Ministry of Health of the Republic of Belarus

GOMEL STATE MEDICAL UNIVERSITY

Department of General and Bioorganic Chemistry

Structure of some compounds studied in bioorganic chemistry

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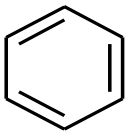
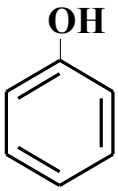
Gomel, 2023

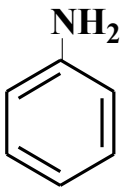
Conjugated and aromatic systems



benzene

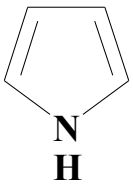


phenol

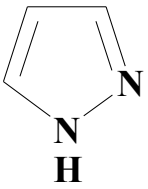


aniline

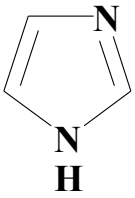
cyclopentadienyl anion



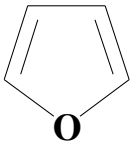
pyrrole



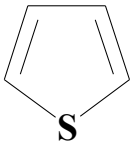
pyrazole



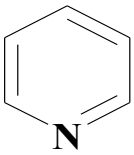
imidazole



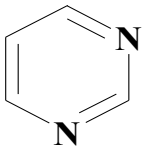
furan



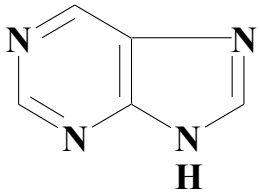
thiophene



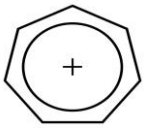
pyridine



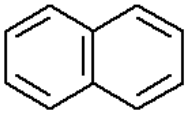
pyrimidine



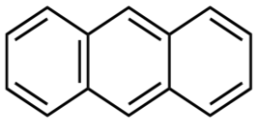
purine



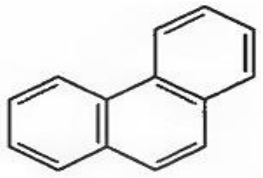
cycloheptatrienyl cation



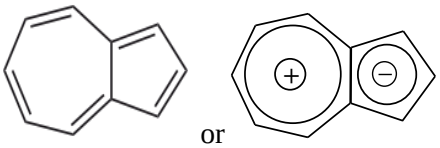
naphthalene



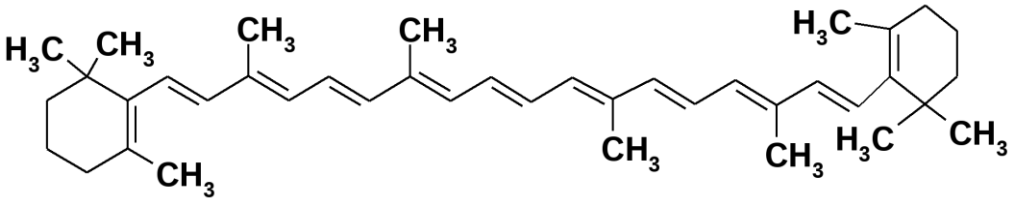
anthracene



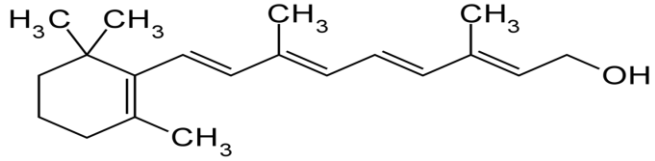
phenanthrene



azylene

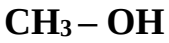


β-carotene



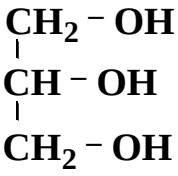
vitamin A (retinol)

Alcohols

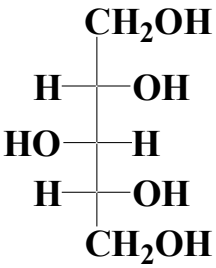


methanol

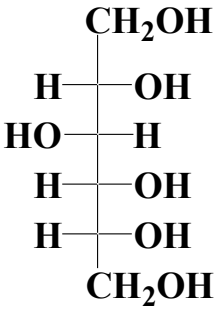
ethanol



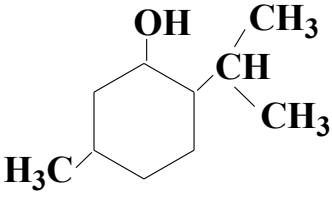
glycerol



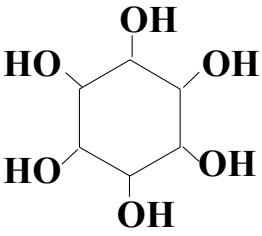
xylitol



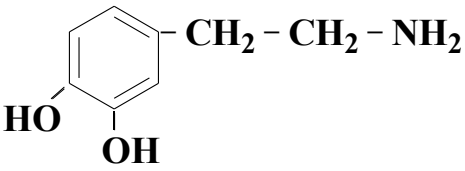
sorbitol



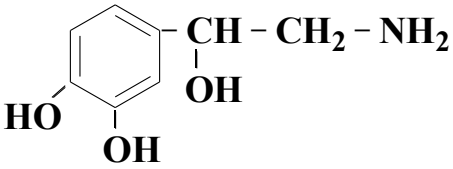
menthol



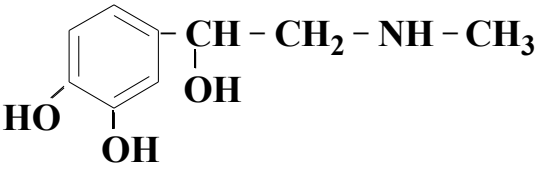
inosit



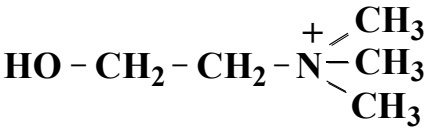
dopamine



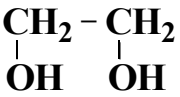
noradrenaline



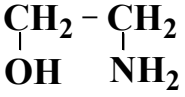
adrenaline



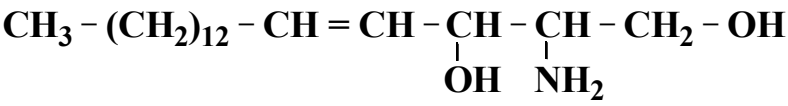
choline



ethanediol-1,2
(ethylene glycol)

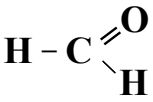


ethanolamine
(colamine)

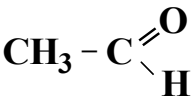


sphingosine

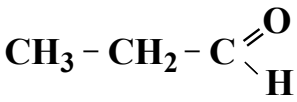
Aldehydes & ketones



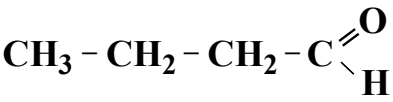
methanal (formaldehyde)



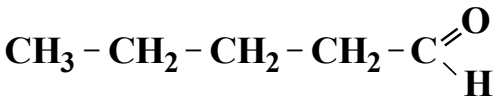
ethanal (acetaldehyde)



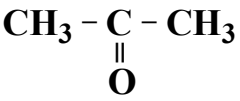
propanal (propionic aldehyde)



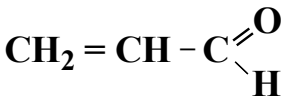
butanal (butyric aldehyde)



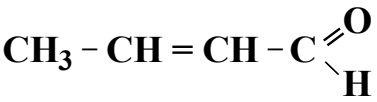
pentanal (valeric aldehyde)



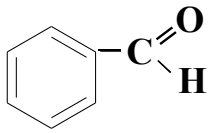
propanone (acetone)



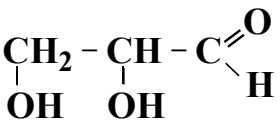
propenal (acroleine)



butene-2-al (crotonic aldehyde)



benzoic aldehyde



glyceraldehyde

Carboxylic acids

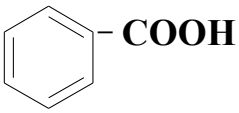
▪ *Saturated monocarboxylic acids*

HCOOH	methanoic (formic) acid
CH_3 – COOH	ethanoic (acetic) acid
CH_3 – CH_2 – COOH	propanoic (propionoic) acid
CH_3 – CH_2 – CH_2 – COOH	butanoic (butyric) acid
CH_3 – CH_2 – CH_2 – CH_2 – COOH	pentanoic (valeric) acid
CH_3 – CH_2 – CH_2 – CH_2 – CH_2 – COOH	hexanoic (caproic) acid
$C_{15}H_{31}$ – COOH	palmitic acid
$C_{17}H_{35}$ – COOH	stearic acid

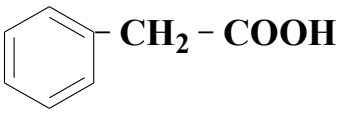
▪ *Saturated dicarboxylic acids*

HOOC – COOH	ethanedioic (oxalic) acid
HOOC – CH_2 – COOH	propanedioic (malonic) acid
HOOC – CH_2 – CH_2 – COOH	butanedioic (succinic) acid
HOOC – CH_2 – CH_2 – CH_2 – COOH	pentanedioic (glutaric) acid
HOOC – $(CH_2)_4$ – COOH	hexanedioic (adipic) acid

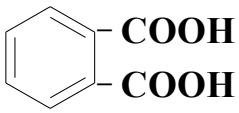
▪ *Aromatic carboxylic acids*



benzoic acid

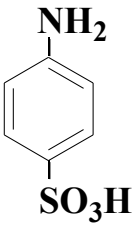


phenyl-acetic acid

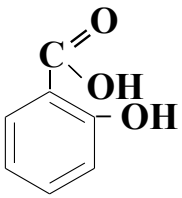


pfthalic acid

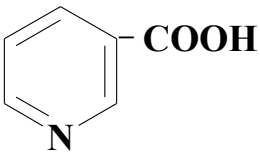
▪ *Hetero functional aromatic carboxylic acids*



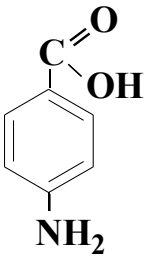
p-sulfanilic acid



salicylic acid



nicotinic acid

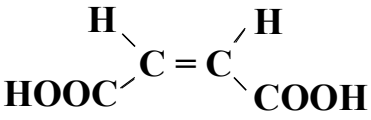


PABA
(para-aminobenzoic acid)

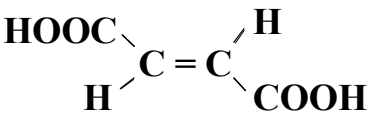
▪ *Unsaturated carboxylic acids*

H_2C = CH – COOH	propenoic (acrylic) acid
CH_3 – CH = CH – COOH	butane-2-oic acid (crotonic) acid
$C_{17}H_{33}$ – COOH **CH_3–$(CH_2)_7$–CH=CH–$(CH_2)_7$–COOH**	oleic acid
$C_{17}H_{31}$ – COOH **CH_3–$(CH_2)_4$–CH=CH–CH_2–CH=CH–$(CH_2)_7$–COOH**	linoleic acid
$C_{17}H_{29}$ – COOH **CH_3–CH_2–CH=CH–CH_2–CH=CH–CH_2–CH=CH–$(CH_2)_7$–COOH**	linolenic acid
$C_{19}H_{31}$ – COOH **CH_3–$(CH_2)_4$–CH=CH–CH_2–CH=CH–CH_2–CH=CH–CH_2–CH=CH–$(CH_2)_3$–COOH**	arachidonic acid

- *Unsaturated dicarboxylic acids*



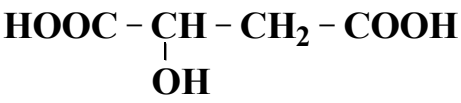
maleic acid
(cis-butenedioic acid)



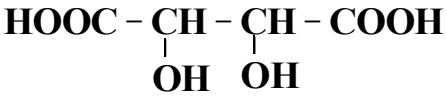
fumaric acid
(trans-butenedioic acid)

- *Hydroxy carboxylic acids*

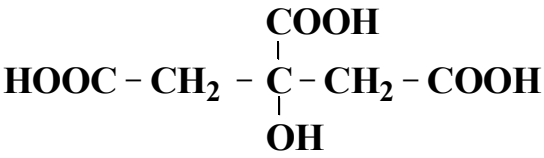
lactic acid



malic acid

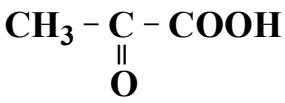


tartaric acid

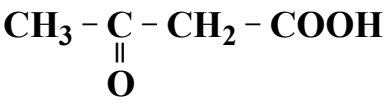


citric acid

- *Keto carboxylic acids or oxo carboxylic acids*

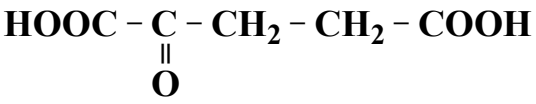


pyruvic acid



acetoacetic acid

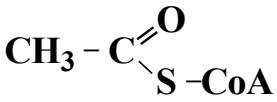
oxaloacetic acid



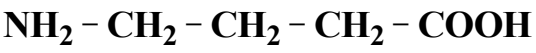
α-ketoglutaric acid

glyoxylic acid

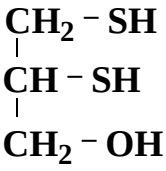
Bioregulators



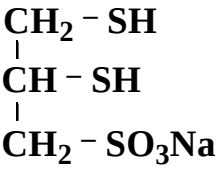
acetyl CoA (acetyl coenzyme A)



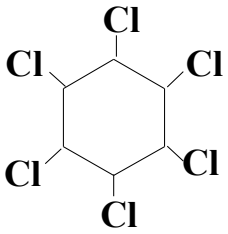
γ-aminobutyric acid



BAL



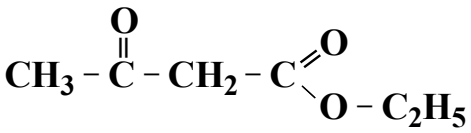
unithiol



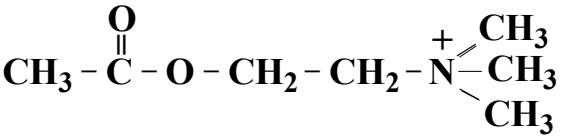
hexachloran

$CHCl_3$
chloroform

CHI_3
iodoform

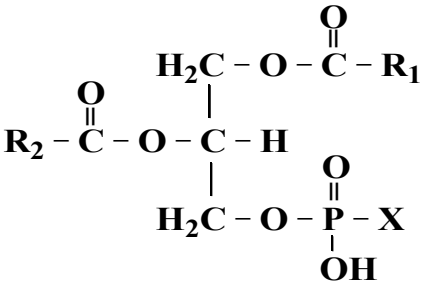


acetoacetic ester

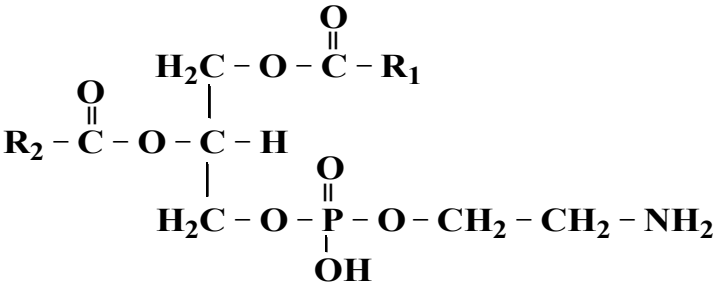


acetylcholine

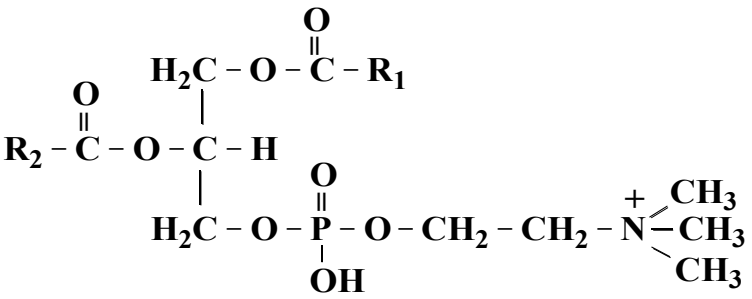
Lipids



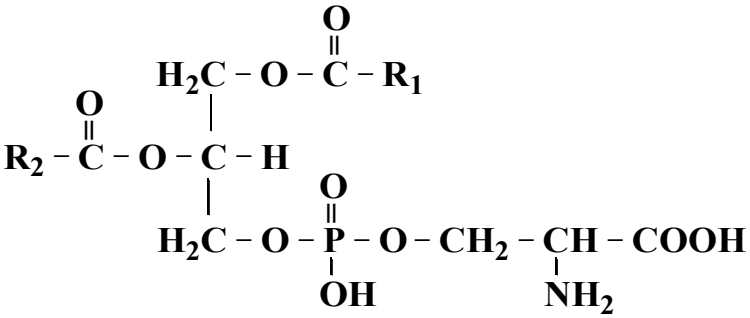
general formula of
phospholipids



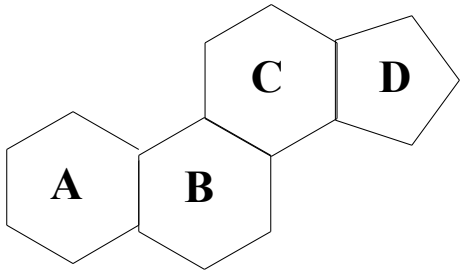
general formula of
phosphatidylethanolamines (cephalines)



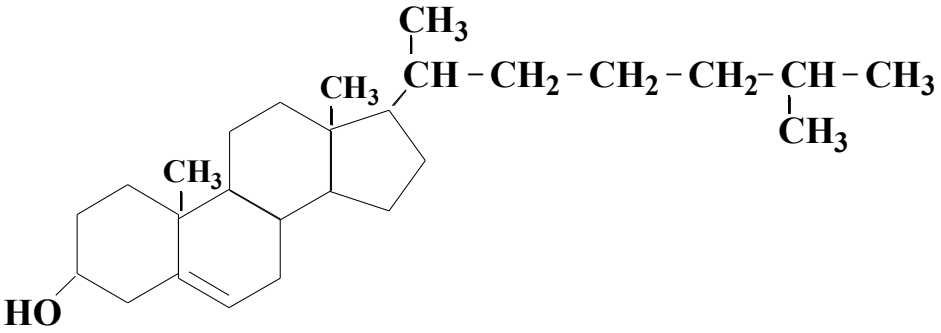
general formula of phosphatidylcholines (lecithins)



general formula of phosphatidylserines

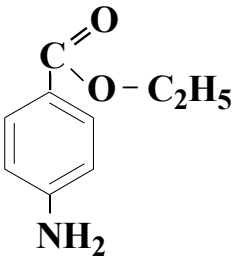


steroid ring

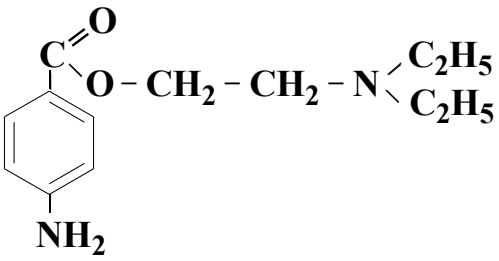


Cholesterol

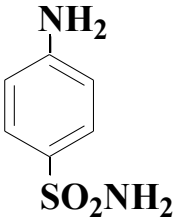
Hetero functional compounds



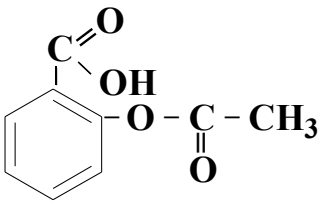
anesthesine



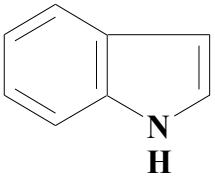
novocaine



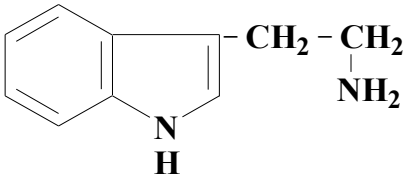
sulfanilamide



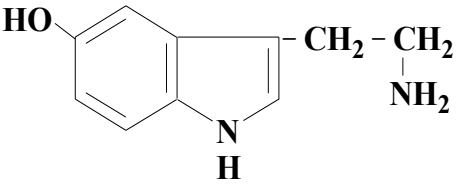
aspirin (acetylsalicylic acid)



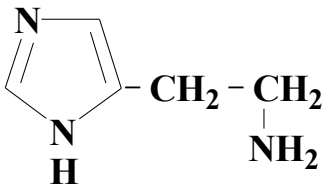
indole



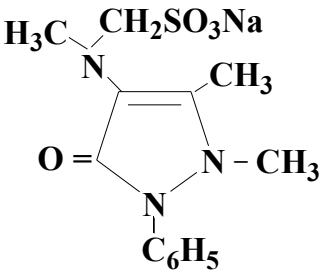
tryptamine



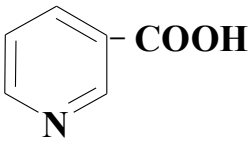
serotonin



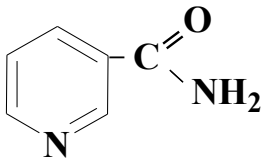
histamine



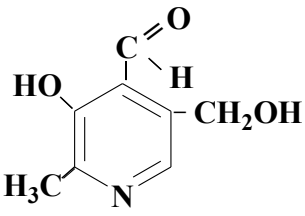
analgin



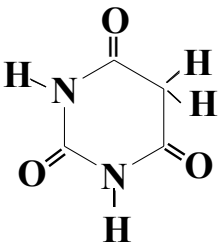
nicotinic acid



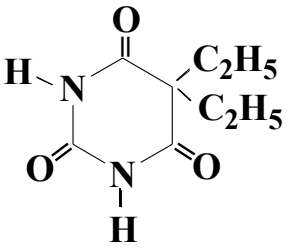
nicotinamide



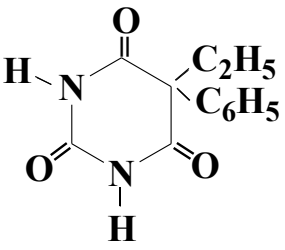
pyridoxal



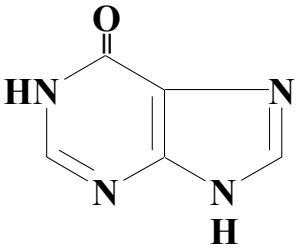
barbituric acid



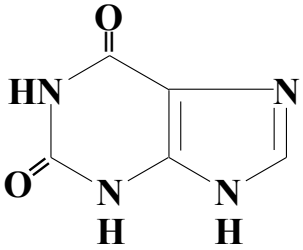
barbital



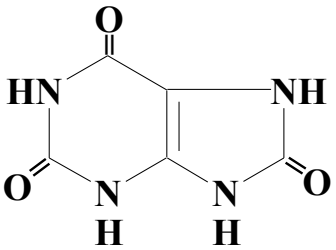
phenobarbital



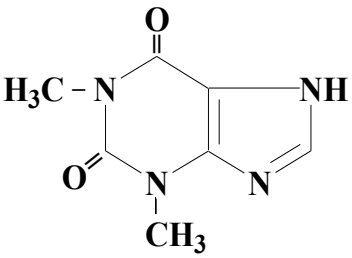
hypoxanthine
6-oxopurine



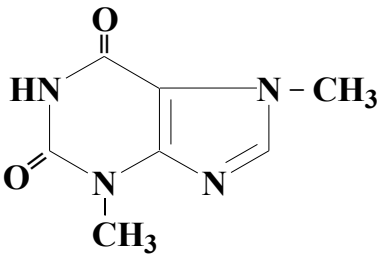
xanthine
2,6-dioxopurine



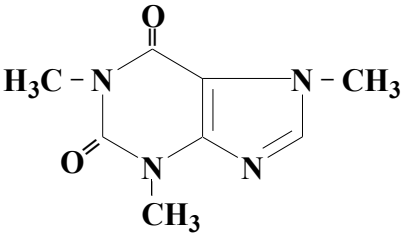
uric acid
2,6,8-trioxopurine



theophylline
(1,3-dimethylxanthine)



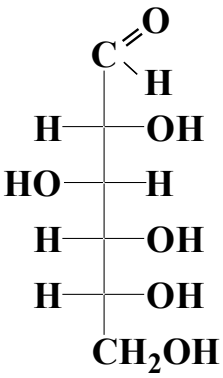
theobromine
(3,7-dimethylxanthine)



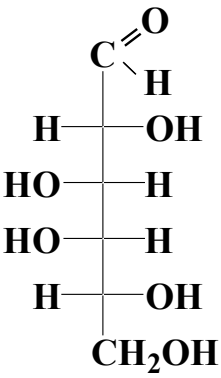
caffeine
(1,3,7-trimethylxanthine)

Carbohydrates

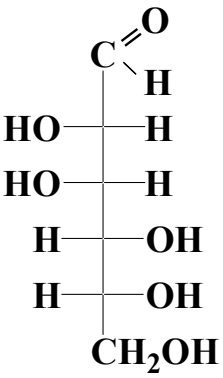
- *Monosaccharides*



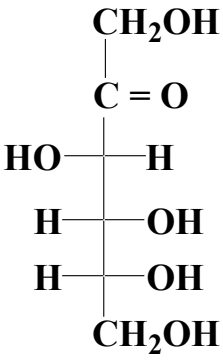
D-glucose



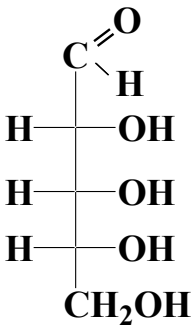
D-galactose
epimer of glucose at C-4



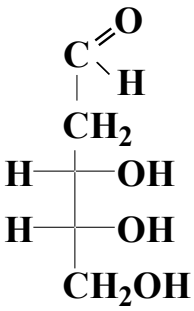
D-mannose
epimer of glucose at C-2



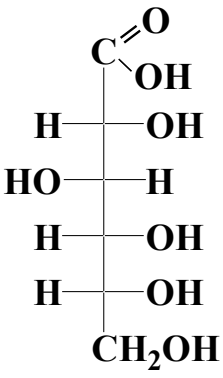
D-fructose



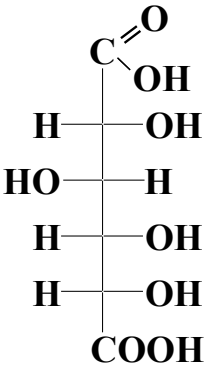
D-ribose



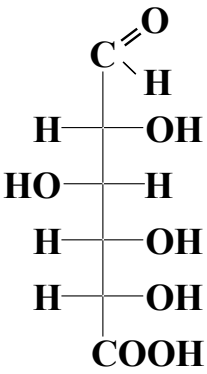
D-deoxyribose



D-gluconic acid

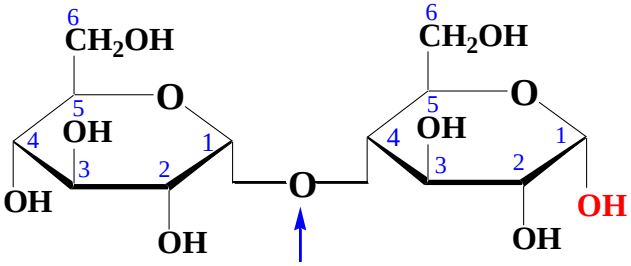


D-glucaric acid



D-glucuronic acid

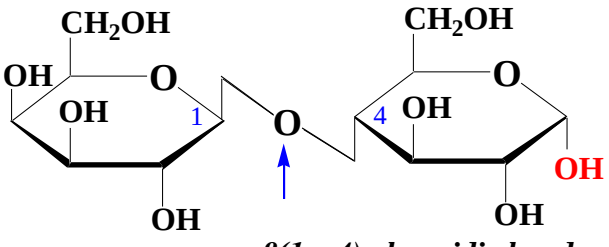
▪ *Di- and polysaccharides*



glycosidic (hemiacetal) hydroxyl group

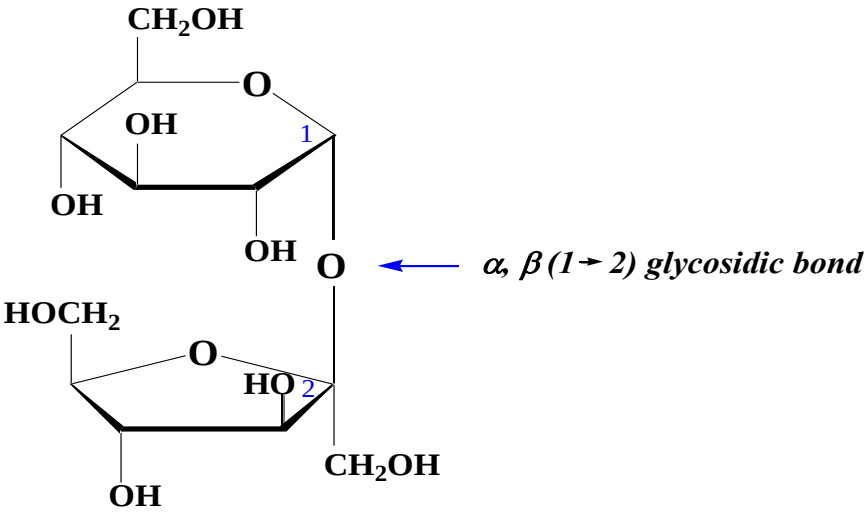
α(1→4) glycosidic bond

α-maltose

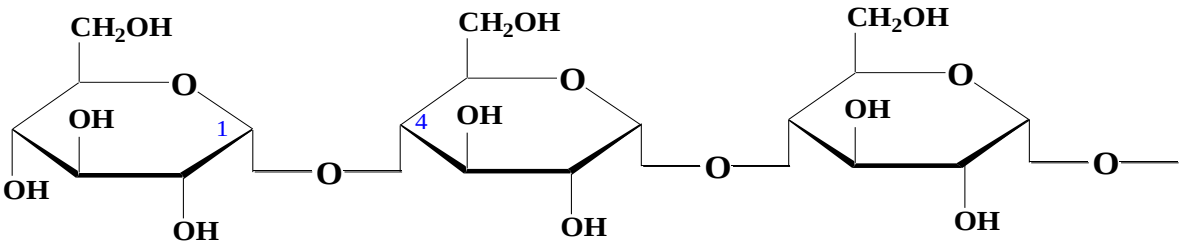


ß(1→4) glycosidic bond

α-lactose

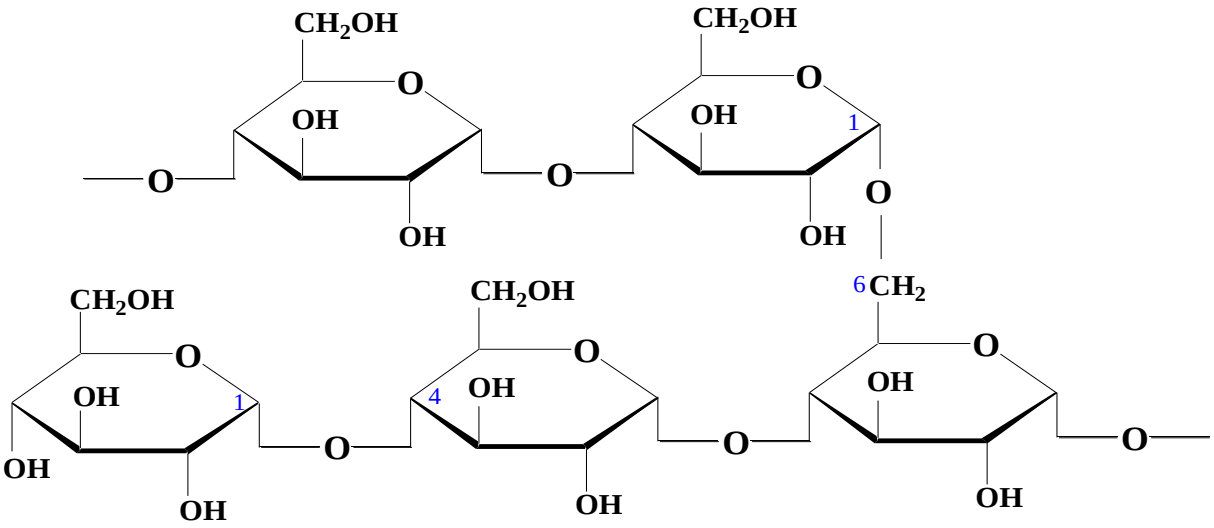


sucrose

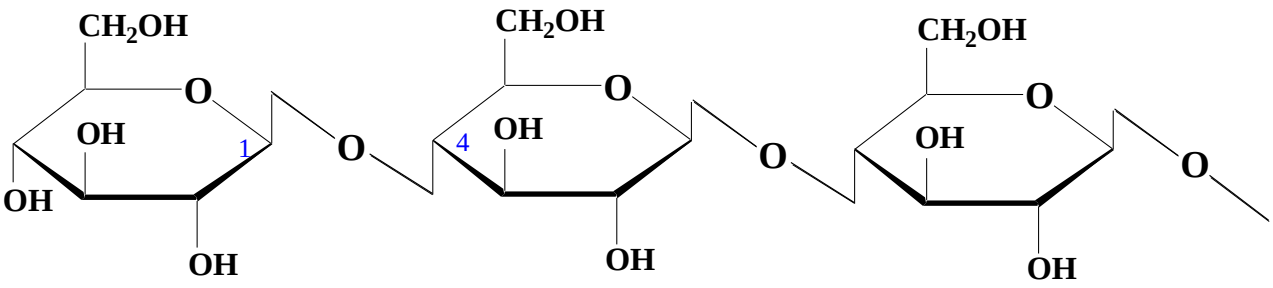


α(1→4) *glycosidic bond*

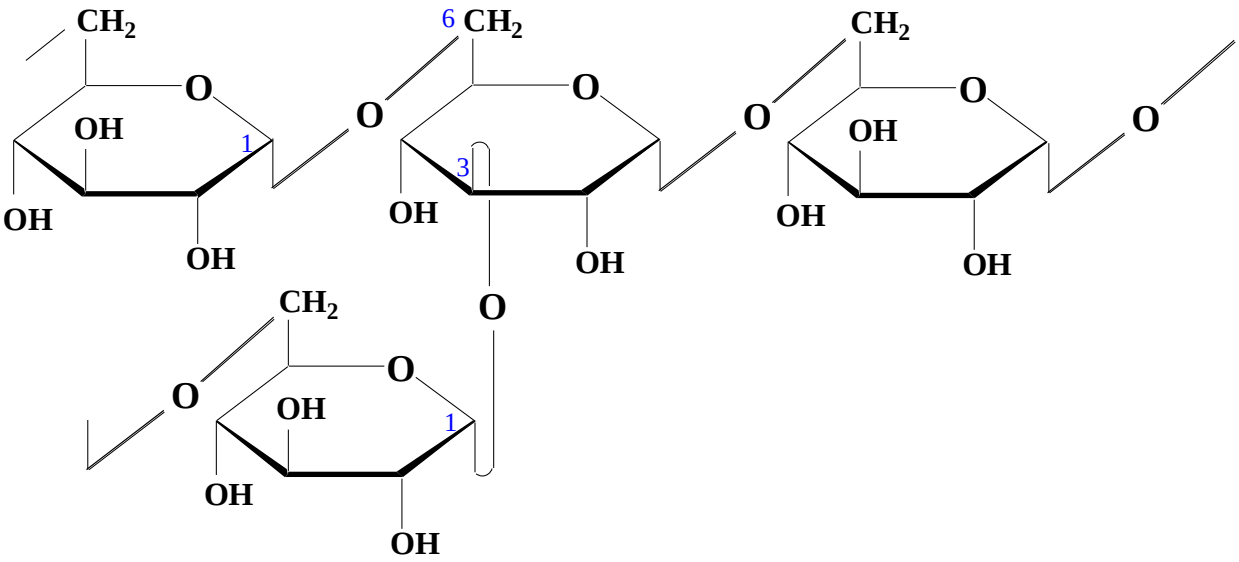
amylose



amylopectin



cellulose



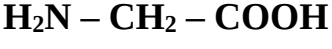
dextrans

α-Amino acids

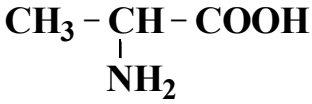
I. Aliphatic amino acids

▪ *Monoaminomonocarboxylic acids*

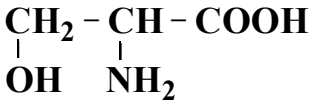
glycine (gly), 2-aminoethanoic acid, aminoacetic acid:



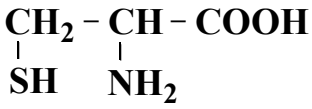
alanine (ala), 2-aminopropanoic acid, α-aminopropionic acid:



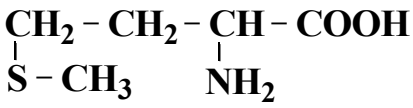
serine (ser), 2-amino-3-hydroxypropanoic acid, α-amino-β-hydroxypropionic acid:



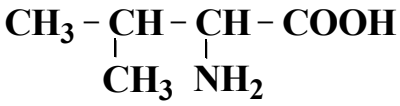
cystein (cys), 2-amino-3-mercaptopropanoic acid, α-amino-β-thiopropionic acid:



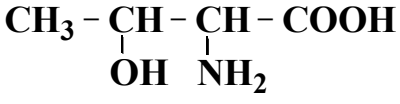
methionine (met), 2-amino-4-methylthiobutanoic acid, α-amino-γ-methylthiobutyric acid:



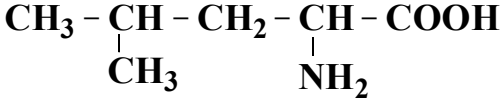
valine (val), 2-amino-3-methylbutanoic acid, α-aminoisovaleric acid:



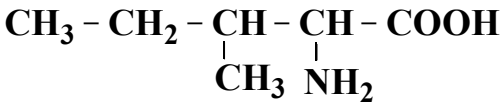
threonine (thr), 2-amino-3-hydroxybutanoic acid, α-amino-β-hydroxybutyric acid:



leucine (leu), 2-amino-4-methylpentanoic acid, α-aminoisocaproic acid:

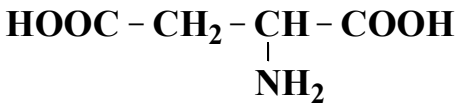


isoleucine (ile), 2-amino-3-methylpentanoic acid, α-amino-β-methylvaleric acid:

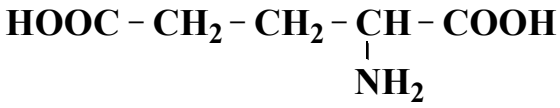


- *Monoamino dicarboxylic acids*

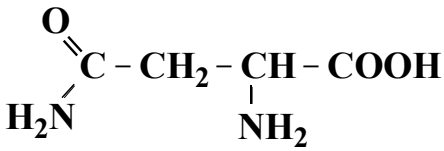
aspartic acid (asp), 2-aminobutanedioic acid, α-aminosuccinic acid:



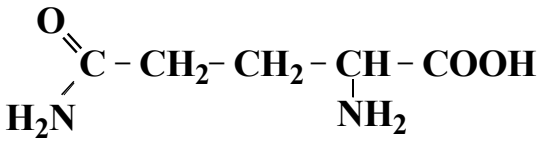
glutamic acid (glu), 2-aminopentanedioic acid, α-aminoglutaric acid:



asparagine (asn), aspartic acid amide:

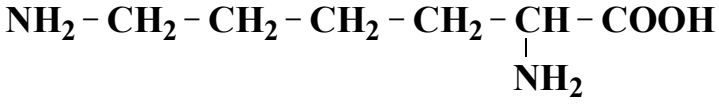


glutamine (gln), glutamic acid amide:

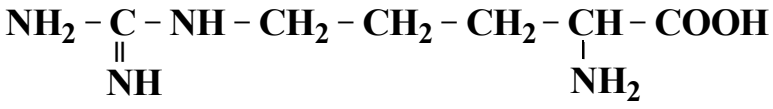


- *Diamino monocarboxylic acids*

lysine (lys), 2,6-diaminohexanoic acid, α,ε-diaminocaproic acid:

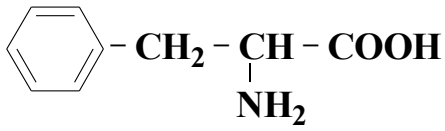


arginine (arg), 2-amino-5-guanidylpentanoic acid, α-amino-δ-guanidylvaleric acid:

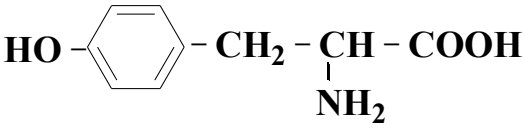


II. Aromatic α-amino acids

phenylalanine (phe), 2-amino-3-phenylpropanoic acid, α-amino-β-phenylpropionic acid:

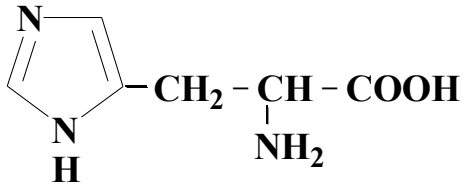


tyrosine (tyr), 2-amino-3-(4-hydroxyphenyl)-propanoic acid:

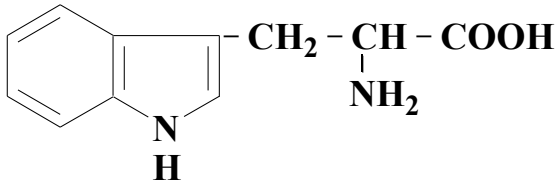


III. Heterocyclic α-amino acids

histidine (his), 2-amino-3-imidazolylpropanoic acid, α-amino-β-imidazolylpropionic acid:

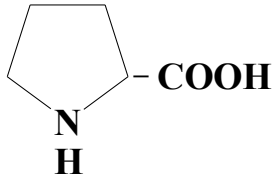


tryptophan (trp), 2-amino-3-indolylpropanoic acid, α-amino-β-indolylpropionic acid:

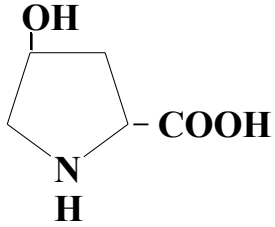


IV. Imino acids

proline (pro), pyrrolidine-2-carboxylic acid:

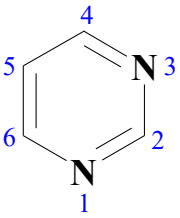


hydroxyproline (HO-pro), 4-hydroxypyrrolidine-2-carboxylic acid:

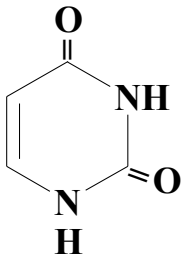


Nucleic acids

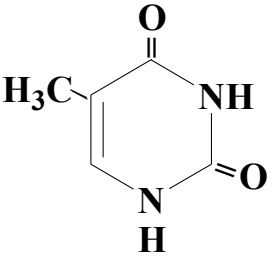
- *Pyrimidine bases*



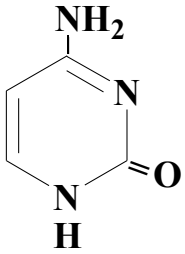
Uracil – U, 2,4-dioxo-pyrimidine



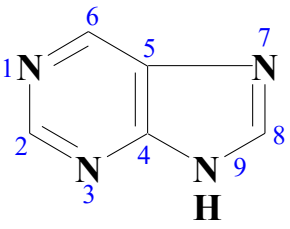
Thymine – T, 5-methyl-2,4-dioxo-pyrimidine:



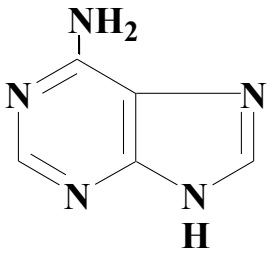
Cytosine – C, 4-amino-2-oxo-pyrimidine:



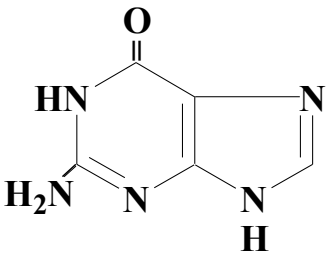
- *Purine bases*



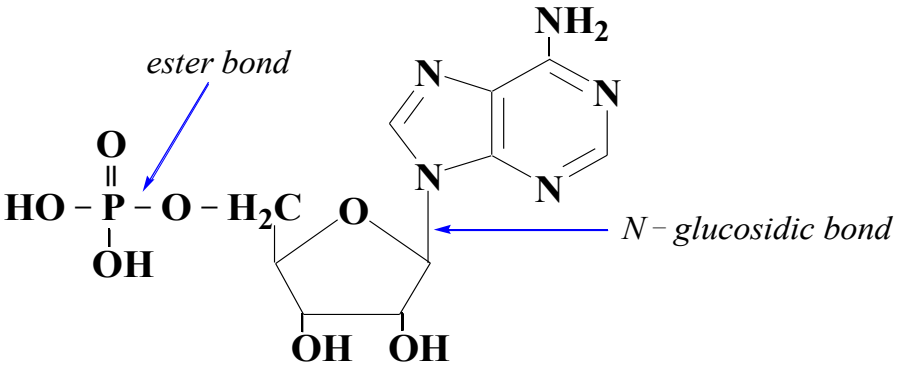
Adenine – A, 6-aminopurine:



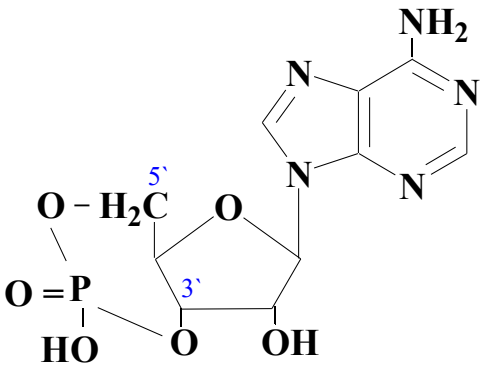
Guanine – G, 2-amino-6-oxopurine:



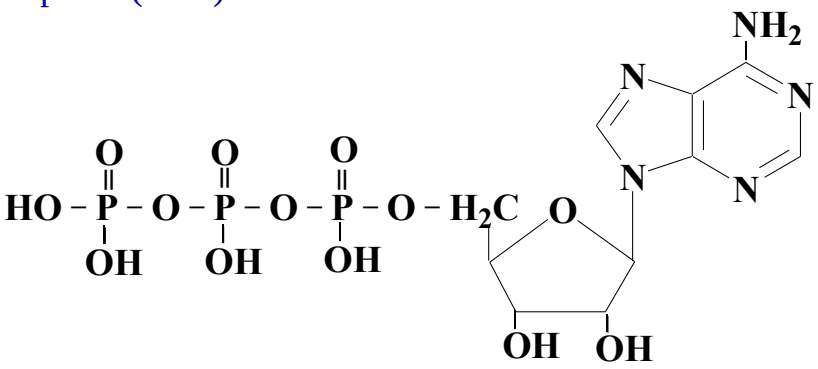
Adenosine-5'-monophosphate or AMP:



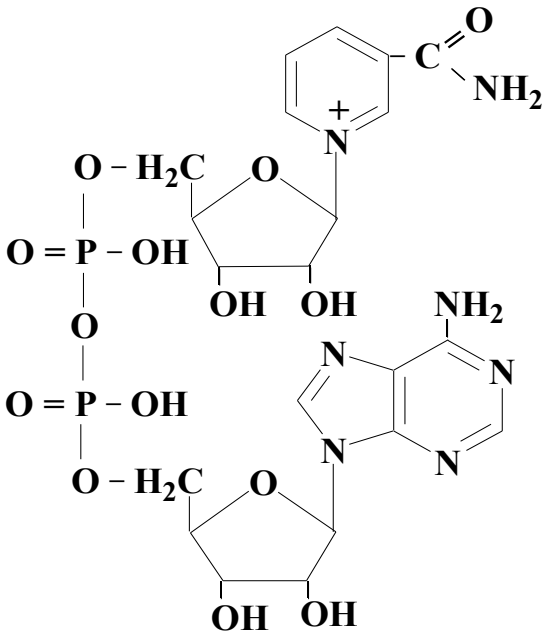
Adenosine -3‘-5‘-cyclic monophosphate or cyclic AMP or c-AMP:



Adenosine triphosphate (ATP):



Nicotinamide adenine dinucleotide or NAD^+:



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