

Online Supporting Information B: The accession numbers and sequences of 18 sub-enzyme classes of EC.1(Oxidoreductases), 8 sub-enzyme classes of EC.2(Transferases), 5 sub-enzyme classes of EC.3(Hydrolases), 6 sub-enzyme classes of EC.4(Lyases), 6 sub-enzyme classes of EC.5(Isomerases), 6 sub-enzyme classes of EC.6(Ligases).

EC.1: The accession numbers and sequences of the 1,820 Oxidoreductases sub-enzyme family classified into 18 sub enzyme families: (EC.1.1) Acting on the CH-OH group of donors; (EC.1.2) Acting on the aldehyde or oxo group of donors; (EC.1.3) Acting on the CH-CH group of donors; (EC.1.4) Acting on the CH-NH(2) group of donors; (EC.1.5) Acting on the CH-NH group of donors; (EC.1.6) Acting on NADH or NADPH; (EC.1.7) Acting on other nitrogenous compounds as donors; (EC.1.8) Acting on a sulfur group of donors; (EC.1.9) Acting on a heme group of donors; (EC.1.10) Acting on diphenols and related substances as donors; (EC.1.11) Acting on a peroxide as acceptor (peroxidases); (EC.1.12) Acting on hydrogen as donor; (EC.1.13) Acting on single donors with incorporation of molecular oxygen; (EC.1.14) Acting on paired donors, with incorporation or reduction of molecular oxygen; (EC.1.15) Acting on superoxide as acceptor; (EC.1.16) Oxidizing metal ions; (EC.1.17) Acting on CH or CH(2) groups; (EC.1.18) Acting on iron-sulfur proteins as donors. No pair of proteins in the above 18 sub enzyme families has more than 40% sequence identity. See the text of the paper for further explanation.

(EC.1.1) 449 “Acting on the CH-OH group of donors” proteins

>Q6AJ55

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>P41561

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>P15959

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>P0C186

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>P11658

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>P47199

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>P20113

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>P15581

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>P07709

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>P30826

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>P65565

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>P16603

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>P29926

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>P36060

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>P65569

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>Q9ZYM7

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>Q5E212

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>P00387

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>P56895

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>Q941Y8

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>O25858

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>P00389

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>P50939

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>P08739

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>Q33819

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(EC.1.7) 35 “Acting on other nitrogenous compounds as donors” proteins

>Q01537

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>Q9NJD8

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>P0AF32

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>P16163

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>P16164

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>Q05531

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>P0AF26

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>004104

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>P45017

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>P39458

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>P42434

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>P38681

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(EC.1.8) 76 “Acting on a sulfur group of donors” proteins

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>P72854

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>P32799

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>P98000

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(EC.1.10) 42 “Acting on diphenols and related substances as donors” proteins

>P17489

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>Q02075

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>P48502

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>P48503

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>P48504

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>P31800

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>P29677

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>P55303

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>O14313

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>P81138

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>P52574

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(EC.1.12) 17 "Acting on hydrogen as donor" proteins

>P22319

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>P80491

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>Q60338

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>P13628

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>P22320

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>P13065

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>P29166

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>P22317

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(EC.1.13) 47 “Acting on single donors with incorporation of molecular oxygen” proteins

>Q7SIC2

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>Q53034

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>P29114

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>P80064

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>P21795

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>P0A3V2

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>P93836

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>P17554

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>033948

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>P42106

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(EC.1.14) 173 “Acting on paired donors, with incorporation or reduction of molecular oxygen” proteins

>O15229

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>P19732

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>P19733

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>P19734

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>P79760

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>P05182

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>005820

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>P49602

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>P42220

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>P93147

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>P93149

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>035084

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>P53639

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>Q9WZC6

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WESSQKITVEE

>Q9RU48

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>Q03302

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>P0A608

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GKCEPNSVAPTGGAPGNFLSAGGHYHVPGHGTGPASGDLASLQVRGDGSAMLVTTTDAFT
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>Q08713

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KQVFSESANSLPGSGWTVLYYDNESGNLQIMTVENHFMNHIAELPVILIVDEFEHAYYLQ
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>Q9Y783

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>066602

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>O35023

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SYSAFKEHFTQASKKVEGVGMAILVWAPRSGRLEILTAEKHQLFSQWDVIPLLPLDVWEH
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(EC.1.16) 20 "Oxidizing metal ions" proteins

>P52093

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>P41822

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>P00450

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>P28733

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>Q17574

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>P53746

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>Q08908

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KIAIFGMPWAKLKL CGESMIEVRISKSSKWWKAEPGQYIYLYFLRPKIFWQSHPTVMD
LVEDGELVVVITVKNGLT KKLQEYLL ESEGYTEM RVLAEGPYGQSTRTHLFESLLFIAGG
AGVPGP L SMAIKAGRQVKSND SHQMIKFVWSVRNLDLLEVYRKEIMVLKELNIDTKIYFT
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GSEGFVDKTRELTA KRVL EHGDKWIEYVEEFQNW

>P78588

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>Q52685

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>Q2YDI9

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>Q8H1T3

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>Q04800

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>Q9UBK8

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QDIWS

>P16171

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>P32791

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CFMLAVVHSIVMTASGVKRGVQSLVRKFYFRWGIVATILMSIIIFQSEKVFRRNRGYEIF
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>Q12473

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>P42578

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>P08332

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>Q12209

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>Q12333

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(EC.1.17) 67 "Acting on CH or CH(2) groups" proteins

>Q6NCF3

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>Q8EWR9

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>Q9X1F7

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>P09853

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>002767

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>Q46800

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>P0A5W8

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>083558

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>P77324

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>P09788

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>P50641

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>P55982

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>Q9KFH7

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>P58676

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>P74240

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>O66503

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>Q7UWC8

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>Q8KFN9

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(EC.1.18) 26 “Acting on iron-sulfur proteins as donors” proteins

>Q07933

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>Q57118

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>P13452

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>P15333

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>P15334

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>P21394

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>P17052

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>P65528

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>007641

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>Q52126

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>P82861

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>Q9Z615

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>005783

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>P42454

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>P21890

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>P19066

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>P77650

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>023877

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>068943

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>Q03304

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>P00467

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>P20620

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>P07771

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>Q44532

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>P71527

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>P11347

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 YNPKVGYKGAIRLVEEITNVILDKIERECTEEDFEVVR

EC.2: The accession numbers and sequences of the 2,847 Transferases sub-enzyme family classified into 8 sub enzyme families: (EC.2.1) Transferring one-carbon groups; (EC.2.2) Transferring aldehyde or ketone residues; (EC.2.3) Acyltransferases; (EC.2.4) Glycosyltransferases; (EC.2.5) Transferring alkyl or aryl groups, other than methyl groups; (EC.2.6) Transferring nitrogenous groups; (EC.2.7) Transferring phosphorous-containing groups; (EC.2.8) Transferring sulfur-containing groups. No pair of proteins in the above 8 sub enzyme families has more than 40% sequence identity. See the text of the paper for further explanation.

(EC.2.1) 529 “Transferring one-carbon groups” proteins

>P11742

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>Q9X0X6

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>O66726

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>Q67JQ1

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>P36216

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>P45975

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>P96172

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K

>P78605

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>P34544

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>Q57BT1

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>P0AGJ2

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>Q8LAX0

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>P06134

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>Q1IMM4

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>P57413

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>Q6MQU0

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>P04392

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>067607

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>P13437

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>P18956

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>Q22267

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>P58998

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>P48439

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>P54856

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>P27242

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>P47202

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>P06559

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>O83990

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>P61642

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>Q8ZYW7

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>P32434

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>Q5WYX3

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>Q04533

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>P29930

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>O93830

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>Q99735

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(EC.2.6) 114 “Transferring nitrogenous groups” proteins

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>P43336

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>P42356

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>P33537

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>P33538

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>P24719

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>P20430

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>P91247

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 FPTYAKSTRTTDEMTTEFFQNISA EHQTQLYEYKLDFLMFNYSVPNYLKLD

EC.3: The accession numbers and sequences of the 3,279 Hydrolases sub-enzyme family classified into 5 sub enzyme families: (EC.3.1) Acting on ester bonds; (EC.3.2) Glycosylases; (EC.3.4) Acting on peptide bonds (peptide hydrolases); (EC.3.5) Acting on carbon-nitrogen bonds, other than peptide bonds; (EC.3.6) Acting on acid anhydrides. No pair of proteins in the above 5 sub enzyme families has more than 40% sequence identity. See the text of the paper for further explanation.

(EC.3.1) 1228 “Acting on ester bonds” proteins

>083490

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>044476

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>P21325

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>P40852

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>P39538

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>O13433

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>P19833

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>P50177

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>P23748

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>P15885

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>Q5UQ00

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>P51529

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>P31206

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>P23044

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>P23551

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>P23552

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>P13933

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>P23557

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>P78617

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>Q39147

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>P56626

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>P06720

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>P02879

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>P29957

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>P22699

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>P25310

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>060502

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>P10477

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>P49942

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>P19424

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>O74799

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>P49007

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>O14405

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>P49008

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>P09805

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>P36911

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>P36912

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>P53753

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>P62575

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>P22507

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>P59206

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>P36917

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>P23671

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>P20845

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>P26223

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>P20847

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>P13559

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>P93543

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>P23253

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>P27034

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>P22963

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>P36362

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>P27046

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>P07683

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>P49062

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>P29750

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>P48842

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>P05656

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>P45798

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>P32906

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>P48845

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>P46236

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>P20533

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>P03480

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>P11218

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>O59843

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>P18192

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>P00723

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>P22222

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>P29853

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>Q18439

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>P21165

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>P24665

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>P21902

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>P17118

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>051875

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>Q00822

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>Q00823

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EC.4: The accession numbers and sequences of the 892 Lyases sub-enzyme family classified into 6 sub enzyme families: (EC.4.1) Carbon-carbon lyases; (EC.4.2) Carbon-oxygen lyases ; (EC.4.3) Carbon-nitrogen lyases ; (EC.4.4) Carbon-sulfur lyases ; (EC.4.6) Phosphorus-oxygen lyases ; (EC.4.99) Other lyases. No pair of proteins in the above 6 sub enzyme families has more than 40% sequence identity. See the text of the paper for further explanation.

(EC.4.1) 340 “Carbon-carbon lyases” proteins

>067520

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>P28629

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>P06562

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>P51382

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>O34607

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>P17324

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>P62368

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>P51839

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EC.6: The accession numbers and sequences of the 965 Ligases sub-enzyme family classified into 6 sub enzyme families: (EC.6.1) Forming carbon-oxygen bonds; (EC.6.2) Forming carbon-sulfur bonds; (EC.6.3) Forming carbon-nitrogen bonds; (EC.6.4) Forming carbon-carbon bonds; (EC.6.5) Forming phosphoric ester bonds; (EC.6.6) Forming nitrogen-metal bonds. No pair of proteins in the above 6 sub enzyme families has more than 40% sequence identity. See the text of the paper for further explanation.

(EC.6.1) 496 “Forming carbon-oxygen bonds” proteins

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(EC.6.4) 13 “Forming carbon-carbon bonds” proteins

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>P43778

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>P63405

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>P34385

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>P31562

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>Q19842

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>P18823

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>P57172

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>P97386

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>P28719

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>O25336

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>074833

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>P32277

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>P43075

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>O66880

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>Q50566

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>084148

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SVS

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>P29929

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>P26174

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>P26175

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>P29933

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>O50314

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>P26162

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