

## SBML Model Report

### Model name: “Butenas2004\_BloodCoagulation”



May 5, 2016

## 1 General Overview

This is a document in SBML Level 2 Version 4 format. This model was created by Michael Schubert<sup>1</sup> at August 26<sup>th</sup> 2011 at 4:36 p. m. and last time modified at October ninth 2014 at 5:08 p. m. Table 1 provides 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	34
events	0	constraints	0
reactions	33	function definitions	0
global parameters	45	unit definitions	0
rules	1	initial assignments	0

## Model Notes

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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 \(2010\)](#)

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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<sup>2</sup>

### 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
compartment_1	compartment_1		3	1	litre	<input checked="" type="checkbox"/>	

### 3.1 Compartment [compartment\\_1](#)

This is a three dimensional compartment with a constant size of one litre.

**Name** compartment\_1

## 4 Species

This model contains 34 species. 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
TF	TF	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
TF_VII	TF_VII	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
VII	VII	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
TF_VIIa	TF_VIIa	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
VIIa	VIIa	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
Xa	Xa	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
IIa	IIa	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
TF_VIIa_X	TF_VIIa_X	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
X	X	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
TF_VIIa_Xa	TF_VIIa_Xa	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
IX	IX	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
TF_VIIa_IX	TF_VIIa_IX	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
IXa	IXa	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
II	II	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
VIII	VIII	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
VIIIa	VIIIa	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
IXa_VIIIa	IXa_VIIIa	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
IXa_VIIIa_X	IXa_VIIIa_X	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
VIIIa1_L	VIIIa1_L	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
VIIIa2	VIIIa2	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
V	V	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$
Va	Va	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	$\square$	$\square$

Id	Name	Compartment	Derived Unit	Constant	Boundary Condi- tion
Xa_Va	Xa_Va	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Xa_Va_II	Xa_Va_II	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
mIIa	mIIa	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
TFPI	TFPI	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Xa_TFPI	Xa_TFPI	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
TF_VIIa_Xa_TFPI	TF_VIIa_Xa_TFPI	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
ATIII	ATIII	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Xa_ATIII	Xa_ATIII	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
mIIa_ATIII	mIIa_ATIII	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
IXa_ATIII	IXa_ATIII	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
IIa_ATIII	IIa_ATIII	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
TF_VIIa_ATIII	TF_VIIa_ATIII	compartment_1	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>

## 5 Parameters

This model contains 45 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
k1	k1	0000038	0.003		✓
k2	k2	0000036	3200000.000		✓
k3	k3	0000038	0.003		✓
k4	k4	0000036	$2.3 \cdot 10^7$		✓
k5	k5	0000036	440000.000		✓
k6	k6	0000036	$1.3 \cdot 10^7$		✓
k7	k7	0000036	23000.000		✓
k8	k8	0000038	1.050		✓
k9	k9	0000036	$2.5 \cdot 10^7$		✓
k10	k10	0000035	6.000		✓
k11	k11	0000038	19.000		✓
k12	k12	0000036	$2.2 \cdot 10^7$		✓
k13	k13	0000038	2.400		✓
k14	k14	0000036	$10^7$		✓
k15	k15	0000035	1.800		✓
k16	k16	0000036	7500.000		✓
k17	k17	0000036	$2 \cdot 10^7$		✓
k18	k18	0000038	0.005		✓
k19	k19	0000036	$10^7$		✓
k20	k20	0000038	0.001		✓
k21	k21	0000036	$10^8$		✓
k22	k22	0000035	8.200		✓
k23	k23	0000039	22000.000		✓
k24	k24	0000035	0.006		✓
k25	k25	0000035	0.001		✓
k26	k26	0000036	$2 \cdot 10^7$		✓
k27	k27	0000038	0.200		✓
k28	k28	0000036	$4 \cdot 10^8$		✓
k29	k29	0000038	103.000		✓
k30	k30	0000036	$10^8$		✓
k31	k31	0000035	63.500		✓
k32	k32	0000036	$1.5 \cdot 10^7$		✓
k33	k33	0000038	$3.6 \cdot 10^{-4}$		✓
k34	k34	0000036	900000.000		✓
k35	k35	0000038	$1.1 \cdot 10^{-4}$		✓
k36	k36	0000036	$3.2 \cdot 10^8$		✓
k37	k37	0000036	$5 \cdot 10^7$		✓

Id	Name	SBO	Value	Unit	Constant
k38	k38	0000036	1500.000		<input checked="" type="checkbox"/>
k39	k39	0000036	7100.000		<input checked="" type="checkbox"/>
k40	k40	0000036	490.000		<input checked="" type="checkbox"/>
k41	k41	0000036	7100.000		<input checked="" type="checkbox"/>
k42	k42	0000036	230.000		<input checked="" type="checkbox"/>
IIa_plus_1- _2mIIa	IIa+1.2mIIa		10 <sup>-9</sup>		<input type="checkbox"/>
k43	k43	0000036	5700.000		<input checked="" type="checkbox"/>
k44	k44	0000036	3000000.000		<input checked="" type="checkbox"/>

## 6 Rule

This is an overview of one rule.

### 6.1 Rule IIa\_plus\_1\_2mIIa

Rule IIa\_plus\_1\_2mIIa is an assignment rule for parameter IIa\_plus\_1\_2mIIa:

$$\text{IIa\_plus\_1\_2mIIa} = [\text{IIa}] + 1.2 \cdot [\text{mIIa}] \quad (1)$$

## 7 Reactions

This model contains 33 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

Nº	Id	Name	Reaction Equation	SBO
1	R1	R1	$\text{TF} + \text{VII} \rightleftharpoons \text{TF\_VII}$	
2	R2	R2	$\text{TF} + \text{VIIa} \rightleftharpoons \text{TF\_VIIa}$	
3	R3	R3	$\text{TF\_VIIa} + \text{VII} \longrightarrow \text{TF\_VIIa} + \text{VIIa}$	
4	R4	R4	$\text{Xa} + \text{VII} \longrightarrow \text{Xa} + \text{VIIa}$	
5	R5	R5	$\text{IIa} + \text{VII} \longrightarrow \text{IIa} + \text{VIIa}$	
6	R6	R6	$\text{TF\_VIIa} + \text{X} \rightleftharpoons \text{TF\_VIIa\_X}$	
7	R7	R7	$\text{TF\_VIIa} + \text{Xa} \rightleftharpoons \text{TF\_VIIa\_Xa}$	
8	R8	R8	$\text{TF\_VIIa} + \text{IX} \rightleftharpoons \text{TF\_VIIa\_IX}$	
9	R9	R9	$\text{Xa} + \text{II} \longrightarrow \text{Xa} + \text{IIa}$	
10	R10	R10	$\text{IIa} + \text{VIII} \longrightarrow \text{IIa} + \text{VIIIa}$	
11	R11	R11	$\text{IXa} + \text{VIIIa} \rightleftharpoons \text{IXa\_VIIIa}$	
12	R12	R12	$\text{IXa\_VIIIa} + \text{X} \rightleftharpoons \text{IXa\_VIIIa\_X}$	
13	R13	R13	$\text{VIIIa} \rightleftharpoons \text{VIIIa1\_L} + \text{VIIIa2}$	
14	R14	R14	$\text{IXa\_VIIIa\_X} \longrightarrow \text{VIIIa1\_L} + \text{VIIIa2} + \text{X} + \text{IXa}$	
15	R15	R15	$\text{IXa\_VIIIa} \longrightarrow \text{VIIIa1\_L} + \text{VIIIa2} + \text{IXa}$	
16	R16	R16	$\text{IIa} + \text{V} \longrightarrow \text{IIa} + \text{Va}$	
17	R17	R17	$\text{Xa} + \text{Va} \rightleftharpoons \text{Xa\_Va}$	
18	R18	R18	$\text{Xa\_Va} + \text{II} \rightleftharpoons \text{Xa\_Va\_II}$	
19	R19	R19	$\text{mIIa} + \text{Xa\_Va} \longrightarrow \text{IIa} + \text{Xa\_Va}$	
20	R20	R20	$\text{Xa} + \text{TFPI} \rightleftharpoons \text{Xa\_TFPI}$	
21	R21	R21	$\text{TF\_VIIa\_Xa} + \text{TFPI} \rightleftharpoons \text{TF\_VIIa\_Xa\_TFPI}$	
22	R22	R22	$\text{TF\_VIIa} + \text{Xa\_TFPI} \longrightarrow \text{TF\_VIIa\_Xa\_TFPI}$	
23	R23	R23	$\text{Xa} + \text{ATIII} \longrightarrow \text{Xa\_ATIII}$	



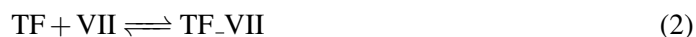
Nº	Id	Name	Reaction Equation	SBO
24	R24	R24	$mIIa + ATIII \longrightarrow mIIa\_ATIII$	
25	R25	R25	$IXa + ATIII \longrightarrow IXa\_ATIII$	
26	R26	R26	$IIa + ATIII \longrightarrow IIa\_ATIII$	
27	R27	R27	$TF\_VIIa + ATIII \longrightarrow TF\_VIIa\_ATIII$	
28	R6b	R6b	$TF\_VIIa\_X \longrightarrow TF\_VIIa\_Xa$	
29	R8b	R8b	$TF\_VIIa\_IX \longrightarrow TF\_VIIa + IXa$	
30	R12b	R12b	$IXa\_VIIIa\_X \longrightarrow IXa\_VIIIa + Xa$	
31	R18b	R18b	$Xa\_Va\_II \longrightarrow Xa\_Va + mIIa$	
32	R28	R28	$IXa + X \longrightarrow IXa + Xa$	
33	R29	R29	$mIIa + V \longrightarrow mIIa + Va$	

## 7.1 Reaction R1

This is a reversible reaction of two reactants forming one product.

**Name** R1

### Reaction equation



### Reactants

Table 6: Properties of each reactant.

Id	Name	SBO
TF	TF	0000010
VII	VII	0000010

### Product

Table 7: Properties of each product.

Id	Name	SBO
TF_VII	TF_VII	0000011

### Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_1 = \text{vol}(\text{compartment}_1) \cdot (k_2 \cdot [\text{TF}] \cdot [\text{VII}] - k_1 \cdot [\text{TF\_VII}]) \quad (3)$$

## 7.2 Reaction R2

This is a reversible reaction of two reactants forming one product.

**Name** R2

### Reaction equation



## Reactants

Table 8: Properties of each reactant.

Id	Name	SBO
TF	TF	0000010
VIIa	VIIa	0000010

## Product

Table 9: Properties of each product.

Id	Name	SBO
TF_VIIa	TF_VIIa	0000011

## Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_2 = \text{vol}(\text{compartment}_1) \cdot (k_4 \cdot [\text{TF}] \cdot [\text{VIIa}] - k_3 \cdot [\text{TF\_VIIa}]) \quad (5)$$

## 7.3 Reaction R3

This is an irreversible reaction of two reactants forming two products.

**Name** R3

## Reaction equation



## Reactants

Table 10: Properties of each reactant.

Id	Name	SBO
TF_VIIa	TF_VIIa	0000461
VII	VII	0000010

## Products

Table 11: Properties of each product.

Id	Name	SBO
TF_VIIa	TF_VIIa	0000461
VIIa	VIIa	0000011

### Kinetic Law

**SBO:0000045** mass action rate law for second order irreversible reactions

**Derived unit** contains undeclared units

$$v_3 = \text{vol}(\text{compartment}_1) \cdot k_5 \cdot [\text{TF\_VIIa}] \cdot [\text{VII}] \quad (7)$$

### 7.4 Reaction R4

This is an irreversible reaction of two reactants forming two products.

**Name** R4

### Reaction equation



### Reactants

Table 12: Properties of each reactant.

Id	Name	SBO
Xa	Xa	0000461
VII	VII	0000010

### Products

Table 13: Properties of each product.

Id	Name	SBO
Xa	Xa	0000461
VIIa	VIIa	0000011

### Kinetic Law

**SBO:0000045** mass action rate law for second order irreversible reactions

**Derived unit** contains undeclared units

$$v_4 = \text{vol}(\text{compartment}_1) \cdot k_6 \cdot [\text{Xa}] \cdot [\text{VII}] \quad (9)$$

## 7.5 Reaction R5

This is an irreversible reaction of two reactants forming two products.

**Name** R5

### Reaction equation



### Reactants

Table 14: Properties of each reactant.

Id	Name	SBO
IIa	IIa	0000461
VII	VII	0000010

### Products

Table 15: Properties of each product.

Id	Name	SBO
IIa	IIa	0000461
VIIa	VIIa	0000011

### Kinetic Law

**SBO:0000045** mass action rate law for second order irreversible reactions

**Derived unit** contains undeclared units

$$v_5 = \text{vol}(\text{compartment}_1) \cdot k_7 \cdot [\text{IIa}] \cdot [\text{VII}] \quad (11)$$

## 7.6 Reaction R6

This is a reversible reaction of two reactants forming one product.

**Name** R6

### Reaction equation



### Reactants

Table 16: Properties of each reactant.

Id	Name	SBO
TF_VIIa	TF_VIIa	0000010
X	X	0000010

### Product

Table 17: Properties of each product.

Id	Name	SBO
TF_VIIa_X	TF_VIIa_X	0000011

### Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

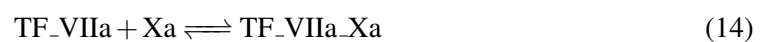
$$v_6 = \text{vol}(\text{compartment}_1) \cdot (k_9 \cdot [\text{TF\_VIIa}] \cdot [\text{X}] - k_8 \cdot [\text{TF\_VIIa\_X}]) \quad (13)$$

## 7.7 Reaction R7

This is a reversible reaction of two reactants forming one product.

**Name** R7

### Reaction equation



### Reactants

Table 18: Properties of each reactant.

Id	Name	SBO
TF_VIIa	TF_VIIa	0000010
Xa	Xa	0000010

## Product

Table 19: Properties of each product.

Id	Name	SBO
TF_VIIa_Xa	TF_VIIa_Xa	0000011

## Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

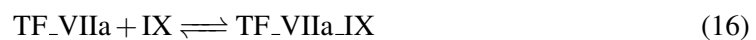
$$v_7 = \text{vol}(\text{compartment}_1) \cdot (k_{12} \cdot [\text{TF\_VIIa}] \cdot [\text{Xa}] - k_{11} \cdot [\text{TF\_VIIa\_Xa}]) \quad (15)$$

## 7.8 Reaction R8

This is a reversible reaction of two reactants forming one product.

**Name** R8

## Reaction equation



## Reactants

Table 20: Properties of each reactant.

Id	Name	SBO
TF_VIIa	TF_VIIa	0000010
IX	IX	0000010

## Product



Table 21: Properties of each product.

Id	Name	SBO
TF_VIIa_IX	TF_VIIa_IX	0000011

### Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_8 = \text{vol}(\text{compartment}_1) \cdot (k_{14} \cdot [\text{TF\_VIIa}] \cdot [\text{IX}] - k_{13} \cdot [\text{TF\_VIIa\_IX}]) \quad (17)$$

### 7.9 Reaction R9

This is an irreversible reaction of two reactants forming two products.

**Name** R9

### Reaction equation



### Reactants

Table 22: Properties of each reactant.

Id	Name	SBO
Xa	Xa	0000461
II	II	0000010

### Products

Table 23: Properties of each product.

Id	Name	SBO
Xa	Xa	0000461
IIa	IIa	0000011

### Kinetic Law

**SBO:0000045** mass action rate law for second order irreversible reactions

**Derived unit** contains undeclared units

$$v_9 = \text{vol}(\text{compartment}_1) \cdot k_{16} \cdot [\text{Xa}] \cdot [\text{II}] \quad (19)$$

### 7.10 Reaction R10

This is an irreversible reaction of two reactants forming two products.

**Name** R10

#### Reaction equation



#### Reactants

Table 24: Properties of each reactant.

Id	Name	SBO
IIa	IIa	0000461
VIII	VIII	0000010

#### Products

Table 25: Properties of each product.

Id	Name	SBO
IIa	IIa	0000461
VIIIa	VIIIa	0000011

#### Kinetic Law

**SBO:0000045** mass action rate law for second order irreversible reactions

**Derived unit** contains undeclared units

$$v_{10} = \text{vol}(\text{compartment}_1) \cdot k_{17} \cdot [\text{IIa}] \cdot [\text{VIII}] \quad (21)$$

### 7.11 Reaction R11

This is a reversible reaction of two reactants forming one product.

**Name** R11

### Reaction equation



### Reactants

Table 26: Properties of each reactant.

Id	Name	SBO
IXa	IXa	0000010
VIIIa	VIIIa	0000010

### Product

Table 27: Properties of each product.

Id	Name	SBO
IXa_VIIIa	IXa_VIIIa	0000011

### Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

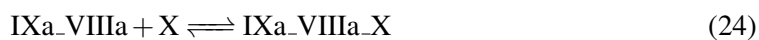
$$v_{11} = \text{vol}(\text{compartment\_1}) \cdot (k_{19} \cdot [\text{IXa}] \cdot [\text{VIIIa}] - k_{18} \cdot [\text{IXa\_VIIIa}]) \quad (23)$$

### 7.12 Reaction R12

This is a reversible reaction of two reactants forming one product.

**Name** R12

### Reaction equation



### Reactants

Table 28: Properties of each reactant.

Id	Name	SBO
IXa.VIIIa	IXa.VIIIa	0000010
X	X	0000010

## Product

Table 29: Properties of each product.

Id	Name	SBO
IXa.VIIIa.X	IXa.VIIIa.X	0000011

## Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_{12} = \text{vol}(\text{compartment}_1) \cdot (k_{21} \cdot [\text{IXa.VIIIa}] \cdot [\text{X}] - k_{20} \cdot [\text{IXa.VIIIa.X}]) \quad (25)$$

## 7.13 Reaction R13

This is a reversible reaction of one reactant forming two products.

**Name** R13

## Reaction equation



## Reactant

Table 30: Properties of each reactant.

Id	Name	SBO
VIIIa	VIIIa	0000010

## Products

Table 31: Properties of each product.

Id	Name	SBO
VIIIa1_L	VIIIa1_L	0000011
VIIIa2	VIIIa2	0000011

### Kinetic Law

**SBO:0000083** mass action rate law for first order forward, second order reverse, reversible reactions, two products, continuous scheme

**Derived unit** contains undeclared units

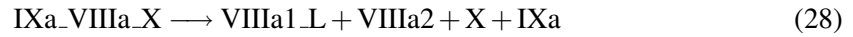
$$v_{13} = \text{vol}(\text{compartment}_1) \cdot (k_{24} \cdot [\text{VIIIa}] - k_{23} \cdot [\text{VIIIa1\_L}] \cdot [\text{VIIIa2}]) \quad (27)$$

### 7.14 Reaction R14

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

**Name** R14

### Reaction equation



### Reactant

Table 32: Properties of each reactant.

Id	Name	SBO
IXa_VIIIa_X	IXa_VIIIa_X	0000010

### Products

Table 33: Properties of each product.

Id	Name	SBO
VIIIa1_L	VIIIa1_L	0000011
VIIIa2	VIIIa2	0000011
X	X	0000011
IXa	IXa	0000011

### Kinetic Law

**SBO:0000049** mass action rate law for first order irreversible reactions, continuous scheme

**Derived unit** contains undeclared units

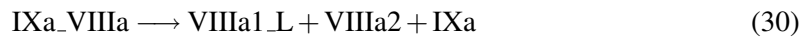
$$v_{14} = \text{vol}(\text{compartment}_1) \cdot k_{25} \cdot [\text{IXa\_VIIIa\_X}] \quad (29)$$

### 7.15 Reaction R15

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

**Name** R15

### Reaction equation



### Reactant

Table 34: Properties of each reactant.

Id	Name	SBO
IXa.VIIIa	IXa_VIIIa	0000010

### Products

Table 35: Properties of each product.

Id	Name	SBO
VIIIa1_L	VIIIa1_L	0000011
VIIIa2	VIIIa2	0000011
IXa	IXa	0000011

### Kinetic Law

**SBO:0000049** mass action rate law for first order irreversible reactions, continuous scheme

**Derived unit** contains undeclared units

$$v_{15} = \text{vol}(\text{compartment}_1) \cdot k_{25} \cdot [\text{IXa\_VIIIa}] \quad (31)$$

### 7.16 Reaction R16

This is an irreversible reaction of two reactants forming two products.

**Name** R16

### Reaction equation



### Reactants

Table 36: Properties of each reactant.

Id	Name	SBO
IIa	IIa	0000461
V	V	0000010

### Products

Table 37: Properties of each product.

Id	Name	SBO
IIa	IIa	0000461
Va	Va	0000011

### Kinetic Law

**SBO:0000045** mass action rate law for second order irreversible reactions

**Derived unit** contains undeclared units

$$v_{16} = \text{vol}(\text{compartment}_1) \cdot k_{26} \cdot [\text{IIa}] \cdot [\text{V}] \quad (33)$$

## 7.17 Reaction R17

This is a reversible reaction of two reactants forming one product.

**Name** R17

### Reaction equation



### Reactants

Table 38: Properties of each reactant.

Id	Name	SBO
Xa	Xa	0000010
Va	Va	0000010

## Product

Table 39: Properties of each product.

Id	Name	SBO
Xa_Va	Xa_Va	0000011

## Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_{17} = \text{vol}(\text{compartment\_1}) \cdot (k_{28} \cdot [\text{Xa}] \cdot [\text{Va}] - k_{27} \cdot [\text{Xa\_Va}]) \quad (35)$$

## 7.18 Reaction R18

This is a reversible reaction of two reactants forming one product.

**Name** R18

## Reaction equation



## Reactants

Table 40: Properties of each reactant.

Id	Name	SBO
Xa_Va	Xa_Va	0000010
II	II	0000010

## Product



Table 41: Properties of each product.

Id	Name	SBO
Xa_Va_II	Xa_Va_II	0000011

### Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

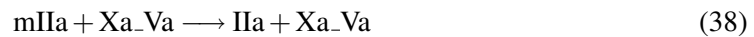
$$v_{18} = \text{vol}(\text{compartment}_1) \cdot (k_{30} \cdot [\text{Xa\_Va}] \cdot [\text{II}] - k_{29} \cdot [\text{Xa\_Va\_II}]) \quad (37)$$

### 7.19 Reaction R19

This is an irreversible reaction of two reactants forming two products.

**Name** R19

### Reaction equation



### Reactants

Table 42: Properties of each reactant.

Id	Name	SBO
mIIa	mIIa	0000010
Xa_Va	Xa_Va	0000461

### Products

Table 43: Properties of each product.

Id	Name	SBO
IIa	IIa	0000011
Xa_Va	Xa_Va	0000461

### Kinetic Law

**SBO:0000045** mass action rate law for second order irreversible reactions

**Derived unit** contains undeclared units

$$v_{19} = \text{vol}(\text{compartment}_1) \cdot k_{32} \cdot [\text{mIIa}] \cdot [\text{Xa\_Va}] \quad (39)$$

## 7.20 Reaction R20

This is a reversible reaction of two reactants forming one product.

**Name** R20

### Reaction equation



### Reactants

Table 44: Properties of each reactant.

Id	Name	SBO
Xa	Xa	0000010
TFPI	TFPI	0000010

### Product

Table 45: Properties of each product.

Id	Name	SBO
Xa_TFPI	Xa_TFPI	0000011

### Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

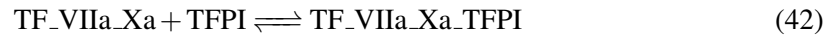
$$v_{20} = \text{vol}(\text{compartment}_1) \cdot (k_{34} \cdot [\text{Xa}] \cdot [\text{TFPI}] - k_{33} \cdot [\text{Xa\_TFPI}]) \quad (41)$$

## 7.21 Reaction R21

This is a reversible reaction of two reactants forming one product.

**Name** R21

### Reaction equation



### Reactants

Table 46: Properties of each reactant.

Id	Name	SBO
TF_VIIa_Xa	TF_VIIa_Xa	0000010
TFPI	TFPI	0000010

### Product

Table 47: Properties of each product.

Id	Name	SBO
TF_VIIa_Xa_TFPI	TF_VIIa_Xa_TFPI	0000011

### Kinetic Law

**SBO:0000101** mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

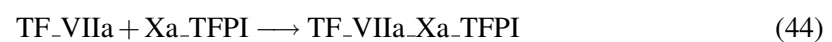
$$v_{21} = \text{vol}(\text{compartment\_1}) \cdot (k36 \cdot [\text{TF\_VIIa\_Xa}] \cdot [\text{TFPI}] - k35 \cdot [\text{TF\_VIIa\_Xa\_TFPI}]) \quad (43)$$

## 7.22 Reaction R22

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

**Name** R22

### Reaction equation



### Reactants

Table 48: Properties of each reactant.

Id	Name	SBO
TF_VIIa	TF_VIIa	0000010
Xa_TFPI	Xa_TFPI	0000010

## Product

Table 49: Properties of each product.

Id	Name	SBO
TF_VIIa_Xa_TFPI	TF_VIIa_Xa_TFPI	0000011

## Kinetic Law

**SBO:0000054** mass action rate law for second order irreversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_{22} = \text{vol}(\text{compartment}_1) \cdot k_{37} \cdot [\text{TF\_VIIa}] \cdot [\text{Xa\_TFPI}] \quad (45)$$

## 7.23 Reaction R23

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

**Name** R23

## Reaction equation



## Reactants

Table 50: Properties of each reactant.

Id	Name	SBO
Xa	Xa	0000010
ATIII	ATIII	0000010

## Product

Table 51: Properties of each product.

Id	Name	SBO
Xa_ATIII	Xa_ATIII	0000011

### Kinetic Law

**SBO:0000054** mass action rate law for second order irreversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_{23} = \text{vol}(\text{compartment}_1) \cdot k_{38} \cdot [\text{Xa}] \cdot [\text{ATIII}] \quad (47)$$

### 7.24 Reaction R24

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

**Name** R24

### Reaction equation



### Reactants

Table 52: Properties of each reactant.

Id	Name	SBO
mIIa	mIIa	0000010
ATIII	ATIII	0000010

### Product

Table 53: Properties of each product.

Id	Name	SBO
mIIa_ATIII	mIIa_ATIII	0000011

### Kinetic Law

**SBO:0000054** mass action rate law for second order irreversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_{24} = \text{vol}(\text{compartment}_1) \cdot k_{39} \cdot [\text{mIIa}] \cdot [\text{ATIII}] \quad (49)$$

### 7.25 Reaction R25

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

**Name** R25

#### Reaction equation



#### Reactants

Table 54: Properties of each reactant.

Id	Name	SBO
IXa	IXa	0000010
ATIII	ATIII	0000010

#### Product

Table 55: Properties of each product.

Id	Name	SBO
IXa\_ATIII	IXa\_ATIII	0000011

#### Kinetic Law

**SBO:0000054** mass action rate law for second order irreversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

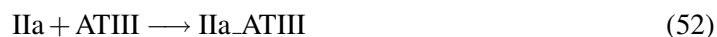
$$v_{25} = \text{vol}(\text{compartment}_1) \cdot k_{40} \cdot [\text{IXa}] \cdot [\text{ATIII}] \quad (51)$$

### 7.26 Reaction R26

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

**Name** R26

### Reaction equation



### Reactants

Table 56: Properties of each reactant.

Id	Name	SBO
IIa	IIa	0000010
ATIII	ATIII	0000010

### Product

Table 57: Properties of each product.

Id	Name	SBO
IIa\_ATIII	IIa\_ATIII	0000011

### Kinetic Law

**SBO:0000054** mass action rate law for second order irreversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_{26} = \text{vol}(\text{compartment\_1}) \cdot k_{41} \cdot [\text{IIa}] \cdot [\text{ATIII}] \quad (53)$$

### 7.27 Reaction R27

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

**Name** R27

### Reaction equation



### Reactants

Table 58: Properties of each reactant.

Id	Name	SBO
TF_VIIa	TF_VIIa	0000010
ATIII	ATIII	0000010

## Product

Table 59: Properties of each product.

Id	Name	SBO
TF_VIIa.ATIII	TF_VIIa.ATIII	0000011

## Kinetic Law

**SBO:0000054** mass action rate law for second order irreversible reactions, two reactants, continuous scheme

**Derived unit** contains undeclared units

$$v_{27} = \text{vol}(\text{compartment\_1}) \cdot k_{42} \cdot [\text{TF\_VIIa}] \cdot [\text{ATIII}] \quad (55)$$

## 7.28 Reaction R6b

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

**Name** R6b

## Reaction equation



## Reactant

Table 60: Properties of each reactant.

Id	Name	SBO
TF_VIIa_X	TF_VIIa_X	0000010

## Product



Table 61: Properties of each product.

Id	Name	SBO
TF_VIIa_Xa	TF_VIIa_Xa	0000011

**Kinetic Law****SBO:0000049** mass action rate law for first order irreversible reactions, continuous scheme**Derived unit** contains undeclared units

$$v_{28} = \text{vol}(\text{compartment}_1) \cdot k_{10} \cdot [\text{TF\_VIIa\_X}] \quad (57)$$

**7.29 Reaction R8b**

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

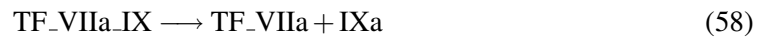
**Name** R8b**Reaction equation****Reactant**

Table 62: Properties of each reactant.

Id	Name	SBO
TF_VIIa_IX	TF_VIIa_IX	0000010

**Products**

Table 63: Properties of each product.

Id	Name	SBO
TF_VIIa	TF_VIIa	0000011
IXa	IXa	0000011

**Kinetic Law****SBO:0000049** mass action rate law for first order irreversible reactions, continuous scheme**Derived unit** contains undeclared units

$$v_{29} = \text{vol}(\text{compartment}_1) \cdot k_{15} \cdot [\text{TF\_VIIa\_IX}] \quad (59)$$

### 7.30 Reaction R12b

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

**Name** R12b

#### Reaction equation



#### Reactant

Table 64: Properties of each reactant.

Id	Name	SBO
IXa_VIIIa_X	IXa_VIIIa_X	0000010

#### Products

Table 65: Properties of each product.

Id	Name	SBO
IXa_VIIIa	IXa_VIIIa	0000011
Xa	Xa	0000011

#### Kinetic Law

**SBO:0000049** mass action rate law for first order irreversible reactions, continuous scheme

**Derived unit** contains undeclared units

$$v_{30} = \text{vol}(\text{compartment}_1) \cdot k_{22} \cdot [\text{IXa\_VIIIa\_X}] \quad (61)$$

### 7.31 Reaction R18b

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

**Name** R18b

#### Reaction equation



## Reactant

Table 66: Properties of each reactant.

Id	Name	SBO
Xa_Va_II	Xa_Va_II	0000010

## Products

Table 67: Properties of each product.

Id	Name	SBO
Xa_Va	Xa_Va	0000011
mIIa	mIIa	0000011

## Kinetic Law

**SBO:0000049** mass action rate law for first order irreversible reactions, continuous scheme

**Derived unit** contains undeclared units

$$v_{31} = \text{vol}(\text{compartment\_1}) \cdot k_{31} \cdot [\text{Xa\_Va\_II}] \quad (63)$$

## 7.32 Reaction R28

This is an irreversible reaction of two reactants forming two products.

**Name** R28

## Reaction equation



## Reactants

Table 68: Properties of each reactant.

Id	Name	SBO
IXa	IXa	0000461
X	X	0000010

## Products

Table 69: Properties of each product.

Id	Name	SBO
IXa	IXa	0000461
Xa	Xa	0000011

### Kinetic Law

**SBO:0000045** mass action rate law for second order irreversible reactions

**Derived unit** contains undeclared units

$$v_{32} = \text{vol}(\text{compartment\_1}) \cdot k_{43} \cdot [\text{IXa}] \cdot [\text{X}] \quad (65)$$

### 7.33 Reaction R29

This is an irreversible reaction of two reactants forming two products.

**Name** R29

### Reaction equation



### Reactants

Table 70: Properties of each reactant.

Id	Name	SBO
mIIa	mIIa	0000461
V	V	0000010

### Products

Table 71: Properties of each product.

Id	Name	SBO
mIIa	mIIa	0000461
Va	Va	0000011

### Kinetic Law

**SBO:0000045** mass action rate law for second order irreversible reactions

**Derived unit** contains undeclared units

$$v_{33} = \text{vol}(\text{compartment\_1}) \cdot k_{44} \cdot [\text{mIIa}] \cdot [\text{V}] \quad (67)$$

## 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 TF

**Name** TF

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

This species takes part in two reactions (as a reactant in [R1](#), [R2](#)).

$$\frac{d}{dt}\text{TF} = -v_1 - v_2 \quad (68)$$

### 8.2 Species TF\_VII

**Name** TF\_VII

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

This species takes part in one reaction (as a product in [R1](#)).

$$\frac{d}{dt}\text{TF\_VII} = v_1 \quad (69)$$

### 8.3 Species VII

**Name** VII

**Initial concentration**  $10^{-8} \text{ mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in [R1](#), [R3](#), [R4](#), [R5](#)).

$$\frac{d}{dt}\text{VII} = -v_1 - v_3 - v_4 - v_5 \quad (70)$$

## 8.4 Species TF\_VIIa

**Name** TF\_VIIa

**Initial concentration** 0 mol · l<sup>-1</sup>

This species takes part in nine reactions (as a reactant in R3, R6, R7, R8, R22, R27 and as a product in R2, R3, R8b).

$$\frac{d}{dt}\text{TF\_VIIa} = v_2 + v_3 + v_{29} - v_3 - v_6 - v_7 - v_8 - v_{22} - v_{27} \quad (71)$$

## 8.5 Species VIIa

**Name** VIIa

**Initial concentration** 10<sup>-10</sup> mol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in R2 and as a product in R3, R4, R5).

$$\frac{d}{dt}\text{VIIa} = v_3 + v_4 + v_5 - v_2 \quad (72)$$

## 8.6 Species Xa

**Name** Xa

**Initial concentration** 9.4 · 10<sup>-11</sup> mol · l<sup>-1</sup>

This species takes part in ten reactions (as a reactant in R4, R7, R9, R17, R20, R23 and as a product in R4, R9, R12b, R28).

$$\frac{d}{dt}\text{Xa} = v_4 + v_9 + v_{30} + v_{32} - v_4 - v_7 - v_9 - v_{17} - v_{20} - v_{23} \quad (73)$$

## 8.7 Species IIa

**Name** IIa

**Initial concentration** 10<sup>-9</sup> mol · l<sup>-1</sup>

This species takes part in nine reactions (as a reactant in R5, R10, R16, R26 and as a product in R5, R9, R10, R16, R19).

$$\frac{d}{dt}\text{IIa} = v_5 + v_9 + v_{10} + v_{16} + v_{19} - v_5 - v_{10} - v_{16} - v_{26} \quad (74)$$

### 8.8 Species TF\_VIIa\_X

**Name** TF\_VIIa\_X

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

This species takes part in two reactions (as a reactant in R6b and as a product in R6).

$$\frac{d}{dt} \text{TF\_VIIa\_X} = v_6 - v_{28} \quad (75)$$

### 8.9 Species X

**Name** X

**Initial concentration**  $1.6 \cdot 10^{-7} \text{ mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in R6, R12, R28 and as a product in R14).

$$\frac{d}{dt} X = v_{14} - v_6 - v_{12} - v_{32} \quad (76)$$

### 8.10 Species TF\_VIIa\_Xa

**Name** TF\_VIIa\_Xa

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

This species takes part in three reactions (as a reactant in R21 and as a product in R7, R6b).

$$\frac{d}{dt} \text{TF\_VIIa\_Xa} = v_7 + v_{28} - v_{21} \quad (77)$$

### 8.11 Species IX

**Name** IX

**Initial concentration**  $9 \cdot 10^{-8} \text{ mol} \cdot \text{l}^{-1}$

This species takes part in one reaction (as a reactant in R8).

$$\frac{d}{dt} IX = -v_8 \quad (78)$$

### 8.12 Species TF\_VIIa\_IX

**Name** TF\_VIIa\_IX

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

This species takes part in two reactions (as a reactant in R8b and as a product in R8).

$$\frac{d}{dt} \text{TF\_VIIa\_IX} = v_8 - v_{29} \quad (79)$$

### 8.13 Species IXa

**Name** IXa

**Initial concentration**  $2.1 \cdot 10^{-10} \text{ mol} \cdot \text{l}^{-1}$

This species takes part in seven reactions (as a reactant in [R11](#), [R25](#), [R28](#) and as a product in [R14](#), [R15](#), [R8b](#), [R28](#)).

$$\frac{d}{dt}\text{IXa} = v_{14} + v_{15} + v_{29} + v_{32} - v_{11} - v_{25} - v_{32} \quad (80)$$

### 8.14 Species II

**Name** II

**Initial concentration**  $1.4 \cdot 10^{-6} \text{ mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [R9](#), [R18](#)).

$$\frac{d}{dt}\text{II} = -v_9 - v_{18} \quad (81)$$

### 8.15 Species VIII

**Name** VIII

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

This species takes part in one reaction (as a reactant in [R10](#)).

$$\frac{d}{dt}\text{VIII} = -v_{10} \quad (82)$$

### 8.16 Species VIIIa

**Name** VIIIa

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

This species takes part in three reactions (as a reactant in [R11](#), [R13](#) and as a product in [R10](#)).

$$\frac{d}{dt}\text{VIIIa} = v_{10} - v_{11} - v_{13} \quad (83)$$



### 8.17 Species IXa\_VIIIa

**Name** IXa\_VIIIa

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

This species takes part in four reactions (as a reactant in R12, R15 and as a product in R11, R12b).

$$\frac{d}{dt} \text{IXa\_VIIIa} = v_{11} + v_{30} - v_{12} - v_{15} \quad (84)$$

### 8.18 Species IXa\_VIIIa\_X

**Name** IXa\_VIIIa\_X

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

This species takes part in three reactions (as a reactant in R14, R12b and as a product in R12).

$$\frac{d}{dt} \text{IXa\_VIIIa\_X} = v_{12} - v_{14} - v_{30} \quad (85)$$

### 8.19 Species VIIIa1\_L

**Name** VIIIa1\_L

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

This species takes part in three reactions (as a product in R13, R14, R15).

$$\frac{d}{dt} \text{VIIIa1\_L} = v_{13} + v_{14} + v_{15} \quad (86)$$

### 8.20 Species VIIIa2

**Name** VIIIa2

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

This species takes part in three reactions (as a product in R13, R14, R15).

$$\frac{d}{dt} \text{VIIIa2} = v_{13} + v_{14} + v_{15} \quad (87)$$

### 8.21 Species V

**Name** V

**Initial concentration**  $2 \cdot 10^{-8} \text{ mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in R16, R29).

$$\frac{d}{dt} \text{V} = -v_{16} - v_{33} \quad (88)$$

## 8.22 Species $V_a$

**Name**  $V_a$

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

This species takes part in three reactions (as a reactant in [R17](#) and as a product in [R16](#), [R29](#)).

$$\frac{d}{dt}V_a = v_{16} + v_{33} - v_{17} \quad (89)$$

## 8.23 Species $Xa\_Va$

**Name**  $Xa\_Va$

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

This species takes part in five reactions (as a reactant in [R18](#), [R19](#) and as a product in [R17](#), [R19](#), [R18b](#)).

$$\frac{d}{dt}Xa\_Va = v_{17} + v_{19} + v_{31} - v_{18} - v_{19} \quad (90)$$

## 8.24 Species $Xa\_Va\_II$

**Name**  $Xa\_Va\_II$

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

This species takes part in two reactions (as a reactant in [R18b](#) and as a product in [R18](#)).

$$\frac{d}{dt}Xa\_Va\_II = v_{18} - v_{31} \quad (91)$$

## 8.25 Species $mIIa$

**Name**  $mIIa$

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

This species takes part in five reactions (as a reactant in [R19](#), [R24](#), [R29](#) and as a product in [R18b](#), [R29](#)).

$$\frac{d}{dt}mIIa = v_{31} + v_{33} - v_{19} - v_{24} - v_{33} \quad (92)$$

### 8.26 Species TFPI

**Name** TFPI

**Initial concentration**  $2.5 \cdot 10^{-9} \text{ mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in R20, R21).

$$\frac{d}{dt} \text{TFPI} = -v_{20} - v_{21} \quad (93)$$

### 8.27 Species Xa\_TFPI

**Name** Xa\_TFPI

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

This species takes part in two reactions (as a reactant in R22 and as a product in R20).

$$\frac{d}{dt} \text{Xa\_TFPI} = v_{20} - v_{22} \quad (94)$$

### 8.28 Species TF\_VIIa\_Xa\_TFPI

**Name** TF\_VIIa\_Xa\_TFPI

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

This species takes part in two reactions (as a product in R21, R22).

$$\frac{d}{dt} \text{TF\_VIIa\_Xa\_TFPI} = v_{21} + v_{22} \quad (95)$$

### 8.29 Species ATIII

**Name** ATIII

**Initial concentration**  $3.4 \cdot 10^{-6} \text{ mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in R23, R24, R25, R26, R27).

$$\frac{d}{dt} \text{ATIII} = -v_{23} - v_{24} - v_{25} - v_{26} - v_{27} \quad (96)$$

### 8.30 Species Xa\_ATIII

**Name** Xa\_ATIII

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

This species takes part in one reaction (as a product in R23).

$$\frac{d}{dt} \text{Xa\_ATIII} = v_{23} \quad (97)$$

### 8.31 Species `mIIa_ATIII`

**Name** `mIIa_ATIII`

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

This species takes part in one reaction (as a product in [R24](#)).

$$\frac{d}{dt} \text{mIIa\_ATIII} = v_{24} \quad (98)$$

### 8.32 Species `IXa_ATIII`

**Name** `IXa_ATIII`

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

This species takes part in one reaction (as a product in [R25](#)).

$$\frac{d}{dt} \text{IXa\_ATIII} = v_{25} \quad (99)$$

### 8.33 Species `IIa_ATIII`

**Name** `IIa_ATIII`

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

This species takes part in one reaction (as a product in [R26](#)).

$$\frac{d}{dt} \text{IIa\_ATIII} = v_{26} \quad (100)$$

### 8.34 Species `TF_VIIa_ATIII`

**Name** `TF_VIIa_ATIII`

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

This species takes part in one reaction (as a product in [R27](#)).

$$\frac{d}{dt} \text{TF\_VIIa\_ATIII} = v_{27} \quad (101)$$

## A Glossary of Systems Biology Ontology Terms

**SBO:0000010 reactant:** Substance consumed by a chemical reaction. Reactants react with each other to form the products of a chemical reaction. In a chemical equation the Reactants are the elements or compounds on the left hand side of the reaction equation. A reactant can be consumed and produced by the same reaction, its global quantity remaining unchanged

**SBO:0000011 product:** Substance that is produced in a reaction. In a chemical equation the Products are the elements or compounds on the right hand side of the reaction equation. A product can be produced and consumed by the same reaction, its global quantity remaining unchanged

**SBO:0000035 forward unimolecular rate constant, continuous case:** Numerical parameter that quantifies the forward velocity of a chemical reaction involving only one reactant. This parameter encompasses all the contributions to the velocity except the quantity of the reactant. It is to be used in a reaction modelled using a continuous framework

**SBO:0000036 forward bimolecular rate constant, continuous case:** Numerical parameter that quantifies the forward velocity of a chemical reaction involving two reactants. This parameter encompasses all the contributions to the velocity except the quantity of the reactants. It is to be used in a reaction modelled using a continuous framework

**SBO:0000038 reverse unimolecular rate constant, continuous case:** Numerical parameter that quantifies the reverse velocity of a chemical reaction involving only one product. This parameter encompasses all the contributions to the velocity except the quantity of the product. It is to be used in a reaction modelled using a continuous framework

**SBO:0000039 reverse bimolecular rate constant, continuous case:** Numerical parameter that quantifies the reverse velocity of a chemical reaction involving only one product. This parameter encompasses all the contributions to the velocity except the quantity of the product. It is to be used in a reaction modelled using a continuous framework

**SBO:0000045 mass action rate law for second order irreversible reactions:** Reaction scheme where the products are created from the reactants and the change of a product quantity is proportional to the product of reactant activities. The reaction scheme does not include any reverse process that creates the reactants from the products. The change of a product quantity is proportional to two reactant quantity

**SBO:0000049 mass action rate law for first order irreversible reactions, continuous scheme:** Reaction scheme where the products are created from the reactants and the change of a product quantity is proportional to the product of reactant activities. The reaction scheme does not include any reverse process that creates the reactants from the products. The change of a product quantity is proportional to the quantity of one reactant. It is to be used in a reaction modelled using a continuous framework.

**SBO:0000054 mass action rate law for second order irreversible reactions, two reactants, continuous scheme:** Reaction scheme where the products are created from the reactants and the change of a product quantity is proportional to the product of reactant activities. The reaction scheme does not include any reverse process that creates the reactants from the products. The change of a product quantity is proportional to the product of two reactant quantities. It is to be used in a reaction modelled using a continuous framework.

**SBO:0000083 mass action rate law for first order forward, second order reverse, reversible reactions, two products, continuous scheme:** Reaction scheme where the products are created from the reactants and the change of a product quantity is proportional to the product of reactant activities. The reaction scheme does include a reverse process that creates the reactants from the products. The rate of the forward process is proportional to the quantity of one reactant. The rate of the reverse process is proportional to the product of two product quantities. It is to be used in a reaction modelled using a continuous framework.

**SBO:0000101 mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme:** Reaction scheme where the products are created from the reactants and the change of a product quantity is proportional to the product of reactant activities. The reaction scheme does include a reverse process that creates the reactants from the products. The rate of the forward process is proportional to the product of two reactant quantities. The rate of the reverse process is proportional to the quantity of one product. It is to be used in a reaction modelled using a continuous framework.

**SBO:0000461 essential activator:** A substance that is absolutely required for occurrence and stimulation of a reaction

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