of PSciT and PSocT has been attempted to compare.

Study group

The study group consists of totally 300 PSciT (n:117) and PSocT (n:60) in the Faculty of Education in the 2014-2015 academic year. The participants' ages ranged from 18 to 26 years. PSciT and PSocT are senior pre-service teachers at the Education Faculty. The concept of atom is taught to students in primary schools and secondary schools. For this reason, it is accepted that PST are familiar with the concept of atom. In addition, PSocT also take courses in science, technology and the history of science in their curriculum. It was not aimed at measuring the knowledge levels of the participants on the concept of atom or concepts of chemistry. In this regard, a statement was made through data collection to inform the PST. In this study, it is aimed to determine the susceptibility of using Anthropomorphism and Animism language to the concept of atom only in educational processes. Social Sciences Course and Science Course are the basic courses of primary and secondary education, although they have different interests. The concept of subjectivity from the concepts of nature education of science is the common theme of scientific thinking. PST in both curricula teach the students throughout primary school. It is expected that PST who are educated in order to establish a common language in terms of subjectivity principle in scientific thinking should have a common language. For this purpose, it was aimed to investigate the predispositions of Anthropomorphism and Animism language usage of PST who were educated in two different fields. For this reason, the participants were selected from these different areas. In selecting the sample, the sample was selected for the purpose and the support was obtained from the existing PST population in the faculty.

Data collection and instrument

The data was gathered with the instrument developed by revision of studies conducted by Nakipoğlu, Poyraz (2006) and Taber (1996). This instrument consists of 25 items. Each item covers 6 choices**.** Three of these choices are about anthropomorphism; the other three choices are about animism. The validity of the measurement tool is limited by the expressions in the qualitative findings of Nakipoğlu and Poyraz (2006) and Taber (1996). In addition, Experts' opinions were taken by insights of two academician in chemistry education. The measuring instrument was applied at the end of the second semester to the science students (n: 59) in the first class. They were asked to specify expressions they did not understand in the test on the measuring instrument, and problems were encountered during the application. The final scale was applied to the main participants. The reliability coefficient of the data obtained from the pre-application was calculated as 0.90 (Important Notice: At the end of the article text, the Turkish form of the measurement tool is given. The English form of the measurement tool is not given because of the different grammatical structures of Turkish and English languages. In the options, the bold font characterizes preferences for anthropomorphism uses, and preferences for non-bold animism uses).

The scoring of the test requires the following rules: if the first three choices the students order represent "Anthropomorphism", it is "8". If the first two choices represent "Anthropomorphism" and the other one represents "Animism", it is "7". If the first choice represents "Anthropomorphism", the second one represents "Animism" and the third one represents "Anthropomorphism", out of three choices, it is "6". If the first choice represents "Animism", and the other two choices represent "Anthropomorphism", it is "5". If the first choice represents "Anthropomorphism", the other two choices represent "Animism" out of three, it is "4". If the first one represents "Animism", the second one represents "Anthropomorphism", and the third one represents "Animism" out of three, it is "3". If the first two choices represent "Animism", the other one represents "Anthropomorphism", out of three, it is "2". If the first three choices represent "Animism", it is "1". This scoring could be seen at Table 1. At this study, the Cronbach-Alfa reliability factor is calculated as 0.854.

Table 1
The scoring of Anthropomorphism and Animism According to the Preferred Responses

First Chose	Second Chose	Third Chose	Score
Animism	Animism	Animism	1
Animism	Animism	Anthropomorphism	2
Animism	Anthropomorphism	Animism	3
Anthropomorphism	Animism	Animism	4
Animism	Anthropomorphism	Anthropomorphism	5
Anthropomorphism	Animism	Anthropomorphism	6
Anthropomorphism	Anthropomorphism	Animism	7
Anthropomorphism	Anthropomorphism	Anthropomorphism	8

Data analysis and Findings

At this part the responses of PSciT and PSocT have been presented as descriptive data by the use of quantitative measuring instrument.

Table 2
The Results of Anthropomorphism and Animism Based on Items

Item	Mean	Standard Deviation	Trend	Item	Mean	Standard Deviation	Trend
i1	4.21	2.569	4	i14	4.92	1.936	5
i2	3.33	1.991	3	i15	5.12	1.978	5
i3	3.49	1.831	3	i16	3.36	2.068	3
i4	4.75	2.189	5	i17	4.56	1.833	5
i5	3.85	2.252	4	i18	2.34	1.909	2
i6	3.10	2.058	3	i19	4.29	2.265	4
i7	3.00	1.991	3	i20	4.62	2.357	5
i8	3.92	2.024	4	i21	1.78	1.249	1
i9	3.37	2.052	3	i22	2.71	2.067	2
i10	2.78	1.662	3	i23	3.28	1.894	3
i11	4.97	2.280	5	i24	4.53	1.994	5
i12	3.37	2.217	3	i25	2.88	2.327	3
i13	3.45	2.000	3				

Table 3
The Scoring Range of Anthropomorphism and Animism

Level	1-Full ANM	2	3	4	5	6	7	8-Full ATM
Score Ranges	1.00-1.88	1.89-2.76	2.77-3.64	3.65-4.52	4.53-5.40	5.41-6.28	6.28-7.16	7.17-8.00

*ATM mark is Anthropomorphism, ANM mark is Animism

The data at Table 2 indicates the responses based on the questions (n=177) given by PSciT and PSocT. The values which come out as a result of the evaluation of the scoring at Table 1 indicates the Anthropomorphism or the Animism of responses given to the questions. For example, when the first question is considered, it has been observed that the scoring (4.21) indicates the problem (at table 3) in the Anthropomorphism and Animism format. When the 21st question is considered, the scoring is (1.78) which is equal to (Table 3) “Full Animism’’.

Table 4.a
Anthropomorphism and Animism Results in Terms of Section Variable (1^{st} – 5^{th} items)

Item	PST' Branches	*n*	*Mean*	*Standard Deviation*	*t test*	*Significantly*
i1	Social	60	2.57	2.118	6.838	0.000
	Science	117	5.05	2.370		
i2	Social	60	1.93	1.471	7.742	0.000
	Science	117	4.05	1.838		
i3	Social	60	2.67	1.548	4.522	0.000
	Science	117	3.91	1.827		
i4	Social	60	3.75	2.088	4.602	0.000
	Science	117	5.26	2.065		
i5	Social	60	3.27	2.385	2.493	0.014
	Science	117	4.15	2.131		

Table 4.b

Anthropomorphism and Animism Results in Terms of Study Field Variable (6^{th} – 25^{th} items)

Item	PST' Branches	*n*	*Mean*	*Standart Deviation*	*t test*	*Significantly*
i6	Social	60	1.70	1.394	7.380	0.000
	Science	117	3.81	1.978		
i7	Social	60	2.08	1.690	4.633	0.000
	Science	117	3.47	1.976		
i9	Social	60	2.48	1.809	4.303	0.000
	Science	117	3.82	2.028		
i10	Social	60	2.18	1.490	3.527	0.001
	Science	117	3.09	1.669		
i11	Social	60	3.87	2.243	4.912	0.000
	Science	117	5.54	2.091		
i15	Social	60	3.48	1.996	9.762	0.000
	Science	117	5.96	1.348		
i16	Social	60	2.48	1.732	4.207	0.000
	Science	117	3.80	2.090		
i17	Social	60	3.50	1.513	6.073	0.000
	Science	117	5.11	1.746		
i18	Social	60	1.65	1.376	3.549	0.000
	Science	117	2.69	2.049		
i19	Social	60	2.97	1.895	6.137	0.000
	Science	117	4.97	2.139		
i20	Social	60	4.73	2.364	0.474	0.636
	Science	117	4.56	2.361		
i21	Social	60	1.37	0.780	3.235	0.001
	Science	117	1.99	1.386		
i22	Social	60	2.22	1.814	2.310	0.022
	Science	117	2.97	2.149		
i23	Social	60	3.65	1.947	1.891	0.060
	Science	117	3.09	1.846		
i24	Social	60	4.75	2.144	1.046	0.297
	Science	117	4.42	1.913		
i25	Social	60	2.73	2.170	0.582	0.561
	Science	117	2.95	2.410		

Table 4.c

Anthropomorphism and Animism Results in Terms of Study Field Variable (Total Test Score)

Item	PST' Branches	*n*	*Mean*	*Standart Deviation*	*t test*	*Significantly*
Total Test Score	Social	60	72.07	20.872	9.661	0.000
	Science	117	102.16	18.950		

The data at Tables 4 (a, b, c), when the responses to the questions have been analyzed in detail, departments of the students can be detected by their Anthropomorphistic or Animism expressions.

When the questions have been analyzed, there is significant difference in the tendency to Animism among the PSocT ($p<.05$).

Table 5.a
Anthropomorphism and Animism Results in Terms of Gender Variable (1st – 11th items)

Item	PST' Gender	*n*	*Mean*	*Standard Deviation*	*t test*	*Significantly*
i1	Female	143	4.13	2.565	0.808	0.420
	Male	34	4.53	2.596		
i2	Female	143	3.29	2.041	0.638	0.524
	Male	34	3.53	1.779		
i3	Female	143	3.48	1.807	0.238	0.812
	Male	34	3.56	1.957		
i4	Female	143	4.80	2.176	0.657	0.512
	Male	34	4.53	2.259		
i5	Female	143	3.87	2.204	0.322	0.748
	Male	34	3.74	2.478		
i6	Female	143	3.07	2.020	0.345	0.730
	Male	34	3.21	2.240		
i7	Female	143	2.98	1.955	0.287	0.775
	Male	34	3.09	2.165		
i8	Female	143	3.93	1.974	0.123	0.902
	Male	34	3.88	2.253		
i9	Female	143	3.37	2.075	0.045	0.964
	Male	34	3.35	1.983		
i10	Female	143	2.76	1.584	0.400	0.690
	Male	34	2.88	1.981		
i11	Female	143	4.94	2.273	0.331	0.741
	Male	34	5.09	2.340		

($p < .05$)

Table 5.b
Anthropomorphism and Animism Results in Terms of Gender Variable (12th- 25th items)

Item	PST' Gender	*n*	*Mean*	*Standard Deviation*	*t test*	*Significantly*
i12	Female	143	3.33	2.184	0.473	0.636
	Male	34	3.53	2.377		
i13	Female	143	3.39	1.921	0.746	0.457
	Male	34	3.68	2.319		
i14	Female	143	4.99	1.925	0.997	0.320
	Male	34	4.62	1.985		
i15	Female	143	5.21	1.935	1.259	0.210
	Male	34	4.74	2.136		
i16	Female	143	3.36	2.064	0.101	0.919
	Male	34	3.32	2.114		
i17	Female	143	4.54	1.767	0.394	0.694
	Male	34	4.68	2.114		

i18	Female	143	2.30	1.928	0.546	0.586
	Male	34	2.50	1.846		
i19	Female	143	4.32	2.244	0.335	0.738
	Male	34	4.18	2.380		
i20	Female	143	4.45	2.387	1.963	0.051
	Male	34	5.32	2.114		
i21	Female	143	1.78	1.217	0.077	0.938
	Male	34	1.76	1.394		
i22	Female	143	2.65	2.050	0.811	0.418
	Male	34	2.97	2.153		
i23	Female	143	3.28	1.970	0.041	0.967
	Male	34	3.26	1.563		
i24	Female	143	4.61	2.014	1.058	0.291
	Male	34	4.21	1.903		
i25	Female	143	2.84	2.340	0.427	0.670
	Male	34	3.03	2.303		

($p < .05$)

Table 5.c
Anthropomorphism and Animism Results in Terms of Gender Variable (Total Test Score)

Item	**PST' Gender**	***n***	***Mean***	***Standard Deviation***	***t test***	***Significantly***
Total Test Score	Female	143	91.67	24.163	0.325	0.746
	Male	34	93.18	24.806		

($p < .05$)

PST (n=177) who has taken part in the survey has been analyzed wheather there has been a difference or not in terms of Anthropomorphism or Animism. When the data at Table 5 has been examined, there has been no significant difference in terms of gender (p=0.746) considering the total test score. When the 10th question is taken into consideration while the social and PSciT prefer the terms “desire, want, be enthusiastic”, no significant difference has been observed in male or female PST (p=0.69).

Table 6
The Scoring List and Results in Terms of Anthropomorphism

General Assessment of Anthropomorphism			
Theme	Code	*f*	*%*
want	want to reunite, want to fill, want to complete, want to be, on request, enthusiastic, as someone is enthusiastic	1482	40.59
work	Tempts to hybridize, try to stay, try to complete, need, as someone needs	354	9.70
need	-when you need, need to	274	7.50
request	demand, the demand, it is requested, require	223	6.11
enthusiasm	enthusiastic, enthusiasm, the enthusiasm, in that enthusiasm	157	4.30
hybridization	apply to hybridization, endeavor hybridization,	148	4.05
perception-thought	recognizes that, it has, thinks that someone has, feels that someone has	146	4.00
like	being like that, likes to be, to be lovers,	143	3.92

free	be free	134	3.67
decisive	decisive	130	3.56
desire	in supply, desirous, the desirable, having the desire,	97	2.66
prefer	prefer to be	86	2.36
comfortable	comfortable, be comfortable	83	2.27
share	with share	74	2.03
not like	not like each other, hate each other, not enjoy each other, hate, not like	64	1.75
lend-borrow	lend someone, borrow something	56	1.53

The data at Table 6 expresses how PSciT and PSocT have been distributed with regard to Anthropomorphism according to the themes as frequency-percent. When Table 6 examined, it has been observed that, PST prefer the word “want” (40.59%) more than the other words and also they prefer the word “borrow-lend” (1.53%) less than the other words. When the given responses have been analyzed, it has been accepted usual for the PST to prefer the word “want” as they use the expressions “want to achieve, become, want to complete” more often in their daily life. And also, the theme “borrow-lend” is less preferred as such word groups “to borrow” or “to lend”.

Table 7
The Scoring List and Results in terms of Animism

General Assessment of Anthropomorphism			
Theme	Code	*f*	*%*
in the event of	case of filling, in case of receive, condition, in case of, it is the case, stop, in case of hybridization, functional status, it is stable, there is case, a condition to complete, holding status	852	20.71
stay-be-appropriate-sturdy	remains at the level, when decisive, be stable, when suitable, sturdy, be firm, free, appropriate, when appropriate	672	16.34
in case of	in the filling, in case of, in the event, if hybridization, in keeping	569	13.83
force-push-pull	apply forces, apply opposed forces, opposed to each other, not attract each other, strength	434	10.55
structure-within	- keep within	381	9.26
towards	filling, tends to stay, is becoming, it is to conclude, is that	364	8.85
give-send	Transfer, send, give	302	7.34
feature	in the hybridization property, the property, it is a feature, the feature, the complete feature	271	6.59
correct-effective	support, correct, effective, helpful	268	6.52

The data at table 7, expresses how PSciT and PSocT have been distributed with regard to Animism according to the themes as frequency-percent. When the Table 7 has been examined, it has been observed that PST prefer the word “in case of” (20.71%) more than the other themes. And also they prefer the word “correct- effective” less (6.52%) than the other words. When Table 7 has been considered in detail, the PST prefer the word “in case of” more than the other words. They use the words such as “in case of, stable, have to be” to ensure their point of view and self-confidence.

Table 8
The Anthropomorphism Evaluation List and Results in Terms of Variable Section

General Assessment of Animism According to PSciT and PSocT		PSciT		PSocT	
Theme	Code	*f*	%	*f*	%
want	want to reunite, want to fill, want to complete, want to be, on request, enthusiastic, as someone is enthusiastic	1050	33.08	345	24.93
work	Tempts to hybridize, try to stay, try to complete, need, as someone needs	265	8.35	84	6.07
need	-when you need, need to	241	7.59	105	7.59
request	demand, the demand, it is requested, require	223	7.03	168	12.14
enthusiasm	enthusiastic, enthusiasm, the enthusiasm, in that enthusiasm	201	6.33	103	7.44
hybridization	apply to hybridization, endeavor hybridization,	185	5.83	76	5.49
perception-thought	recognizes that, it has, thinks that someone has, feels that someone has	152	4.79	32	2.31
like	being like that, likes to be, to be lovers,	151	4.76	-	0.00
free	be free	132	4.16	87	6.29
decisive	decisive	122	3.84	92	6.65
desire	in supply, desirous, the desirable, having the desire,	112	3.53	30	2.17
prefer	prefer to be	108	3.40	92	6.65
comfortable	comfortable, be comfortable	70	2.21	85	6.14
share	with share	68	2.14	18	1.30
not like	not like each other, hate each other, not enjoy each other, hate, not like	53	1.67	-	0.00
lend-borrow	lend someone, borrow something	41	1.29	67	4.84

The data at Table 8 expresses how PSciT and PSocT have been distributed with regard to Anthropomorphism according to the comparison in terms of themes as frequency-percent. When table 8 has been examined, PSciT prefer the word “want” (33.08%) more than the other themes. They prefer the Word “borrow-lend” (1.29%) less than the other words. And also, PSciT prefer the word “want” (24.93%) more than the other words. They prefer the word” prefer” less than the other ones. When we take into account the results, PSciT and PSocT prefer the Anthropomorphism theme “want” less because there is no significant difference in the use of group words based on the field of the study. However, PSciT prefer the Anthropomorphism theme “decisive” less while PSocT choose the word “prefer”. As this result has been taken into account, PSciT are decisive and sure on duty; conversely, PSocT do not choose the word “decisive” to indicate that they are not sure the reflection of their thoughts and behaviors.

Table 9
The Animism Scoring List and Results in terms of Variable Section

General Assessment of Anthropomorphism According to PSciT and PSocT		PSciT		PSocT	
Theme	Code	*f*	%	*f*	%
in the event of	case of filling, in case of receive, condition, in case of, it is the case, stop, in case of hybridization, functional status, it is stable, there is case, a condition to complete, holding status	934	24.38	513	22.80
stay-be-appropriate-sturdy	remains at the level, when decisive, be stable, when suitable, sturdy, be firm, free, appropriate, when appropriate	734	19.16	317	14.09

in case of	in the filling, in case of, in the event, if hybridization, in keeping	368	9.61	308	13.69
force-push-pull	apply forces, apply opposed forces, opposed to each other, not attract each other, strength	364	9.50	226	10.04
structure-within	- keep within	363	9.48	233	10.36
towards	filling, tends to stay, is becoming, it is to conclude, is that	321	8.38	191	8.49
give-send	Transfer, send, give	262	6.84	182	8.09
feature	in the hybridization property, the property, it is a feature, the feature, the complete feature	259	6.76	136	6.04
correct-effective	support, correct, effective, helpful	226	5.90	144	6.40

The data at Table 9 expresses how PSciT and PSocT have been distributed with regard to Animism according to the comparison in terms of themes as frequency-percent. When Table 9 has been considered, PSciT prefer the word “in case of” (24.38%) more than the other themes. They also prefer the word “structure, within” (5.90%) less than the other words. PSocT prefer the word “in case of” (22.80%) more than the other words. They prefer the word “take-send” (6.04%) less than the other words. When we take into account the results, science and PSocT prefer the theme “in case of” less than the other words because there is no significant difference in the use of words based on the field of the study. It is thought that this shows the clear reflection of the teachers’ point of view and self-confidence in the perspective of daily events.

Table 10
The Anthropomorphism Scoring List and Results in terms of Gender Section

General Assessment of Animism According to PST' Gender		Female PST		Male PST	
Theme	Code	*f*	*%*	*f*	*%*
want	want to reunite, want to fill, want to complete, want to be, on request, enthusiastic, as someone is enthusiastic	1489	38.18	319	37.84
work	Tempts to hybridize, try to stay, try to complete, need, as someone needs	378	9.69	32	3.80
need	-when you need, need to	293	7.51	25	2.97
request	demand, the demand, it is requested, require	278	7.13	89	10.56
enthusiasm	enthusiastic, enthusiasm, the enthusiasm, in that enthusiasm	216	5.54	50	5.93
hybridization	apply to hybridization, endeavor hybridization,	192	4.92	35	4.15
perception-thought	recognizes that, it has, thinks that someone has, feels that someone has	188	4.82	57	6.76
like	being like that, likes to be, to be lovers,	171	4.38	22	2.61
free	be free	169	4.33	32	3.80
decisive	decisive	164	4.21	42	4.98
desire	in supply, desirous, the desirable, having the desire,	139	3.56	68	8.07
prefer	prefer to be	81	2.08	30	3.56
comfortable	comfortable, be comfortable	72	1.85	26	3.08
share	with share	70	1.79	16	1.90
not like	not like each other, hate each other, not enjoy each other, hate, not like				
lend-borrow	lend someone, borrow something				

The data at Table 10 expresses how PSciT and PSocT have been distributed with regard to Anthropomorphism according to the gender in terms of themes as frequency-percent. When table 10 has been considered, female PST prefer the Word “want” (38.18%) more than the other words. And

they prefer the word “prefer” (1.79%) less than the other words. And also it has been observed that male PST prefer the word “want” (37.84%) more than the other words. They prefer the word “prefer” (1.90%) less than the other words. According to the survey results, both male and female PST prefer the theme group “want” more and there is no change in terms of gender. It is thought that female students prefer the word “desire” less, as a result they don’t reflect their enthusiasm to the lessons. Male students choose the theme “prefer” less. This shows that male students have no difficulty while choosing the word and they are sure of themselves.

Table 11
The Animism Scoring List and Results in Terms of Gender Variable

General Assessment of Anthropomorphism According to PST' Gender		Female PST		Male PST	
Theme	Code	*f*	*%*	*f*	*%*
in the event of	case of filling, in case of receive, condition, in case of, it is the case, stop, in case of hybridization, functional status, it is stable, there is case, a condition to complete, holding status	1135	22.87	343	27.31
stay-be-appropriate-sturdy	remains at the level, when decisive, be stable, when suitable, sturdy, be firm, free, appropriate, when appropriate	819	16.50	189	15.05
in case of	in the filling, in case of, in the event, if hybridization, in keeping	486	9.79	104	8.28
force-push-pull	apply forces, apply opposed forces, opposed to each other, not attract each other, strength	482	9.71	111	8.84
structure-within	- keep within	477	9.61	128	10.19
towards	filling, tends to stay, is becoming, it is to conclude, is that	471	9.49	76	6.05
give-send	Transfer, send, give	421	8.48	87	6.93
feature	in the hybridization property, the property, it is a feature, the feature, the complete feature	344	6.93	105	8.36
correct-effective	support, correct, effective, helpful	328	6.61	113	9.00

The data at Table 11 expresses how PSciT and PSocT have been distributed with regard to Animism according to the gender in terms of themes as frequency-percent. When table 11 is examined, female PST prefer the word "in case” (22.87%) more than the other themes. They prefer the word “structure-within” (6.61%) less than the others. And also male PST prefer the word “in case” (27.31%) more than the other words. They prefer the words “correct-effective” (6.05%) less than the others. When we take into account the survey results, both male and female PST prefer the theme “in case” more and there is no significant difference in choosing the theme according to the gender. Female gender PST prefer the word “keep within”, because it is thought that they don’t reflect the emotion “possession” to their lessons. Male PST prefer “correct-effective” theme less because they don’t use these word groups such as “support, correct, effective, helpful” in their daily life and they don’t reflect these to their routine.

Results and Discussion

The findings which have been laid out and reviewed in this research show that PSciT and PSocT make use of the themes “animism” and “anthropomorphism”. For example: when we consider “animism” and “anthropomorphism results according to the section variable at Table (4a-4b) social PST use Animism expressions more. When we check Table (4c) there is significant difference ($p<05$).

Social PST uses more Animism language. It has been observed that PSocT prefer the following expressions; “want, like, prefer, enjoy, hate” more than the other words. It has been seen that PSciT mostly use the following expressions; “perceive, think, feel”. As a result, PST use the non-academic expressions that they prefer to use in their daily life. In the light of these findings, when we consider the usage level of PST’ Anthropomorphism languages, the number of responses that PSciT have given are far more than the PSocT.

Research in the use of anthropomorphism language related to the concept of atom has been carried out and data has generally been collected by means of qualitative data collection. For example, in a survey conducted with the participation of English and Swedish students, it was found that students were more likely to use anthropomorphism language for the atomic concept (Taber and Watts, 1996; Adbo & Taber; 2013; Taber & Adbo, 2013). In this study conducted by Turkish students, quantitative data collection method was used in contrast to Taber and Watts (1996), Adbo and Taber (2013), Taber and Adbo (2013). Because they collect their data at different times with qualitative methods. In this study, the results which are similar to the research findings of Taber and Watts (1996), Adbo and Taber (2013); Taber and Adbo (2013) have been obtained. It has also been understood that Turkish students use anthropomorphism language in a similar way to British and Swedish students. In the light of these findings, it can be concluded that the use of anthropomorphism language is a universal phenomenon and that similar outcomes may occur in different cultures. Unlike other studies, quantitative measurement tool was developed in this study to determine the use of anthropomorphism language and it was revealed that quantitative measurement can be used in anthropomorphism use in wider samples.

Students' visual spatial intelligences influence the use of anthropomorphism language. Al-Balushi (2013) investigated the effect of anthropomorphism visualizations levels on students with low and high visual spatial intelligence. According to the results; Participants' anthropomorphism visualizations differed according to scientific subjects and low-high spatial visual intelligence. Participants' anthropomorphism visualizations for the water cycle were found to be higher than the anthropomorphism visualizations for space concept and cell division. It has been determined that students with low level anthropomorphism visualization learn scientific concepts and use them more often than students with other high level anthropomorphism visualization. In this study, there are differences when anthropomorphism uses are compared between PSciT and PSocT. PSocT have less anthropomorphism use than PSciT. In this scope; visual and spatial intelligence of PSciT and PSocT are examined, it is seen that the visual-spatial intelligences of PSocT are lower than those of PSciT (Ataş, 2011; Güneş and Gökçek, 2010; Öztürk, Özsoy, Vural and Baysan, 2017). This finding may be an indication of the reasons for choosing anthropomorphism uses of PSocT. According to these findings; it can be concluded that people with low anthropomorphism visualization and high spatial intelligence can easily learn scientific concepts. Less anthropomorphism usage and more visualization activities in lessons may benefit learning of scientific concepts. More correlational investigations are needed to obtain more comprehensive information.

Taber and Watts (1996) have suggested that studies on anthropomorphism and animism uses should be highly involved and that anthropomorphism use in chemistry may result in significant educational outcomes. Al-Balushi (2013) also suggested that different studies on broader and different anthropomorphism quantitative measures should be reproduced to support their findings. From this suggestion of Taber and Watts (1996) so far, there has not been much research on anthropomorphism and animism uses in chemistry for a long time. The data obtained from the quantitative measurement in this study again supports the quantitative findings of Al-Balushi (2013) and the qualitative findings of Taber and Watts (1996). As a result, it may also be proven that there may be an anthropomorphism use with a quantitative measurement in this study.

It has been understood that the level of anthropomorphism language use of students who are familiar with chemistry subjects is less than those who have yet to learn chemistry topics (Talanquer, 2007). The results of this study do not support the prediction of Talanquer (2007). In this study, the anthropomorphism use rates of PSciT (51.01%) were slightly higher than the PSocT’s'

anthropomorphism language usage rate (36.4%). Some studies have shown that anthropomorphism language use helps students understand. Zohar and Ginossar (1998) found that 80% of students used anthropomorphism language uses in biology books. Anthropomorphism language use was supported by the study of Zohar and Ginossar (1998), which helped students to imagine and visualization them. In this study, it can be shown that the anthropomorphism language uses of PSciT are more in need of learning chemistry concepts of PSciT than PSocT, and therefore they are in the world of visualization and daily usage language to learn these concepts.

According to Al-Balushi (2009), students can use as an instrument to make anthropomorphism expressions meaningful. Such anthropomorphism visualizations may show that they imagine the microscopic world. Al-Balushi (2009) achieved similar results to this study. Al-Balushi (2009) showed that 36.4% of university students preferred anthropomorphism language use in chemistry related concepts. The use of anthropomorphism languages by Turkish students is a bit more than the findings of the studies in the literature.

There are also criticisms about the use of anthropomorphism content or the presentation of metaphoric content in lessons. Teachers tend to use anthropomorphism languages and metaphors to better communication with models. For this reason, models used in science lessons can give students the habits of using anthropomorphism language. Anthropomorphism explanations may be useful in the initial stages of learning and may have emerged as an example to completely replace the descriptions to introduce students to abstract concepts. (Taber & Watts 1996). In particular, students who have yet to learn scientific concepts may doubt their knowledge by mixing the content of scientific knowledge with anthropomorphism language (Taber, 2014; Adbo & Taber, 2013; Taber & Adbo, 2013).

There is some suspicion that students have an anthropomorphism language use of the origins of their misunderstanding of the subject from the family, from the resource books or the course contents. Perhaps the anthropomorphism language use of PSciT who are accustomed to chemistry topics may be more supportive of these criticisms than the PSocT. The use of anthropomorphism language should be included in the explorations in which conceptual understanding and conceptual misconception are examined.

In research, it has been observed that there is no exact truth in the use of expression “animism” in the field of science. When we consider the surveys in this scientific field, the expression “animism” prevent students from scaring of the science lessons, then it helps students to break the prejudice towards the lesson and it also helps them to grasp the meaning of abstract concepts. These studies are believed to be fruitful to see if the teachers use these expressions in the correct way and also to see how much of this scientific language they make use of (Banister & Ryan, 2001; Nicoll, 2001; Kallery & Psillos, 2004; Nakiboğlu and Poyraz, 2006; Özdemir, 2012). Teachers’ effective use of language has a considerable part in language teaching process. It is thought that this clear use of language will help students to understand the chemistry better (Pyburn, Pazicni, Benassi & Tappin, 2013). Students will be aware of the importance of language when they face the difficulty in understand three dimensional structures, reactions and many more concepts.

In the recent studies, it is thought that specifying the importance of language used in chemistry and the further studies about this will support the future surveys in chemistry. In the future studies, the research about the language that teachers use each chemistry and how the language will be influenced by the teachers’ beliefs and thoughts while teaching. It is thought that the questions such as the importance and difficulties of language while teaching in heterogeneous classes, what the language differences in chemistry teaching and evaluation points are and they should be answered to contribute in chemistry teaching and learning (Taber, 2015).

As a result, the expressions “anthropomorphism” and “animism” cover a significant place in teaching and learning processes. This study helps us making the following inferences; the determination and relieving ‘Anthropomorphism’ and ‘Animism’ of PSciT and PSocT, determination of the missing points in the education of this field. Taking steps into this field will be really important. To overcome the difficulties in the field of science, there should be more studies to correct the deficiencies at the point of scientific language in the lessons. Understanding the importance of the use

of these expressions “Anthropomorphism and Animism” in teaching science by teachers is really essential. Also, it is really difficult to make an assessment in this direction.

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Attachment: Anthropomorphism and Animism Language Usage Scale for the Concept of Atom (Turkish Form)

Important Notice: At the end of the article text, the Turkish form of the measurement tool is given. The English form of the measurement tool is not given because of the different grammatical structures of Turkish and English languages. In the options, the bold font characterizes preferences for anthropomorphism uses, and preferences for non-bold animism uses.

Sevgili Arkadaşlar;

Atom, yapısı ve özellikleri ile ilgili çalışmanın bir parçası olan bu anket, sadece bilimsel amaç için kullanılacaktır. Bu anket sizin bilginizi ölçmeye çalışmamaktadır. Hangi tercihi yapsanız dahi doğru kavramlara ulaşılmaktadır. Yani tüm tercihler doğrudur. Bu nedenle bu anket başarınızı ölçen bir anket değildir. Sadece konuyla ilişkin boşluklarda yer alan uygun kelime veya kelime gruplarını bulmaya çalışmaktayız. Bu konuda göstereceğiniz ilgi ve yardımlarınızdan dolayı teşekkür ederiz.

Anketi nasıl dolduracaksınız?

Her maddede boşluklar bulunmaktadır. Bu boşluklara size göre uygun olan kelime ya da kelime gruplarını önem düzeyi 1 den başlayarak 1,2,3 şeklinde numaralar vermenizdir. Üç seçenekten fazla sıralama yapmayınız.

En önemli 1, orta düzeyde önemli 2, düşük düzeyde önemli 3

I. KİŞİSEL BİLGİLER

Adınız :	**Soyadınız:**	**No:**	**Sınıfınız:**
Bölümünüz:	**Doğum Tarihiniz:**		**Memleketiniz:**
Cinsiyetiniz: K ( )	**E( )**		

1) Atomlar daha fazla bağ yaparak daha düşük enerjili ……..
olmayı ister
olmayı sever
düzeyde kalır
olma durumundadır
yapıdadır
olmayı tercih eder

2)Atomik orbitaller kendi başlarına kararsız yapıda yani yüksek enerjili oldukları için bileşik yaparak daha kararlı ……..
olmayı sever
olma durumundadır
olma yönündedir
olmak ister
olma hevesindedir
yapıdadır

3) Atomların hepsi kararlı olma durumundadır ve bundan dolayı yarı dolu yapıda …….
kalma hevesindedir
olma durumundadır
durur
kalmaya çalışır
kalma arzusundadır
kalmaya yönelir

4) Atomik orbitaller kararlı olmak için oktetini ……
doldurmak ister
tamamlamak durumundadır
tamamlama özelliğindedir
tamamlamak ister
tamamlamaya çalışır

tamamlama yönündedir

5) Atomik orbitallerde elektronlar uygun konumda olabilmek için boşluklara, boş orbitallere geçme …… bulunurlar. Elektronlar birbirlerini iterler.
arzında
halinde
özelliğinde
isteğinde
durumunda
talebinde

6) Yarı dolu ve boş orbitalleri yardımıyla iki atomik orbitaldeki elektronlar birleşip hibritleşerek bileşik oluşturma …….. Bu nedenle hibritleşirler.
isteğindedir
hevesindedir
özelliğindedir
talebindedir
durumundadır
halindedir

7) Son yörüngedeki elektronlar bağ yapma ya da kopma …… dolayı hibritleşme yaparak elektron geçişi yaparlar.
isteğinden
hevesinden
özelliğinden
talebinden
durumundan
halinden

8) Atomlar, daha düzenli bir yapıya geçme ……Bu nedenle değerlik elektronlarını tamamlarlar.
talebindedir
halindedir
durumundadır
isteğindedir
hevesindedir
özelliğinden

9) Atomlar bağ yapabilmek için uygun enerji seviyesine gelme ……..
talebindedir
durumundadır
halindedir
isteğindedir
hevesindedir
özelliğindedir

10) Bileşiklerde atomlar arasındaki bağ kısadır ve bu nedenle elektronları çekme ……..artar.
talebi
hevesi
kuvveti
isteği
durumu
hali

11) Atomlar kararlı yapıya ulaşabilmek için oktet …….. Bu yüzden atomlar arasında hibritleşme olur.
-i doldurmak ister
-i doldurma durumundadır
-i doldurma halindedir
-i doldurmaya heveslidir
-i tamamlamak ister
-i doldurma yönündedir

12) Atomlar enerji seviyelerini eşitleme ……..
talebindedir
durumundadır
halindedir
isteğindedir
arzusundadır
özelliğindedir

13) Atomlar daha fazla bağ yapıp daha az enerjili duruma geçebilmek ve daha kararlı olabilmek için varsa oktet boşluklarını tamamlayıp bağ yapma olasılığını arttırma……

isteğindedir
arzusundadır
halindedir
hevesindedir
durumundadır
yönündedir

14) Atomların elektronları hibritleşme durumunda en ……. durumdadırlar.

kararlı
uygun
sağlam
rahat
istekli
doğru

15) Atomların etkileşmesiyle oluşacak molekül, düşük enerjide ve …… olma durumundadırlar.

kararlı
istekli
doğru
rahat
uygun
sağlam

16) Moleküller hibritleşme yaptıklarında daha kararlı hale geçerler. Bütün atomlar, kararlı oldukları zaman ……. yapıda bulunurlar.

kararlı
istekli
doğru
rahat
uygun
sağlam

17) Atomlar bağ yapmaya …… hibritleşme yaparlar.

ihtiyaç duyduklarında
istekli olduklarında
kararlı olduklarında
hevesli olduklarında
uygun olduklarında
müsait olduklarında

18) Dış yörüngedeki yayılmış elektronlar elektik iletkenliğinde …….. olabilir.

etkili
istekli
hevesli
yardımcı
destek
arzulu

19) Atomlar daha düşük bir enerji seviyesinde ……..

bulunmak isterler
kararlı durumundadır
işlevsel durumdadır
olmayı severler
olmaktan hoşlanırlar
olma durumundadır

20) Atomlar oktetlerini tamamlamak için …….

hibritleşmeye başvurur
hibritleşmeye çaba gösterir
hibritleşme özelliğindedir
hibritleşmeye çalışır
hibritleşme durumundadır
hibritleşme halindedir

21) İki pozitif yük her zaman ‘birbirini iter’ ‘çünkü farklı yüklerdir ve birbirlerin……

birbirlerinden hoşlanmaz
birbirlerine zıt kuvvet uygular
birbirlerini çekmez
birbirlerini sevmez
birbirlerinden nefret eder

birbirlerine ters kuvvet uygular

22) Yemek tuzundaki bir sodyum atomu ‘ elektronlarından bir tanesini klor ……..;

-a ödünç verir

-a verir

-a gönderir

-a borç verir

ile paylaşır

-a aktarır

23) Argon ısıtıldığında veya kaynatıldığında, argon atomları eğer istiyorlarsa etraflarında hareket ederek ……..

serbest olur

kararlı olur

sağlam olur

özgür olur

hür olur

rahat olur

24) Hidrojen gazında hidrojen atomunun birinci kabuğu, kararlı olmak için elektron ……

-a kavuşmak ister

alma durumundadır

tutma durumundadır

-a ihtiyaç duyar

talep eder

tutma halindedir

25) Hidrojen gazı daha kararlı olmak için başka bir hidrojenle elektronlarını paylaşır, diğer hidrojen atomu böylelikle iki elektron ……..

-a sahip olduğunu algılar

-u bünyesinde tutar

-u yapısında bulundurur

-a sahip olduğunu düşünür

-a sahip olduğunu hisseder

-u üzerinde tutar