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ELEKTRODINAMIKADA SABABIYAT PRINSIPI

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Odatda borliqdagi har bir hodisaning paydo bo‘lishi va rivojlanishida o‘z sababi bo‘ladi va ayni vaqtda uning o‘zi ham boshqa hodisalarning kelib chiqishi va rivojlanishiga sabab bo‘lib xizmat qilishi mumkin. Ayrim hodisalarni tushunmoq uchun biz ularni umumiy aloqadorlikdan ayirib olishimiz hamda ularni alohida-alohida tekshirishimiz lozim.

Tabiat va jamiyatdagi sabab-oqibat bog‘lanishlarning kishilar fikridagi ifodasi sababiyat kategoriyasining paydo bo‘lishiga olib kelgan. Sababiyat hodisalar o‘rtasidagi shunday ichki aloqadorlikki, bunda har doim bir hodisa mavjud bo‘lar ekan, uning ketidan muqarrar ravishda ikkinchisi sodir bo‘ladi.

Klassik elektrodinamikada nuqtaviy zaryad deb fazoning cheksiz kichik hajmida joylashgan cheksiz kichik dq —zaryad qabul qilingan

$$dq = \rho dV$$

Bu model fazoda zaryadning uzluksiz taqsimlanganligiga mos keladi. Ikkinchi model - diskret nuqtaviy zaryad modelidir. Bu modelga ko‘ra, q —ixtiyoriy qiymatli makroskopik zaryad fazoning geometrik nuqtasida joylashishi mumkin. Bu holda zaryad zichligi

$$\rho(\vec{r}) = q\delta(\vec{r} - \vec{r}_0)$$

kabi aniqlanadi, bu yerda $q\delta(\vec{r} - \vec{r}_0)$ —Dirakning delta funksiyasi deyiladi, $\vec{r}_0$ — zaryad joylashgan nuqtaning radius vektori. Biz

$$\rho = \rho(\vec{r}, t)$$
$$\vec{j} = \vec{j}(\vec{r}, t)$$

ekanligini bilamiz, ya‘ni ρ va $\vec{j}$ fazo nuqtasi koordinatalari hamda vaqtning funktsiyasidir. Shu sababli ham diskret nuqtaviy zaryad uchun

$$\rho = \rho\delta\left(\vec{r} - \vec{r}_0(t)\right) \qquad (1)$$
$$\vec{j} = q\upsilon\delta\left(\vec{r} - \vec{r}_0(t)\right)$$

munosabat o‘rinliligi kelib chiqadi.

Faraz qilamiz, vakuumda zaryadlangan zarralar hamda elektromagnit maydondan iborat izolyatsiyalangan sistema bo‘lsin. Sistemaning dastlabki holati ma‘lum bo‘lsin. Ya‘ni, zaryadli zarralarning koordinatalari va tezliklari hamda elektromagnit maydonning tashkil etuvchi $-\vec{E}$ va $-\vec{B}$ vektorlari ma‘lum bo‘lsin. Bu sistemaning bundan keyingi ixtiyoriy vaqt momentlaridagi holatini aniqlash talab qilinsin. Buning uchun sistemaning umumiy maydonini hamda har bir zaryadli zarraga ta‘sir qiluvchi kuchni aniqlaymiz. Bu vaqt ichida zaryadlar joylashish koordinatalari o‘zgaradi va unga mos holda sistema hosil qilgan umumiy elektromagnit maydon ham o‘zgaradi va hakoza bu jarayon doimo o‘zgarib turadi. Shu sababli ham bu masala yechimga ega emas. Ikkinchi tomondan esa:

1. Izolyatsiyalangan sistemsani har doim ham ajratib olish imkoni yo‘q.
2. Zaryadli zarralar sistemasida zarralar tezlanishli harakat qilishadi va natijada radiatsion ishqalanish kuchlari hosil bo‘ladi, bu kuchlarni esa hisobga olishning imkoni yo‘q.

3. Zaryadlar harakatini mexanika qonunlari yordamida o‘rganish uchun jismlarning mexanik modeli zarur va bu modelda jismlar o‘rnida zaryadlar jiylashgan bo‘lishi kerak.

Superpozitsiya prinsipi hamda (1) sistema yordamida Maksvell tenglamalari sistemasi quyidagi ko‘rinishga ega bo‘ladi:

$$\begin{cases} \operatorname{div}\vec{E} = \dfrac{1}{\varepsilon_0}\Sigma\rho_i\delta(\vec{r}-\vec{r}_i) \\ \operatorname{rot}\vec{E} = -\dfrac{\partial\vec{B}}{\partial t} \\ \operatorname{div}\vec{B} = 0 \\ \operatorname{rot}\vec{B} = \mu_0\sum q_i\vec{r}_i\delta(\vec{r}-\vec{r}_i) \end{cases} \qquad (2)$$

Bu sistemaga Lorents kuchi ifodasini quyidagi ko‘rinishda qo‘shib yozamiz

$$\frac{d\vec{p}_i}{dt} = q_i\vec{E} + q_i[\dot{\vec{r}}_i\vec{B}] \qquad (3)$$

(2) hamda (3) ifodalar birgalikda vakuumdagi zaryadlar va elektromagnit maydon sistemasi uchun Maksvell-Lorens tenglamalari deyiladi.

Maksvell-Lorens tenglamalari boshlang‘ich shartlarga ko‘ra zaryadli zarralar va elektromagnit maydon sistemasi holatini aniqlashga imkon beradi. Demak, elektrodinamika dinamik qonuniyatlar nazariyasi deb hisoblanar ekan. Shu sababli ham elektrodinamikada sababiyat prinsipi o‘rinlidir: zaryadlar - maydon sistemasining biror vaqtdagi holati bu sistemaning keyingi vaqt momenlaridagi holatini anilashga imkon beradi. Lekin Maksvell-Lorents tenglamalarining aniq yechimi kam sondagi zaryadlar uchun ham mavjud emas. Shu sababli ham maydon-zaryadlar sistemasi holatini aniqlash uchun boshqa taqribiy usullar qo‘llaniladi. Maksvell-lorents tenglamalari esa faqat prinsipal ahamiyatga ega. Ya‘ni, maydon-zaryadlar sistemasining boshlang‘ich holati ma‘lum bo‘lsa bu sistemaning istalgan vaqtdagi holatini sababiyat prinsipi asosida aniqlash mumkin. Lekin buni hisolashning o‘ta murakkabligi sababli bu maqsadni amalga oshirib bo‘lmaydi.

Adabiyotlar ro’yxati

1. Ж.М.Абдуллаев, Л.И.Очилов. “Изъятие пресной воды из подземных вод при помощи гелиоустановки водоносного опреснителя”. Молодой учёный научный журнал. 2015/5. 274-276
2. Abdullayev J. M. ANALYSIS OF THE CALCULATION OF THE ELECTROSTATIC FIELD BY DIFFERENTIATING AND INTEGRATING METHODS// Uzbek Scholar Journal Volume- 24, January, 2024 www.uzbekscholar.com
3. Azzamova Nilufar Buronovna, Nasriddinov Komiljon Rahmatovich. Electrodynamics As A Basis For Consolidating Knowledge Of Electromagnetism. Solid State Technology. 4(63). 5146.
4. Nasriddinov Komiljon Raxmatovich, Azzamova Nilufar Buronovna “ELEKTROMAGNITIZM” VA “ELEKTRODINAMIKA” O‘QUV PREDMETLARI ORASIDAGI UMUMIYLIKLAR VA UNING MUHIM JIHATLARI// Uzbek Scholar Journal Volume- 25, February, 2024 www.uzbekscholar.com
5. B.N Khushvaqtov Didactic factors affecting improvement academicia: an international multidisciplinary research journal 2021й 1823-1826б
6. B. N. Xushvaqtov Integrative model of improving the content of classes in optics European Journal of Research and Reflection in Educational Sciences Vol 7 (12)

7. Khushvaktov Bekmurod Normurodovich TEACHING PHYSICS ON THE BASIS OF PEDAGOGICAL TECHNOLOGIES Uzbek Scholar Journal Volume- 24, January, 2024 www.uzbekscholar.com
8. U.R.Bekpulatov. "Physical style of thinking-methodological basis for the formation of a scientific world view". Theoretical&Applied Science. 09(89). 183-188.
9. U.R.Bekpulatov METHODOLOGICAL SIGNIFICANCE OF THE PRINCIPLES OF "SYMMETRY AND DISSYMMETRY" IN THE SYSTEM OF PHYSICAL KNOWLEDGE // Uzbek scholar ISSN: 2181-0869 JOURNAL DOI: HTTPS:// DOI.ORG/10.31251 IFSIJ JIF 2024: 7.125 SJIF 2024: 6.59 Volume-24, January-2024
10. F.Nabiyeva. Issiqlik hodisalarini o'qitishga oid umumiy metodik tavsiyalar. «Science and innovation». 446-449.
11. Nabiyeva Firuza Odil qizi THE IMPORTANCE OF PRACTICAL TRAINING IN THE TEACHING OF THE" ELECTROMAGNETISM " DEPARTMENT// // Uzbek scholar ISSN: 2181-0869 JOURNAL DOI: HTTPS://DOI.ORG/10.31251 IFSIJ JIF 2024: 7.125 SJIF 2024: 6.59 Volume-24, January-2024
12. D.I.Kamalova, S.N.Abdisalomova. "Zamonaviy innovatsion ta'lim". Journal of universal science research. Volume 1. Issue 1. 17 january, 2023. pp. 187-189.
13. D.I.Kamalova, Y.O'.Mardanova. The role of pedagogical competencies in improving technical knowledge of students in the higher education system. International scientific-online conference "Innovation in the modern education system". Washington, USA. Part 12. November 25. 2021. pp. 434-437.
14. Khamroeva Sevara Nasriddinovna THE THEORETICAL SIGNIFICANCE OF DEVELOPING LOGICAL THINKING SKILLS AMONG FUTURE PHYSICS TEACHERS uzbek scholar journal volume- 24, january, 2024 www.uzbekscholar.com 193-196
15. Laylo Turdieva, Khamroeva Sevara Nasriddinovna METHODOLOGY FOR TEACHING THE TOPIC "DEVICE USED IN CRAFTS" uzbek scholar journal volume- 24, january, 2024 www.uzbekscholar.com225-227
16. Tursunboy Izzatillo ugli Soliyev, Amrullo Mustafoyevich Muzafarov, Bahriddin Faxriddinovich Izbosarov. Experimental determination of the radioactive equilibrium coefficient between radionuclides of the uranium decay chain. International Scientific Journal Theoretical&Applied Science. 801-804.
17. Soliyev Tursunboy Izzatillo ugli RELATION BETWEEN RADIOACTIVE EQUILIBRIUM COEFFICIENT AND SAMPLE AGE // Uzbek scholar ISSN: 2181-0869 JOURNAL DOI: HTTPS://DOI.ORG/10.31251 IFSIJ JIF 2024: 7.125 SJIF 2024: 6.59 Volume-24, January-2024
18. Sayfullaeva Gulkhayo Ikhtiyor Kizi, Shodiev Khamza Ruziculovich, Xaitova Shakhnoza G'olibjon Kizi // CONDITIONS FOR THE FORMATION OF TEACHING INNOVATION ACTIVITIES// Journal of Pharmaceutical Negative Results Volume 14. Issue 2. 2023. 2420-24233 pp
19. Sayfullayeva Gulhayo Ixtiyor qizi, Norqulov Madina Hamza qizi Astronomiyani axborot ta'lim muhitlaridan foydalanib o'qitishning pedagogik tamoyillari// «Zamonaviy dunyoda innovatsion tadqiqotlar: Nazariya va amaliyot» nomli ilmiy, masofaviy onlayn konferensiyasi 104-109 https://doi.org/10.5281/zenodo.10443860
20. Sayfullayeva Gulhayo Ixtiyor qizi Namozova Nilufar Tuxtamurodovna Astronomiya fanini o'qitishda elektron darsliklarning o'ziga xos xususiyatlari va afzalliklari// Journal of Universal Science Research 1 (10), 873-877
21. Н Намозова, Г Сайфуллаева Астрономия фанига интеграциялашган медиатаълимнинг

фаолиятли тузилмаси// бюллетень педагогов нового Узбекистана 1 (7), 21-23

22. Aziza Bozorova, Gulhayo Sayfullayeva kredit–Modul Ta'lim Tizimida Talabalarning Mustaqil Ta'lim Jarayonini Tashkil Etish// Бюллетень студентов нового Узбекистана, 2023

23. Haydarova Dilorom, Sayfullayeva Gulhayo Pyton dasturida astronomiyadan animatsiya yaratish // Journal of Universal Science Research, 2023

24. Kamolov Ikhtiyor Ramazonovich Features of using mathematical knowledge and laws of physics in teaching astronomy Uzbek scholar journal volume- 24, january, 2024 www.uzbekscholar.com 152-157

25. I.R. Kamolov, G.I. Sayfullaeva -Formation of teacher's competence in the performance of laboratory and experimental works Journal of critical reviews. ISSN-2394-5125, 2020

26. Саттаров Ахлиддин Ризакулович ОБУЧЕНИЯ ЗНАНИЕ ПО "ФИЗИКЕ СОЛНЦА" В ВЫСШИХ ПЕДАГОГИЧЕСКИХ УЧЕБНЫХ ЗАВЕДЕНИЯХ НА ОСНОВЕ ИНТЕГРАТИВНОГО ПОДХОДА // Uzbek scholar ISSN: 2181-0869 JOURNAL DOI: HTTPS://DOI.ORG/10.31251 IFSIJ JIF 2024: 7.125 SJIF 2024: 6.59 Volume-24, January-2024

27. Sattorov Ahliddin Rizoqulovich, Kamolov Ixtiyor Ramazonovich Astrofizika fanini integrativ yondoshuv asosida o'qitishning metodik asoslari//SCIENCE AND INNOVATION INTERNATIONAL SCIENTIFIC JOURNAL VOLUME 1 ISSUE 8 UIF-2022: 8.2 | ISSN: 2181-3337

28. Э. А. Кудратов Э. А. Аллаберганова, Г. М., Кутбеддинов, А. К., Каримов, А. М., Интерактивные методы обучения студентов естественных специальностей на основании радиационных факторов экосистемы. Педагогика и современность ISSN: 2304-9065

29. E.N.Xudayberdiyev. "Bo'lajak fizika o'qituvchilarini tayyorlashda olamning fizik manzarasi bo'yicha tasavvurlarni shakllantirish". Academic research in educational sciences. 2021.

30. Barakayeva Sarvinoz To`lqunovna THE ROLE OF ASTRONOMICAL COMPONENTS IN THE INTERDISCIPLINARY TEACHING OF THE "SUN AND SOLAR SYSTEM" SECTION FROM ASTRONOMY// Uzbek scholar ISSN: 2181-0869 JOURNAL DOI: HTTPS://DOI.ORG/10.31251 IFSIJ JIF 2024: 7.125 SJIF 2024: 6.59 Volume-24, January-2024

31. Barakayeva Sarvinoz To`lqunovna INTEGRATIVE APPROACH IN ASTRONOMY TEACHING AND ITS PRACTICAL ESSENCE// SCIENCE AND INNOVATION INTERNATIONAL SCIENTIFIC JOURNAL VOLUME 3 ISSUE 1 JANUARY 2024 UIF-2022: 8.2 | ISSN: 2181-3337 | SCIENTISTS.UZ

32. Сайфуллаева Гулхаё Ихтиёровна, Негматов Сайибжан Садыкович , Абед Нодира Сайибжановна, Камолов Ихтиёр Рамазонович, Баракаева Сарвиноз Тулкуновна, Камалова Дилнавоз Ихтиёровна МЕТОДИКА ПОЛУЧЕНИЯ КОМПОЗИЦИОННЫХ ОБРАЗЦОВ НА ОСНОВЕ ТЕРМОРЕАКТИВНЫХ ФУРАНО-ЭПОКСИДНЫХ ПОЛИМЕРОВ И ОРГАНОМИНЕРАЛЬНЫХ НАПОЛНИТЕЛЕЙ// Универсум технические науки январь, 2021 1(82)

33. L.K.Samandarov, E.N.Xudayberdiyev. Methodological problems of teaching the theory of particle-wave dualism for physics students. Theoretical&applied science. Теоретическая и прикладная наука. 256-262.

34. Samandarov Latifbek Kalandar ugli Didactic principles of implementation of integration among the disciplines of nuclear physics and biology, chemistry, mathematics, computer science// Uzbek scholar ISSN: 2181-0869 JOURNAL DOI: HTTPS://DOI.ORG/10.31251 IFSIJ JIF 2024: 7.125 SJIF 2024: 6.59 Volume-24, January-2024