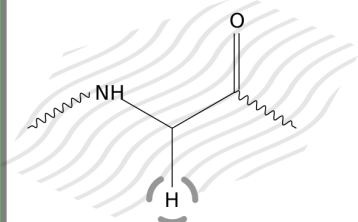


O

GLYCINE (GLY)

G

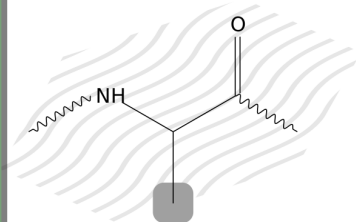


	Molar mass	75.07
	Isoelectric point	5.97
	Solubility	225
	Frequency	7.5

O

ALANINE (ALA)

A

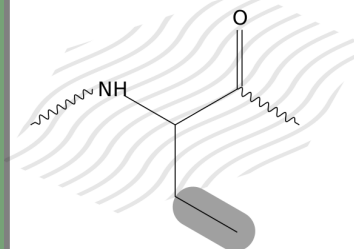


	Molar mass	89.09
	Isoelectric point	6.02
	Solubility	160
	Frequency	9.0

O

VALINE (VAL)

V

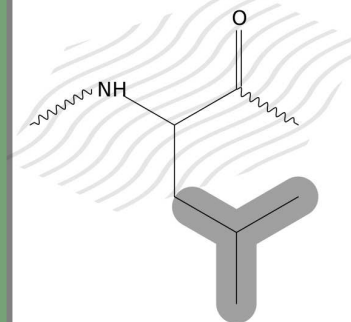


	Molar mass	117.15
	Isoelectric point	5.96
	Solubility	85
	Frequency	6.9

O

LEUCINE (LEU)

L

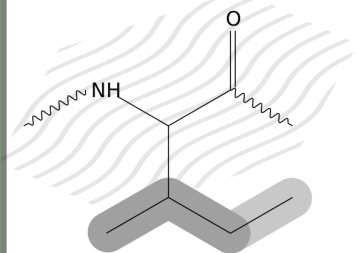


	Molar mass	131.17
	Isoelectric point	5.98
	Solubility	24
	Frequency	7.5

O

ISOLEUCINE (ILE)

I

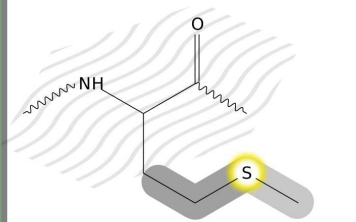


	Molar mass	131.17
	Isoelectric point	5.94
	Solubility	32
	Frequency	4.6

O

METHIONINE (MET)

M

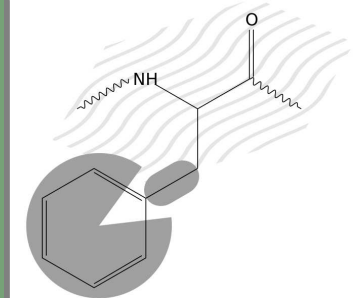


	Molar mass	149.21
	Isoelectric point	5.74
	Solubility	53
	Frequency	1.7

O

PHENYLALANINE (PHE)

F

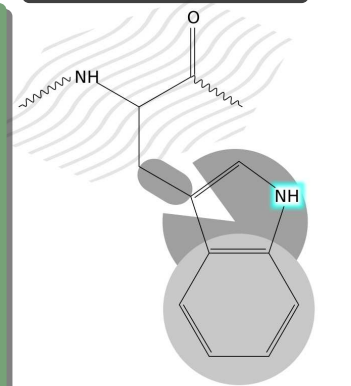


	Molar mass	165.19
	Isoelectric point	5.48
	Solubility	27
	Frequency	3.5

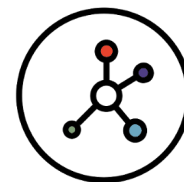
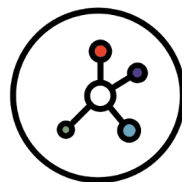
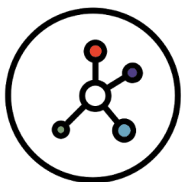
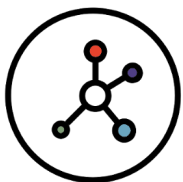
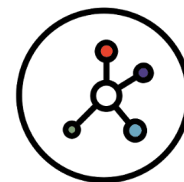
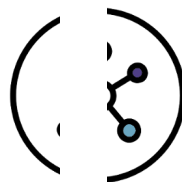
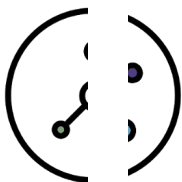
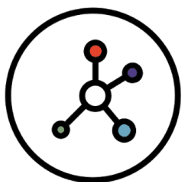
O

TRYPTOPHAN (TRP)

W



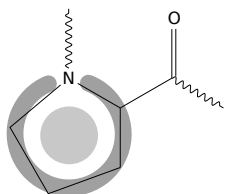
	Molar mass	204.23
	Isoelectric point	5.88
	Solubility	10
	Frequency	1.1



O

PROLINE
(PRO)

P

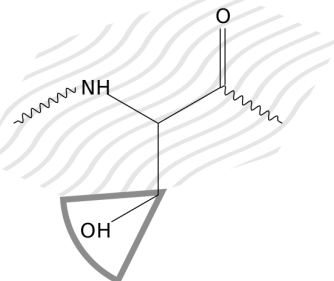


	Molar mass	115.13
	Isoelectric point	6.30
	Solubility	1550
	Frequency	4.6

•

SERINE
(SER)

S

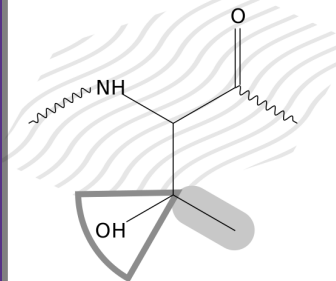


	Molar mass	105.09
	Isoelectric point	5.68
	Solubility	360
	Frequency	7.1

•

THREONINE
(THR)

T

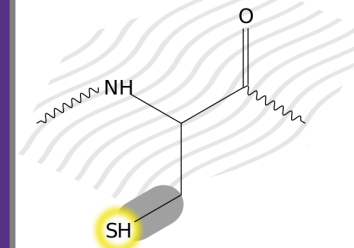


	Molar mass	119.12
	Isoelectric point	5.64
	Solubility	90
	Frequency	6.0

•

CYSTEINE
(CYS)

C

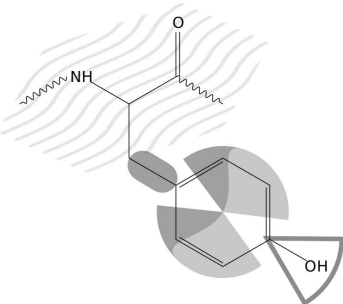


	Molar mass	121.15
	Isoelectric point	5.02
	Solubility	160
	Frequency	2.8

•

TYROSINE
(TYR)

Y

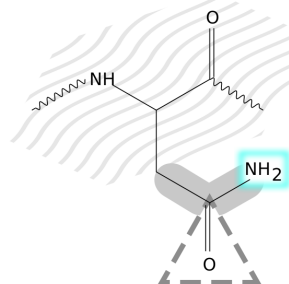


	Molar mass	181.19
	Isoelectric point	5.65
	Solubility	0.38
	Frequency	3.5

•

ASPARAGINE
(ASN)

N

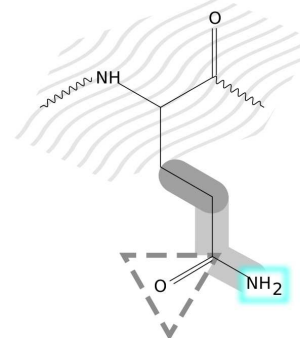


	Molar mass	132.12
	Isoelectric point	5.41
	Solubility	20
	Frequency	4.4

•

GLUTAMINE
(GLN)

Q

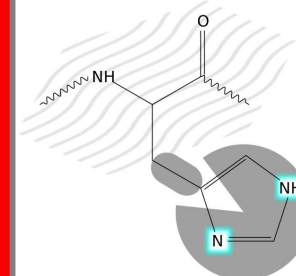


	Molar mass	146.15
	Isoelectric point	5.65
	Solubility	35
	Frequency	3.9

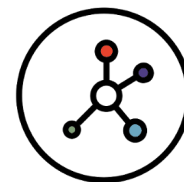
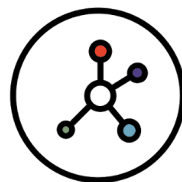
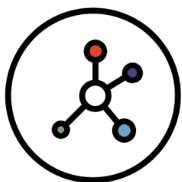
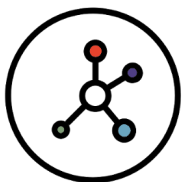
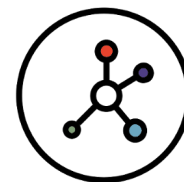
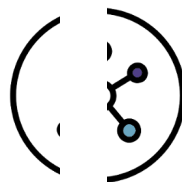
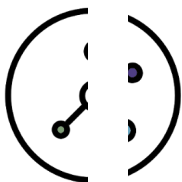
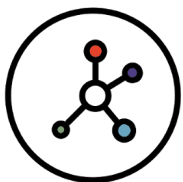
⊕

HISTIDINE
(HIS)

H



	Molar mass	155.15
	Isoelectric point	7.50
	Solubility	38.2
	Frequency	2.1



⊕

LYSINE
(LYS)

K

⚖️	Molar mass	146.19
⚡	Isoelectric point	9.59
🔬	Solubility	2000
🕒	Frequency	7.0

⊕

ARGININE
(ARG)

R

⚖️	Molar mass	174.20
⚡	Isoelectric point	11.50
🔬	Solubility	149
🕒	Frequency	4.7

⊖

GLUTAMATE
(GLU)

E

⚖️	Molar mass	147.13
⚡	Isoelectric point	3.22
🔬	Solubility	7.5
🕒	Frequency	6.2

⊖

ASPARTATE
(ASP)

D

⚖️	Molar mass	133.10
⚡	Isoelectric point	2.77
🔬	Solubility	4.0
🕒	Frequency	5.5

•

POLAR
side chains

Six amino acids have side chains that are polar but not charged. These amino acids may participate in H bonds and are usually found at the surface of proteins.

○

NON-POLAR
side chains

Nine amino acids have side chains that are non-polar. These side chains are composed mostly of C and H and have very small dipole moments. These amino acids are usually buried within the core of proteins.

⊕

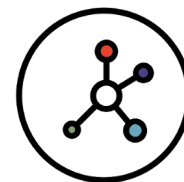
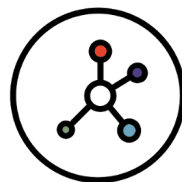
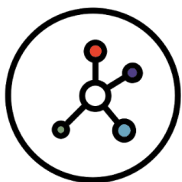
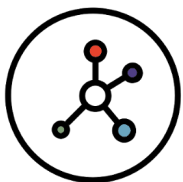
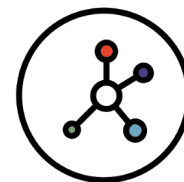
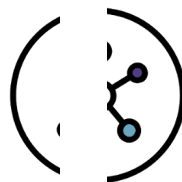
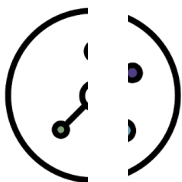
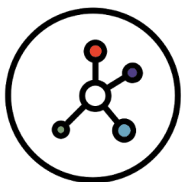
BASIC
side chains

Three basic amino acids are polar and highly hydrophilic. Their side chains contain N and resemble ammonia, which is a base, whose pKa's are high enough that they tend to bind protons, gaining a positive charge in the process.

⊖

ACIDIC
side chains

Two acidic amino acids are polar and negatively charged. Their side chains have a second carboxylic acid groups whose pKa's are low enough to lose protons, gaining a negative charge in the process.





RULES



Distribute all cards amongst all players.

*Last seated player, **challenges** any other player for :*

- any amino acid card
- a card of a specific colour
- a particular amino acid

Next turn, the player who lost a card speaks up to try and gain another player's card.

To win, collect cards of the same colour. Protect your completed colour by folding the cards in front of you.



Molar mass [g/mol]



Isoelectric point



Solubility in water at $20^{\circ}C$ [g/L]



Frequency in proteins [%]

