



# Differential Equation System

*Full Model*

# 1 Global Parameters

Parameter	Value	Value Units
$N$	602299999999999980000000	
$vol$	7e-016	
$k_{translation}$	0.16667	
$k_{const.transcr}$	0.0011	
$k_{open}$	7.5	
$k_{gesloten}$	500	
$d_{mRNA}$	0.0023105	
$k_{transcr.CIIP22}$	0.0125	
$d_{cI434}$	9.627e-005	
$k_{B0032}$	0.16667	
$k_{B0034}$	0.55	
$translation_{LuxR}$	0.55556	
$transcription_{LuxR}$	0.025	
$d_{diff}$	8e-005	
$d_{HSLext}$	1.02e-006	

## 2 Rate Laws

### 2.1 Reaction 1

	Reactants	Products
Species	Gene_lactonase pT7_tag	closed_mRNA_lactonase Gene_lactonase pT7_tag

#### Reaction Rate

$$v_1 = [lactonaseproduction] \cdot Gene_{lactonase} \cdot k_{max} \cdot \frac{filter.pT7_{tag}}{(K_{T7} + filter.pT7_{tag})} \quad (1)$$

	Parameter	Value	Value Units
Parameters	$K_{T7}$	421	
	$k_{max}$	0.044	

### 2.2 Reaction 2

	Reactants	Products
Species	open_mRNA_lactonase open_mRNA_lactonase_complex	lactonase open_mRNA_lactonase open_mRNA_lactonase_complex

#### Reaction Rate

$$v_2 = k_{B0032} \cdot ([lactonaseproduction] \cdot open_{mRNA}_{lactonase} + [lactonaseproduction] \cdot open_{mRNA}_{lactonase\_complex}) \quad (2)$$

	Parameter	Value	Value Units
Parameters			

### 2.3 Reaction 3

	Reactants	Products
Species	lactonase	sa30_degraded

**Reaction Rate**

$$v_3 = d_{lva} \cdot [lactonaseproduction].lactonase \quad (3)$$

Parameter	Value	Value Units
$d_{lva}$	0.0002814	

**2.4 Reaction 4**

Species	Reactants	Products
	closed_mRNA_lactonase	open_mRNA_lactonase

**Reaction Rate**

$$v_4 = k_{open} \cdot [lactonaseproduction].closed_{mRNA_lactonase} - k_{gesloten} \cdot [lactonaseproduction].open_{mRNA_lactonase} \quad (4)$$

Parameter	Value	Value Units
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**2.5 Reaction 5**

Species	Reactants	Products
	mRNA_RIBOKEY closed_mRNA_lactonase	open_mRNA_lactonase_complex

**Reaction Rate**

$$v_5 = k_{complex1} \cdot filter.mRNA_{RIBOKEY} \cdot [lactonaseproduction].closed_{mRNA_lactonase} - k_{dis1} \cdot [lactonaseproduction] \quad (5)$$

Parameter	Value	Value Units
$k_{complex1}$	0.00237	
$k_{dis1}$	0.00416	

**2.6 Reaction 6**

Species	Reactants	Products
	mRNA_RIBOKEY	sa3_degraded

**Reaction Rate**

$$v_6 = d_{mRNA\_RIBOKEY} \cdot filter.mRNA_{RIBOKEY} \quad (6)$$

Parameter	Value	Value Units
$d_{mRNA\_RIBOKEY}$	0.004621	

**2.7 Reaction 7**

Species	Reactants	Products
	closed_mRNA_T7	sa10_degraded

**Reaction Rate**

$$v_7 = d_{gesloten.mRNA.T7} \cdot filter.closed_{mRNA.T7} \quad (7)$$

Parameters	Parameter	Value	Value Units
	$d_{gesloten\_mRNA\_T7}$	0.004621	

## 2.8 Reaction 8

Species	Reactants	Products
	pT7_tag	sa15_degraded

### Reaction Rate

$$v_8 = d_{pT7\_tag} \cdot filter.pT7_{tag} \quad (8)$$

Parameters	Parameter	Value	Value Units
	$d_{pT7\_tag}$	0.0015525	

## 2.9 Reaction 9

Species	Reactants	Products
	Gene_RIBOKEY	mRNA_RIBOKEY
	TetR_var_transcr_rate	Gene_RIBOKEY
		TetR_var_transcr_rate

### Reaction Rate

$$v_9 = filter.Gene_{RIBOKEY} \cdot default.TetR_{var\_transcr\_rate} \quad (9)$$

Parameters	Parameter	Value	Value Units
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## 2.10 Reaction 10

Species	Reactants	Products
	Gene_T7	closed_mRNA_T7
		Gene_T7

### Reaction Rate

$$v_{10} = k_{const\_transcr} \cdot filter.Gene_{T7} \quad (10)$$

Parameters	Parameter	Value	Value Units
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## 2.11 Reaction 11

Species	Reactants	Products
	open_mRNA_T7	pT7_tag
	open_mRNA_T7_complex	open_mRNA_T7
		open_mRNA_T7_complex

### Reaction Rate

$$v_{11} = k_{translation} \cdot (filter.open_{mRNA\_T7} + filter.open_{mRNA\_T7\_complex}) \quad (11)$$

Parameters	Parameter	Value	Value Units
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## 2.12 Reaction 12

Species	Reactants	Products
	closed_mRNA_T7	open_mRNA_T7

## Reaction Rate

$$v_{12} = k_{open} \cdot filter.closed_{mRNA\_T7} - k_{gesloten} \cdot filter.open_{mRNA\_T7} \quad (12)$$

Parameters	Parameter	Value	Value Units
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## 2.13 Reaction 13

Species	Reactants	Products
	open_mRNA_T7	sa18.degraded

## Reaction Rate

$$v_{13} = d_{open\_mRNA\_T7} \cdot filter.open_{mRNA\_T7} \quad (13)$$

Parameters	Parameter	Value	Value Units
	$d_{open\_mRNA\_T7}$	0.0023105	

## 2.14 Reaction 14

Species	Reactants	Products
	mRNA_RIBOKEY closed_mRNA_T7	open_mRNA_T7_complex

## Reaction Rate

$$v_{14} = k_{complex} \cdot filter.mRNA_{RIBOKEY} \cdot filter.closed_{mRNA\_T7} - k_{dis} \cdot filter.open_{mRNA\_T7\_complex} \quad (14)$$

Parameters	Parameter	Value	Value Units
	$k_{complex}$	0.00237	
	$k_{dis}$	0.00416	

## 2.15 Reaction 15

Species	Reactants	Products
	open_mRNA_T7_complex	csa3.degraded

## Reaction Rate

$$v_{15} = d_{open\_mRNA\_T7\_complex} \cdot filter.open_{mRNA\_T7\_complex} \quad (15)$$

Parameters	Parameter	Value	Value Units
	$d_{open\_mRNA\_T7\_complex}$	0.0023105	

## 2.16 Reaction 16

Species	Reactants	Products
	mRNA_LuxR	C0062.LuxR mRNA_LuxR

## Reaction Rate

$$v_{16} = celldeath.mRNA_{LuxR} \cdot translation_{LuxR} \quad (16)$$

Parameters	Parameter	Value	Value Units
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## 2.17 Reaction 17

Species	Reactants	Products
	C0062_LuxR HSL	HSL_LuxR_complex

### Reaction Rate

$$v_{17} = \text{celldeath.C0062}_{LuxR} \cdot \text{default.HSL} \cdot k_a - \text{celldeath.HSL}_{LuxR\_complex} \cdot k_d \quad (17)$$

Parameters	Parameter	Value	Value Units
	$k_a$	0.002372	
	$k_d$	1	

## 2.18 Reaction 18

Species	Reactants	Products
	C0062_LuxR	sa38_degraded

### Reaction Rate

$$v_{18} = \text{celldeath.C0062}_{LuxR} \cdot d_{LuxR} \quad (18)$$

Parameters	Parameter	Value	Value Units
	$d_{LuxR}$	9.627e-005	

## 2.19 Reaction 19

Species	Reactants	Products
	HSL_LuxR_complex	HSL

### Reaction Rate

$$v_{19} = \text{celldeath.HSL}_{LuxR\_complex} \cdot d_{complex} \quad (19)$$

Parameters	Parameter	Value	Value Units
	$d_{complex}$	9.627e-005	

## 2.20 Reaction 20

Species	Reactants	Products
	Gene_LuxR	mRNA_LuxR
	CIIP22	Gene_LuxR
	HSL_LuxR_complex	CIIP22
		HSL_LuxR_complex

### Reaction Rate

$$v_{20} = k_{transcr} \cdot \text{celldeath.Gene}_{LuxR} \cdot \frac{Km_{CIIP22}^2}{(Km_{CIIP22}^2 + \text{memory.CIIP22}^2)} \cdot \left( \frac{\left( \frac{\text{celldeath.HSL}_{LuxR\_complex}}{\text{vol} \cdot N} \right)^{hill}}{(Km_{LuxR}^{hill} + \left( \frac{\text{celldeath.HSL}_{LuxR\_complex}}{\text{vol} \cdot N} \right)^{hill})} \right) \quad (20)$$

Parameter	Value	Value Units
$Km_{CIIIP22}$	0.1099	
$k_{transcr}$	0.003	
$Km_{LuxR}$	4.05e-006	
$hill$	2.08	
$k_l$	0.0005	

## 2.21 Reaction 21

Species	Reactants	Products
	HSL lactonase	EnzymeComplex

### Reaction Rate

$$v_{21} = default.HSL \cdot [lactonaseproduction].lactonase \cdot k_{a1} \quad (21)$$

Parameter	Value	Value Units
$k_{a1}$	0.002372	

## 2.22 Reaction 22

Species	Reactants	Products
	EnzymeComplex	hydroxyacid lactonase

### Reaction Rate

$$v_{22} = default.EnzymeComplex \cdot k_{cat} \quad (22)$$

Parameter	Value	Value Units
$k_{cat}$	29	

## 2.23 Reaction 23

Species	Reactants	Products
	EnzymeComplex	HSL lactonase

### Reaction Rate

$$v_{23} = default.EnzymeComplex \cdot k_{d1} \quad (23)$$

Parameter	Value	Value Units
$k_{d1}$	4470	

## 2.24 Reaction 24

Species	Reactants	Products
	Gene_C0061 C0012_LacI	mRNA_C0061 Gene_C0061 C0012_LacI

### Reaction Rate

$$v_{24} = k_{trans.LacI} \cdot \frac{Km^n}{\left(\left(\frac{inverter.C0012LacI}{(vol \cdot N)}\right)^n + Km^n\right)} \quad (24)$$

Parameter	Value	Value Units
$n$	2	
$Km$	1e-010	
$k_{trans\_LacI}$	0.0025	

### 2.25 Reaction 25

Species	Reactants	Products
	mRNA_C0061	C0061_LuxI mRNA_C0061

#### Reaction Rate

$$v_{25} = k_{B0032} \cdot inverter.mRNA_{C0061} \quad (25)$$

Parameter	Value	Value Units
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### 2.26 Reaction 26

Species	Reactants	Products
	EnzymeComplex_LuxI C0061_LuxI	HSL C0061_LuxI

#### Reaction Rate

$$v_{26} = k_{LuxHSL} \cdot inverter.C0061_{LuxI} \quad (26)$$

Parameter	Value	Value Units
$k_{LuxHSL}$	0.016667	

### 2.27 Reaction 27

Species	Reactants	Products
	mRNA_C0061	sa22_degraded

#### Reaction Rate

$$v_{27} = inverter.mRNA_{C0061} \cdot d_{mRNA.C0061} \quad (27)$$

Parameter	Value	Value Units
$d_{mRNA.C0061}$	0.0025	

### 2.28 Reaction 28

Species	Reactants	Products
	C0061_LuxI	sa23_degraded

#### Reaction Rate

$$v_{28} = inverter.C0061_{LuxI} \cdot d_{lva} \quad (28)$$

Parameter	Value	Value Units
$d_{lva}$	0.0002814	



### 2.29 Reaction 29

Species	Reactants	Products
	C0012_LacI	sa11_degraded

#### Reaction Rate

$$v_{29} = inverter.C0012_{LacI} \cdot d_{lva} \quad (29)$$

Parameters	Parameter	Value	Value Units
	$d_{lva}$	0.0002814	

### 2.30 Reaction 30

Species	Reactants	Products
	mRNA_C0061 antimRNA_LuxI	complex_LuxI

#### Reaction Rate

$$v_{30} = inverter.mRNA_{C0061} \cdot memory.antimRNA_{LuxI} \cdot k_{complex3} \quad (30)$$

Parameters	Parameter	Value	Value Units
	$k_{complex3}$	0.00237	

### 2.31 Reaction 31

Species	Reactants	Products
	complex_LuxI	csa1_degraded

#### Reaction Rate

$$v_{31} = memory.complex_{LuxI} \cdot d_{mRNA_{C0061}.complex} \quad (31)$$

Parameters	Parameter	Value	Value Units
	$d_{mRNA_{C0061}.complex}$	0.005	

### 2.32 Reaction 32

Species	Reactants	Products
	pT7_tag Gene_LacI	closed_mRNA_LacI pT7_tag Gene_LacI

#### Reaction Rate

$$v_{32} = inverter.Gene_{LacI} \cdot k_{max} \cdot \frac{filter.pT7_{tag}}{(K_{T7} + filter.pT7_{tag})} \quad (32)$$

Parameters	Parameter	Value	Value Units
	$K_{T7}$	421	
	$k_{max}$	0.044	

### 2.33 Reaction 33

	Reactants	Products
Species	open_mRNA_LacI open_mRNA_LacI_complex	C0012_LacI open_mRNA_LacI open_mRNA_LacI_complex

#### Reaction Rate

$$v_{33} = k_{B0032} \cdot (inverter.open_{mRNA}LacI + inverter.open_{mRNA}LacI_{complex}) \quad (33)$$

Parameters	Parameter	Value	Value Units

### 2.34 Reaction 34

	Reactants	Products
Species	closed_mRNA_LacI	open_mRNA_LacI

#### Reaction Rate

$$v_{34} = k_{open} \cdot inverter.closed_{mRNA}LacI - k_{gesloten} \cdot inverter.open_{mRNA}LacI \quad (34)$$

Parameters	Parameter	Value	Value Units

### 2.35 Reaction 35

	Reactants	Products
Species	mRNA_RIBOKEY closed_mRNA_LacI	open_mRNA_LacI_complex

#### Reaction Rate

$$v_{35} = k_{complex2} \cdot filter.mRNA_{RIBOKEY} \cdot inverter.closed_{mRNA}LacI - k_{dis2} \cdot inverter.open_{mRNA}LacI_{complex} \quad (35)$$

Parameters	Parameter	Value	Value Units
	$k_{complex2}$	0.00237	
	$k_{dis2}$	0.00416	

### 2.36 Reaction 36

	Reactants	Products
Species	closed_mRNA_LacI	sa129_degraded

#### Reaction Rate

$$v_{36} = d_{gesloten.mRNA}LacI \cdot inverter.closed_{mRNA}LacI \quad (36)$$

Parameters	Parameter	Value	Value Units
	$d_{gesloten.mRNA}LacI$	0.004621	

### 2.37 Reaction 37

	Reactants	Products
Species	open_mRNA_LacI	sa130_degraded

**Reaction Rate**

$$v_{37} = d_{open\_mRNA\_LacI} \cdot inverter.open\_mRNA\_LacI \quad (37)$$

Parameter	Value	Value Units
$d_{open\_mRNA\_LacI}$	0.0023105	

**2.38 Reaction 38**

Species	Reactants	Products
	HSL	sa72_degraded

**Reaction Rate**

$$v_{38} = d_{HSL} \cdot default.HSL \quad (38)$$

Parameter	Value	Value Units
$d_{HSL}$	1.02e-006	

**2.39 Reaction 39**

Species	Reactants	Products
	closed_mRNA_lactonase	sa38_degraded

**Reaction Rate**

$$v_{39} = d_{gesloten\_mRNA\_lactonase} \cdot [lactonaseproduction] \cdot closed\_mRNA\_lactonase \quad (39)$$

Parameter	Value	Value Units
$d_{gesloten\_mRNA\_lactonase}$	0.004621	

**2.40 Reaction 40**

Species	Reactants	Products
	open_mRNA_lactonase	sa37_degraded

**Reaction Rate**

$$v_{40} = d_{open\_mRNA\_lactonase} \cdot [lactonaseproduction] \cdot open\_mRNA\_lactonase \quad (40)$$

Parameter	Value	Value Units
$d_{open\_mRNA\_lactonase}$	0.0023105	

**2.41 Reaction 41**

Species	Reactants	Products
	open_mRNA_lactonase_complex	csa5_degraded

**Reaction Rate**

$$v_{41} = d_{open\_mRNA\_lactonase\_complex} \cdot [lactonaseproduction] \cdot open\_mRNA\_lactonase\_complex \quad (41)$$

Parameter	Value	Value Units
$d_{open\_mRNA\_lactonase\_complex}$	0.0023105	

## 2.42 Reaction 42

Species	Reactants	Products
	open_mRNA_LacI_complex	csa10_degraded

### Reaction Rate

$$v_{42} = d_{open\_mRNA\_LacI\_complex} \cdot inverter.open\_mRNA\_LacI\_complex \quad (42)$$

Parameters	Parameter	Value	Value Units
	$d_{open\_mRNA\_LacI\_complex}$	0.0023105	

## 2.43 Reaction 43

Species	Reactants	Products
	mRNA_LuxR	sa64_degraded

### Reaction Rate

$$v_{43} = d_{mRNA\_LuxR} \cdot celldeath.mRNA_{LuxR} \quad (43)$$

Parameters	Parameter	Value	Value Units
	$d_{mRNA\_LuxR}$	0.00227	

## 2.44 Reaction 44

Species	Reactants	Products
	Gene_ccdB	mRNA_ccdB
	HSL_LuxR_complex	Gene_ccdB
	CIIP22	HSL_LuxR_complex CIIP22

### Reaction Rate

$$v_{44} = f_{stop} \cdot k_{transcr} \cdot celldeath.Gene\_ccdB \cdot \frac{Km_{CIIP22}^2}{(Km_{CIIP22}^2 + memory.CIIP22^2)} \cdot \left( \frac{\left( \frac{celldeath.HSL_{LuxR\_complex}}{(vol \cdot N)} \right)^{hill}}{(Km_{LuxR}^{hill} + \left( \frac{celldeath.HSL_{LuxR\_complex}}{(vol \cdot N)} \right)^{hill})} \right) \quad (44)$$

Parameters	Parameter	Value	Value Units
	$Km_{CIIP22}$	0.1099	
	$k_{transcr}$	0.003	
	$hill$	2.08	
	$Km_{LuxR}$	4.05e-006	
	$f_{stop}$	0.4	

## 2.45 Reaction 45

Species	Reactants	Products
	mRNA_ccdB	P1010_ccdB mRNA_ccdB

### Reaction Rate

$$v_{45} = celldeath.mRNA_{ccdB} \cdot k_{Cdb} \quad (45)$$

Parameters	Parameter	Value	Value Units
	$k_{CcdB}$	0.0055556	

## 2.46 Reaction 46

Species	Reactants	Products
	mRNA_ccdB	sa44_degraded

### Reaction Rate

$$v_{46} = celldeath.mRNA_{ccdB} \cdot d_{mRNA\_ccdB} \quad (46)$$

Parameters	Parameter	Value	Value Units
	$d_{mRNA\_ccdB}$	0.00231	

## 2.47 Reaction 47

Species	Reactants	Products
	P1010_ccdB	sa45_degraded

### Reaction Rate

$$v_{47} = celldeath.P1010_{ccdB} \cdot d_{CcdB} \quad (47)$$

Parameters	Parameter	Value	Value Units
	$d_{CcdB}$	0.000289	

## 2.48 Reaction 48

Species	Reactants	Products
	Gene_GFP TetR_var_transcr_rate	mRNA_GFP Gene_GFP TetR_var_transcr_rate

### Reaction Rate

$$v_{48} = default.TetR_{var\_transcr\_rate} \cdot output.Gene_{GFP} \quad (48)$$

Parameters	Parameter	Value	Value Units
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## 2.49 Reaction 49

Species	Reactants	Products
	mRNA_GFP	GFP mRNA_GFP

### Reaction Rate

$$v_{49} = output.mRNA_{GFP} \cdot k_{B0032} \quad (49)$$

Parameters	Parameter	Value	Value Units
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## 2.50 Reaction 50

Species	Reactants	Products
	mRNA_GFP	sa10_degraded

**Reaction Rate**

$$v_{50} = output.mRNA_{GFP} \cdot d_{mRNA_{GFP}} \quad (50)$$

Parameter	Value	Value Units
$d_{mRNA_{GFP}}$	0.0023	

**2.51 Reaction 51**

Species	Reactants	Products
	GFP	sa11_degraded

**Reaction Rate**

$$v_{51} = output.GFP \cdot d_{lva} \quad (51)$$

Parameter	Value	Value Units
$d_{lva}$	0.0002814	

**2.52 Reaction 52**

Species	Reactants	Products
	HSL	extracellular HSL

**Reaction Rate**

$$v_{52} = \left( \frac{default.HSL}{V_{cell} - \frac{medium.[extracellularHSL]}{V_{ext}}} \right) \cdot diff_{rate} \cdot V_{cell} \quad (52)$$

Parameter	Value	Value Units
$diff_{rate}$	0.03	
$V_{cell}$	7e-016	
$V_{ext}$	1e-015	

**2.53 Reaction 53**

Species	Reactants	Products
	Gene_CIIP22	mRNA_CIIP22
	cl434_lva	Gene_CIIP22
	cl434	cl434_lva
		cl434

**Reaction Rate**

$$v_{53} = k_{transcr\_CIIP22} \cdot memory.Gene_{CIIP22} \cdot \frac{Km^2}{(Km^2 + (memory.cI434_{lva} + memory.cI434)^2)} \quad (53)$$

Parameter	Value	Value Units
$Km$	0.8708	

**2.54 Reaction 54**

Species	Reactants	Products
	mRNA_CIIP22	CIIP22
		mRNA_CIIP22

**Reaction Rate**

$$v_{54} = k_{transl.CIIP22} \cdot memory.mRNA_{CIIP22} \quad (54)$$

Parameter	Value	Value Units
$k_{transl.CIIP22}$	0.0055556	

**2.55 Reaction 55**

Species	Reactants	Products
	Gene_cl434 CIIP22	mRNA_cl434 Gene_cl434 CIIP22

**Reaction Rate**

$$v_{55} = k_{transcr} \cdot memory.Gene_{cl434} \cdot \frac{Km^2}{(Km^2 + memory.CIIP22^2)} \quad (55)$$

Parameter	Value	Value Units
$k_{transcr}$	0.004	
$Km$	0.1099	

**2.56 Reaction 56**

Species	Reactants	Products
	mRNA_cl434	cl434_lva mRNA_cl434

**Reaction Rate**

$$v_{56} = k_{transl} \cdot memory.mRNA_{cl434} \quad (56)$$

Parameter	Value	Value Units
$k_{transl}$	0.038888	

**2.57 Reaction 57**

Species	Reactants	Products
	CIIP22	sa13_degraded

**Reaction Rate**

$$v_{57} = d_{CIIP22} \cdot memory.CIIP22 \quad (57)$$

Parameter	Value	Value Units
$d_{CIIP22}$	0.00028811	

**2.58 Reaction 58**

Species	Reactants	Products
	mRNA_CIIP22	sa10_degraded

**Reaction Rate**

$$v_{58} = d_{mRNA} \cdot memory.mRNA_{CIIP22} \quad (58)$$

Parameter	Value	Value Units
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### 2.59 Reaction 59

Species	Reactants	Products
	mRNA_cl434	sa11_degraded

#### Reaction Rate

$$v_{59} = d_{mRNA} \cdot \text{memory.mRNA}_{cI434} \quad (59)$$

Parameters	Parameter	Value	Value Units
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### 2.60 Reaction 60

Species	Reactants	Products
	cl434_lva	sa14_degraded

#### Reaction Rate

$$v_{60} = d_{cI434.lva} \cdot \text{memory.cI434}_{lva} \quad (60)$$

Parameters	Parameter	Value	Value Units
	$d_{cI434.lva}$	0.00028811	

### 2.61 Reaction 61

Species	Reactants	Products
	Gene_antiLuxI	antimRNA_LuxI
	cl434_lva	Gene_antiLuxI
	cl434	cl434_lva cl434

#### Reaction Rate

$$v_{61} = k_{transcr\_antiLuxIgen} \cdot Km^n \cdot \frac{\text{memory.Gene}_{antiLuxI}}{((\text{memory.cI434}_{lva} + \text{memory.cI434})^n + Km^n)} \quad (61)$$

Parameters	Parameter	Value	Value Units
	$k_{transcr\_antiLuxIgen}$	0.0125	
	$Km$	0.8708	
	$n$	2	

### 2.62 Reaction 62

Species	Reactants	Products
	antimRNA_LuxI	sa179_degraded

#### Reaction Rate

$$v_{62} = d_{antiRNA} \cdot \text{memory.antimRNA}_{LuxI} \quad (62)$$

Parameters	Parameter	Value	Value Units
	$d_{antiRNA}$	0.0045304	



### 2.63 Reaction 63

	Reactants	Products
Species	TetR_var.transcr.rate Gene_sensor	asRNA_cl434 TetR_var.transcr.rate Gene_sensor

#### Reaction Rate

$$v_{63} = \text{default.TetR}_{var.transcr.rate} \cdot \text{memory.Gene}_{sensor} \quad (63)$$

Parameters	Parameter	Value	Value Units
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### 2.64 Reaction 64

	Reactants	Products
Species	asRNA_cl434	sa22_degraded

#### Reaction Rate

$$v_{64} = d_{mRNA} \cdot \text{memory.asRNA}_{cI434} \quad (64)$$

Parameters	Parameter	Value	Value Units
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### 2.65 Reaction 65

	Reactants	Products
Species	asRNA_cl434	cl434 asRNA_cl434

#### Reaction Rate

$$v_{65} = \text{memory.asRNA}_{cI434} \cdot k_{sensor.transl} \quad (65)$$

Parameters	Parameter	Value	Value Units
	$k_{sensor.transl}$	0.0055556	

### 2.66 Reaction 66

	Reactants	Products
Species	cl434	sa24_degraded

#### Reaction Rate

$$v_{66} = d_{cI434} \cdot \text{memory.cI434} \quad (66)$$

Parameters	Parameter	Value	Value Units
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### 2.67 Reaction 67

	Reactants	Products
Species	extracellular HSL	sa314_degraded

#### Reaction Rate

$$v_{67} = (d_{HSLext} + d_{diff}) \cdot [\text{extracellularHSL}] \quad (67)$$

Parameters	Parameter	Value	Value Units
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### 3 Equations

#### 3.1 Species: HSL

$$\frac{d[HSL]}{dt} = -v_{17} + v_{19} - v_{21} + v_{23} + v_{26} - v_{38} - v_{52} \quad (68)$$

#### 3.2 Species: hydroxyacid

$$\frac{d[hydroxyacid]}{dt} = +v_{22} \quad (69)$$

#### 3.3 Species: EnzymeComplex

$$\frac{d[EnzymeComplex]}{dt} = +v_{21} - v_{22} - v_{23} \quad (70)$$

#### 3.4 Species: sa72\_degraded

$$\frac{d[sa72_{degraded}]}{dt} = +v_{38} \quad (71)$$

#### 3.5 Species: EnzymeComplex\_LuxI

$$\frac{d[EnzymeComplex_{LuxI}]}{dt} = -v_{26} \quad (72)$$

#### 3.6 Species: TetR\_var\_transcr\_rate

$$\frac{d[TetR_{var\_transcr\_rate}]}{dt} = +v_9 - v_9 + v_{48} - v_{48} + v_{63} - v_{63} \quad (73)$$

#### 3.7 Species: mRNA\_RIBOKEY

$$\frac{d[mRNA_{RIBOKEY}]}{dt} = -v_5 - v_6 + v_9 - v_{14} - v_{35} \quad (74)$$

#### 3.8 Species: sa10\_degraded

$$\frac{d[sa10_{degraded}]}{dt} = +v_7 + v_{50} + v_{58} \quad (75)$$

#### 3.9 Species: sa18\_degraded

$$\frac{d[sa18_{degraded}]}{dt} = +v_{13} \quad (76)$$

#### 3.10 Species: csa3\_degraded

$$\frac{d[csa3_{degraded}]}{dt} = +v_{15} \quad (77)$$

#### 3.11 Species: sa3\_degraded

$$\frac{d[sa3_{degraded}]}{dt} = +v_6 \quad (78)$$

### 3.12 Species: Gene\_RIBOKEY

$$\frac{d[Gene_{RIBOKEY}]}{dt} = +v_9 - v_9 \quad (79)$$

### 3.13 Species: Gene\_T7

$$\frac{d[Gene_{T7}]}{dt} = +v_{10} - v_{10} \quad (80)$$

### 3.14 Species: open\_mRNA\_T7

$$\frac{d[open_{mRNA_{T7}}]}{dt} = +v_{11} - v_{11} + v_{12} - v_{13} \quad (81)$$

### 3.15 Species: open\_mRNA\_T7\_complex

$$\frac{d[open_{mRNA_{T7\_complex}}]}{dt} = +v_{11} - v_{11} + v_{14} - v_{15} \quad (82)$$

### 3.16 Species: pT7\_tag

$$\frac{d[pT7_{tag}]}{dt} = +v_1 - v_1 - v_8 + v_{11} + v_{32} - v_{32} \quad (83)$$

### 3.17 Species: sa15\_degraded

$$\frac{d[sa15_{degraded}]}{dt} = +v_8 \quad (84)$$

### 3.18 Species: closed\_mRNA\_T7

$$\frac{d[closed_{mRNA_{T7}}]}{dt} = -v_7 + v_{10} - v_{12} - v_{14} \quad (85)$$

### 3.19 Species: sa23\_degraded

$$\frac{d[sa23_{degraded}]}{dt} = +v_{28} \quad (86)$$

### 3.20 Species: sa11\_degraded

$$\frac{d[sa11_{degraded}]}{dt} = +v_{29} + v_{51} + v_{59} \quad (87)$$

### 3.21 Species: C0012\_LacI

$$\frac{d[C0012_{LacI}]}{dt} = +v_{24} - v_{24} - v_{29} + v_{33} \quad (88)$$

### 3.22 Species: sa22\_degraded

$$\frac{d[sa22_{degraded}]}{dt} = +v_{27} + v_{64} \quad (89)$$

### 3.23 Species: C0061\_LuxI

$$\frac{d[C0061_{LuxI}]}{dt} = +v_{25} + v_{26} - v_{26} - v_{28} \quad (90)$$

**3.24 Species: mRNA\_C0061**

$$\frac{d[mRNA_{C0061}]}{dt} = +v_{24} + v_{25} - v_{25} - v_{27} - v_{30} \quad (91)$$

**3.25 Species: open\_mRNA\_LacI**

$$\frac{d[open_{mRNA\_LacI}]}{dt} = +v_{33} - v_{33} + v_{34} - v_{37} \quad (92)$$

**3.26 Species: sa130\_degraded**

$$\frac{d[sa130_{degraded}]}{dt} = +v_{37} \quad (93)$$

**3.27 Species: sa129\_degraded**

$$\frac{d[sa129_{degraded}]}{dt} = +v_{36} \quad (94)$$

**3.28 Species: Gene\_LacI**

$$\frac{d[Gene_{LacI}]}{dt} = +v_{32} - v_{32} \quad (95)$$

**3.29 Species: open\_mRNA\_LacI\_complex**

$$\frac{d[open_{mRNA\_LacI\_complex}]}{dt} = +v_{33} - v_{33} + v_{35} - v_{42} \quad (96)$$

**3.30 Species: csa10\_degraded**

$$\frac{d[csa10_{degraded}]}{dt} = +v_{42} \quad (97)$$

**3.31 Species: closed\_mRNA\_LacI**

$$\frac{d[closed_{mRNA\_LacI}]}{dt} = +v_{32} - v_{34} - v_{35} - v_{36} \quad (98)$$

**3.32 Species: Gene\_C0061**

$$\frac{d[Gene_{C0061}]}{dt} = +v_{24} - v_{24} \quad (99)$$

**3.33 Species: lactonase**

$$\frac{d[lactonase]}{dt} = +v_2 - v_3 - v_{21} + v_{22} + v_{23} \quad (100)$$

**3.34 Species: sa30\_degraded**

$$\frac{d[sa30_{degraded}]}{dt} = +v_3 \quad (101)$$

**3.35 Species: Gene\_lactonase**

$$\frac{d[Gene_{lactonase}]}{dt} = +v_1 - v_1 \quad (102)$$

**3.36 Species: open\_mRNA\_lactonase**

$$\frac{d[\text{open}_{mRNA}lactonase]}{dt} = +v_2 - v_2 + v_4 - v_{40} \quad (103)$$

**3.37 Species: open\_mRNA\_lactonase\_complex**

$$\frac{d[\text{open}_{mRNA}lactonase_{complex}]}{dt} = +v_2 - v_2 + v_5 - v_{41} \quad (104)$$

**3.38 Species: sa37\_degraded**

$$\frac{d[sa37_{degraded}]}{dt} = +v_{40} \quad (105)$$

**3.39 Species: sa38\_degraded**

$$\frac{d[sa38_{degraded}]}{dt} = +v_{18} + v_{39} \quad (106)$$

**3.40 Species: csa5\_degraded**

$$\frac{d[csa5_{degraded}]}{dt} = +v_{41} \quad (107)$$

**3.41 Species: closed\_mRNA\_lactonase**

$$\frac{d[\text{closed}_{mRNA}lactonase]}{dt} = +v_1 - v_4 - v_5 - v_{39} \quad (108)$$

**3.42 Species: sa11\_degraded**

$$\frac{d[sa11_{degraded}]}{dt} = +v_{29} + v_{51} + v_{59} \quad (109)$$

**3.43 Species: sa10\_degraded**

$$\frac{d[sa10_{degraded}]}{dt} = +v_7 + v_{50} + v_{58} \quad (110)$$

**3.44 Species: Gene\_GFP**

$$\frac{d[Gene_{GFP}]}{dt} = +v_{48} - v_{48} \quad (111)$$

**3.45 Species: mRNA\_GFP**

$$\frac{d[mRNA_{GFP}]}{dt} = +v_{48} + v_{49} - v_{49} - v_{50} \quad (112)$$

**3.46 Species: GFP**

$$\frac{d[GFP]}{dt} = +v_{49} - v_{51} \quad (113)$$

**3.47 Species: HSL\_LuxR\_complex**

$$\frac{d[HSL_{LuxR}_{complex}]}{dt} = +v_{17} - v_{19} + v_{20} - v_{20} + v_{44} - v_{44} \quad (114)$$

**3.48 Species: mRNA\_LuxR**

$$\frac{d[mRNA_{LuxR}]}{dt} = +v_{16} - v_{16} + v_{20} - v_{43} \quad (115)$$

**3.49 Species: C0062\_LuxR**

$$\frac{d[C0062_{LuxR}]}{dt} = +v_{16} - v_{17} - v_{18} \quad (116)$$

**3.50 Species: sa64\_degraded**

$$\frac{d[sa64_{degraded}]}{dt} = +v_{43} \quad (117)$$

**3.51 Species: sa45\_degraded**

$$\frac{d[sa45_{degraded}]}{dt} = +v_{47} \quad (118)$$

**3.52 Species: sa44\_degraded**

$$\frac{d[sa44_{degraded}]}{dt} = +v_{46} \quad (119)$$

**3.53 Species: sa38\_degraded**

$$\frac{d[sa38_{degraded}]}{dt} = +v_{18} + v_{39} \quad (120)$$

**3.54 Species: Gene\_LuxR**

$$\frac{d[Gene_{LuxR}]}{dt} = +v_{20} - v_{20} \quad (121)$$

**3.55 Species: Gene\_ccdB**

$$\frac{d[Gene_{ccdB}]}{dt} = +v_{44} - v_{44} \quad (122)$$

**3.56 Species: mRNA\_ccdB**

$$\frac{d[mRNA_{ccdB}]}{dt} = +v_{44} + v_{45} - v_{45} - v_{46} \quad (123)$$

**3.57 Species: P1010\_ccdB**

$$\frac{d[P1010_{ccdB}]}{dt} = +v_{45} - v_{47} \quad (124)$$

**3.58 Species: extracellular HSL**

$$\frac{d[extracellularHSL]}{dt} = +v_{52} - v_{67} \quad (125)$$

**3.59 Species: sa314\_degraded**

$$\frac{d[sa314_{degraded}]}{dt} = +v_{67} \quad (126)$$

**3.60 Species: complex\_LuxI**

$$\frac{d[\text{complex}_{LuxI}]}{dt} = +v_{30} - v_{31} \quad (127)$$

**3.61 Species: csa1\_degraded**

$$\frac{d[\text{csa1}_{degraded}]}{dt} = +v_{31} \quad (128)$$

**3.62 Species: Gene\_cI434**

$$\frac{d[\text{Gene}_{cI434}]}{dt} = +v_{55} - v_{55} \quad (129)$$

**3.63 Species: mRNA\_cI434**

$$\frac{d[\text{mRNA}_{cI434}]}{dt} = +v_{55} + v_{56} - v_{56} - v_{59} \quad (130)$$

**3.64 Species: Gene\_sensor**

$$\frac{d[\text{Gene}_{sensor}]}{dt} = +v_{63} - v_{63} \quad (131)$$

**3.65 Species: asRNA\_cI434**

$$\frac{d[\text{asRNA}_{cI434}]}{dt} = +v_{63} - v_{64} + v_{65} - v_{65} \quad (132)$$

**3.66 Species: sa11\_degraded**

$$\frac{d[\text{sa11}_{degraded}]}{dt} = +v_{29} + v_{51} + v_{59} \quad (133)$$

**3.67 Species: sa22\_degraded**

$$\frac{d[\text{sa22}_{degraded}]}{dt} = +v_{27} + v_{64} \quad (134)$$

**3.68 Species: cI434\_lva**

$$\frac{d[\text{cI434}_{lva}]}{dt} = +v_{53} - v_{53} + v_{56} - v_{60} + v_{61} - v_{61} \quad (135)$$

**3.69 Species: Gene\_CIIP22**

$$\frac{d[\text{Gene}_{CIIP22}]}{dt} = +v_{53} - v_{53} \quad (136)$$

**3.70 Species: sa10\_degraded**

$$\frac{d[\text{sa10}_{degraded}]}{dt} = +v_7 + v_{50} + v_{58} \quad (137)$$

**3.71 Species: cI434**

$$\frac{d[\text{cI434}]}{dt} = +v_{53} - v_{53} + v_{61} - v_{61} + v_{65} - v_{66} \quad (138)$$

### 3.72 Species: mRNA\_CIIP22

$$\frac{d[mRNA_{CIIP22}]}{dt} = +v_{53} + v_{54} - v_{54} - v_{58} \quad (139)$$

### 3.73 Species: sa14\_degraded

$$\frac{d[sa14_{degraded}]}{dt} = +v_{60} \quad (140)$$

### 3.74 Species: Gene\_antiLuxI

$$\frac{d[Gene_{antiLuxI}]}{dt} = +v_{61} - v_{61} \quad (141)$$

### 3.75 Species: sa24\_degraded

$$\frac{d[sa24_{degraded}]}{dt} = +v_{66} \quad (142)$$

### 3.76 Species: CIIP22

$$\frac{d[CIIP22]}{dt} = +v_{20} - v_{20} + v_{44} - v_{44} + v_{54} + v_{55} - v_{55} - v_{57} \quad (143)$$

### 3.77 Species: sa13\_degraded

$$\frac{d[sa13_{degraded}]}{dt} = +v_{57} \quad (144)$$

### 3.78 Species: antimRNA\_LuxI

$$\frac{d[antimRNA_{LuxI}]}{dt} = -v_{30} + v_{61} - v_{62} \quad (145)$$

### 3.79 Species: sa179\_degraded

$$\frac{d[sa179_{degraded}]}{dt} = +v_{62} \quad (146)$$

## 4 Compartments

### 4.1 default

Species	Initial Amount	Initial Amount Units
HSL	0	
hydroxyacid	0	
EnzymeComplex	0	
sa72_degraded	0	
EnzymeComplex_LuxI	1	
TetR_var_transcr_rate	5e-005	



#### 4.2 filter

Species	Initial Amount	Initial Amount Units
mRNA_RIBOKEY	0	
sa10_degraded	0	
sa18_degraded	0	
csa3_degraded	0	
sa3_degraded	0	
Gene_RIBOKEY	1	
Gene_T7	1	
open_mRNA_T7	0	
open_mRNA_T7_complex	0	
pT7_tag	0	
sa15_degraded	0	
closed_mRNA_T7	0	

#### 4.3 inverter

Species	Initial Amount	Initial Amount Units
sa23_degraded	0	
sa11_degraded	0	
C0012_Lacl	0	
sa22_degraded	0	
C0061_LuxI	0	
mRNA_C0061	0	
open_mRNA_Lacl	0	
sa130_degraded	0	
sa129_degraded	0	
Gene_Lacl	1	
open_mRNA_Lacl_complex	0	
csa10_degraded	0	
closed_mRNA_Lacl	0	
Gene_C0061	1	

#### 4.4 lactonase production

Species	Initial Amount	Initial Amount Units
lactonase	0	
sa30_degraded	0	
Gene_lactonase	1	
open_mRNA_lactonase	0	
open_mRNA_lactonase_complex	0	
sa37_degraded	0	
sa38_degraded	0	
csa5_degraded	0	
closed_mRNA_lactonase	0	

#### 4.5 output

Species	Initial Amount	Initial Amount Units
sa11_degraded	0	
sa10_degraded	0	
Gene_GFP	1	
mRNA_GFP	0	
GFP	0	

#### 4.6 celldeath

Species	Initial Amount	Initial Amount Units
HSL_LuxR_complex	0	
mRNA_LuxR	0	
C0062_LuxR	0	
sa64_degraded	0	
sa45_degraded	0	
sa44_degraded	0	
sa38_degraded	0	
Gene_LuxR	1	
Gene_ccdB	1	
mRNA_ccdB	0	
P1010_ccdB	0	

#### 4.7 medium

Species	Initial Amount	Initial Amount Units
extracellular HSL	0	
sa314_degraded	0	

#### 4.8 memory

Species	Initial Amount	Initial Amount Units
complex_LuxI	0	
csa1_degraded	0	
Gene_cl434	1	
mRNA_cl434	0	
Gene_sensor	1	
asRNA_cl434	0	
sa11_degraded	0	
sa22_degraded	0	
cl434_lva	0	
Gene_CIIP22	1	
sa10_degraded	0	
cl434	0	
mRNA_CIIP22	0	
sa14_degraded	0	
Gene_antiLuxI	12	
sa24_degraded	0	
CIIP22	0	
sa13_degraded	0	
antimRNA_LuxI	0	
sa179_degraded	0	