International Journal of
Inclusive and Sustainable Education
ISSN: 2833-5414
Volume 1 | No 5 | Nov-2022

Methodology of Organizing Practical Training on the Subject of "Nuclear Models" (On the Example of Pedagogy in Higher Educational Institutions)

K. R. Nasriddinov [1], R. V. Qosimjonov

[1] Prosessor of Chirchik State Pedagogical Univestety

[2] Lecturer of Kokand State Pedagogical Institute

Abstract: This article is devoted to organization of practical classes on the topic “Nuclear models” in the nuclear physics section. The role and significance of non-standard tests in practical classes have been studied and non-standard tests for this section have been developed.

Keywords: atomic nucleus, nuclear models, nuclear reactor, droplet model of the nucleus, methodology, practical classes.

Introduction

It is known that all information about Nuclei is obtained from relevant experiments. The main purpose of the theory of the atomic nucleus is to explain and predict:

a) static characteristics of the ground states of nuclei with a given composition;

b) excitation spectrum of a given nucleus;

c) the results of one or another nuclear change.

At the beginning of the scheme is the microscopic theory of the nucleus, the foundations of which have already been determined. It originates from the general idea of the nucleus as a system of many strongly interacting nucleons. But, as mentioned above, this idea itself is not so perfect (constructive) at the moment. Therefore, the modern microscopic theory of the nucleus is also a unique model with limited goals. It comes from considering the nucleus as a limited system of fermions (nucleons), to describe which the Russian scientist A. B. Migdal and other physicists used an improved version of the quantum Fermi-fluid theory. This improved version uses the powerful hardware of quantum field theory and includes ideas such as superconductivity, superfluidity, and more. Microscopic theory in its modern form does not allow to calculate the properties of real nuclei. Currently, its main purpose is to demonstrate the substantiation of nuclear models and their areas of application. Microscopic theory reveals the internal unity of different models and eliminates the conflict between the contradictory assumptions of some of them. In this sense, it can be called "nuclear model model".

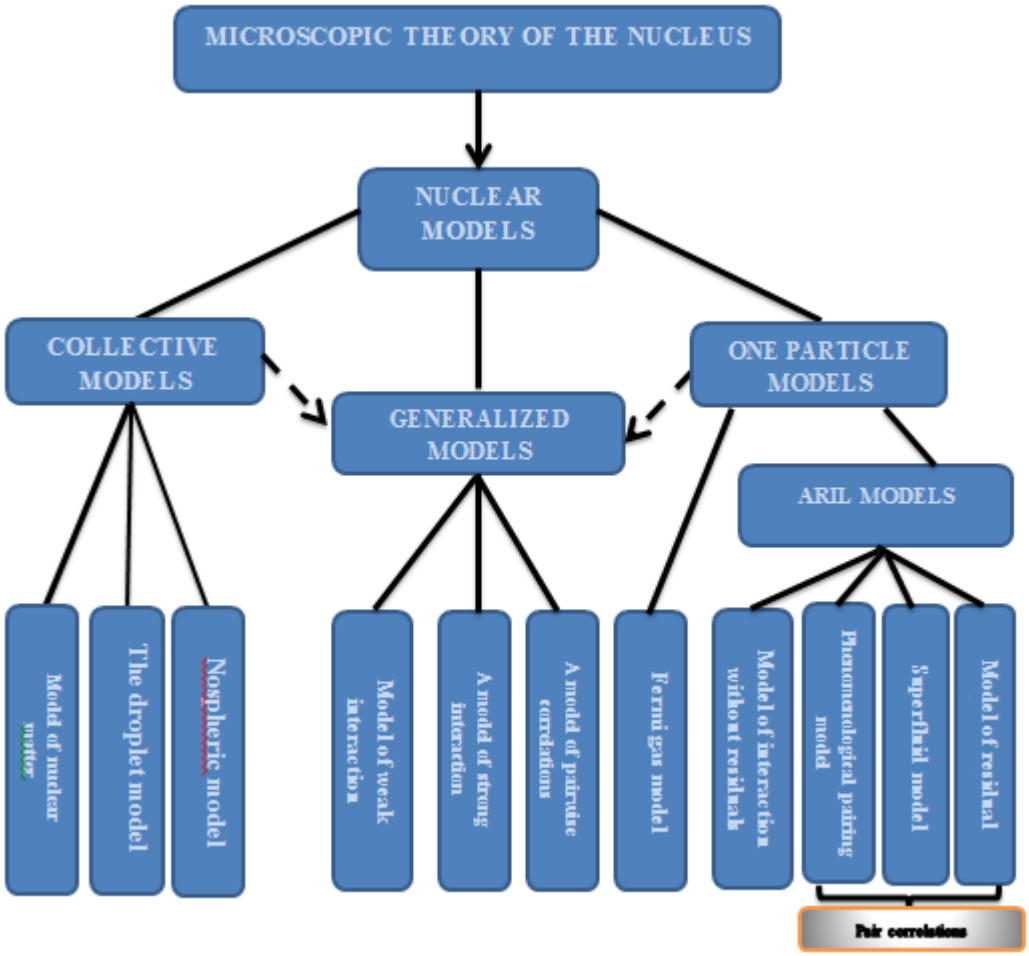
The main classification feature of certain kernel models is related to which degrees of freedom they consider to be practically independent. Collective models take into account the degrees of freedom corresponding to the correlated (correlated) movement of a large number of nucleons. They are also commonly referred to as strongly interacting nuclear models. The reason for this is that collective effects are believed to play a major role when a particle makes frequent and strong collisions with its nearest neighbors. In phenomenological language, this means that the range of forces between nucleons R_S and the free path of nucleons λ are considered to be small: $R_S \ll R$ and $\lambda \ll R$, where

R is the radius of the nucleus. Thus, in collective models, the nucleus is likened to a liquid or a solid body.

Single-particle models take into account the degrees of freedom that describe the motion of individual nucleons. They are sometimes called independent particle models. This is due to the assumption that the free path of the nucleon is large ($\lambda \gg R$). As a result, each particle is considered to move independently of the others in a specific field corresponding to itself, that is, in the potential field formed as a result of the joint movement of all nucleons in the nucleus. Thus, here the nucleus is compared to a gas.

Both collective and single-particle degrees of freedom are used in generalized models. If we follow the same terminology, they interpret the nucleus as a two-

Scheme 1.



phase system - a liquid (or a deformable solid) in dynamic equilibrium with a vapor.

Literature Analysis and Methodology

Practical training in physics in higher education institutions includes problem solving, laboratory training and conducting seminars. Working with problems occupies a special place in the system of scientific knowledge, that is, it is a means of strengthening the acquired theoretical knowledge and applying it in practice. In this process, students develop practical and thinking methods, skills and abilities.

However, since there are very few questions on the topic of nuclear models, in our opinion, the use of educational tests in the practical training will lead to the strengthening of the theoretical knowledge obtained in the lecture training.

Discussion

Here are some tutorial tests on the topic:

1. What is the microscopic theory of the nucleus?

A. It is the smallest component of the body, in which the properties of a chemical element are preserved.

B. The smallest structural particle of the body that exhibits the main chemical and physical properties. It has the feature of independent living.

C. His perfect theory has not been created.

D. It is the smallest component of the body, and it has the characteristic of independent existence.

2. How many types of nuclear models are there?

A. 1 piece B. 2 piece C. 4 piece D. 3 piece

3. Which models are included in the collective models.

A. Nuclear matter, droplet and nonspherical models.

B. Pairwise correlations, strong interaction, and weak interaction models.

C. Residual interaction, transient and non-residual interaction models.

D. Nuclear matter, droplet, residual interaction and flow models.

4. Which models are included in generalized models.

A. Nuclear matter, droplet and nonspherical models.

B. Pairwise correlations, strong interaction, and weak interaction models.

C. Residual interaction, transient and non-residual interaction models.

D. Nuclear matter, droplet, residual interaction and flow models.

5. Which models are included in one-particle models.

A. Nuclear matter, droplet and nonspherical models.

B. Pairwise correlations, strong interaction, and weak interaction models.

C. Fermi - gas, residual interaction, flux and non-residual interaction models.

D. Nuclear matter, droplet, residual interaction and flow models.

6. Which models are included in shell models.

A. Nuclear matter, droplet and nonspherical models.

B. Pairwise correlations, strong interaction, and weak interaction models.

C. Residual interaction, drift, phenomenological pairing, and non-residual interaction models.

D. Nuclear matter, droplet, residual interaction and flow models.

7. Which models are explained by pairwise correlations?

A. Nuclear matter, droplet and nonspherical models.

B. Pairwise correlations, strong interaction, and weak interaction models.

C. Transferable, phenomenological coupling, and residual interaction models.

D. Nuclear matter, droplet, residual interaction and flow models.

Results

Such tests serve as a means of strengthening students' theoretical knowledge, repeating it during practical training, and at the same time strengthening it.

Conclusion

The above-mentioned test tasks are for students in the process of teaching the topic of nuclear models in the Department of Nuclear Physics of General Physics in higher educational institutions of pedagogy.

- ✓ strengthening theoretical knowledge;
- ✓ controlling acquired knowledge;
- ✓ serves as a knowledge assessment tool.

References

1. Наумов А. И. Физика атомного ядра и элементарных частиц. – М.: Просвещение, 1984. – 384 с.
2. Nasriddinov K.R., Qosimjonov R.V. Yadro fizikasida nostandart testlarning o‘rni va ahamiyati. Academic Research in Educational Sciences Volume 3 | Issue 6 | 2022 ISSN: 2181-1385. –B. 509-517.
3. R.V. Qosimjonov. In practical exercises of nuclear physics nuclear physics analysis of protection laws. Berlin Studies Transnational Journal of Science and Humanities ISSN 2749-0866 Vol.2 Issue 1.5 Pedagogical sciences http://berlinstudies.de/ Berlin. 2022. –P. 321-326.
4. R.V. Qosimjonov. Amaliy mashg’ulotlarda testlardan foydalanishning o’rni va ahamiyati. Материалы Международной научной конференции “Тенденции развития физики конденсированных сред”. –Фергана, 25 май, 2021 год. ЧАСТЬ 2. –B. 153-156.
5. Nasriddinov K.R., Xudayberdiyev E.N., Qosimjonov R.V., Samandarov L.Q. Umumiy fizika. Atom va yadro fizikasidan masalalar to‘plami. O‘quv qo‘llanma. –Toshkent, Malik print Co, 2022. –209 b.