

# **Mavzu: Aminokislotalar, kimyoviy xossalari va stereokimyosi**

**Ma'ruzachi: kimyo fanlari doktori, dots. L.S.Kamolov**



**•Reja.**

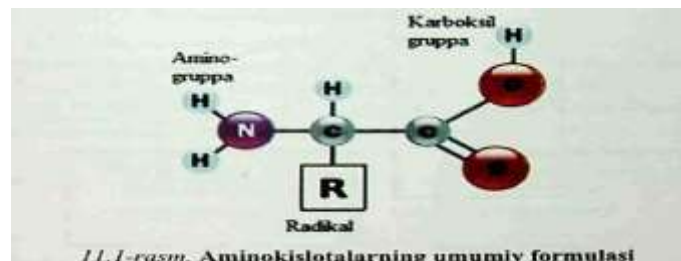
- 1. Aminokislotalar, ularning fizik-kimyoviy xossalari.**
- 2. Aminokislotalarni olinish usullari.**
- 3. Aminokislotalarga xos bo'lgan kimyoviy reaksiyalar.**
- 4. Aminokislotalar stereokimyosi.**

- **Aminokislotalar, ularning fizik-kimyoviy xossalari**

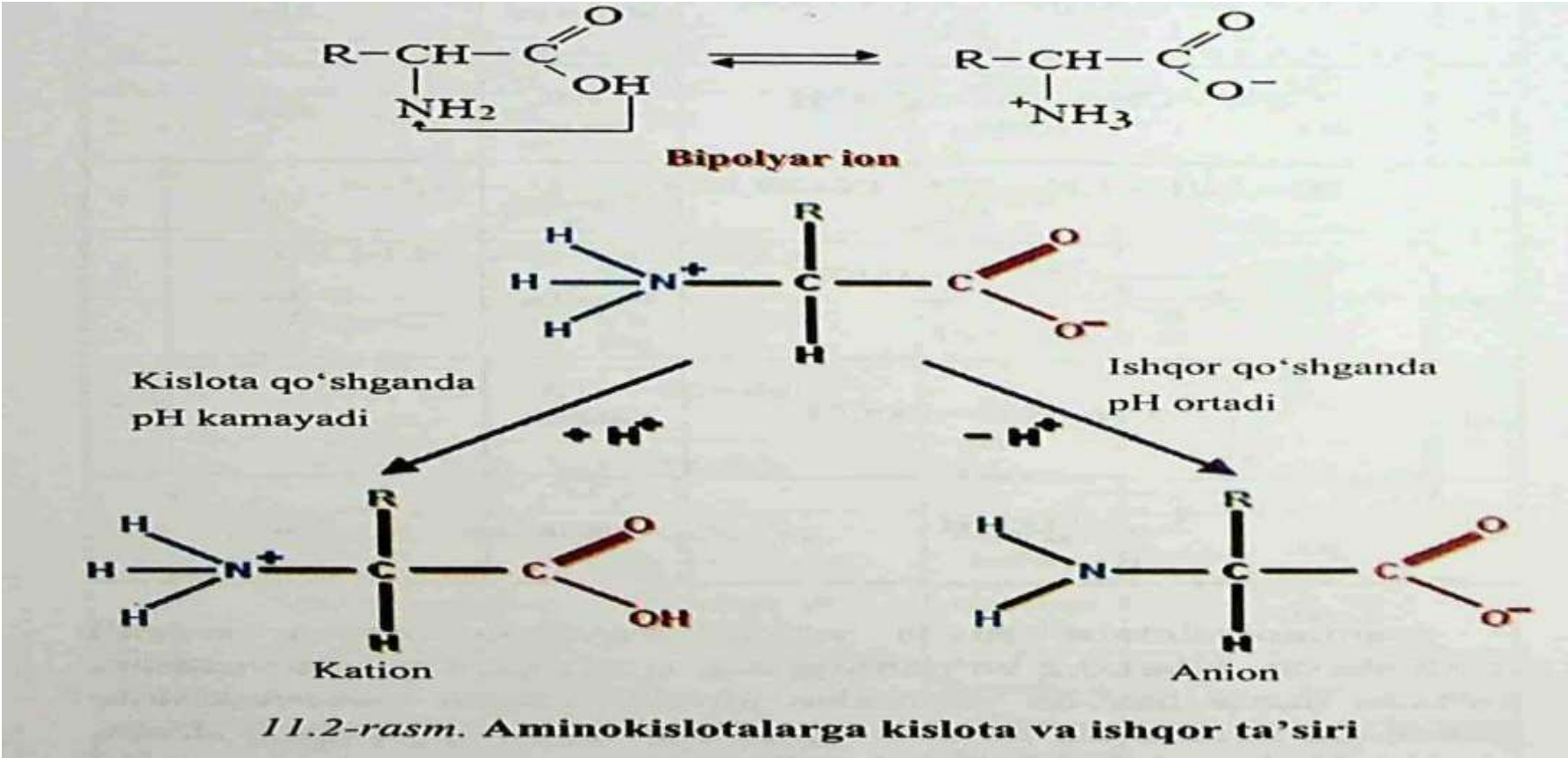
- Barcha oqsillarning asosiy qurilish elementlari aminokislotalar ekanligi ko'pdan buyon ma'lum bo'lsa ham, oqsillarning to'la aminokislotali tarkibi faqat XX asrning 30-yillaridagina batamom belgilandi. Buning sababi, bir tomondan aminokislotalar hali yaxshi o'rganilmagani, oqsil tarkibiga qaysi aminokislotalar kirganligi aniq ma'lum bo'lmaganligi bo'lsa, ikkinchidan ularning ayrim vakillarini sifat va miqdor analizi usullari hali mukammal bo'lmaganligi edi. Bu muammo faqat 40- yillarning boshlarida qog'oz xromotografiyasi usuli qo'llanilishi bilan hal bo'ldi.

- Tabiatda 300 ga yaqin aminokislotalar uchraydi. Lekin ularning hammasi ham oqsil tarkibiga kirmaydi. Aminokislotalarning ko'p qismi ayrim organizmlarda, ba'zilar alohida oqsillar va peptidlar tarkibida bo'ladi. Hamma organizmlarda oqsillar tarkibiga kiradigan aminokislotalar soni 20 ga teng. Ular proteinogen aminokislotalar deb ataladi.

- $\alpha$  - aminokislotalar - geterofunksional birikmalardir. Ular tarkibida karboksil - COOH va aminokislota -NH<sub>2</sub> guruhlari mavjud. Amino-guruh barcha proteinogen aminokislotalarda  $\alpha$  - uglerod atomida joylashganligidan, ular  $\alpha$  - aminokislotalar qatorini tashkil qiladilar.



Aminokislotalarning dissotsilanishini Brenstedning kislota va asoslar nazariyasi bo'yicha yaxshi tushinsa bo'ladi. Bu nazariyaga binoan proton berishi mumkin bo'lgan hamma birikmalar kislotalar qatoriga, uni qabul qilgan birikmalar asoslar qatoriga kiritiladi. Shu nuqtai nazardan COOH va NH<sub>3</sub><sup>+</sup> guruhlari kislota, COO<sup>-</sup> va NH<sub>2</sub> ni asos deb hisoblash kerak. Barcha aminokislotalar suvli eritmalarida ikki qutbli ionlar (svitter-ionlar) shaklida, ya'ni aminokislotalarning karboksil guruhi dissotsilangan, aminoguruhi esa protonlangan holda bo'ladi.



## Aminokislotalarni olinish usullari

### a-aminokislotalarni organizmda sintezlanishiga ko'ra

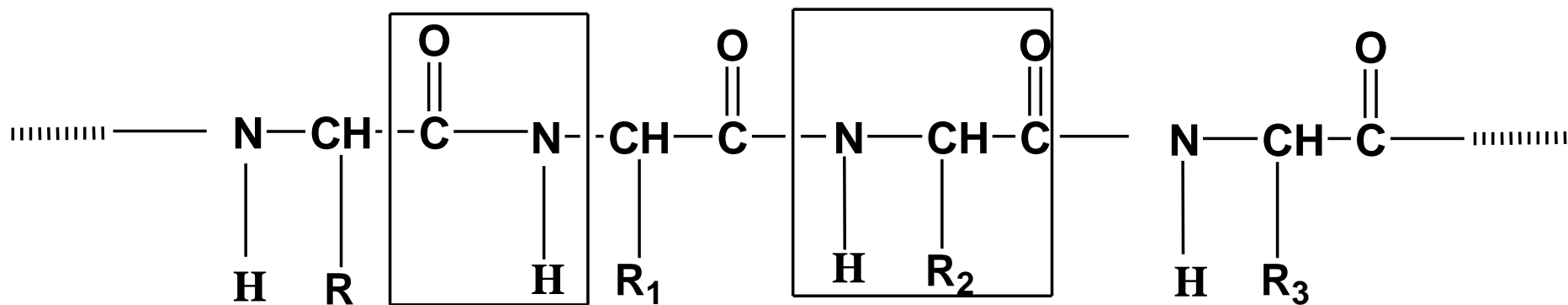
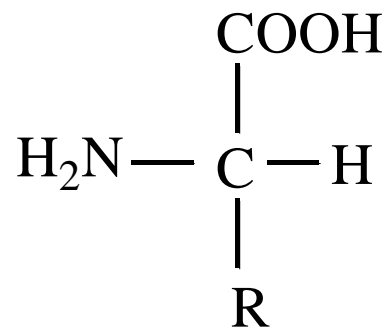
- almashinadigan; almashinmaydigan sinflarga bo'lish mumkin.

Barcha oqsillar tarkibiga kiradigan eng muhim a-aminokislotalarning soni 20 tani tashkil etadi. Ularning ba'zilar organizmda sintezlanmaydi, ular **almashinmaydigan aminokislotalar** deyiladi. Almashinmaydigan aminokislotalar iste'mol qilinadigan oziq-ovqat mahsulotlari orqali organizmga kiradi. Ularga: valin, leytsin, izo-leytsin, treonin, lizin, metionin, fenilalanin va triptofanlar kiradi. 7-jadvalda ularning nomiga yulduzcha belgisi qo'yilgan.

Organizmda sintezlanadigan aminokislotalar **almashinadigan aminokislotalar** deyiladi. Ularga: glitsin, alanin, serin, asparagin kislota, glutamin kislota, sistein, tirozin, gistidin va prolinlar kiradi.

Odam oqsillarida mavjud bo'lgan 20 ta aminokislotalar R-guruhlari bilan farqlanadi. Masalan, alaninning R radikal o'rnida metil -CH<sub>3</sub> guruh bor. Agar aminokislotalda musbat va manfiy zaryadlar mutanosib bo'lsa, umumiy zaryad "0" ga teng bo'ladi. Bu holat izoelektrik nuqta (pI) nomi bilan ma'lum bo'lgan pH ning ma'lum qiymatiga to'g'ri keladi.

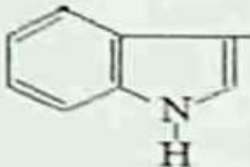
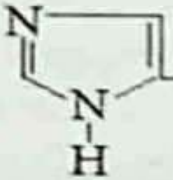
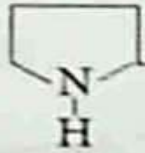
## Aminokislotalar va ularning sinflanishi





Muhim  $\alpha$ -aminokislotalar

| N <sup>o</sup> | $\alpha$ -aminokislotalar   | Nomi                 | 3 harfli nomi |
|----------------|---|----------------------|---------------|
| 1.             | $\text{NH}_2\text{—CH}_2\text{—COOH}$   | Glitsin              | Gli           |
| 2.             | $\text{CH}_3\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$  | Alanin               | Ala           |
| 3.             | $(\text{CH}_3)_2\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$  | Valin*               | Val           |
| 4.             | $(\text{CH}_3)_2\text{CH—CH}_2\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$  | Leytsin*             | Ley           |
| 5.             | $\text{CH}_3\text{—CH}_2\text{—}\underset{\text{CH}_3}{\text{CH}}\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$     | Izoleytsin*          | Ile           |
| 6.             | $\text{HO—CH}_2\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$   | Serin                | Cer           |
| 7.             | $\text{CH}_3\text{—}\underset{\text{OH}}{\text{CH}}\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$                   | Treonin*             | Tre           |
| 8.             | $\text{HOOC—CH}_2\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$   | Asparagin<br>kislota | Asp           |
| 9.             | $\text{HOOC—(CH}_2)_2\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$   | Glutamin<br>kislota  | Glu           |
| 10.            | $\text{NH}_2\text{OC—CH}_2\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$  | Asparagin            | Asn           |
| 11.            | $\text{NH}_2\text{OC—CH}_2\text{—CH}_2\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$                                | Glutamin             | Gln           |
| 12.            | $\text{NH}_2\text{—(CH}_2)_4\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$  | Lizin*               | Liz           |
| 13.            | $\text{NH}_2\text{—}\underset{\text{NH}}{\text{C}}\text{—NH—(CH}_2)_3\text{—}\underset{\text{NH}_2}{\text{CH}}\text{—COOH}$ | Arginin              | Arg           |

|     |  |                   |     |
|-----|--|-------------------|-----|
| 14. | $\text{HS} - \text{CH}_2 - \underset{\text{NH}_2}{\text{CH}} - \text{COOH}$  | Sistein           | Sis |
| 15. | $\text{CH}_3 - \text{S} - (\text{CH}_2)_2 - \underset{\text{NH}_2}{\text{CH}} - \text{COOH}$   | Metionin*         | Met |
| 16. | $\text{C}_6\text{H}_5 - \text{CH}_2 - \underset{\text{NH}_2}{\text{CH}} - \text{COOH}$   | Fenila-<br>lanin* | Fen |
| 17. | $\text{HO} - \text{C}_6\text{H}_5 - \text{CH}_2 - \underset{\text{NH}_2}{\text{CH}} - \text{COOH}$   | Tirozin           | Tir |
| 18. |  $\text{CH}_2 - \underset{\text{NH}_2}{\text{CH}} - \text{COOH}$  | Triptofan*        | Tri |
| 19. |  $\text{CH}_2 - \underset{\text{NH}_2}{\text{CH}} - \text{COOH}$ | Gistidin          | Gis |
| 20. |  $\text{COOH}$  | Prolin            | Pro |



Radikal R ning kimyoviy tabiatiga qarab  $\alpha$  - aminokislotalar ochiq zanjirli (alifatik), aromatik va geterohalqali aminokislotalariga bo'linadi. Ochiq zanjirli radikalda karboksil - COOH guruh, amino - NH<sub>2</sub> guruh, gidroksil - OH guruh va oltingugurt bo'lishi mumkin. Shunga ko'ra, ochiq zanjirli  $\alpha$  - aminokislotalarga (glitsin, alanin, valin, leysin, izo-leysin), ikki asosli monoaminokislotalarga (asparagin va glutamin kislotalar), bir asosli diaminokislotalarga (lizin, arginin), gidroksiaminokislotalarga (serin, treonin) va oltingugurt saqlovchi aminokislotalarga (sistein, sistin, metionin) bo'linadi.

Molekulasidagi karboksil va aminoguruhlarining umumiy soniga ko'ra,  $\alpha$  - aminokislotalar neytral (bir asosli monoaminokislotalar), asosli (bir asosli diaminokislotalar) va kislotalai (ikki asosli monoamino-kislotalar) bo'ladi.

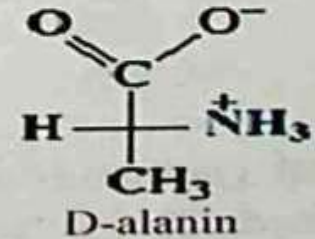
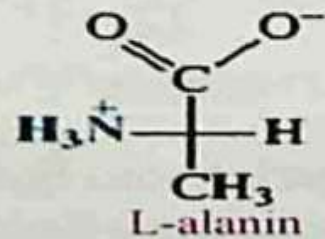
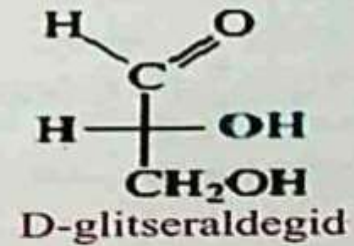
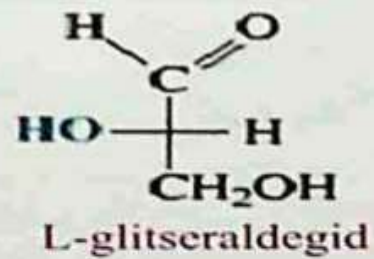
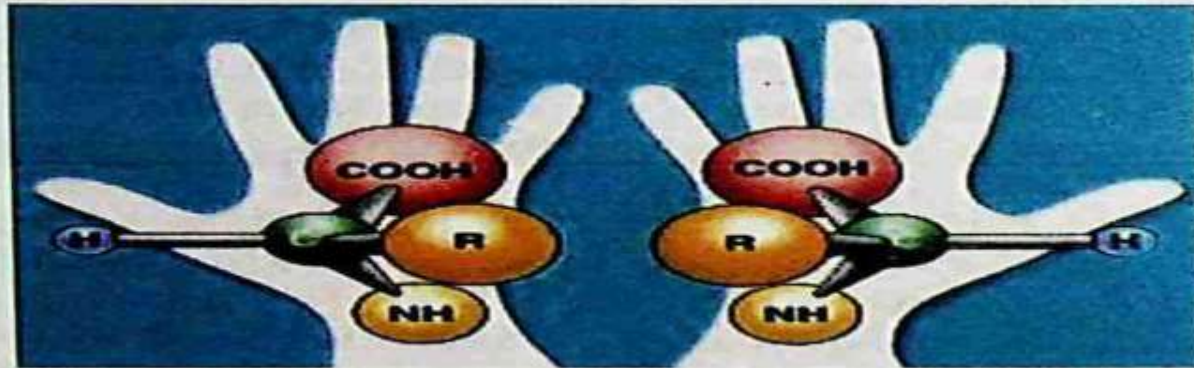
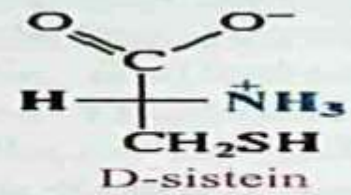
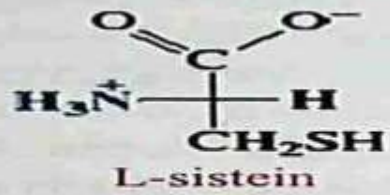
$\alpha$  - aminokislotalar ichida oltingugurt saqlovchi aminokislotalar-ning funksiyasi ko'proq o'rganilgan. Masalan, metionin hamma oqsillarda, ayniqsa fermentlar va garmonlarda saqlanadi hamda metabolitik jarayon-larda muhim rol o'ynaydi.

Sistein va sistinning o'zaro bir-biriga o'tib turishi hujayrada boradigan qator oksidlanish-qaytarilish jarayonlari asosida yotadi. Sistiya, hamma tiollar singari oson oksidlanib, disulfid-sistina aylanadi. Sistindagi disulfid bog'i o'z navbatida oson qaytarilib sistein hosil bo'ladi.

## • Aminokislotalar stereokimyosi

Tabiiy manbalardan olinadigan qarayb barcha  $\alpha$  - aminokislotalar optik faolikka esa, chunki ular molekulasidagi  $\alpha$ -uglerod atomi assimetrik uglerod atomidir (xirallik markazi). Faqat glitsin  $\text{H}_2\text{N}-\text{CH}_2-\text{COOH}$  bundan mustasno bo'lib, uning molekulasida xirillik markazi yo'q.

Xirallikga ega birikma tuzilishi bo'yicha bir-birini ko'zgudagi aksini ifodalaydigan qo'sh izomerlar shaklida bo'ladi. Ular bir-biridan  $\alpha$  - atomlarga birikkan guruhlarining fazodagi yo'nalishlari bilan farqlanadi-lar. Buning natijasida paydo bo'ladigan ikki konfiguratsiya D- va L- stereo-izomerlar deb yuritiladi. Bu izomerlarning biri ikkinchisining ustiga qo'yilsa, ular o'ng va chap kaft kabi bir-birini qoplamaydi. Ular enantiomerlar deb ataladi. Xral birikmalar bir xil kimyoviy va fizik xususiyatga ega bo'lib, faqatgina qutblangan nur tekisligini chapga yoki o'ngga burish belgisi bilan farqlanadilar. Ularning burish burchaklari ham bir-biriga teng. Bu xil qobiliyatni + yoki - belgisi bilan ko'rsatiladi, lekin nur sathini burish belgisi molekulaning D- yoki L- konfiguratsiyasiga muvofiq kelishi shart emas. L (Leve, chap) va D (dexter, o'ng) belgilar enantiomerlarning tuzilishi jihatidan qaysi qatorga kirishini ko'rsatadi.



E'tiboringiz uchun rahmat