SBML Model Report

Model name: "Fernandez2006_ModelA"

May 6, 2016

1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by the following two authors: Nicolas Le Novre[1] and Lukas Endler[2] at March 28th 2006 at 3:55 p. m. and last time modified at April eighth 2016 at 3:37 p. m. Table 1 shows an overview of the quantities of all components of this model.

Table 1: Number of components in this model, which are described in the following sections.

Element	Quantity	Element	Quantity
compartment types	0	compartments	1
species types	0	species	64
events	21	constraints	0
reactions	120	function definitions	0
global parameters	7	unit definitions	0
rules	0	initial assignments	0

Model Notes

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commercially or not, in a restricted way or not.

To cite BioModels Database, please use: Li C, Donizelli M, Rodriguez N, Dharuri H, Endler L, Chelliah V, Li L, He E, Henry A, Stefan MI, Snoep JL, Hucka M, Le Novre N, Laibe C (2010) BioModels Database: An enhanced, curated and annotated resource for published quantitative kinetic models. BMC Syst Biol., 4:92.

2 Unit Definitions

This is an overview of five unit definitions which are all predefined by SBML and not mentioned in the model.

2.1 Unit `substance`

Notes Mole is the predefined SBML unit for `substance`.

Definition mol

2.2 Unit `volume`

Notes Litre is the predefined SBML unit for `volume`.

Definition l

2.3 Unit `area`

Notes Square metre is the predefined SBML unit for `area` since SBML Level 2 Version 1.

Definition m^2

2.4 Unit `length`

Notes Metre is the predefined SBML unit for `length` since SBML Level 2 Version 1.

Definition m

2.5 Unit `time`

Notes Second is the predefined SBML unit for `time`.

Definition s

3 Compartment

This model contains one compartment.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
`Spine`	Spine		3	10^{-15}	l	☑	

3.1 Compartment `Spine`

This is a three dimensional compartment with a constant size of 10^{-15} litre.

Name Spine

4 Species

This model contains 64 species. The boundary condition of one of these species is set to `true` so that this species' amount cannot be changed by any reaction. Section 8 provides further details and the derived rates of change of each species.

Table 3: Properties of each species.

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
D	D	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
CDK5	CDK5	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D_CDK5	D_CDK5	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D75	D75	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
CK1	CK1	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D_CK1	D_CK1	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D137	D137	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PKA	PKA	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D_PKA	D_PKA	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34	D34	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_CDK5	D34_CDK5	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_CK1	D34_CK1	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PP2B	PP2B	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_PP2B	D34_PP2B	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75	D34:75	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_137	D34:137	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D75CK1	D75_CK1	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D75_PKA	D75_PKA	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PP2A	PP2A	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D75_PP2A	D75_PP2A	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PP2AP	PP2AP	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
D75_PP2AP	D75_PP2AP	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D75_137	D75:137	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D137_CDK5	D137_CDK5	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D137_PKA	D137_PKA	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D137_PP2C	D137_PP2C	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PP2C	PP2C	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75_CK1	D34:75_CK1	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_137_CDK5	D34:137_CDK5	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75_137	D34:75:137	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D75_137_PKA	D75:137_PKA	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75_PP2B	D34:75_PP2B	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_137_PP2B	D34:137_PP2B	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75_137_PP2B	D34:75:137_PP2B	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75_PP2A	D34:75_PP2A	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D75_137_PP2A	D75:137_PP2A	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75_134_PP2A	D34:75:137_PP2A	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75_PP2AP	D34:75_PP2AP	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D75_137_PP2AP	D75:137_PP2AP	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75_137_PP2AP	D34:75:137_PP2AP	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_137_PP2C	D34:137_PP2C	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D75_137_PP2C	D75:137_PP2C	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PDE	PDE	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PP2Binactive	PP2Binactive	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
D34_75_137_PP2C	D34:75:137_PP2C	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
CK1P	CK1P	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
CK1P_PP2B	CK1P_PP2B	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PDE_PKA	PDE_PKA	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
PDEP	PDEP	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PP2A_PKA	PP2A_PKA	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
Ca	Ca	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
PP2BinactiveCa2	PP2BinactiveCa2	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
R2C2	R2C2	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cAMP	cAMP	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cAMP_R2C2	cAMP_R2C2	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cAMP2_R2C2	cAMP2_R2C2	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cAMP3_R2C2	cAMP3_R2C2	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cAMP4_R2C2	cAMP4_R2C2	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cAMP4_R2C	cAMP4_R2C	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cAMP4_R2	cAMP4_R2	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cAMP_PDE	cAMP_PDE	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
AMP	AMP	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cAMP_PDEP	cAMP_PDEP	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟
Empty	Empty	Spine	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	☑	☑

5 Parameters

This model contains seven global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
k57	ca_in		$2.5 \cdot 10^{-8}$		⊟
cAMP_delay	cAMP_delay		400.000		☑
cAMP_Ca_delay	cAMP_Ca_delay		50.000		☑
kon_high	kon_high		$6.6 \cdot 10^{-6}$		☑
spike_duration	spike_duration		2.000		☑
spike_interval	spike_interval		2.000		☑
kon_low	kon_low		$2.5 \cdot 10^{-8}$		☑

6 Events

This is an overview of 21 events. Each event is initiated whenever its trigger condition switches from `false` to `true`. A delay function postpones the effects of an event to a later time point. At the time of execution, an event can assign values to species, parameters or compartments if these are not set to constant.

6.1 Event cAMP_pulse

Name cAMP_pulse

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} \tag{1}$$

Assignment

$$\text{cAMP} = 6.5999999999999995E - 6 \tag{2}$$

6.2 Event ca_on1

Name ca_on1

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} \tag{3}$$

Assignment

$$\text{k57} = \text{kon\_high} \tag{4}$$

6.3 Event ca_on2

Name ca_on2

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + 1 \cdot (\text{spike\_duration} + \text{spike\_interval}) \quad (5)$$

Assignment

$$\text{k57} = \text{kon\_high} \quad (6)$$

6.4 Event ca_off1

Name ca_off

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} \quad (7)$$

Assignment

$$\text{k57} = \text{kon\_low} \quad (8)$$

6.5 Event Ca_on3

Name Ca_on3

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + 2 \cdot (\text{spike\_duration} + \text{spike\_interval}) \quad (9)$$

Assignment

$$\text{k57} = \text{kon\_high} \quad (10)$$

6.6 Event ca_on4

Name ca_on4

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + 3 \cdot (\text{spike\_duration} + \text{spike\_interval}) \quad (11)$$

Assignment

$$\text{k57} = \text{kon\_high} \quad (12)$$

6.7 Event ca_on5

Name ca_on5

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + 4 \cdot (\text{spike\_duration} + \text{spike\_interval}) \quad (13)$$

Assignment

$$\text{k57} = \text{kon\_high} \quad (14)$$

6.8 Event ca_on6

Name ca_on6

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + 5 \cdot (\text{spike\_duration} + \text{spike\_interval}) \quad (15)$$

Assignment

$$\text{k57} = \text{kon\_high} \quad (16)$$

6.9 Event ca_on7

Name ca_on7

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + 6 \cdot (\text{spike\_duration} + \text{spike\_interval}) \quad (17)$$

Assignment

$$\text{k57} = \text{kon\_high} \quad (18)$$

6.10 Event ca_on8

Name ca_on8

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + 7 \cdot (\text{spike\_duration} + \text{spike\_interval}) \quad (19)$$

Assignment

$$\text{k57} = \text{kon\_high} \quad (20)$$

6.11 Event ca_on9

Name ca_on9

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + 8 \cdot (\text{spike\_duration} + \text{spike\_interval}) \quad (21)$$

Assignment

$$\text{k57} = \text{kon\_high} \quad (22)$$

6.12 Event ca_on10

Name ca_on10

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + 9 \cdot (\text{spike\_duration} + \text{spike\_interval}) \quad (23)$$

Assignment

$$\text{k57} = \text{kon\_high} \quad (24)$$

6.13 Event ca_off2

Name ca_off2

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} + 1 \cdot (\text{spike\_interval} + \text{spike\_duration}) \tag{25}$$

Assignment

$$\text{k57} = \text{kon\_low} \tag{26}$$

6.14 Event ca_off3

Name ca_off3

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} + 2 \cdot (\text{spike\_interval} + \text{spike\_duration}) \tag{27}$$

Assignment

$$\text{k57} = \text{kon\_low} \tag{28}$$

6.15 Event ca_off4

Name ca_off4

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} + 3 \cdot (\text{spike\_interval} + \text{spike\_duration}) \tag{29}$$

Assignment

$$\text{k57} = \text{kon\_low} \tag{30}$$

6.16 Event ca_off5

Name ca_off5

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} + 4 \cdot (\text{spike\_interval} + \text{spike\_duration}) \tag{31}$$

Assignment

$$\text{k57} = \text{kon\_low} \tag{32}$$

6.17 Event ca_off6

Name ca_off6

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} + 5 \cdot (\text{spike\_interval} + \text{spike\_duration}) \tag{33}$$

Assignment

$$\text{k57} = \text{kon\_low} \tag{34}$$

6.18 Event ca_off7

Name ca_off7

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} + 6 \cdot (\text{spike\_interval} + \text{spike\_duration}) \tag{35}$$

Assignment

$$\text{k57} = \text{kon\_low} \tag{36}$$

6.19 Event ca_off8

Name ca_off8

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} + 7 \cdot (\text{spike\_interval} + \text{spike\_duration}) \tag{37}$$

Assignment

$$\text{k57} = \text{kon\_low} \tag{38}$$

6.20 Event ca_off9

Name ca_off9

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} + 8 \cdot (\text{spike\_interval} + \text{spike\_duration}) \tag{39}$$

Assignment

$$\text{k57} = \text{kon\_low} \tag{40}$$

6.21 Event ca_off10

Name ca_off10

Trigger condition

$$\text{time} \geq \text{cAMP\_delay} + \text{cAMP\_Ca\_delay} + \text{spike\_duration} + 9 \cdot (\text{spike\_interval} + \text{spike\_duration}) \tag{41}$$

Assignment

$$\text{k57} = \text{kon\_low} \tag{42}$$

7 Reactions

This model contains 120 reactions. All reactions are listed in the following table and are subsequently described in detail. If a reaction is affected by a modifier, the identifier of this species is written above the reaction arrow.

Table 5: Overview of all reactions

№	Id	Name	Reaction Equation	SBO
1	von1	D_CDK5_binding	D + CDK5 ⟶ D_CDK5	
2	voff1	D_CDK5_unbinding	D_CDK5 ⟶ D + CDK5	
3	vcat1	DPhospho_by_CDK5_on_75	D_CDK5 ⟶ D75 + CDK5	
4	von2	DCDK1_binding	D + CK1 ⟶ D_CK1	
5	voff2	D_CDK1_unbinding	D_CK1 ⟶ D + CK1	
6	vcat2	D_Phospho_by_CK1_on_137	D_CK1 ⟶ D137 + CK1	
7	von3	D_PKA_binding	D + PKA ⟶ D_PKA	
8	voff3	D_PKA_unbinding	D_PKA ⟶ D + PKA	
9	vcat3	D_Phospho_by_PKA_on_34	D_PKA ⟶ D34 + PKA	
10	von4	D34_CDK5_binding	D34 + CDK5 ⟶ D34_CDK5	
11	von5	D34_CK1_binding	D34 + CK1 ⟶ D34_CK1	
12	von6	D34_PP2B_binding	D34 + PP2B ⟶ D34_PP2B	
13	voff4	D34_CDK5_unbinding	D34_CDK5 ⟶ D34 + CDK5	
14	vcat4	D34_Phospho_by_CDK5_on_75	D34_CDK5 ⟶ D34_75 + CDK5	
15	voff5	D34_CK1_unbinding	D34_CK1 ⟶ D34 + CK1	
16	vcat5	D34_Phospho_by_CK1_on_137	D34_CK1 ⟶ D34_137 + CK1	
17	vcat6	D34_Dephospho_by_PP2B	D34_PP2B ⟶ D + PP2B	
18	voff6	D34_PP2B_unbinding	D34_PP2B ⟶ D34 + PP2B	
19	von7	D75_CK1_binding	D75 + CK1 ⟶ D75CK1	
20	von8	D75_PKA_binding	D75 + PKA ⟶ D75_PKA	
21	von9	D75_PP2A_binding	D75 + PP2A ⟶ D75_PP2A	
22	von10	D75_PP2AP_binding	D75 + PP2AP ⟶ D75_PP2AP	
23	voff7	D75_CK1_unbinding	D75CK1 ⟶ D75 + CK1	

№	Id	Name	Reaction Equation	SBO
24	vcat7	D75_Phospho_by_CK1_on_137	D75CK1 ⟶ CK1 + D75_137	
25	vcat8	D75_Phospho_by_PKA_on_34	D75_PKA ⟶ D34_75 + PKA	
26	voff8	D75_PKA_unbinding	D75_PKA ⟶ D75 + PKA	
27	vcat9	D75_dephospho_by_PP2A	D75_PP2A ⟶ D + PP2A	
28	voff9	D75_PP2A_unbinding	D75_PP2A ⟶ D75 + PP2A	
29	vcat10	D75_dephospho_by_PP2AP	D75_PP2AP ⟶ D + PP2AP	
30	voff10	D75_PP2AP_unbinding	D75_PP2AP ⟶ D75 + PP2AP	
31	von11	D137_CDK5_binding	D137 + CDK5 ⟶ D137_CDK5	
32	von12	D137_PKA_binding	D137 + PKA ⟶ D137_PKA	
33	von13	D137_PP2C_binding	D137 + PP2C ⟶ D137_PP2C	
34	voff11	D137_CDK5_unbinding	D137_CDK5 ⟶ D137 + CDK5	
35	vcat11	D137_Phospho_by_CDK5_on_75	D137_CDK5 ⟶ D75_137 + CDK5	
36	voff12	D137_PKA_unbinding	D137_PKA ⟶ D137 + PKA	
37	vcat12	D137_phospho_by_PKA_on_34	D137_PKA ⟶ D34_137 + PKA	
38	vcat13	D137_dephospho_by_PP2C	D137_PP2C ⟶ D + PP2C	
39	voff13	D137_PP2C_unbinding	D137_PP2C ⟶ D137 + PP2C	
40	von14	D34:75_CK1_binding	D34_75 + CK1 ⟶ D34_75_CK1	
41	von18	D34:137_CDK5_binding	D34_137 + CDK5 ⟶ D34_137_CDK5	
42	voff18	D34:137_CDK5_unbinding	D34_137_CDK5 ⟶ D34_137 + CDK5	
43	voff14	D34:75_CK1_unbinding	D34_75_CK1 ⟶ D34_75 + CK1	
44	vcat14	D34:75_phospho_by_CK1_on_137	D34_75_CK1 ⟶ D34_75_137 + CK1	
45	vcat18	D34:137_phospho_by_CDK5_on_75	D34_137_CDK5 ⟶ D34_75_137 + CDK5	
46	von21	D75:137_PKA_binding	D75_137 + PKA ⟶ D75_137_PKA	
47	vcat21	D75:137_phospho_by_PKA_on_34	D75_137_PKA ⟶ D34_75_137 + PKA	
48	voff21	D75:137_PKA_unbinding	D75_137_PKA ⟶ D75_137 + PKA	
49	von17	D34:75_PP2B_binding	D34_75 + PP2B ⟶ D34_75_PP2B	
50	voff17	D34:75_PP2B_unbinding	D34_75_PP2B ⟶ D34_75 + PP2B	
51	vcat17	D34:75_dephopsho_by_PP2B_on_34	D34_75_PP2B ⟶ D75 + PP2B	
52	von19	D34:137_PP2B_binding	D34_137 + PP2B ⟶ D34_137_PP2B	

№	Id	Name	Reaction Equation	SBO
53	vcat19	D34:137_dephospho_by_PP2B_on_34	D34_137_PP2B ⟶ D137 + PP2B	
54	voff19	D34:137_PP2B_unbinding	D34_137_PP2B ⟶ D34_137 + PP2B	
55	von27	D34:75:137_PP2B_binding	D34_75_137 + PP2B ⟶ D34_75_137_PP2B	
56	voff27	D34:75:137_PP2B_unbinding	D34_75_137_PP2B ⟶ D34_75_137 + PP2B	
57	vcat27	D34:75:137_dephospho_by_PP2B_on_34	D34_75_137_PP2B ⟶ D75_137 + PP2B	
58	von15	D34:75_PP2A_binding	D34_75 + PP2A ⟶ D34_75_PP2A	
59	vcat15	D34:75_dephospho_by_PP2A_on_75	D34_75_PP2A ⟶ D34 + PP2A	
60	voff15	D34:75_PP2A_unbinding	D34_75_PP2A ⟶ D34_75 + PP2A	
61	von22	D75:137_PP2A_binding	D75_137 + PP2A ⟶ D75_137_PP2A	
62	vcat22	D75:137_dephospho_by_PP2A_on_75	D75_137_PP2A ⟶ D137 + PP2A	
63	voff22	D75:137_PP2A_unbinding	D75_137_PP2A ⟶ D75_137 + PP2A	
64	von25	D34:75:137_PP2A_binding	D34_75_137 + PP2A ⟶ D34_75_134_PP2A	
65	vcat25	D34:75:137_dephospho_by_PP2A_on_75	D34_75_134_PP2A ⟶ D34_137 + PP2A	
66	voff25	D34:75:137_PP2A_unbinding	D34_75_134_PP2A ⟶ D34_75_137 + PP2A	
67	von16	D34:75_PP2AP_binding	D34_75 + PP2AP ⟶ D34_75_PP2AP	
68	vcat16	D34:75_dephospho_by_PP2AP_on_75	D34_75_PP2AP ⟶ D34 + PP2AP	
69	voff16	D34:75_PP2AP_unbinding	D34_75_PP2AP ⟶ D34_75 + PP2AP	
70	von23	D75:137_PP2AP_binding	D75_137 + PP2AP ⟶ D75_137_PP2AP	
71	vcat23	D75:137_dephospho_by_PP2AP_on_75	D75_137_PP2AP ⟶ D137 + PP2AP	
72	voff23	D75:137_PP2AP_unbinding	D75_137_PP2AP ⟶ D75_137 + PP2AP	
73	vcat26	D34:75:137_dephospho_by_PP2AP_on 75	D34_75_137_PP2AP ⟶ D34_137 + PP2AP	
74	von26	D34:75:137_PP2AP_binding	D34_75_137 + PP2AP ⟶ D34_75_137_PP2AP	
75	voff26	D34:75:137_PP2AP_unbinding	D34_75_137_PP2AP ⟶ D34_75_137 + PP2AP	
76	von20	D34:137_PP2C_binding	D34_137 + PP2C ⟶ D34_137_PP2C	
77	vcat20	D34:137_dephospho_by_PP2C_on_137	D34_137_PP2C ⟶ D34 + PP2C	
78	voff20	D34:137_PP2C_unbinding	D34_137_PP2C ⟶ D34_137 + PP2C	
79	von24	D75:137_PP2C_binding	D75_137 + PP2C ⟶ D75_137_PP2C	
80	vcat24	D75:137_dephospho_by_PP2C_137	D75_137_PP2C ⟶ D75 + PP2C	
81	voff24	D75:137_PP2C_unbinding	D75_137_PP2C ⟶ D75_137 + PP2C	

№	Id	Name	Reaction Equation	SBO
82	von28	D34:75:137_PP2C_binding	D34_75_137 + PP2C ⟶ D34_75_137_PP2C	
83	vcat28	D34:75:137_dephospho_by_PP2C_on_137	D34_75_137_PP2C ⟶ D34_75 + PP2C	
84	voff28	D34:75:137_PP2C_unbinding	D34_75_137_PP2C ⟶ D34_75_137 + PP2C	
85	von29	CK1P_PP2B_binding	CK1P + PP2B ⟶ CK1P_PP2B	
86	voff29	CK1P_PP2B_unbinding	CK1P_PP2B ⟶ CK1P + PP2B	
87	vcat29	CK1P_dephospho_by_PP2B	CK1P_PP2B ⟶ CK1 + PP2B	
88	vcat30	CK1_phosphorylation	CK1 ⟶ CK1P	
89	von31	PDE_PKA_binding	PDE + PKA ⟶ PDE_PKA	
90	vcat31	PDE_phospho_by_PKA	PDE_PKA ⟶ PDEP + PKA	
91	voff31	PDE_PKA_unbinding	PDE_PKA ⟶ PDE + PKA	
92	vcat32	PDEP_dephospho	PDEP ⟶ PDE	
93	von33	PP2A_PKA_binding	PP2A + PKA ⟶ PP2A_PKA	
94	voff33	PP2A_PKA_unbinding	PP2A_PKA ⟶ PP2A + PKA	
95	vcat33	PP2A_phospho_by_PKA	PP2A_PKA ⟶ PP2AP + PKA	
96	vcat34	PP2AP_dephospho	PP2AP ⟶ PP2A	
97	von35	PP2Binactive_Ca_binding	PP2Binactive + 2 Ca ⟶ PP2BinactiveCa2	
98	von36	PP2B_activation	PP2BinactiveCa2 + 2 Ca ⟶ PP2B	
99	voff35	PP2BinactiveCa2_Ca_unbinding	PP2BinactiveCa2 ⟶ PP2Binactive + 2 Ca	
100	voff36	PP2B_inactivation	PP2B ⟶ PP2BinactiveCa2 + 2 Ca	
101	von37	R2C2_cAMP_binding	R2C2 + cAMP ⟶ cAMP_R2C2	
102	von38	cAMP_R2C2_binding_by_cAMP	cAMP_R2C2 + cAMP ⟶ cAMP2_R2C2	
103	von39	cAMP2_R2C2_binding_by_cAMP	cAMP2_R2C2 + cAMP ⟶ cAMP3_R2C2	
104	von40	cAMP3_R2C2_binding_by_cAMP	cAMP3_R2C2 + cAMP ⟶ cAMP4_R2C2	
105	voff37	cAMP_R2C2_unbinding	cAMP_R2C2 ⟶ R2C2 + cAMP	
106	voff38	cAMP2_R2C2_unbinding	cAMP2_R2C2 ⟶ cAMP_R2C2 + cAMP	
107	voff39	cAMP3_R2C2_unbinding	cAMP3_R2C2 ⟶ cAMP2_R2C2 + cAMP	
108	voff40	cAMP4_R2C2_unbinding	cAMP4_R2C2 ⟶ cAMP3_R2C2 + cAMP	
109	von41	cAMP4_R2C_PKA_binding	cAMP4_R2C + PKA ⟶ cAMP4_R2C2	
110	voff41	cAMP4_R2C2_PKA_unbinding	cAMP4_R2C2 ⟶ cAMP4_R2C + PKA	

№	Id	Name	Reaction Equation	SBO
111	von42	cAMP4_R2_PKA_binding	cAMP4_R2 + PKA ⟶ cAMP4_R2C	
112	von43	cAMP4_R2C_PKA_unbinding	cAMP4_R2C ⟶ cAMP4_R2 + PKA	
113	von44	cAMP_PDE_binding	cAMP + PDE ⟶ cAMP_PDE	
114	voff44	cAMP_PDE_unbinding	cAMP_PDE ⟶ cAMP + PDE	
115	vcat44	cAMP_PDE_degradation	cAMP_PDE ⟶ AMP + PDE	
116	von45	cAMP_PDEP_binding	cAMP + PDEP ⟶ cAMP_PDEP	
117	voff45	cAMP_PDEP_unbinding	cAMP_PDEP ⟶ cAMP + PDEP	
118	vcat45	cAMP_PDEP_degradation	cAMP_PDEP ⟶ AMP + PDEP	
119	v57	Ca_in	Empty ⟶ Ca	
120	v58	Ca_destroy	Ca ⟶ Empty	

7.1 Reaction von1

This is an irreversible reaction of two reactants forming one product.

Name D_CDK5_binding

Reaction equation

$$\mathrm{D} + \mathrm{CDK5} \longrightarrow \mathrm{D\_CDK5} \tag{43}$$

Reactants

Table 6: Properties of each reactant.

Id	Name	SBO
D	D	
CDK5	CDK5	

Product

Table 7: Properties of each product.

Id	Name	SBO
D_CDK5	D_CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \mathrm{vol}\,(\mathrm{Spine}) \cdot \mathrm{kon1} \cdot [\mathrm{D}] \cdot [\mathrm{CDK5}] \tag{44}$$

Table 8: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon1	kon1		5600000.0		☑

7.2 Reaction voff1

This is an irreversible reaction of one reactant forming two products.

Name D_CDK5_unbinding

Reaction equation

$$\text{D\_CDK5} \longrightarrow \text{D} + \text{CDK5} \tag{45}$$

Reactant

Table 9: Properties of each reactant.

Id	Name	SBO
D_CDK5	D_CDK5	

Products

Table 10: Properties of each product.

Id	Name	SBO
D	D	
CDK5	CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \text{vol}\,(\text{Spine}) \cdot [\text{D\_CDK5}] \cdot \text{koff1} \tag{46}$$

Table 11: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff1	koff1		12.0		☑

7.3 Reaction vcat1

This is an irreversible reaction of one reactant forming two products.

Name DPhospho_by_CDK5_on_75

Reaction equation

$$\text{D\_CDK5} \longrightarrow \text{D75} + \text{CDK5} \tag{47}$$

Reactant

Table 12: Properties of each reactant.

Id	Name	SBO
D_CDK5	D_CDK5	

Products

Table 13: Properties of each product.

Id	Name	SBO
D75	D75	
CDK5	CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_3 = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D\_CDK5}] \cdot \mathrm{kcat1} \tag{48}$$

Table 14: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat1	kcat1		3.0		☑

7.4 Reaction von2

This is an irreversible reaction of two reactants forming one product.

Name DCDK1_binding

Reaction equation

$$\mathrm{D} + \mathrm{CK1} \longrightarrow \mathrm{D\_CK1} \tag{49}$$

Reactants

Table 15: Properties of each reactant.

Id	Name	SBO
D	D	
CK1	CK1	

Product

Table 16: Properties of each product.

Id	Name	SBO
D_CK1	D_CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_4 = \mathrm{vol}(\mathrm{Spine}) \cdot [\mathrm{D}] \cdot [\mathrm{CK1}] \cdot \mathrm{kon2} \tag{50}$$

Table 17: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon2	kon2		4400000.0		☑

7.5 Reaction voff2

This is an irreversible reaction of one reactant forming two products.

Name D_CDK1_unbinding

Reaction equation

$$\mathrm{D\_CK1} \longrightarrow \mathrm{D} + \mathrm{CK1} \tag{51}$$

Reactant

Table 18: Properties of each reactant.

Id	Name	SBO
D_CK1	D_CK1	

Products

Table 19: Properties of each product.

Id	Name	SBO
D	D	

Id	Name	SBO
CK1	CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_5 = \mathrm{vol}\,(\mathrm{Spine}) \cdot \mathrm{koff2} \cdot [\mathrm{D\_CK1}] \tag{52}$$

Table 20: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff2	koff2		12.0		☑

7.6 Reaction vcat2

This is an irreversible reaction of one reactant forming two products.

Name D_Phospho_by_CK1_on_137

Reaction equation

$$\mathrm{D\_CK1} \longrightarrow \mathrm{D137} + \mathrm{CK1} \tag{53}$$

Reactant

Table 21: Properties of each reactant.

Id	Name	SBO
D_CK1	D_CK1	

Products

Table 22: Properties of each product.

Id	Name	SBO
D137	D137	
CK1	CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_6 = \mathrm{vol}\,(\mathrm{Spine}) \cdot \mathrm{kcat2} \cdot [\mathrm{D\_CK1}] \tag{54}$$

Table 23: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat2	kcat2		3.0		☑

7.7 Reaction von3

This is an irreversible reaction of two reactants forming one product.

Name D_PKA_binding

Reaction equation

$$\mathrm{D} + \mathrm{PKA} \longrightarrow \mathrm{D\_PKA} \tag{55}$$

Reactants

Table 24: Properties of each reactant.

Id	Name	SBO
D	D	
PKA	PKA	

Product

Table 25: Properties of each product.

Id	Name	SBO
D_PKA	D_PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_7 = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D}] \cdot [\mathrm{PKA}] \cdot \mathrm{kon3} \tag{56}$$

Table 26: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon3	kon3		5600000.0		☑

7.8 Reaction voff3

This is an irreversible reaction of one reactant forming two products.

Name D_PKA_unbinding

Reaction equation

$$\text{D\_PKA} \longrightarrow \text{D} + \text{PKA} \tag{57}$$

Reactant

Table 27: Properties of each reactant.

Id	Name	SBO
D_PKA	D_PKA	

Products

Table 28: Properties of each product.

Id	Name	SBO
D	D	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_8 = \text{vol}\,(\text{Spine}) \cdot [\text{D\_PKA}] \cdot \text{koff3} \tag{58}$$

Table 29: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff3	koff3		10.8		☑

7.9 Reaction vcat3

This is an irreversible reaction of one reactant forming two products.

Name D_Phospho_by_PKA_on_34

Reaction equation

$$\text{D\_PKA} \longrightarrow \text{D34} + \text{PKA} \tag{59}$$

Reactant

Table 30: Properties of each reactant.

Id	Name	SBO
D_PKA	D_PKA	

Products

Table 31: Properties of each product.

Id	Name	SBO
D34	D34	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_9 = \text{vol}\,(\text{Spine}) \cdot [\text{D\_PKA}] \cdot \text{kcat3} \tag{60}$$

Table 32: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat3	kcat3		2.7		☑

7.10 Reaction von4

This is an irreversible reaction of two reactants forming one product.

Name D34_CDK5_binding

Reaction equation

$$\mathrm{D34} + \mathrm{CDK5} \longrightarrow \mathrm{D34\_CDK5} \tag{61}$$

Reactants

Table 33: Properties of each reactant.

Id	Name	SBO
D34	D34	
CDK5	CDK5	

Product

Table 34: Properties of each product.

Id	Name	SBO
D34_CDK5	D34_CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_{10} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34}] \cdot [\mathrm{CDK5}] \cdot \mathrm{kon4} \tag{62}$$

Table 35: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon4	kon4		5600000.0		☑

7.11 Reaction von5

This is an irreversible reaction of two reactants forming one product.

Name D34_CK1_binding

Reaction equation

$$\mathrm{D34} + \mathrm{CK1} \longrightarrow \mathrm{D34\_CK1} \tag{63}$$

Reactants

Table 36: Properties of each reactant.

Id	Name	SBO
D34	D34	
CK1	CK1	

Product

Table 37: Properties of each product.

Id	Name	SBO
D34_CK1	D34_CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_{11} = \text{vol}\,(\text{Spine}) \cdot [\text{D34}] \cdot [\text{CK1}] \cdot \text{kon5} \tag{64}$$

Table 38: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon5	kon5		4400000.0		☑

7.12 Reaction von6

This is an irreversible reaction of two reactants forming one product.

Name D34_PP2B_binding

Reaction equation

$$\text{D34} + \text{PP2B} \longrightarrow \text{D34\_PP2B} \tag{65}$$

Reactants

Table 39: Properties of each reactant.

Id	Name	SBO
D34	D34	
PP2B	PP2B	

Product

Table 40: Properties of each product.

Id	Name	SBO
D34_PP2B	D34_PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{12} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34}] \cdot [\mathrm{PP2B}] \cdot \mathrm{kon6} \tag{66}$$

Table 41: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon6	kon6		10^7		☑

7.13 Reaction voff4

This is an irreversible reaction of one reactant forming two products.

Name D34_CDK5_unbinding

Reaction equation

$$\mathrm{D34\_CDK5} \longrightarrow \mathrm{D34} + \mathrm{CDK5} \tag{67}$$

Reactant

Table 42: Properties of each reactant.

Id	Name	SBO
D34_CDK5	D34_CDK5	

Products

Table 43: Properties of each product.

Id	Name	SBO
D34	D34	

Id	Name	SBO
CDK5	CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_{13} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_CDK5}] \cdot \mathrm{koff4} \tag{68}$$

Table 44: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff4	koff4		12.0		☑

7.14 Reaction vcat4

This is an irreversible reaction of one reactant forming two products.

Name D34_Phospho_by_CDK5_on_75

Reaction equation

$$\mathrm{D34\_CDK5} \longrightarrow \mathrm{D34\_75} + \mathrm{CDK5} \tag{69}$$

Reactant

Table 45: Properties of each reactant.

Id	Name	SBO
D34_CDK5	D34_CDK5	

Products

Table 46: Properties of each product.

Id	Name	SBO
D34_75	D34:75	
CDK5	CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_{14} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_CDK5}] \cdot \mathrm{kcat4} \tag{70}$$

Table 47: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat4	kcat4		3.0		☑

7.15 Reaction voff5

This is an irreversible reaction of one reactant forming two products.

Name D34_CK1_unbinding

Reaction equation

$$\mathrm{D34\_CK1} \longrightarrow \mathrm{D34} + \mathrm{CK1} \tag{71}$$

Reactant

Table 48: Properties of each reactant.

Id	Name	SBO
D34_CK1	D34_CK1	

Products

Table 49: Properties of each product.

Id	Name	SBO
D34	D34	
CK1	CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_{15} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_CK1}] \cdot \mathrm{koff5} \tag{72}$$

Table 50: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff5	koff5		12.0		☑

7.16 Reaction vcat5

This is an irreversible reaction of one reactant forming two products.

Name D34_Phospho_by_CK1_on_137

Reaction equation

$$\text{D34\_CK1} \longrightarrow \text{D34\_137} + \text{CK1} \tag{73}$$

Reactant

Table 51: Properties of each reactant.

Id	Name	SBO
D34_CK1	D34_CK1	

Products

Table 52: Properties of each product.

Id	Name	SBO
D34_137	D34:137	
CK1	CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_{16} = \text{vol}(\text{Spine}) \cdot [\text{D34\_CK1}] \cdot \text{kcat5} \tag{74}$$

Table 53: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat5	kcat5		3.0		☑

7.17 Reaction vcat6

This is an irreversible reaction of one reactant forming two products.

Name D34_Dephospho_by_PP2B

Reaction equation

$$\text{D34\_PP2B} \longrightarrow \text{D} + \text{PP2B} \tag{75}$$

Reactant

Table 54: Properties of each reactant.

Id	Name	SBO
D34_PP2B	D34_PP2B	

Products

Table 55: Properties of each product.

Id	Name	SBO
D	D	
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{17} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_PP2B}] \cdot \text{kcat6} \tag{76}$$

Table 56: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat6	kcat6		4.0		☑

7.18 Reaction voff6

This is an irreversible reaction of one reactant forming two products.

Name D34_PP2B_unbinding

Reaction equation

$$\text{D34\_PP2B} \longrightarrow \text{D34} + \text{PP2B} \tag{77}$$

Reactant

Table 57: Properties of each reactant.

Id	Name	SBO
D34_PP2B	D34_PP2B	

Products

Table 58: Properties of each product.

Id	Name	SBO
D34	D34	
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{18} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_PP2B}] \cdot \text{koff6} \tag{78}$$

Table 59: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff6	koff6		16.0		☑

7.19 Reaction von7

This is an irreversible reaction of two reactants forming one product.

Name D75_CK1_binding

Reaction equation

$$\text{D75} + \text{CK1} \longrightarrow \text{D75CK1} \tag{79}$$

Reactants

Table 60: Properties of each reactant.

Id	Name	SBO
D75	D75	
CK1	CK1	

Product

Table 61: Properties of each product.

Id	Name	SBO
D75CK1	D75_CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_{19} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75}] \cdot [\mathrm{CK1}] \cdot \mathrm{kon7} \tag{80}$$

Table 62: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon7	kon7		4400000.0		☑

7.20 Reaction von8

This is an irreversible reaction of two reactants forming one product.

Name D75_PKA_binding

Reaction equation

$$\mathrm{D75} + \mathrm{PKA} \longrightarrow \mathrm{D75\_PKA} \tag{81}$$

Reactants

Table 63: Properties of each reactant.

Id	Name	SBO
D75	D75	
PKA	PKA	

Product

Table 64: Properties of each product.

Id	Name	SBO
D75_PKA	D75_PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{20} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75}] \cdot [\mathrm{PKA}] \cdot \mathrm{kon8} \tag{82}$$

Table 65: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon8	kon8		5600000.0		☑

7.21 Reaction von9

This is an irreversible reaction of two reactants forming one product.

Name D75_PP2A_binding

Reaction equation

$$\mathrm{D75} + \mathrm{PP2A} \longrightarrow \mathrm{D75\_PP2A} \tag{83}$$

Reactants

Table 66: Properties of each reactant.

Id	Name	SBO
D75	D75	
PP2A	PP2A	

Product

Table 67: Properties of each product.

Id	Name	SBO
D75_PP2A	D75_PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{21} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75}] \cdot [\mathrm{PP2A}] \cdot \mathrm{kon9} \tag{84}$$

Table 68: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon9	kon9		3800000.0		☑

7.22 Reaction von10

This is an irreversible reaction of two reactants forming one product.

Name D75_PP2AP_binding

Reaction equation

$$\mathrm{D75} + \mathrm{PP2AP} \longrightarrow \mathrm{D75\_PP2AP} \tag{85}$$

Reactants

Table 69: Properties of each reactant.

Id	Name	SBO
D75	D75	
PP2AP	PP2AP	

Product

Table 70: Properties of each product.

Id	Name	SBO
D75_PP2AP	D75_PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{22} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75}] \cdot [\mathrm{PP2AP}] \cdot \mathrm{kon10} \tag{86}$$

Table 71: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon10	kon10		$1.7 \cdot 10^7$		☑

7.23 Reaction voff7

This is an irreversible reaction of one reactant forming two products.

Name D75_CK1_unbinding

Reaction equation

$$\mathrm{D75CK1} \longrightarrow \mathrm{D75} + \mathrm{CK1} \tag{87}$$

Reactant

Table 72: Properties of each reactant.

Id	Name	SBO
D75CK1	D75_CK1	

Products

Table 73: Properties of each product.

Id	Name	SBO
D75	D75	
CK1	CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_{23} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75CK1}] \cdot \mathrm{koff7} \tag{88}$$

Table 74: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff7	koff7		12.0		☑

7.24 Reaction vcat7

This is an irreversible reaction of one reactant forming two products.

Name D75_Phospho_by_CK1_on_137

Reaction equation

$$\text{D75CK1} \longrightarrow \text{CK1} + \text{D75\_137} \tag{89}$$

Reactant

Table 75: Properties of each reactant.

Id	Name	SBO
D75CK1	D75_CK1	

Products

Table 76: Properties of each product.

Id	Name	SBO
CK1	CK1	
D75_137	D75:137	

Kinetic Law

Derived unit contains undeclared units

$$v_{24} = \text{vol}\,(\text{Spine}) \cdot [\text{D75CK1}] \cdot \text{kcat7} \tag{90}$$

Table 77: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat7	kcat7		3.0		☑

7.25 Reaction vcat8

This is an irreversible reaction of one reactant forming two products.

Name D75_Phospho_by_PKA_on_34

Reaction equation

$$\text{D75\_PKA} \longrightarrow \text{D34\_75} + \text{PKA} \tag{91}$$

Reactant

Table 78: Properties of each reactant.

Id	Name	SBO
D75_PKA	D75_PKA	

Products

Table 79: Properties of each product.

Id	Name	SBO
D34_75	D34:75	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{25} = \text{vol}(\text{Spine}) \cdot [\text{D75\_PKA}] \cdot \text{kcat8} \tag{92}$$

Table 80: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat8	kcat8		0.0		☑

7.26 Reaction voff8

This is an irreversible reaction of one reactant forming two products.

Name D75_PKA_unbinding

Reaction equation

$$\text{D75\_PKA} \longrightarrow \text{D75} + \text{PKA} \tag{93}$$

Reactant

Table 81: Properties of each reactant.

Id	Name	SBO
D75_PKA	D75_PKA	

Products

Table 82: Properties of each product.

Id	Name	SBO
D75	D75	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{26} = \text{vol}\,(\text{Spine}) \cdot [\text{D75\_PKA}] \cdot \text{koff8} \tag{94}$$

Table 83: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff8	koff8		10.8		☑

7.27 Reaction vcat9

This is an irreversible reaction of one reactant forming two products.

Name D75_dephospho_by_PP2A

Reaction equation

$$\text{D75\_PP2A} \longrightarrow \text{D} + \text{PP2A} \tag{95}$$

Reactant

Table 84: Properties of each reactant.

Id	Name	SBO
D75_PP2A	D75_PP2A	

Products

Table 85: Properties of each product.

Id	Name	SBO
D	D	
PP2A	PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{27} = \text{vol}\,(\text{Spine}) \cdot [\text{D75\_PP2A}] \cdot \text{kcat9} \tag{96}$$

Table 86: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat9	kcat9		10.0		☑

7.28 Reaction voff9

This is an irreversible reaction of one reactant forming two products.

Name D75_PP2A_unbinding

Reaction equation

$$\text{D75\_PP2A} \longrightarrow \text{D75} + \text{PP2A} \tag{97}$$

Reactant

Table 87: Properties of each reactant.

Id	Name	SBO
D75_PP2A	D75_PP2A	

Products

Table 88: Properties of each product.

Id	Name	SBO
D75	D75	
PP2A	PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{28} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_PP2A}] \cdot \mathrm{koff9} \tag{98}$$

Table 89: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff9	koff9		24.0		☑

7.29 Reaction vcat10

This is an irreversible reaction of one reactant forming two products.

Name D75_dephospho_by_PP2AP

Reaction equation

$$\mathrm{D75\_PP2AP} \longrightarrow \mathrm{D} + \mathrm{PP2AP} \tag{99}$$

Reactant

Table 90: Properties of each reactant.

Id	Name	SBO
D75_PP2AP	D75_PP2AP	

Products

Table 91: Properties of each product.

Id	Name	SBO
D	D	
PP2AP	PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{29} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_PP2AP}] \cdot \mathrm{kcat10} \tag{100}$$

Table 92: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat10	kcat10		24.0		☑

7.30 Reaction voff10

This is an irreversible reaction of one reactant forming two products.

Name D75_PP2AP_unbinding

Reaction equation

$$\mathrm{D75\_PP2AP} \longrightarrow \mathrm{D75} + \mathrm{PP2AP} \tag{101}$$

Reactant

Table 93: Properties of each reactant.

Id	Name	SBO
D75_PP2AP	D75_PP2AP	

Products

Table 94: Properties of each product.

Id	Name	SBO
D75	D75	
PP2AP	PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{30} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_PP2AP}] \cdot \mathrm{koff10} \tag{102}$$

Table 95: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff10	koff10		40.0		☑

7.31 Reaction von11

This is an irreversible reaction of two reactants forming one product.

Name D137_CDK5_binding

Reaction equation

$$\mathrm{D137} + \mathrm{CDK5} \longrightarrow \mathrm{D137\_CDK5} \tag{103}$$

Reactants

Table 96: Properties of each reactant.

Id	Name	SBO
D137	D137	
CDK5	CDK5	

Product

Table 97: Properties of each product.

Id	Name	SBO
D137_CDK5	D137_CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_{31} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D137}] \cdot [\mathrm{CDK5}] \cdot \mathrm{kon11} \tag{104}$$

Table 98: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon11	kon11		5600000.0		☑

7.32 Reaction von12

This is an irreversible reaction of two reactants forming one product.

Name D137_PKA_binding

Reaction equation

$$\mathrm{D137} + \mathrm{PKA} \longrightarrow \mathrm{D137\_PKA} \tag{105}$$

Reactants

Table 99: Properties of each reactant.

Id	Name	SBO
D137	D137	
PKA	PKA	

Product

Table 100: Properties of each product.

Id	Name	SBO
D137_PKA	D137_PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{32} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D137}] \cdot [\mathrm{PKA}] \cdot \mathrm{kon12} \tag{106}$$

Table 101: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon12	kon12		5600000.0		☑

7.33 Reaction von13

This is an irreversible reaction of two reactants forming one product.

Name D137_PP2C_binding

Reaction equation

$$\mathrm{D137} + \mathrm{PP2C} \longrightarrow \mathrm{D137\_PP2C} \tag{107}$$

Reactants

Table 102: Properties of each reactant.

Id	Name	SBO
D137	D137	
PP2C	PP2C	

Product

Table 103: Properties of each product.

Id	Name	SBO
D137_PP2C	D137_PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{33} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D137}] \cdot [\mathrm{PP2C}] \cdot \mathrm{kon13} \tag{108}$$

Table 104: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon13	kon13		7500000.0		☑

7.34 Reaction voff11

This is an irreversible reaction of one reactant forming two products.

Name D137_CDK5_unbinding

Reaction equation

$$\text{D137\_CDK5} \longrightarrow \text{D137} + \text{CDK5} \tag{109}$$

Reactant

Table 105: Properties of each reactant.

Id	Name	SBO
D137_CDK5	D137_CDK5	

Products

Table 106: Properties of each product.

Id	Name	SBO
D137	D137	
CDK5	CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_{34} = \text{vol}\,(\text{Spine}) \cdot [\text{D137\_CDK5}] \cdot \text{koff11} \tag{110}$$

Table 107: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff11	koff11		12.0		☑

7.35 Reaction vcat11

This is an irreversible reaction of one reactant forming two products.

Name D137_Phospho_by_CDK5_on_75

Reaction equation

$$\text{D137\_CDK5} \longrightarrow \text{D75\_137} + \text{CDK5} \tag{111}$$

Reactant

Table 108: Properties of each reactant.

Id	Name	SBO
D137_CDK5	D137_CDK5	

Products

Table 109: Properties of each product.

Id	Name	SBO
D75_137	D75:137	
CDK5	CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_{35} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D137\_CDK5}] \cdot \mathrm{kcat11} \tag{112}$$

Table 110: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat11	kcat11		3.0		☑

7.36 Reaction voff12

This is an irreversible reaction of one reactant forming two products.

Name D137_PKA_unbinding

Reaction equation

$$\mathrm{D137\_PKA} \longrightarrow \mathrm{D137} + \mathrm{PKA} \tag{113}$$

Reactant

Table 111: Properties of each reactant.

Id	Name	SBO
D137_PKA	D137_PKA	

Products

Table 112: Properties of each product.

Id	Name	SBO
D137	D137	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{36} = \mathrm{vol}(\mathrm{Spine}) \cdot [\mathrm{D137\_PKA}] \cdot \mathrm{koff12} \tag{114}$$

Table 113: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff12	koff12		10.8		☑

7.37 Reaction vcat12

This is an irreversible reaction of one reactant forming two products.

Name D137_phospho_by_PKA_on_34

Reaction equation

$$\mathrm{D137\_PKA} \longrightarrow \mathrm{D34\_137} + \mathrm{PKA} \tag{115}$$

Reactant

Table 114: Properties of each reactant.

Id	Name	SBO
D137_PKA	D137_PKA	

Products

Table 115: Properties of each product.

Id	Name	SBO
D34_137	D34:137	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{37} = \mathrm{vol}(\mathrm{Spine}) \cdot [\mathrm{D137\_PKA}] \cdot \mathrm{kcat12} \tag{116}$$

Table 116: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat12	kcat12		2.7		☑

7.38 Reaction vcat13

This is an irreversible reaction of one reactant forming two products.

Name D137_dephospho_by_PP2C

Reaction equation

$$\mathrm{D137\_PP2C} \longrightarrow \mathrm{D} + \mathrm{PP2C} \tag{117}$$

Reactant

Table 117: Properties of each reactant.

Id	Name	SBO
D137_PP2C	D137_PP2C	

Products

Table 118: Properties of each product.

Id	Name	SBO
D	D	
PP2C	PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{38} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D137\_PP2C}] \cdot \mathrm{kcat13} \tag{118}$$

Table 119: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat13	kcat13		3.0		☑

7.39 Reaction voff13

This is an irreversible reaction of one reactant forming two products.

Name D137_PP2C_unbinding

Reaction equation

$$\mathrm{D137\_PP2C} \longrightarrow \mathrm{D137} + \mathrm{PP2C} \tag{119}$$

Reactant

Table 120: Properties of each reactant.

Id	Name	SBO
D137_PP2C	D137_PP2C	

Products

Table 121: Properties of each product.

Id	Name	SBO
D137	D137	
PP2C	PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{39} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D137\_PP2C}] \cdot \mathrm{koff13} \tag{120}$$

Table 122: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff13	koff13		12.0		☑

7.40 Reaction von14

This is an irreversible reaction of two reactants forming one product.

Name D34:75_CK1_binding

Reaction equation

$$\mathrm{D34\_75} + \mathrm{CK1} \longrightarrow \mathrm{D34\_75\_CK1} \tag{121}$$

Reactants

Table 123: Properties of each reactant.

Id	Name	SBO
D34_75	D34:75	
CK1	CK1	

Product

Table 124: Properties of each product.

Id	Name	SBO
D34_75_CK1	D34:75_CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_{40} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75}] \cdot [\mathrm{CK1}] \cdot \mathrm{kon14} \tag{122}$$

Table 125: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon14	kon14		4400000.0		☑

7.41 Reaction von18

This is an irreversible reaction of two reactants forming one product.

Name D34:137_CDK5_binding

Reaction equation

$$\text{D34\_137} + \text{CDK5} \longrightarrow \text{D34\_137\_CDK5} \tag{123}$$

Reactants

Table 126: Properties of each reactant.

Id	Name	SBO
D34_137	D34:137	
CDK5	CDK5	

Product

Table 127: Properties of each product.

Id	Name	SBO
D34_137_CDK5	D34:137_CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_{41} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_137}] \cdot [\text{CDK5}] \cdot \text{kon18} \tag{124}$$

Table 128: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon18	kon18		5600000.0		☑

7.42 Reaction voff18

This is an irreversible reaction of one reactant forming two products.

Name D34:137_CDK5_unbinding

Reaction equation

$$\text{D34\_137\_CDK5} \longrightarrow \text{D34\_137} + \text{CDK5} \tag{125}$$

Reactant

Table 129: Properties of each reactant.

Id	Name	SBO
D34_137_CDK5	D34:137_CDK5	

Products

Table 130: Properties of each product.

Id	Name	SBO
D34_137	D34:137	
CDK5	CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_{42} = \text{vol}(\text{Spine}) \cdot [\text{D34\_137\_CDK5}] \cdot \text{koff18} \tag{126}$$

Table 131: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff18	koff18		12.0		☑

7.43 Reaction voff14

This is an irreversible reaction of one reactant forming two products.

Name D34:75_CK1_unbinding

Reaction equation

$$\text{D34\_75\_CK1} \longrightarrow \text{D34\_75} + \text{CK1} \tag{127}$$

Reactant

Table 132: Properties of each reactant.

Id	Name	SBO
D34_75_CK1	D34:75_CK1	

Products

Table 133: Properties of each product.

Id	Name	SBO
D34_75 CK1	D34:75 CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_{43} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_CK1}] \cdot \mathrm{koff14} \tag{128}$$

Table 134: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff14	koff14		12.0		☑

7.44 Reaction vcat14

This is an irreversible reaction of one reactant forming two products.

Name D34:75_phospho_by_CK1_on_137

Reaction equation

$$\mathrm{D34\_75\_CK1} \longrightarrow \mathrm{D34\_75\_137} + \mathrm{CK1} \tag{129}$$

Reactant

Table 135: Properties of each reactant.

Id	Name	SBO
D34_75_CK1	D34:75_CK1	

Products

Table 136: Properties of each product.

Id	Name	SBO
D34_75_137	D34:75:137	
CK1	CK1	

Kinetic Law

Derived unit contains undeclared units

$$v_{44} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_CK1}] \cdot \mathrm{kcat14} \tag{130}$$

Table 137: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat14	kcat14		3.0		☑

7.45 Reaction vcat18

This is an irreversible reaction of one reactant forming two products.

Name D34:137_phospho_by_CDK5_on_75

Reaction equation

$$\mathrm{D34\_137\_CDK5} \longrightarrow \mathrm{D34\_75\_137} + \mathrm{CDK5} \tag{131}$$

Reactant

Table 138: Properties of each reactant.

Id	Name	SBO
D34_137_CDK5	D34:137_CDK5	

Products

Table 139: Properties of each product.

Id	Name	SBO
D34_75_137	D34:75:137	
CDK5	CDK5	

Kinetic Law

Derived unit contains undeclared units

$$v_{45} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_137\_CDK5}] \cdot \mathrm{kcat18} \tag{132}$$

Table 140: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat18	kcat18		3.0		☑

7.46 Reaction von21

This is an irreversible reaction of two reactants forming one product.

Name D75:137_PKA_binding

Reaction equation

$$\mathrm{D75\_137} + \mathrm{PKA} \longrightarrow \mathrm{D75\_137\_PKA} \tag{133}$$

Reactants

Table 141: Properties of each reactant.

Id	Name	SBO
D75_137	D75:137	
PKA	PKA	

Product

Table 142: Properties of each product.

Id	Name	SBO
D75_137_PKA	D75:137_PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{46} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_137}] \cdot [\mathrm{PKA}] \cdot \mathrm{kon21} \tag{134}$$

Table 143: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon21	kon21		5600000.0		☑

7.47 Reaction vcat21

This is an irreversible reaction of one reactant forming two products.

Name D75:137_phospho_by_PKA_on_34

Reaction equation

$$\mathrm{D75\_137\_PKA} \longrightarrow \mathrm{D34\_75\_137} + \mathrm{PKA} \tag{135}$$

Reactant

Table 144: Properties of each reactant.

Id	Name	SBO
D75_137_PKA	D75:137_PKA	

Products

Table 145: Properties of each product.

Id	Name	SBO
D34_75_137	D34:75:137	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{47} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_137\_PKA}] \cdot \mathrm{kcat21} \tag{136}$$

Table 146: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat21	kcat21		0.0		☑

7.48 Reaction voff21

This is an irreversible reaction of one reactant forming two products.

Name D75:137_PKA_unbinding

Reaction equation

$$\text{D75\_137\_PKA} \longrightarrow \text{D75\_137} + \text{PKA} \tag{137}$$

Reactant

Table 147: Properties of each reactant.

Id	Name	SBO
D75_137_PKA	D75:137_PKA	

Products

Table 148: Properties of each product.

Id	Name	SBO
D75_137	D75:137	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{48} = \text{vol}(\text{Spine}) \cdot [\text{D75\_137\_PKA}] \cdot \text{koff21} \tag{138}$$

Table 149: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff21	koff21		10.8		☑

7.49 Reaction von17

This is an irreversible reaction of two reactants forming one product.

Name D34:75_PP2B_binding

Reaction equation

$$\text{D34\_75} + \text{PP2B} \longrightarrow \text{D34\_75\_PP2B} \tag{139}$$

Reactants

Table 150: Properties of each reactant.

Id	Name	SBO
D34_75	D34:75	
PP2B	PP2B	

Product

Table 151: Properties of each product.

Id	Name	SBO
D34_75_PP2B	D34:75_PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{49} = \text{vol}(\text{Spine}) \cdot [\text{D34\_75}] \cdot [\text{PP2B}] \cdot \text{kon17} \tag{140}$$

Table 152: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon17	kon17		10^7		☑

7.50 Reaction voff17

This is an irreversible reaction of one reactant forming two products.

Name D34:75_PP2B_unbinding

Reaction equation

$$\text{D34\_75\_PP2B} \longrightarrow \text{D34\_75} + \text{PP2B} \tag{141}$$

Reactant

Table 153: Properties of each reactant.

Id	Name	SBO
D34_75_PP2B	D34:75_PP2B	

Products

Table 154: Properties of each product.

Id	Name	SBO
D34_75	D34:75	
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{50} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_75\_PP2B}] \cdot \text{koff17} \tag{142}$$

Table 155: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff17	koff17		1600.0		☑

7.51 Reaction vcat17

This is an irreversible reaction of one reactant forming two products.

Name D34:75_dephopsho_by_PP2B_on_34

Reaction equation

$$\text{D34\_75\_PP2B} \longrightarrow \text{D75} + \text{PP2B} \tag{143}$$

Reactant

Table 156: Properties of each reactant.

Id	Name	SBO
D34_75_PP2B	D34:75_PP2B	

Products

Table 157: Properties of each product.

Id	Name	SBO
D75	D75	
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{51} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_PP2B}] \cdot \mathrm{kcat17} \tag{144}$$

Table 158: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat17	kcat17		4.0		☑

7.52 Reaction von19

This is an irreversible reaction of two reactants forming one product.

Name D34:137_PP2B_binding

Reaction equation

$$\mathrm{D34\_137} + \mathrm{PP2B} \longrightarrow \mathrm{D34\_137\_PP2B} \tag{145}$$

Reactants

Table 159: Properties of each reactant.

Id	Name	SBO
D34_137	D34:137	
PP2B	PP2B	

Product

Table 160: Properties of each product.

Id	Name	SBO
D34_137_PP2B	D34:137_PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{52} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_137}] \cdot [\mathrm{PP2B}] \cdot \mathrm{kon19} \tag{146}$$

Table 161: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon19	kon19		75000.0		☑

7.53 Reaction vcat19

This is an irreversible reaction of one reactant forming two products.

Name D34:137_dephospho_by_PP2B_on_34

Reaction equation

$$\mathrm{D34\_137\_PP2B} \longrightarrow \mathrm{D137} + \mathrm{PP2B} \tag{147}$$

Reactant

Table 162: Properties of each reactant.

Id	Name	SBO
D34_137_PP2B	D34:137_PP2B	

Products

Table 163: Properties of each product.

Id	Name	SBO
D137	D137	

Id	Name	SBO
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{53} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_137\_PP2B}] \cdot \mathrm{kcat19} \tag{148}$$

Table 164: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat19	kcat19		0.03		☑

7.54 Reaction voff19

This is an irreversible reaction of one reactant forming two products.

Name D34:137_PP2B_unbinding

Reaction equation

$$\mathrm{D34\_137\_PP2B} \longrightarrow \mathrm{D34\_137} + \mathrm{PP2B} \tag{149}$$

Reactant

Table 165: Properties of each reactant.

Id	Name	SBO
D34_137_PP2B	D34:137_PP2B	

Products

Table 166: Properties of each product.

Id	Name	SBO
D34_137	D34:137	
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{54} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_137\_PP2B}] \cdot \mathrm{koff19} \tag{150}$$

Table 167: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff19	koff19		0.12		☑

7.55 Reaction von27

This is an irreversible reaction of two reactants forming one product.

Name D34:75:137_PP2B_binding

Reaction equation

$$\mathrm{D34\_75\_137} + \mathrm{PP2B} \longrightarrow \mathrm{D34\_75\_137\_PP2B} \tag{151}$$

Reactants

Table 168: Properties of each reactant.

Id	Name	SBO
D34_75_137	D34:75:137	
PP2B	PP2B	

Product

Table 169: Properties of each product.

Id	Name	SBO
D34_75_137_PP2B	D34:75:137_PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{55} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_137}] \cdot [\mathrm{PP2B}] \cdot \mathrm{kon27} \tag{152}$$

Table 170: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon27	kon27		75000.0		☑

7.56 Reaction voff27

This is an irreversible reaction of one reactant forming two products.

Name D34:75:137_PP2B_unbinding

Reaction equation

$$\text{D34\_75\_137\_PP2B} \longrightarrow \text{D34\_75\_137} + \text{PP2B} \tag{153}$$

Reactant

Table 171: Properties of each reactant.

Id	Name	SBO
D34_75_137_PP2B	D34:75:137_PP2B	

Products

Table 172: Properties of each product.

Id	Name	SBO
D34_75_137	D34:75:137	
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{56} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_75\_137\_PP2B}] \cdot \text{koff27} \tag{154}$$

Table 173: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff27	koff27		120.0		☑

7.57 Reaction vcat27

This is an irreversible reaction of one reactant forming two products.

Name D34:75:137_dephospho_by_PP2B_on_34

Reaction equation

$$\text{D34\_75\_137\_PP2B} \longrightarrow \text{D75\_137} + \text{PP2B} \tag{155}$$

Reactant

Table 174: Properties of each reactant.

Id	Name	SBO
D34_75_137_PP2B	D34:75:137_PP2B	

Products

Table 175: Properties of each product.

Id	Name	SBO
D75_137	D75:137	
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{57} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_75\_137\_PP2B}] \cdot \text{kcat27} \tag{156}$$

Table 176: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat27	kcat27		0.03		☑

7.58 Reaction von15

This is an irreversible reaction of two reactants forming one product.

Name D34:75_PP2A_binding

Reaction equation

$$\text{D34\_75} + \text{PP2A} \longrightarrow \text{D34\_75\_PP2A} \tag{157}$$

Reactants

Table 177: Properties of each reactant.

Id	Name	SBO
D34_75	D34:75	
PP2A	PP2A	

Product

Table 178: Properties of each product.

Id	Name	SBO
D34_75_PP2A	D34:75_PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{58} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_75}] \cdot [\text{PP2A}] \cdot \text{kon15} \tag{158}$$

Table 179: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon15	kon15		3800000.0		☑

7.59 Reaction vcat15

This is an irreversible reaction of one reactant forming two products.

Name D34:75_dephospho_by_PP2A_on_75

Reaction equation

$$\text{D34\_75\_PP2A} \longrightarrow \text{D34} + \text{PP2A} \tag{159}$$

Reactant

Table 180: Properties of each reactant.

Id	Name	SBO
D34_75_PP2A	D34:75_PP2A	

Products

Table 181: Properties of each product.

Id	Name	SBO
D34	D34	
PP2A	PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{59} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_PP2A}] \cdot \mathrm{kcat15} \tag{160}$$

Table 182: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat15	kcat15		10.0		☑

7.60 Reaction voff15

This is an irreversible reaction of one reactant forming two products.

Name D34:75_PP2A_unbinding

Reaction equation

$$\mathrm{D34\_75\_PP2A} \longrightarrow \mathrm{D34\_75} + \mathrm{PP2A} \tag{161}$$

Reactant

Table 183: Properties of each reactant.

Id	Name	SBO
D34_75_PP2A	D34:75_PP2A	

Products

Table 184: Properties of each product.

Id	Name	SBO
D34_75	D34:75	
PP2A	PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{60} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_PP2A}] \cdot \mathrm{koff15} \tag{162}$$

Table 185: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff15	koff15		24.0		☑

7.61 Reaction von22

This is an irreversible reaction of two reactants forming one product.

Name D75:137_PP2A_binding

Reaction equation

$$\mathrm{D75\_137} + \mathrm{PP2A} \longrightarrow \mathrm{D75\_137\_PP2A} \tag{163}$$

Reactants

Table 186: Properties of each reactant.

Id	Name	SBO
D75_137	D75:137	
PP2A	PP2A	

Product

Table 187: Properties of each product.

Id	Name	SBO
D75_137_PP2A	D75:137_PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{61} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_137}] \cdot [\mathrm{PP2A}] \cdot \mathrm{kon22} \tag{164}$$

Table 188: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon22	kon22		3800000.0		☑

7.62 Reaction vcat22

This is an irreversible reaction of one reactant forming two products.

Name D75:137_dephospho_by_PP2A_on_75

Reaction equation

$$\mathrm{D75\_137\_PP2A} \longrightarrow \mathrm{D137} + \mathrm{PP2A} \tag{165}$$

Reactant

Table 189: Properties of each reactant.

Id	Name	SBO
D75_137_PP2A	D75:137_PP2A	

Products

Table 190: Properties of each product.

Id	Name	SBO
D137	D137	
PP2A	PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{62} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_137\_PP2A}] \cdot \mathrm{kcat22} \tag{166}$$

Table 191: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat22	kcat22		10.0		☑

7.63 Reaction voff22

This is an irreversible reaction of one reactant forming two products.

Name D75:137_PP2A_unbinding

Reaction equation

$$\mathrm{D75\_137\_PP2A} \longrightarrow \mathrm{D75\_137} + \mathrm{PP2A} \tag{167}$$

Reactant

Table 192: Properties of each reactant.

Id	Name	SBO
D75_137_PP2A	D75:137_PP2A	

Products

Table 193: Properties of each product.

Id	Name	SBO
D75_137	D75:137	
PP2A	PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{63} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_137\_PP2A}] \cdot \mathrm{koff22} \tag{168}$$

Table 194: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff22	koff22		24.0		☑

7.64 Reaction von25

This is an irreversible reaction of two reactants forming one product.

Name D34:75:137_PP2A_binding

Reaction equation

$$\text{D34\_75\_137} + \text{PP2A} \longrightarrow \text{D34\_75\_134\_PP2A} \tag{169}$$

Reactants

Table 195: Properties of each reactant.

Id	Name	SBO
D34_75_137	D34:75:137	
PP2A	PP2A	

Product

Table 196: Properties of each product.

Id	Name	SBO
D34_75_134_PP2A	D34:75:137_PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{64} = \text{vol}(\text{Spine}) \cdot [\text{D34\_75\_137}] \cdot [\text{PP2A}] \cdot \text{kon25} \tag{170}$$

Table 197: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon25	kon25		3800000.0		☑

7.65 Reaction vcat25

This is an irreversible reaction of one reactant forming two products.

Name D34:75:137_dephospho_by_PP2A_on_75

Reaction equation

$$\text{D34\_75\_134\_PP2A} \longrightarrow \text{D34\_137} + \text{PP2A} \tag{171}$$

Reactant

Table 198: Properties of each reactant.

Id	Name	SBO
D34_75_134_PP2A	D34:75:137_PP2A	

Products

Table 199: Properties of each product.

Id	Name	SBO
D34_137	D34:137	
PP2A	PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{65} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_75\_134\_PP2A}] \cdot \text{kcat25} \tag{172}$$

Table 200: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat25	kcat25		10.0		☑

7.66 Reaction voff25

This is an irreversible reaction of one reactant forming two products.

Name D34:75:137_PP2A_unbinding

Reaction equation

$$\text{D34\_75\_134\_PP2A} \longrightarrow \text{D34\_75\_137} + \text{PP2A} \tag{173}$$

Reactant

Table 201: Properties of each reactant.

Id	Name	SBO
D34_75_134_PP2A	D34:75:137_PP2A	

Products

Table 202: Properties of each product.

Id	Name	SBO
D34_75_137	D34:75:137	
PP2A	PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{66} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_75\_134\_PP2A}] \cdot \text{koff25} \tag{174}$$

Table 203: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff25	koff25		24.0		☑

7.67 Reaction von16

This is an irreversible reaction of two reactants forming one product.

Name D34:75_PP2AP_binding

Reaction equation

$$\text{D34\_75} + \text{PP2AP} \longrightarrow \text{D34\_75\_PP2AP} \tag{175}$$

Reactants

Table 204: Properties of each reactant.

Id	Name	SBO
D34_75	D34:75	
PP2AP	PP2AP	

Product

Table 205: Properties of each product.

Id	Name	SBO
D34_75_PP2AP	D34:75_PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{67} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_75}] \cdot [\text{PP2AP}] \cdot \text{kon16} \tag{176}$$

Table 206: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon16	kon16		$1.7 \cdot 10^7$		☑

7.68 Reaction vcat16

This is an irreversible reaction of one reactant forming two products.

Name D34:75_dephospho_by_PP2AP_on_75

Reaction equation

$$\text{D34\_75\_PP2AP} \longrightarrow \text{D34} + \text{PP2AP} \tag{177}$$

Reactant

Table 207: Properties of each reactant.

Id	Name	SBO
D34_75_PP2AP	D34:75_PP2AP	

Products

Table 208: Properties of each product.

Id	Name	SBO
D34	D34	
PP2AP	PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{68} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_PP2AP}] \cdot \mathrm{kcat16} \tag{178}$$

Table 209: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat16	kcat16		24.0		☑

7.69 Reaction voff16

This is an irreversible reaction of one reactant forming two products.

Name D34:75_PP2AP_unbinding

Reaction equation

$$\mathrm{D34\_75\_PP2AP} \longrightarrow \mathrm{D34\_75} + \mathrm{PP2AP} \tag{179}$$

Reactant

Table 210: Properties of each reactant.

Id	Name	SBO
D34_75_PP2AP	D34:75_PP2AP	

Products

Table 211: Properties of each product.

Id	Name	SBO
D34_75	D34:75	
PP2AP	PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{69} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_PP2AP}] \cdot \mathrm{koff16} \tag{180}$$

Table 212: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff16	koff16		40.0		☑

7.70 Reaction von23

This is an irreversible reaction of two reactants forming one product.

Name D75:137_PP2AP_binding

Reaction equation

$$\mathrm{D75\_137} + \mathrm{PP2AP} \longrightarrow \mathrm{D75\_137\_PP2AP} \tag{181}$$

Reactants

Table 213: Properties of each reactant.

Id	Name	SBO
D75_137	D75:137	
PP2AP	PP2AP	

Product

Table 214: Properties of each product.

Id	Name	SBO
D75_137_PP2AP	D75:137_PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{70} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_137}] \cdot [\mathrm{PP2AP}] \cdot \mathrm{kon23} \tag{182}$$

Table 215: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon23	kon23		$1.7 \cdot 10^7$		☑

7.71 Reaction vcat23

This is an irreversible reaction of one reactant forming two products.

Name D75:137_dephospho_by_PP2AP_on_75

Reaction equation

$$\mathrm{D75\_137\_PP2AP} \longrightarrow \mathrm{D137} + \mathrm{PP2AP} \tag{183}$$

Reactant

Table 216: Properties of each reactant.

Id	Name	SBO
D75_137_PP2AP	D75:137_PP2AP	

Products

Table 217: Properties of each product.

Id	Name	SBO
D137	D137	
PP2AP	PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{71} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_137\_PP2AP}] \cdot \mathrm{kcat23} \tag{184}$$

Table 218: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat23	kcat23		24.0		☑

7.72 Reaction voff23

This is an irreversible reaction of one reactant forming two products.

Name D75:137_PP2AP_unbinding

Reaction equation

$$\text{D75\_137\_PP2AP} \longrightarrow \text{D75\_137} + \text{PP2AP} \tag{185}$$

Reactant

Table 219: Properties of each reactant.

Id	Name	SBO
D75_137_PP2AP	D75:137_PP2AP	

Products

Table 220: Properties of each product.

Id	Name	SBO
D75_137	D75:137	
PP2AP	PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{72} = \text{vol}\,(\text{Spine}) \cdot [\text{D75\_137\_PP2AP}] \cdot \text{koff23} \tag{186}$$

Table 221: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff23	koff23		40.0		☑

7.73 Reaction vcat26

This is an irreversible reaction of one reactant forming two products.

Name D34:75:137_dephospho_by_PP2AP_on 75

Reaction equation

$$\text{D34\_75\_137\_PP2AP} \longrightarrow \text{D34\_137} + \text{PP2AP} \tag{187}$$

Reactant

Table 222: Properties of each reactant.

Id	Name	SBO
D34_75_137_PP2AP	D34:75:137_PP2AP	

Products

Table 223: Properties of each product.

Id	Name	SBO
D34_137	D34:137	
PP2AP	PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{73} = \text{vol}(\text{Spine}) \cdot [\text{D34\_75\_137\_PP2AP}] \cdot \text{kcat26} \tag{188}$$

Table 224: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat26	kcat26		24.0		☑

7.74 Reaction von26

This is an irreversible reaction of two reactants forming one product.

Name D34:75:137_PP2AP_binding

Reaction equation

$$\text{D34\_75\_137} + \text{PP2AP} \longrightarrow \text{D34\_75\_137\_PP2AP} \tag{189}$$

Reactants

Table 225: Properties of each reactant.

Id	Name	SBO
D34_75_137	D34:75:137	
PP2AP	PP2AP	

Product

Table 226: Properties of each product.

Id	Name	SBO
D34_75_137_PP2AP	D34:75:137_PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{74} = \text{vol}\,(\text{Spine}) \cdot [\text{D34\_75\_137}] \cdot [\text{PP2AP}] \cdot \text{kon26} \tag{190}$$

Table 227: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon26	kon26		$1.7 \cdot 10^7$		☑

7.75 Reaction voff26

This is an irreversible reaction of one reactant forming two products.

Name D34:75:137_PP2AP_unbinding

Reaction equation

$$\text{D34\_75\_137\_PP2AP} \longrightarrow \text{D34\_75\_137} + \text{PP2AP} \tag{191}$$

Reactant

Table 228: Properties of each reactant.

Id	Name	SBO
D34_75_137_PP2AP	D34:75:137_PP2AP	

Products

Table 229: Properties of each product.

Id	Name	SBO
D34_75_137 PP2AP	D34:75:137 PP2AP	

Kinetic Law

Derived unit contains undeclared units

$$v_{75} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_137\_PP2AP}] \cdot \mathrm{koff26} \tag{192}$$

Table 230: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff26	koff26		40.0		☑

7.76 Reaction von20

This is an irreversible reaction of two reactants forming one product.

Name D34:137_PP2C_binding

Reaction equation

$$\mathrm{D34\_137} + \mathrm{PP2C} \longrightarrow \mathrm{D34\_137\_PP2C} \tag{193}$$

Reactants

Table 231: Properties of each reactant.

Id	Name	SBO
D34_137 PP2C	D34:137 PP2C	

Product

Table 232: Properties of each product.

Id	Name	SBO
D34_137_PP2C	D34:137_PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{76} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_137}] \cdot [\mathrm{PP2C}] \cdot \mathrm{kon20} \tag{194}$$

Table 233: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon20	kon20		7500000.0		☑

7.77 Reaction vcat20

This is an irreversible reaction of one reactant forming two products.

Name D34:137_dephospho_by_PP2C_on_137

Reaction equation

$$\mathrm{D34\_137\_PP2C} \longrightarrow \mathrm{D34} + \mathrm{PP2C} \tag{195}$$

Reactant

Table 234: Properties of each reactant.

Id	Name	SBO
D34_137_PP2C	D34:137_PP2C	

Products

Table 235: Properties of each product.

Id	Name	SBO
D34	D34	

Id	Name	SBO
PP2C	PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{77} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_137\_PP2C}] \cdot \mathrm{kcat20} \tag{196}$$

Table 236: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat20	kcat20		3.0		☑

7.78 Reaction voff20

This is an irreversible reaction of one reactant forming two products.

Name D34:137_PP2C_unbinding

Reaction equation

$$\mathrm{D34\_137\_PP2C} \longrightarrow \mathrm{D34\_137} + \mathrm{PP2C} \tag{197}$$

Reactant

Table 237: Properties of each reactant.

Id	Name	SBO
D34_137_PP2C	D34:137_PP2C	

Products

Table 238: Properties of each product.

Id	Name	SBO
D34_137	D34:137	
PP2C	PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{78} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_137\_PP2C}] \cdot \mathrm{koff20} \tag{198}$$

Table 239: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff20	koff20		12.0		☑

7.79 Reaction von24

This is an irreversible reaction of two reactants forming one product.

Name D75:137_PP2C_binding

Reaction equation

$$\mathrm{D75\_137} + \mathrm{PP2C} \longrightarrow \mathrm{D75\_137\_PP2C} \tag{199}$$

Reactants

Table 240: Properties of each reactant.

Id	Name	SBO
D75_137	D75:137	
PP2C	PP2C	

Product

Table 241: Properties of each product.

Id	Name	SBO
D75_137_PP2C	D75:137_PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{79} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D75\_137}] \cdot [\mathrm{PP2C}] \cdot \mathrm{kon24} \tag{200}$$

Table 242: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon24	kon24		7500000.0		☑

7.80 Reaction vcat24

This is an irreversible reaction of one reactant forming two products.

Name D75:137_dephospho_by_PP2C_137

Reaction equation

$$\text{D75\_137\_PP2C} \longrightarrow \text{D75} + \text{PP2C} \tag{201}$$

Reactant

Table 243: Properties of each reactant.

Id	Name	SBO
D75_137_PP2C	D75:137_PP2C	

Products

Table 244: Properties of each product.

Id	Name	SBO
D75	D75	
PP2C	PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{80} = \text{vol}(\text{Spine}) \cdot [\text{D75\_137\_PP2C}] \cdot \text{kcat24} \tag{202}$$

Table 245: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat24	kcat24		3.0		☑

7.81 Reaction voff24

This is an irreversible reaction of one reactant forming two products.

Name D75:137_PP2C_unbinding

Reaction equation

$$\text{D75\_137\_PP2C} \longrightarrow \text{D75\_137} + \text{PP2C} \tag{203}$$

Reactant

Table 246: Properties of each reactant.

Id	Name	SBO
D75_137_PP2C	D75:137_PP2C	

Products

Table 247: Properties of each product.

Id	Name	SBO
D75_137	D75:137	
PP2C	PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{81} = \text{vol}(\text{Spine}) \cdot [\text{D75\_137\_PP2C}] \cdot \text{koff24} \tag{204}$$

Table 248: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff24	koff24		12.0		☑

7.82 Reaction von28

This is an irreversible reaction of two reactants forming one product.

Name D34:75:137_PP2C_binding

Reaction equation

$$\text{D34\_75\_137} + \text{PP2C} \longrightarrow \text{D34\_75\_137\_PP2C} \tag{205}$$

Reactants

Table 249: Properties of each reactant.

Id	Name	SBO
D34_75_137	D34:75:137	
PP2C	PP2C	

Product

Table 250: Properties of each product.

Id	Name	SBO
D34_75_137_PP2C	D34:75:137_PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{82} = \text{vol}(\text{Spine}) \cdot [\text{D34\_75\_137}] \cdot [\text{PP2C}] \cdot \text{kon28} \tag{206}$$

Table 251: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon28	kon28		7500000.0		☑

7.83 Reaction vcat28

This is an irreversible reaction of one reactant forming two products.

Name D34:75:137_dephospho_by_PP2C_on_137

Reaction equation

$$\text{D34\_75\_137\_PP2C} \longrightarrow \text{D34\_75} + \text{PP2C} \tag{207}$$

Reactant

Table 252: Properties of each reactant.

Id	Name	SBO
D34_75_137_PP2C	D34:75:137_PP2C	

Products

Table 253: Properties of each product.

Id	Name	SBO
D34_75	D34:75	
PP2C	PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{83} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_137\_PP2C}] \cdot \mathrm{kcat28} \tag{208}$$

Table 254: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat28	kcat28		3.0		☑

7.84 Reaction voff28

This is an irreversible reaction of one reactant forming two products.

Name D34:75:137_PP2C_unbinding

Reaction equation

$$\mathrm{D34\_75\_137\_PP2C} \longrightarrow \mathrm{D34\_75\_137} + \mathrm{PP2C} \tag{209}$$

Reactant

Table 255: Properties of each reactant.

Id	Name	SBO
D34_75_137_PP2C	D34:75:137_PP2C	

Products

Table 256: Properties of each product.

Id	Name	SBO
D34_75_137	D34:75:137	
PP2C	PP2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{84} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{D34\_75\_137\_PP2C}] \cdot \mathrm{koff28} \tag{210}$$

Table 257: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff28	koff28		12.0		☑

7.85 Reaction von29

This is an irreversible reaction of two reactants forming one product.

Name CK1P_PP2B_binding

Reaction equation

$$\mathrm{CK1P} + \mathrm{PP2B} \longrightarrow \mathrm{CK1P\_PP2B} \tag{211}$$

Reactants

Table 258: Properties of each reactant.

Id	Name	SBO
CK1P	CK1P	
PP2B	PP2B	

Product

Table 259: Properties of each product.

Id	Name	SBO
CK1P_PP2B	CK1P_PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{85} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{CK1P}] \cdot [\mathrm{PP2B}] \cdot \mathrm{kon29} \tag{212}$$

Table 260: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon29	kon29		$3 \cdot 10^7$		☑

7.86 Reaction voff29

This is an irreversible reaction of one reactant forming two products.

Name CK1P_PP2B_unbinding

Reaction equation

$$\mathrm{CK1P\_PP2B} \longrightarrow \mathrm{CK1P} + \mathrm{PP2B} \tag{213}$$

Reactant

Table 261: Properties of each reactant.

Id	Name	SBO
CK1P_PP2B	CK1P_PP2B	

Products

Table 262: Properties of each product.

Id	Name	SBO
CK1P	CK1P	
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{86} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{CK1P\_PP2B}] \cdot \mathrm{koff29} \tag{214}$$

Table 263: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff29	koff29		24.0		☑

7.87 Reaction vcat29

This is an irreversible reaction of one reactant forming two products.

Name CK1P_dephospho_by_PP2B

Reaction equation

$$\mathrm{CK1P\_PP2B} \longrightarrow \mathrm{CK1} + \mathrm{PP2B} \tag{215}$$

Reactant

Table 264: Properties of each reactant.

Id	Name	SBO
CK1P_PP2B	CK1P_PP2B	

Products

Table 265: Properties of each product.

Id	Name	SBO
CK1	CK1	
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{87} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{CK1P\_PP2B}] \cdot \mathrm{kcat29} \tag{216}$$

Table 266: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat29	kcat29		6.0		☑

7.88 Reaction vcat30

This is an irreversible reaction of one reactant forming one product.

Name CK1_phosphorylation

Reaction equation

$$\mathrm{CK1} \longrightarrow \mathrm{CK1P} \tag{217}$$

Reactant

Table 267: Properties of each reactant.

Id	Name	SBO
CK1	CK1	

Product

Table 268: Properties of each product.

Id	Name	SBO
CK1P	CK1P	

Kinetic Law

Derived unit contains undeclared units

$$v_{88} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{CK1}] \cdot \mathrm{kcat30} \tag{218}$$

Table 269: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat30	kcat30		1.0		☑

7.89 Reaction von31

This is an irreversible reaction of two reactants forming one product.

Name PDE_PKA_binding

Reaction equation

$$\mathrm{PDE} + \mathrm{PKA} \longrightarrow \mathrm{PDE\_PKA} \tag{219}$$

Reactants

Table 270: Properties of each reactant.

Id	Name	SBO
PDE	PDE	
PKA	PKA	

Product

Table 271: Properties of each product.

Id	Name	SBO
PDE_PKA	PDE_PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{89} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{PDE}] \cdot [\mathrm{PKA}] \cdot \mathrm{kon31} \tag{220}$$

Table 272: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon31	kon31		6000000.0		☑

7.90 Reaction vcat31

This is an irreversible reaction of one reactant forming two products.

Name PDE_phospho_by_PKA

Reaction equation

$$\text{PDE\_PKA} \longrightarrow \text{PDEP} + \text{PKA} \tag{221}$$

Reactant

Table 273: Properties of each reactant.

Id	Name	SBO
PDE_PKA	PDE_PKA	

Products

Table 274: Properties of each product.

Id	Name	SBO
PDEP	PDEP	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{90} = \text{vol}\,(\text{Spine}) \cdot [\text{PDE\_PKA}] \cdot \text{kcat31} \tag{222}$$

Table 275: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat31	kcat31		9.0		☑

7.91 Reaction voff31

This is an irreversible reaction of one reactant forming two products.

Name PDE_PKA_unbinding

Reaction equation

$$\text{PDE\_PKA} \longrightarrow \text{PDE} + \text{PKA} \tag{223}$$

Reactant

Table 276: Properties of each reactant.

Id	Name	SBO
PDE_PKA	PDE_PKA	

Products

Table 277: Properties of each product.

Id	Name	SBO
PDE	PDE	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{91} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{PDE\_PKA}] \cdot \mathrm{koff31} \tag{224}$$

Table 278: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff31	koff31		36.0		☑

7.92 Reaction vcat32

This is an irreversible reaction of one reactant forming one product.

Name PDEP_dephospho

Reaction equation

$$\mathrm{PDEP} \longrightarrow \mathrm{PDE} \tag{225}$$

Reactant

Table 279: Properties of each reactant.

Id	Name	SBO
PDEP	PDEP	

Product

Table 280: Properties of each product.

Id	Name	SBO
PDE	PDE	

Kinetic Law

Derived unit contains undeclared units

$$v_{92} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{PDEP}] \cdot \mathrm{kcat32} \tag{226}$$

Table 281: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat32	kcat32		0.1		☑

7.93 Reaction von33

This is an irreversible reaction of two reactants forming one product.

Name PP2A_PKA_binding

Reaction equation

$$\mathrm{PP2A} + \mathrm{PKA} \longrightarrow \mathrm{PP2A\_PKA} \tag{227}$$

Reactants

Table 282: Properties of each reactant.

Id	Name	SBO
PP2A	PP2A	
PKA	PKA	

Product

Table 283: Properties of each product.

Id	Name	SBO
PP2A_PKA	PP2A_PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{93} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{PP2A}] \cdot [\mathrm{PKA}] \cdot \mathrm{kon33} \tag{228}$$

Table 284: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon33	kon33		10^7		☑

7.94 Reaction voff33

This is an irreversible reaction of one reactant forming two products.

Name PP2A_PKA_unbinding

Reaction equation

$$\mathrm{PP2A\_PKA} \longrightarrow \mathrm{PP2A} + \mathrm{PKA} \tag{229}$$

Reactant

Table 285: Properties of each reactant.

Id	Name	SBO
PP2A_PKA	PP2A_PKA	

Products

Table 286: Properties of each product.

Id	Name	SBO
PP2A	PP2A	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{94} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{PP2A\_PKA}] \cdot \mathrm{koff33} \tag{230}$$

Table 287: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff33	koff33		16.0		☑

7.95 Reaction vcat33

This is an irreversible reaction of one reactant forming two products.

Name PP2A_phospho_by_PKA

Reaction equation

$$\mathrm{PP2A\_PKA} \longrightarrow \mathrm{PP2AP} + \mathrm{PKA} \tag{231}$$

Reactant

Table 288: Properties of each reactant.

Id	Name	SBO
PP2A_PKA	PP2A_PKA	

Products

Table 289: Properties of each product.

Id	Name	SBO
PP2AP	PP2AP	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{95} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{PP2A\_PKA}] \cdot \mathrm{kcat33} \tag{232}$$

Table 290: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat33	kcat33		4.0		☑

7.96 Reaction vcat34

This is an irreversible reaction of one reactant forming one product.

Name PP2AP_dephospho

Reaction equation

$$\text{PP2AP} \longrightarrow \text{PP2A} \tag{233}$$

Reactant

Table 291: Properties of each reactant.

Id	Name	SBO
PP2AP	PP2AP	

Product

Table 292: Properties of each product.

Id	Name	SBO
PP2A	PP2A	

Kinetic Law

Derived unit contains undeclared units

$$v_{96} = \text{vol}\,(\text{Spine}) \cdot [\text{PP2AP}] \cdot \text{kcat34} \tag{234}$$

Table 293: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat34	kcat34		5.0		☑

7.97 Reaction von35

This is an irreversible reaction of two reactants forming one product.

Name PP2Binactive_Ca_binding

Reaction equation

$$\text{PP2Binactive} + 2\,\text{Ca} \longrightarrow \text{PP2BinactiveCa2} \tag{235}$$

Reactants

Table 294: Properties of each reactant.

Id	Name	SBO
PP2Binactive	PP2Binactive	
Ca	Ca	

Product

Table 295: Properties of each product.

Id	Name	SBO
PP2BinactiveCa2	PP2BinactiveCa2	

Kinetic Law

Derived unit contains undeclared units

$$v_{97} = \text{vol}\,(\text{Spine}) \cdot [\text{PP2Binactive}] \cdot [\text{Ca}] \cdot [\text{Ca}] \cdot \text{kon35} \tag{236}$$

Table 296: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon35	kon35		10^{15}		☑

7.98 Reaction von36

This is an irreversible reaction of two reactants forming one product.

Name PP2B_activation

Reaction equation

$$\text{PP2BinactiveCa2} + 2\,\text{Ca} \longrightarrow \text{PP2B} \tag{237}$$

Reactants

Table 297: Properties of each reactant.

Id	Name	SBO
PP2BinactiveCa2	PP2BinactiveCa2	
Ca	Ca	

Product

Table 298: Properties of each product.

Id	Name	SBO
PP2B	PP2B	

Kinetic Law

Derived unit contains undeclared units

$$v_{98} = \text{vol}\,(\text{Spine}) \cdot [\text{PP2BinactiveCa2}] \cdot [\text{Ca}] \cdot [\text{Ca}] \cdot \text{kon36} \tag{238}$$

Table 299: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon36	kon36		$3 \cdot 10^{15}$		☑

7.99 Reaction voff35

This is an irreversible reaction of one reactant forming two products.

Name PP2BinactiveCa2_Ca_unbinding

Reaction equation

$$\text{PP2BinactiveCa2} \longrightarrow \text{PP2Binactive} + 2\,\text{Ca} \tag{239}$$

Reactant

Table 300: Properties of each reactant.

Id	Name	SBO
PP2BinactiveCa2	PP2BinactiveCa2	

Products

Table 301: Properties of each product.

Id	Name	SBO
PP2Binactive Ca	PP2Binactive Ca	

Kinetic Law

Derived unit contains undeclared units

$$v_{99} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{PP2BinactiveCa2}] \cdot \mathrm{koff35} \tag{240}$$

Table 302: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff35	koff35		1.0		☑

7.100 Reaction voff36

This is an irreversible reaction of one reactant forming two products.

Name PP2B_inactivation

Reaction equation

$$\mathrm{PP2B} \longrightarrow \mathrm{PP2BinactiveCa2} + 2\,\mathrm{Ca} \tag{241}$$

Reactant

Table 303: Properties of each reactant.

Id	Name	SBO
PP2B	PP2B	

Products

Table 304: Properties of each product.

Id	Name	SBO
PP2BinactiveCa2 Ca	PP2BinactiveCa2 Ca	

Kinetic Law

Derived unit contains undeclared units

$$v_{100} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{PP2B}] \cdot \mathrm{koff36} \tag{242}$$

Table 305: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff36	koff36		1.0		☑

7.101 Reaction von37

This is an irreversible reaction of two reactants forming one product.

Name R2C2_cAMP_binding

Reaction equation

$$\mathrm{R2C2} + \mathrm{cAMP} \longrightarrow \mathrm{cAMP\_R2C2} \tag{243}$$

Reactants

Table 306: Properties of each reactant.

Id	Name	SBO
R2C2	R2C2	
cAMP	cAMP	

Product

Table 307: Properties of each product.

Id	Name	SBO
cAMP_R2C2	cAMP_R2C2	

Kinetic Law

Derived unit contains undeclared units

$$v_{101} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{R2C2}] \cdot [\mathrm{cAMP}] \cdot \mathrm{kon37} \tag{244}$$

Table 308: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon37	kon37		$5.4 \cdot 10^7$		☑

7.102 Reaction von38

This is an irreversible reaction of two reactants forming one product.

Name cAMP_R2C2_binding_by_cAMP

Reaction equation

$$\mathrm{cAMP\_R2C2} + \mathrm{cAMP} \longrightarrow \mathrm{cAMP2\_R2C2} \tag{245}$$

Reactants

Table 309: Properties of each reactant.

Id	Name	SBO
cAMP_R2C2	cAMP_R2C2	
cAMP	cAMP	

Product

Table 310: Properties of each product.

Id	Name	SBO
cAMP2_R2C2	cAMP2_R2C2	

Kinetic Law

Derived unit contains undeclared units

$$v_{102} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP\_R2C2}] \cdot [\mathrm{cAMP}] \cdot \mathrm{kon38} \tag{246}$$

Table 311: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon38	kon38		$5.4 \cdot 10^7$		☑

7.103 Reaction von39

This is an irreversible reaction of two reactants forming one product.

Name cAMP2_R2C2_binding_by_cAMP

Reaction equation

$$\mathrm{cAMP2\_R2C2} + \mathrm{cAMP} \longrightarrow \mathrm{cAMP3\_R2C2} \tag{247}$$

Reactants

Table 312: Properties of each reactant.

Id	Name	SBO
cAMP2_R2C2	cAMP2_R2C2	
cAMP	cAMP	

Product

Table 313: Properties of each product.

Id	Name	SBO
cAMP3_R2C2	cAMP3_R2C2	

Kinetic Law

Derived unit contains undeclared units

$$v_{103} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP2\_R2C2}] \cdot [\mathrm{cAMP}] \cdot \mathrm{kon39} \tag{248}$$

Table 314: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon39	kon39		$7.5 \cdot 10^7$		☑

7.104 Reaction von40

This is an irreversible reaction of two reactants forming one product.

Name cAMP3_R2C2_binding_by_cAMP

Reaction equation

$$\text{cAMP3\_R2C2} + \text{cAMP} \longrightarrow \text{cAMP4\_R2C2} \tag{249}$$

Reactants

Table 315: Properties of each reactant.

Id	Name	SBO
cAMP3_R2C2	cAMP3_R2C2	
cAMP	cAMP	

Product

Table 316: Properties of each product.

Id	Name	SBO
cAMP4_R2C2	cAMP4_R2C2	

Kinetic Law

Derived unit contains undeclared units

$$v_{104} = \text{vol}\,(\text{Spine}) \cdot [\text{cAMP3\_R2C2}] \cdot [\text{cAMP}] \cdot \text{kon40} \tag{250}$$

Table 317: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon40	kon40		$7.5 \cdot 10^7$		☑

7.105 Reaction voff37

This is an irreversible reaction of one reactant forming two products.

Name cAMP_R2C2_unbinding

Reaction equation

$$\text{cAMP\_R2C2} \longrightarrow \text{R2C2} + \text{cAMP} \tag{251}$$

Reactant

Table 318: Properties of each reactant.

Id	Name	SBO
cAMP_R2C2	cAMP_R2C2	

Products

Table 319: Properties of each product.

Id	Name	SBO
R2C2	R2C2	
cAMP	cAMP	

Kinetic Law

Derived unit contains undeclared units

$$v_{105} = \text{vol}\,(\text{Spine}) \cdot [\text{cAMP\_R2C2}] \cdot \text{koff37} \tag{252}$$

Table 320: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff37	koff37		33.0		☑

7.106 Reaction voff38

This is an irreversible reaction of one reactant forming two products.

Name cAMP2_R2C2_unbinding

Reaction equation

$$\text{cAMP2\_R2C2} \longrightarrow \text{cAMP\_R2C2} + \text{cAMP} \tag{253}$$

Reactant

Table 321: Properties of each reactant.

Id	Name	SBO
cAMP2_R2C2	cAMP2_R2C2	

Products

Table 322: Properties of each product.

Id	Name	SBO
cAMP_R2C2	cAMP_R2C2	
cAMP	cAMP	

Kinetic Law

Derived unit contains undeclared units

$$v_{106} = \text{vol}(\text{Spine}) \cdot [\text{cAMP2\_R2C2}] \cdot \text{koff38} \tag{254}$$

Table 323: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff38	koff38		33.0		☑

7.107 Reaction voff39

This is an irreversible reaction of one reactant forming two products.

Name cAMP3_R2C2_unbinding

Reaction equation

$$\text{cAMP3\_R2C2} \longrightarrow \text{cAMP2\_R2C2} + \text{cAMP} \tag{255}$$

Reactant

Table 324: Properties of each reactant.

Id	Name	SBO
cAMP3_R2C2	cAMP3_R2C2	

Products

Table 325: Properties of each product.

Id	Name	SBO
cAMP2_R2C2	cAMP2_R2C2	
cAMP	cAMP	

Kinetic Law

Derived unit contains undeclared units

$$v_{107} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP3\_R2C2}] \cdot \mathrm{koff39} \tag{256}$$

Table 326: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff39	koff39		110.0		☑

7.108 Reaction voff40

This is an irreversible reaction of one reactant forming two products.

Name cAMP4_R2C2_unbinding

Reaction equation

$$\mathrm{cAMP4\_R2C2} \longrightarrow \mathrm{cAMP3\_R2C2} + \mathrm{cAMP} \tag{257}$$

Reactant

Table 327: Properties of each reactant.

Id	Name	SBO
cAMP4_R2C2	cAMP4_R2C2	

Products

Table 328: Properties of each product.

Id	Name	SBO
cAMP3_R2C2	cAMP3_R2C2	
cAMP	cAMP	

Kinetic Law

Derived unit contains undeclared units

$$v_{108} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP4\_R2C2}] \cdot \mathrm{koff40} \tag{258}$$

Table 329: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff40	koff40		32.5		☑

7.109 Reaction von41

This is an irreversible reaction of two reactants forming one product.

Name cAMP4_R2C_PKA_binding

Reaction equation

$$\mathrm{cAMP4\_R2C} + \mathrm{PKA} \longrightarrow \mathrm{cAMP4\_R2C2} \tag{259}$$

Reactants

Table 330: Properties of each reactant.

Id	Name	SBO
cAMP4_R2C	cAMP4_R2C	
PKA	PKA	

Product

Table 331: Properties of each product.

Id	Name	SBO
cAMP4_R2C2	cAMP4_R2C2	

Kinetic Law

Derived unit contains undeclared units

$$v_{109} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP4\_R2C}] \cdot [\mathrm{PKA}] \cdot \mathrm{kon41} \tag{260}$$

Table 332: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon41	kon41		$1.8 \cdot 10^7$		☑

7.110 Reaction voff41

This is an irreversible reaction of one reactant forming two products.

Name cAMP4_R2C2_PKA_unbinding

Reaction equation

$$\mathrm{cAMP4\_R2C2} \longrightarrow \mathrm{cAMP4\_R2C} + \mathrm{PKA} \tag{261}$$

Reactant

Table 333: Properties of each reactant.

Id	Name	SBO
cAMP4_R2C2	cAMP4_R2C2	

Products

Table 334: Properties of each product.

Id	Name	SBO
cAMP4_R2C	cAMP4_R2C	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{110} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP4\_R2C2}] \cdot \mathrm{koff41} \tag{262}$$

Table 335: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff41	koff41		60.0		☑

7.111 Reaction von42

This is an irreversible reaction of two reactants forming one product.

Name cAMP4_R2_PKA_binding

Reaction equation

$$\mathrm{cAMP4\_R2} + \mathrm{PKA} \longrightarrow \mathrm{cAMP4\_R2C} \tag{263}$$

Reactants

Table 336: Properties of each reactant.

Id	Name	SBO
cAMP4_R2	cAMP4_R2	
PKA	PKA	

Product

Table 337: Properties of each product.

Id	Name	SBO
cAMP4_R2C	cAMP4_R2C	

Kinetic Law

Derived unit contains undeclared units

$$v_{111} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP4\_R2}] \cdot [\mathrm{PKA}] \cdot \mathrm{kon42} \tag{264}$$

Table 338: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon42	kon42		$1.8 \cdot 10^7$		☑

7.112 Reaction von43

This is an irreversible reaction of one reactant forming two products.

Name cAMP4_R2C_PKA_unbinding

Reaction equation

$$\text{cAMP4\_R2C} \longrightarrow \text{cAMP4\_R2} + \text{PKA} \tag{265}$$

Reactant

Table 339: Properties of each reactant.

Id	Name	SBO
cAMP4_R2C	cAMP4_R2C	

Products

Table 340: Properties of each product.

Id	Name	SBO
cAMP4_R2	cAMP4_R2	
PKA	PKA	

Kinetic Law

Derived unit contains undeclared units

$$v_{112} = \text{vol}\,(\text{Spine}) \cdot [\text{cAMP4\_R2C}] \cdot \text{kon43} \tag{266}$$

Table 341: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon43	kon43		60.0		☑

7.113 Reaction von44

This is an irreversible reaction of two reactants forming one product.

Name cAMP_PDE_binding

Reaction equation

$$\text{cAMP} + \text{PDE} \longrightarrow \text{cAMP\_PDE} \tag{267}$$

Reactants

Table 342: Properties of each reactant.

Id	Name	SBO
cAMP	cAMP	
PDE	PDE	

Product

Table 343: Properties of each product.

Id	Name	SBO
cAMP_PDE	cAMP_PDE	

Kinetic Law

Derived unit contains undeclared units

$$v_{113} = \text{vol}\,(\text{Spine}) \cdot [\text{cAMP}] \cdot [\text{PDE}] \cdot \text{kon44} \tag{268}$$

Table 344: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon44	kon44		2520000.0		☑

7.114 Reaction voff44

This is an irreversible reaction of one reactant forming two products.

Name cAMP_PDE_unbinding

Reaction equation

$$\text{cAMP\_PDE} \longrightarrow \text{cAMP} + \text{PDE} \tag{269}$$

Reactant

Table 345: Properties of each reactant.

Id	Name	SBO
cAMP_PDE	cAMP_PDE	

Products

Table 346: Properties of each product.

Id	Name	SBO
cAMP	cAMP	
PDE	PDE	

Kinetic Law

Derived unit contains undeclared units

$$v_{114} = \text{vol}\,(\text{Spine}) \cdot [\text{cAMP\_PDE}] \cdot \text{koff44} \tag{270}$$

Table 347: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff44	koff44		40.0		☑

7.115 Reaction vcat44

This is an irreversible reaction of one reactant forming two products.

Name cAMP_PDE_degradation

Reaction equation

$$\text{cAMP\_PDE} \longrightarrow \text{AMP} + \text{PDE} \tag{271}$$

Reactant

Table 348: Properties of each reactant.

Id	Name	SBO
cAMP_PDE	cAMP_PDE	

Products

Table 349: Properties of each product.

Id	Name	SBO
AMP	AMP	
PDE	PDE	

Kinetic Law

Derived unit contains undeclared units

$$v_{115} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP\_PDE}] \cdot \mathrm{kcat44} \tag{272}$$

Table 350: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat44	kcat44		10.0		☑

7.116 Reaction von45

This is an irreversible reaction of two reactants forming one product.

Name cAMP_PDEP_binding

Reaction equation

$$\mathrm{cAMP} + \mathrm{PDEP} \longrightarrow \mathrm{cAMP\_PDEP} \tag{273}$$

Reactants

Table 351: Properties of each reactant.

Id	Name	SBO
cAMP	cAMP	
PDEP	PDEP	

Product

Table 352: Properties of each product.

Id	Name	SBO
cAMP_PDEP	cAMP_PDEP	

Kinetic Law

Derived unit contains undeclared units

$$v_{116} = \text{vol}\,(\text{Spine}) \cdot [\text{cAMP}] \cdot [\text{PDEP}] \cdot \text{kon45} \tag{274}$$

Table 353: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kon45	kon45		5040000.0		☑

7.117 Reaction voff45

This is an irreversible reaction of one reactant forming two products.

Name cAMP_PDEP_unbinding

Reaction equation

$$\text{cAMP\_PDEP} \longrightarrow \text{cAMP} + \text{PDEP} \tag{275}$$

Reactant

Table 354: Properties of each reactant.

Id	Name	SBO
cAMP_PDEP	cAMP_PDEP	

Products

Table 355: Properties of each product.

Id	Name	SBO
cAMP	cAMP	

Id	Name	SBO
PDEP	PDEP	

Kinetic Law

Derived unit contains undeclared units

$$v_{117} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP\_PDEP}] \cdot \mathrm{koff45} \tag{276}$$

Table 356: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
koff45	koff45		80.0		☑

7.118 Reaction vcat45

This is an irreversible reaction of one reactant forming two products.

Name cAMP_PDEP_degradation

Reaction equation

$$\mathrm{cAMP\_PDEP} \longrightarrow \mathrm{AMP} + \mathrm{PDEP} \tag{277}$$

Reactant

Table 357: Properties of each reactant.

Id	Name	SBO
cAMP_PDEP	cAMP_PDEP	

Products

Table 358: Properties of each product.

Id	Name	SBO
AMP	AMP	
PDEP	PDEP	

Kinetic Law

Derived unit contains undeclared units

$$v_{118} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{cAMP\_PDEP}] \cdot \mathrm{kcat45} \tag{278}$$

Table 359: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kcat45	kcat45		20.0		☑

7.119 Reaction v57

This is an irreversible reaction of one reactant forming one product.

Name Ca_in

Reaction equation

$$\mathrm{Empty} \longrightarrow \mathrm{Ca} \tag{279}$$

Reactant

Table 360: Properties of each reactant.

Id	Name	SBO
Empty	Empty	

Product

Table 361: Properties of each product.

Id	Name	SBO
Ca	Ca	

Kinetic Law

Derived unit contains undeclared units

$$v_{119} = \mathrm{vol}\,(\mathrm{Spine}) \cdot \mathrm{k57} \tag{280}$$

7.120 Reaction v58

This is an irreversible reaction of one reactant forming one product.

Name Ca_destroy

Reaction equation

$$\mathrm{Ca} \longrightarrow \mathrm{Empty} \tag{281}$$

Reactant

Table 362: Properties of each reactant.

Id	Name	SBO
Ca	Ca	

Product

Table 363: Properties of each product.

Id	Name	SBO
Empty	Empty	

Kinetic Law

Derived unit contains undeclared units

$$v_{120} = \mathrm{vol}\,(\mathrm{Spine}) \cdot [\mathrm{Ca}] \cdot \mathrm{k58} \tag{282}$$

Table 364: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
k58	k58		1.7		☑

8 Derived Rate Equations

When interpreted as an ordinary differential equation framework, this model implies the following set of equations for the rates of change of each species.

Identifiers for kinetic laws highlighted in gray cannot be verified to evaluate to units of SBML substance per time. As a result, some SBML interpreters may not be able to verify the

consistency of the units on quantities in the model. Please check if

- parameters without an unit definition are involved or
- volume correction is necessary because the `hasOnlySubstanceUnits` flag may be set to `false` and `spacialDimensions`> 0 for certain species.

8.1 Species D

Name D

Initial concentration $4.98 \cdot 10^{-6}\ \mathrm{mol} \cdot \mathrm{l}^{-1}$

This species takes part in ten reactions (as a reactant in von1, von2, von3 and as a product in voff1, voff2, voff3, vcat6, vcat9, vcat10, vcat13).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D} = v_2 + v_5 + v_8 + v_{17} + v_{27} + v_{29} + v_{38} - v_1 - v_4 - v_7 \tag{283}$$

8.2 Species CDK5

Name CDK5

Initial concentration $2 \cdot 10^{-7}\ \mathrm{mol} \cdot \mathrm{l}^{-1}$

This species takes part in twelve reactions (as a reactant in von1, von4, von11, von18 and as a product in voff1, vcat1, voff4, vcat4, voff11, vcat11, voff18, vcat18).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{CDK5} = v_2 + v_3 + v_{13} + v_{14} + v_{34} + v_{35} + v_{42} + v_{45} - v_1 - v_{10} - v_{31} - v_{41} \tag{284}$$

8.3 Species D_CDK5

Name D_CDK5

Initial concentration $0\ \mathrm{mol} \cdot \mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff1, vcat1 and as a product in von1).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D\_CDK5} = v_1 - v_2 - v_3 \tag{285}$$

8.4 Species D75

Name D75

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in eleven reactions (as a reactant in von7, von8, von9, von10 and as a product in vcat1, voff7, voff8, voff9, voff10, vcat17, vcat24).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75} = v_3 + v_{23} + v_{26} + v_{28} + v_{30} + v_{51} + v_{80} - v_{19} - v_{20} - v_{21} - v_{22} \tag{286}$$

8.5 Species CK1

Name CK1

Initial concentration $1.66\cdot 10^{-7}\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in 14 reactions (as a reactant in von2, von5, von7, von14, vcat30 and as a product in voff2, vcat2, voff5, vcat5, voff7, vcat7, voff14, vcat14, vcat29).

$$\begin{aligned}\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{CK1} = {} & v_5 + v_6 + v_{15} + v_{16} + v_{23} + v_{24} + v_{43} \\ & + v_{44} + v_{87} - v_4 - v_{11} - v_{19} - v_{40} - v_{88}\end{aligned} \tag{287}$$

8.6 Species D_CK1

Name D_CK1

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff2, vcat2 and as a product in von2).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D\_CK1} = v_4 - v_5 - v_6 \tag{288}$$

8.7 Species D137

Name D137

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in ten reactions (as a reactant in von11, von12, von13 and as a product in vcat2, voff11, voff12, voff13, vcat19, vcat22, vcat23).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D137} = v_6 + v_{34} + v_{36} + v_{39} + v_{53} + v_{62} + v_{71} - v_{31} - v_{32} - v_{33} \tag{289}$$

8.8 Species PKA

Name PKA

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in 22 reactions (as a reactant in von3, von8, von12, von21, von31, von33, von41, von42 and as a product in voff3, vcat3, vcat8, voff8, voff12, vcat12, vcat21, voff21, vcat31, voff31, voff33, vcat33, voff41, von43).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PKA} = v_8 + v_9 + v_{25} + v_{26} + v_{36} + v_{37} + v_{47} + v_{48} + v_{90} + v_{91} + v_{94} + v_{95} + v_{110} + v_{112} - v_7 - v_{20} - v_{32} - v_{46} - v_{89} - v_{93} - v_{109} - v_{111} \tag{290}$$

8.9 Species D_PKA

Name D_PKA

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff3, vcat3 and as a product in von3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D\_PKA} = v_7 - v_8 - v_9 \tag{291}$$

8.10 Species D34

Name D34

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in ten reactions (as a reactant in von4, von5, von6 and as a product in vcat3, voff4, voff5, voff6, vcat15, vcat16, vcat20).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34} = v_9 + v_{13} + v_{15} + v_{18} + v_{59} + v_{68} + v_{77} - v_{10} - v_{11} - v_{12} \tag{292}$$

8.11 Species D34_CDK5

Name D34_CDK5

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff4, vcat4 and as a product in von4).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_CDK5} = v_{10} - v_{13} - v_{14} \tag{293}$$

8.12 Species D34_CK1

Name D34_CK1

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff5, vcat5 and as a product in von5).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_CK1} = v_{11} - v_{15} - v_{16} \tag{294}$$

8.13 Species PP2B

Name PP2B

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in 17 reactions (as a reactant in von6, von17, von19, von27, von29, voff36 and as a product in vcat6, voff6, voff17, vcat17, vcat19, voff19, voff27, vcat27, voff29, vcat29, von36).

$$\begin{aligned}\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PP2B} = {} & v_{17} + v_{18} + v_{50} + v_{51} + v_{53} + v_{54} + v_{56} + v_{57} + v_{86} \\ & + v_{87} + v_{98} - v_{12} - v_{49} - v_{52} - v_{55} - v_{85} - v_{100}\end{aligned} \tag{295}$$

8.14 Species D34_PP2B

Name D34_PP2B

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat6, voff6 and as a product in von6).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_PP2B} = v_{12} - v_{17} - v_{18} \tag{296}$$

8.15 Species D34_75

Name D34:75

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in eleven reactions (as a reactant in von14, von17, von15, von16 and as a product in vcat4, vcat8, voff14, voff17, voff15, voff16, vcat28).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75} = v_{14} + v_{25} + v_{43} + v_{50} + v_{60} + v_{69} + v_{83} - v_{40} - v_{49} - v_{58} - v_{67} \tag{297}$$

8.16 Species D34_137

Name D34:137

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in ten reactions (as a reactant in von18, von19, von20 and as a product in vcat5, vcat12, voff18, voff19, vcat25, vcat26, voff20).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_137} = v_{16} + v_{37} + v_{42} + v_{54} + v_{65} + v_{73} + v_{78} - v_{41} - v_{52} - v_{76} \tag{298}$$

8.17 Species D75CK1

Name D75_CK1

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff7, vcat7 and as a product in von7).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75CK1} = v_{19} - v_{23} - v_{24} \tag{299}$$

8.18 Species D75_PKA

Name D75_PKA

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat8, voff8 and as a product in von8).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75\_PKA} = v_{20} - v_{25} - v_{26} \tag{300}$$

8.19 Species PP2A

Name PP2A

Initial concentration $2\cdot 10^{-7}\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in 15 reactions (as a reactant in von9, von15, von22, von25, von33 and as a product in vcat9, voff9, vcat15, voff15, vcat22, voff22, vcat25, voff25, voff33, vcat34).

$$\begin{aligned}\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PP2A} = {} & v_{27} + v_{28} + v_{59} + v_{60} + v_{62} + v_{63} + v_{65} + v_{66} \\ & + v_{94} + v_{96} - v_{21} - v_{58} - v_{61} - v_{64} - v_{93}\end{aligned} \tag{301}$$

8.20 Species D75_PP2A

Name D75_PP2A

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat9, voff9 and as a product in von9).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75\_PP2A} = v_{21} - v_{27} - v_{28} \tag{302}$$

8.21 Species PP2AP

Name PP2AP

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in 14 reactions (as a reactant in von10, von16, von23, von26, vcat34 and as a product in vcat10, voff10, vcat16, voff16, vcat23, voff23, vcat26, voff26, vcat33).

$$\begin{aligned}\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PP2AP} = {} & v_{29} + v_{30} + v_{68} + v_{69} + v_{71} + v_{72} + v_{73} \\ & + v_{75} + v_{95} - v_{22} - v_{67} - v_{70} - v_{74} - v_{96}\end{aligned} \tag{303}$$

8.22 Species D75_PP2AP

Name D75_PP2AP

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat10, voff10 and as a product in von10).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75\_PP2AP} = v_{22} - v_{29} - v_{30} \tag{304}$$

8.23 Species D75_137

Name D75:137

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in eleven reactions (as a reactant in von21, von22, von23, von24 and as a product in vcat7, vcat11, voff21, vcat27, voff22, voff23, voff24).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75\_137} = v_{24} + v_{35} + v_{48} + v_{57} + v_{63} + v_{72} + v_{81} - v_{46} - v_{61} - v_{70} - v_{79} \tag{305}$$

8.24 Species D137_CDK5

Name D137_CDK5

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff11, vcat11 and as a product in von11).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D137\_CDK5} = v_{31} - v_{34} - v_{35} \tag{306}$$

8.25 Species D137_PKA

Name D137_PKA

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff12, vcat12 and as a product in von12).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D137\_PKA} = v_{32} - v_{36} - v_{37} \tag{307}$$

8.26 Species D137_PP2C

Name D137_PP2C

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat13, voff13 and as a product in von13).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D137\_PP2C} = v_{33} - v_{38} - v_{39} \tag{308}$$

8.27 Species PP2C

Name PP2C

Initial concentration $1.33\cdot 10^{-7}\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in twelve reactions (as a reactant in von13, von20, von24, von28 and as a product in vcat13, voff13, vcat20, voff20, vcat24, voff24, vcat28, voff28).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PP2C} = v_{38} + v_{39} + v_{77} + v_{78} + v_{80} + v_{81} + v_{83} + v_{84} - v_{33} - v_{76} - v_{79} - v_{82} \tag{309}$$

8.28 Species D34_75_CK1

Name D34:75_CK1

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff14, vcat14 and as a product in von14).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75\_CK1} = v_{40} - v_{43} - v_{44} \tag{310}$$

8.29 Species D34_137_CDK5

Name D34:137_CDK5

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff18, vcat18 and as a product in von18).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_137\_CDK5} = v_{41} - v_{42} - v_{45} \tag{311}$$

8.30 Species D34_75_137

Name D34:75:137

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in eleven reactions (as a reactant in von27, von25, von26, von28 and as a product in vcat14, vcat18, vcat21, voff27, voff25, voff26, voff28).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75\_137} = v_{44} + v_{45} + v_{47} + v_{56} + v_{66} + v_{75} + v_{84} - v_{55} - v_{64} - v_{74} - v_{82} \tag{312}$$

8.31 Species D75_137_PKA

Name D75:137_PKA

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat21, voff21 and as a product in von21).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75\_137\_PKA} = v_{46} - v_{47} - v_{48} \tag{313}$$

8.32 Species D34_75_PP2B

Name D34:75_PP2B

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff17, vcat17 and as a product in von17).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75\_PP2B} = v_{49} - v_{50} - v_{51} \tag{314}$$

8.33 Species D34_137_PP2B

Name D34:137_PP2B

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat19, voff19 and as a product in von19).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_137\_PP2B} = v_{52} - v_{53} - v_{54} \tag{315}$$

8.34 Species D34_75_137_PP2B

Name D34:75:137_PP2B

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff27, vcat27 and as a product in von27).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75\_137\_PP2B} = v_{55} - v_{56} - v_{57} \tag{316}$$

8.35 Species D34_75_PP2A

Name D34:75_PP2A

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat15, voff15 and as a product in von15).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75\_PP2A} = v_{58} - v_{59} - v_{60} \tag{317}$$

8.36 Species D75_137_PP2A

Name D75:137_PP2A

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat22, voff22 and as a product in von22).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75\_137\_PP2A} = v_{61} - v_{62} - v_{63} \tag{318}$$

8.37 Species D34_75_134_PP2A

Name D34:75:137_PP2A

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat25, voff25 and as a product in von25).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75\_134\_PP2A} = v_{64} - v_{65} - v_{66} \tag{319}$$

8.38 Species D34_75_PP2AP

Name D34:75_PP2AP

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat16, voff16 and as a product in von16).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75\_PP2AP} = v_{67} - v_{68} - v_{69} \tag{320}$$

8.39 Species D75_137_PP2AP

Name D75:137_PP2AP

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat23, voff23 and as a product in von23).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75\_137\_PP2AP} = v_{70} - v_{71} - v_{72} \tag{321}$$

8.40 Species D34_75_137_PP2AP

Name D34:75:137_PP2AP

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat26, voff26 and as a product in von26).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75\_137\_PP2AP} = v_{74} - v_{73} - v_{75} \tag{322}$$

8.41 Species D34_137_PP2C

Name D34:137_PP2C

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat20, voff20 and as a product in von20).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_137\_PP2C} = v_{76} - v_{77} - v_{78} \tag{323}$$

8.42 Species D75_137_PP2C

Name D75:137_PP2C

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat24, voff24 and as a product in von24).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D75\_137\_PP2C} = v_{79} - v_{80} - v_{81} \tag{324}$$

8.43 Species PDE

Name PDE

Initial concentration $2\cdot 10^{-6}\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in six reactions (as a reactant in von31, von44 and as a product in voff31, vcat32, voff44, vcat44).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PDE} = v_{91} + v_{92} + v_{114} + v_{115} - v_{89} - v_{113} \tag{325}$$

8.44 Species PP2Binactive

Name PP2Binactive

Initial concentration $3.32 \cdot 10^{-7}$ mol $\cdot$ l^{-1}

This species takes part in two reactions (as a reactant in von35 and as a product in voff35).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PP2Binactive} = v_{99} - v_{97} \tag{326}$$

8.45 Species D34_75_137_PP2C

Name D34:75:137_PP2C

Initial concentration 0 mol $\cdot$ l^{-1}

This species takes part in three reactions (as a reactant in vcat28, voff28 and as a product in von28).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D34\_75\_137\_PP2C} = v_{82} - v_{83} - v_{84} \tag{327}$$

8.46 Species CK1P

Name CK1P

Initial concentration 0 mol $\cdot$ l^{-1}

This species takes part in three reactions (as a reactant in von29 and as a product in voff29, vcat30).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{CK1P} = v_{86} + v_{88} - v_{85} \tag{328}$$

8.47 Species CK1P_PP2B

Name CK1P_PP2B

Initial concentration 0 mol $\cdot$ l^{-1}

This species takes part in three reactions (as a reactant in voff29, vcat29 and as a product in von29).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{CK1P\_PP2B} = v_{85} - v_{86} - v_{87} \tag{329}$$

8.48 Species PDE_PKA

Name PDE_PKA

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in vcat31, voff31 and as a product in von31).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PDE\_PKA} = v_{89} - v_{90} - v_{91} \tag{330}$$

8.49 Species PDEP

Name PDEP

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in five reactions (as a reactant in vcat32, von45 and as a product in vcat31, voff45, vcat45).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PDEP} = v_{90} + v_{117} + v_{118} - v_{92} - v_{116} \tag{331}$$

8.50 Species PP2A_PKA

Name PP2A_PKA

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff33, vcat33 and as a product in von33).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PP2A\_PKA} = v_{93} - v_{94} - v_{95} \tag{332}$$

8.51 Species Ca

Name Ca

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

Charge 2

This species takes part in six reactions (as a reactant in von35, von36, v58 and as a product in voff35, voff36, v57).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Ca} = 2\,v_{99} + 2\,v_{100} + v_{119} - 2\,v_{97} - 2\,v_{98} - v_{120} \tag{333}$$

8.52 Species PP2BinactiveCa2

Name PP2BinactiveCa2

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

Charge 2

This species takes part in four reactions (as a reactant in von36, voff35 and as a product in von35, voff36).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PP2BinactiveCa2} = v_{97} + v_{100} - v_{98} - v_{99} \tag{334}$$

8.53 Species R2C2

Name R2C2

Initial concentration $6.64\cdot 10^{-6}\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in two reactions (as a reactant in von37 and as a product in voff37).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{R2C2} = v_{105} - v_{101} \tag{335}$$

8.54 Species cAMP

Name cAMP

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

Involved in event cAMP_pulse

This species takes part in twelve reactions (as a reactant in von37, von38, von39, von40, von44, von45 and as a product in voff37, voff38, voff39, voff40, voff44, voff45).

$$\begin{aligned}\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cAMP} = {} & v_{105} + v_{106} + v_{107} + v_{108} + v_{114} + v_{117} \\ & - v_{101} - v_{102} - v_{103} - v_{104} - v_{113} - v_{116}\end{aligned} \tag{336}$$

Furthermore, one event influences this species' rate of change.

8.55 Species cAMP_R2C2

Name cAMP_R2C2

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in von38, voff37 and as a product in von37, voff38).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cAMP\_R2C2} = v_{101} + v_{106} - v_{102} - v_{105} \tag{337}$$

8.56 Species cAMP2_R2C2

Name cAMP2_R2C2

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in von39, voff38 and as a product in von38, voff39).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cAMP2\_R2C2} = v_{102} + v_{107} - v_{103} - v_{106} \tag{338}$$

8.57 Species cAMP3_R2C2

Name cAMP3_R2C2

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in von40, voff39 and as a product in von39, voff40).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cAMP3\_R2C2} = v_{103} + v_{108} - v_{104} - v_{107} \tag{339}$$

8.58 Species cAMP4_R2C2

Name cAMP4_R2C2

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in voff40, voff41 and as a product in von40, von41).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cAMP4\_R2C2} = v_{104} + v_{109} - v_{108} - v_{110} \tag{340}$$

8.59 Species cAMP4_R2C

Name cAMP4_R2C

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in von41, von43 and as a product in voff41, von42).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cAMP4\_R2C} = v_{110} + v_{111} - v_{109} - v_{112} \tag{341}$$

8.60 Species cAMP4_R2

Name cAMP4_R2

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in two reactions (as a reactant in von42 and as a product in von43).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cAMP4\_R2} = v_{112} - v_{111} \tag{342}$$

8.61 Species cAMP_PDE

Name cAMP_PDE

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff44, vcat44 and as a product in von44).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cAMP\_PDE} = v_{113} - v_{114} - v_{115} \tag{343}$$

8.62 Species AMP

Name AMP

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in two reactions (as a product in vcat44, vcat45).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{AMP} = v_{115} + v_{118} \tag{344}$$

8.63 Species cAMP_PDEP

Name cAMP_PDEP

Initial concentration $0\ \mathrm{mol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in voff45, vcat45 and as a product in von45).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cAMP\_PDEP} = v_{116} - v_{117} - v_{118} \tag{345}$$

8.64 Species Empty

Name Empty

Initial concentration $0\ \mathrm{mol} \cdot \mathrm{l}^{-1}$

This species takes part in two reactions (as a reactant in v57 and as a product in v58), which do not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Empty} = 0 \tag{346}$$

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