

Human Metabolism

2. Enzymes

and key to Main Map

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Enzymes are classified by The Enzyme Commission of The International Union of Biochemistry and Molecular Biology in 6 main classes (each with 2 subclasses):

1. Oxidoreductases
2. Transferases
3. Hydrolases
4. Lyases
5. Isomerases
6. Ligases

In the list below each enzyme is assigned an arbitrary number and is shown with its coordinate to the Main Map and the Enzyme Commission's main class and first subclass.

Acetylcholin esterase	1	B-7	3.1	$\alpha(1-6)$ -Glucosidase	76	A-4	3.2	Phenylalanine monooxygenase	145	D-3	1.14
Acetyl-CoA acetyl transferase	2	E-8	2.3	Glutamate dehydrogenase	77	E-5	1.4	Phosphatidate phosphatase	146	A-9	3.1
Acetyl-CoA carboxylase	3	E-8	6.3	Glutamate kinase dehydrogenase	78	F-5	1.1	Phosphodiesterase	147	G-2	3.1
Aconitase	4	D-6	4.4	Glutamate transaminase	79	E-6	2.6	Phosphoenolpyruvate carboxy kinase	148	D-5	4.1
ACP-acetyl transferase	5	D-8	2.3	Glutaminase	80	E-6	3.5	Phosphofructo kinase	149	A-6	2.7
ACP-malonyl transferase	6	E-9	2.3	Glutamine synthetase	81	F-6	6.3	Phosphoglucose isomerase	150	A-5	5.3
Acyl-CoA dehydrogenase	7	D-11	1.3	Glutathione peroxidase	82	H-9	1.11	Phosphoglucose mutase	151	A-4	2.7
Acyl-CoA synthase	8	C-11	6.2	Glutathione reductase	83	H-9	1.6	6-Phosphogluconate dehydrogenase	152	B-4	1.1
Adenylate cyclase	9	G-2	4.6	Glyceraldehyd kinase	84	B-7	2.7	3-Phosphoglycerate dehydrogenase	153	C-6	1.1
Adenylate deaminase	10	D-1	3.5	Glycerol dehydrogenase	85	B-6	1.2	3-Phosphoglycerate kinase	154	B-6	2.7
Adenylate kinase	11	B-2	2.7	Glycerol kinase	86	B-8	2.7	Phosphoglycerate mutase	155	C-6	2.7
Alanine transaminase	12	C-7	2.6	Glycerol phosphate acyl transferase	87	B-9	2.3	Phosphopentose epimerase	157	B-4	5.1
Alcohol dehydrogenase	13	D-8	1.1	Glycerol phosphate dehydrogenase	88	B-7	1.2	Phosphopentose isomerase	158	B-4	5.3
Aldehyde dehydrogenase	13a	D-8	1.1	Glycin synthase	89	C-8	2.1	Phosphoserine phosphatase	161	C-8	3.1
Amidophosphoribosyltransferase	14	B-3	2.4	Glycogen phosphorylase	90	A-3	2.4	Phosphoserine transaminase	162	C-7	2.6
Aminoacyl-tRNA synthetase	15	F-1	6.1	Glycogen synthase	91	A-4	2.4	Primase	163	B-1	2.7
Aminopeptidase	16	E-1	3.4	Glycosyl-(4-6)-transferase	92	A-3	2.4	Prolyl hydroxylase	164	G-5	1.14
Aminotransferase	17	G-2	2.6	Guanine deaminase	93	D-1	3.5	Propionyl-CoA carboxylase	165	H-5	4.1
δ -Aminolevulinat dehydrase	18	H-4	4.2	Heme oxygenase	94	G-4	1.14	Pyridine nucleotide transhydrogenase	167	H-1	1.6
δ -Aminolevulinat synthetase	19	G-5	2.3	Hexokinase	96	A-5	2.7	Pyroline carboxylate reductase	168	F-5	1.5
α -Amylase	20	A-5	3.2	Homocysteine methyl transferase	97	G-6	2.1	Pyruvate carboxylase	169	C-6	4.1
Arginase	21	F-3	3.5	Homogentisat 1,2-dioxygenase	98	D-4	1.13	Pyruvate dehydrogenase complex:			
Argininosuccinate lyase	22	F-3	4.3	3-Hydroxyacyl-ACP dehydratase	100	D-9	4.2	Pyruvate dehydrogenase	171a	C-6	1.2
Argininosuccinate synthetase	23	F-3	6.3	Hydroxyacyl-CoA dehydrogenase	101	D-11	1.1	Dihydrolipeoyl transacetylase	171b	D-6	2.3
Asparaginase	24	F-3	3.5	Hydroxyacyl-CoA epimerase	102	D-11	5.1	Dihydrolipeoyl dehydrogenase	171c	D-7	1.6
Asparagine synthetase	25	E-3	6.3	Hydroxybutyrate dehydrogenase	103	H-10	1.1	Pyruvate kinase	172	C-6	2.7
Aspartate aminotransferase	26	F-4	2.6	Hydroxymethylglutaryl-CoA lyase	104	G-10	4.1	Ribonucleotide reductase	174	B/C-2	1.7
Aspartate transcarbamoylase	27	C-4	2.1	Hydroxymethylglutaryl-CoA reductase	105	G-11	1.1	Ribose phosphate diphospho transferase	175	B-3	2.7
ATP synthetase	29	H-8/10	2.7	Hydroxymethylglutaryl-CoA synthase	106	G-9	4.1	RNA polymerase	176	C-1	2.7
Biliverdin reductase	30	H-3	1.3	Hydroxyphenylpyruvate dioxygenase	107	D-4	1.13	Serine dehydratase	177	C-7	4.2
Carbamoyl phosphate synthetase I	31	F-2	2.7	Hypoxanthine-guanine phosphoribosyl transferase	108	B-4	2.4	Serine hydroxy methyl transferase	178	C-3/7	2.1
Carbamoyl phosphate synthetase II	31	C-5	2.7	Isocitrate dehydrogenase	109	E-6	1.1	Succinate dehydrogenase	179	E-5	1.3
Carboxypeptidase	33	F-1	3.4	3-Ketoacyl-ACP reductase	110	D-9	1.1	Succinyl-CoA synthetase	180	E-5	6.2
Catechol-O-methyl transferase	34	E-3	2.1	3-Ketoacyl-ACP synthase	111	D-9	2.3	Sucrose	181	A-6	3.2
Choline-acetyl transferase	35	B-8	2.3	3-Ketoacyl-CoA transferase	112	F-9	2.8	Thiolase	183	E-11	2.3
Chymotrypsin	36	F-1	3.4	α -Ketoglutarate dehydrogenase complex	113	E-6	1.2	Thioredoxin reductase	184	B-2	1.6
Citrate lyase	37	D-6	4.1	Lactase	114	A-4	3.2	Threonine dehydratase	185	C-7	4.2
Citrate synthase	38	D-6	2.3	Lactate dehydrogenase	115	C-6	1.1	Thymidylate synthase	186	C-2	2.1
Creatine kinase	39	G-3	2.7	Lactonase	116	B-4	3.1	Thiolase	183	E-8	2.3
CTP synthetase	40	B-1	6.3	Lactose synthase	117	A-4	2.4	Thioredoxin reductase	184	B-2	1.6
Cystathionine lyase	41	H-7	4.4	Leucine transaminase	118	F-7	2.6	Threonine dehydratase	185	C-7	4.2
Cystathionine synthase	42	G-7	4.2	Lipase	119	C-10	3.1	Thymidylate synthase	186	C-2	2.1
Cysteine desulfhydrase	43	C-7	4.4	Lipoprotein lipase	120	A-10	3.1	Thiolase	183	E-8	2.3
Cytochrome oxidase = cytochrome aa ₃	44	H-10	1.9	Malate dehydrogenase (NAD*)	122	D-5	1.1	Thioredoxin reductase	184	B-2	1.6
Diglyceride acyl transferase	46	A-9	2.3	Malate dehydrogenase (NADP*)	123	D-5	1.1	Threonine dehydratase	185	C-7	4.2
Dihydrobiopterin reductase	47	C-3	1.6	Maltase	124	A-5	3.2	Thymidylate synthase	186	C-2	2.1
Dihydrofolate reductase	48	C-3	1.5	Methionine adenosyl transferase	125	G-6	2.5	Transaldolase	187	B-5	2.2
Dihydroorotase	49	C-4	3.5	Methylmalonyl-CoA mutase	126	G-5	5.4	Transaminase	188	G-2	2.6
Dihydroorotate oxidase	50	C-3	1.3	Methylmalonyl-CoA racemase	127	G-5	5.1	Transketolase	189	B/C-5	2.2
2,3-Diphosphoglycerate mutase	52	B-6	2.7	Monoamine oxidase	128	E-3	1.4	Triosephosphate isomerase	190	B-6	5.3
2,3-Diphosphoglycerate phosphatase	53	B-6	3.1	NADH-ubiquinone reductase	130	H-7	1.6	Trypsin	191	F-1	3.4
DNA ligase	54	B-1	6.5	Nucleoside diphosphate kinase	133	B-1	2.7	Tyrosine monooxygenase	192	D-3	1.14
DNA polymerase	55	B-1	2.7	Nucleoside monophosphate kinase	134	B-2	2.7	Tyrosine transaminase	193	D-4	2.6
Dopa decarboxylase	56	D-4	4.1	Nucleosidase	135	D-1	3.2	Ubiquinol-cytochrome c reductase	194	H-8	1.6
Enolase	57	C-6	4.2	Nucleoside phosphorylase	136	D-1	2.4	UDP-glucose dehydrogenase	195	A-3	1.1
Enoyl-ACP reductase	58	C-9	1.3	5-Nucleotidase	137	C-1	3.1	UDP-glucose 4-epimerase	196	A-4	5.1
Enoyl-CoA hydratase	59	D-11	4.2	Ornithine transaminase	138	F-6	2.6	UDP-glucose pyrophosphorylase	197	A-4	2.7
Enoyl-CoA isomerase	60	D-11	5.3	Ornithine transcarbamoylase	139	F-3	2.1	Uroporphyrinogen synthetase	198	H-4	4.3
Exonuclease 3'→5' or 5'→3'	62	B-1	3.1	Orotate phosphoribosyl transferase	140	B-3	2.4	UV-specific endonuclease	199	B-1	3.1
Ferrochelataze	64	G-4	4.99	Orotidylate decarboxylase	141	C-2	4.1	Xanthine oxidase	200	E-1	1.2
Fructokinase	65	A-7	2.7	Pancreatic lipase	142	C-10	3.1	Key to Main Map:			
Fructose-1,6-diphosphate aldolase	66	B-6	4.1	Pepsin	143	F-1	3.4	The numbers adjacent to the arrows refer to the Enzymes Map.			
Fructose-1,6-diphosphatase	67	A-6	3.1	Peptidyl transferase	144	F-1	2.3	Substrates and/or coenzymes (also substrates) are indicated with the following symbols: \rightleftarrows or \rightleftharpoons .			
Fructose-1-phosphat aldolase	68	A-7	4.1					Metabolic sequences with one or more less important metabolite(s) are shown as \rightleftarrows .			
Fumarase	69	D-5	4.2					\rightleftharpoons Indicates that two different enzymes are involved in the conversions in one direction and its opposite.			