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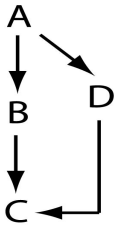
Unit 4 - Week 3

Assignment 3

The due date for submitting this assignment has passed. Due on 2018-02-28, 23:59 IST.
As per our records you have not submitted this assignment.

1) The name of the following network motif is _____. ***2 points***



- Incoherent feed-forward
- Coherent feed-forward
- Positive feedback
- Bi-fan

No, the answer is incorrect.
Score: 0

Accepted Answers:
Coherent feed-forward

2) A dynamical system has bifurcation if and only if _____. ***2 points***

- change in the value of a parameter causes change in value of another parameter.
- change in the value of a parameter does not affect steady state in any way.
- change in the value of a parameter causes change in number of steady states or stability of steady states or both.
- change in the value of a parameter causes change in steady state values of dependent variables.

No, the answer is incorrect.
Score: 0

Accepted Answers:
change in the value of a parameter causes change in number of steady states or stability of steady states or both.

3) For which of the following system of ODEs, number of possible steady states depends upon the numerical value of a parameter? For all the ODEs, consider: ***2 points***

$a \neq 0$;

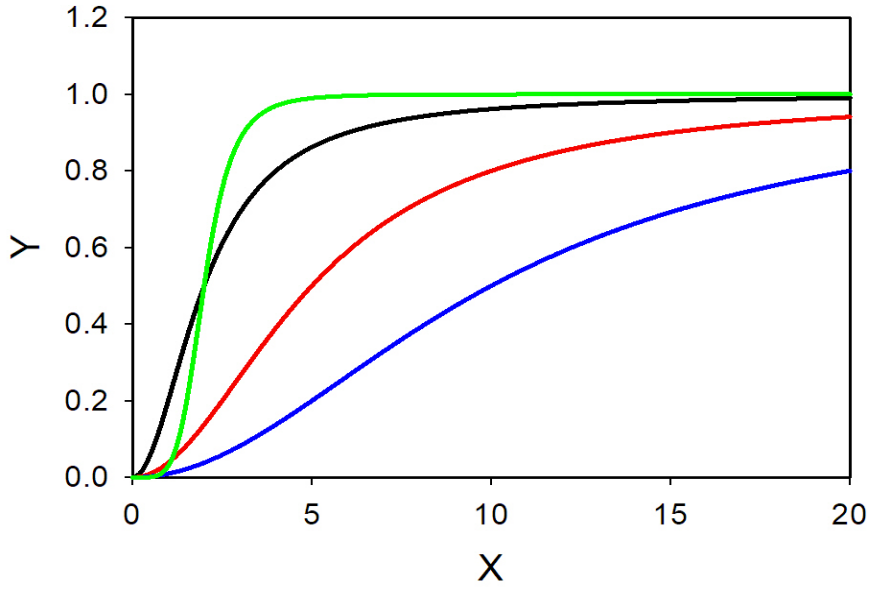
- $\frac{dx}{dt} = a.x^2; \frac{dy}{dt} = b.y$
- $\frac{dx}{dt} = a.x + c; \frac{dy}{dt} = b.y$
- $\frac{dx}{dt} = a.x; \frac{dy}{dt} = b.y$
- $\frac{dx}{dt} = a - x^2; \frac{dy}{dt} = b.y$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$\frac{dx}{dt} = a - x^2; \frac{dy}{dt} = b.y$

4) Four Hill functions are shown in the following figure. Which of those has the highest Hill Constant? ***2 points***



- The red curve
- The black curve
- The blue curve
- The green curve

No, the answer is incorrect.
Score: 0

Accepted Answers:
The blue curve

5) Which of the following is an assumption in the formulation of Michaelis–Menten equation for an enzymatic reaction? ***2 points***

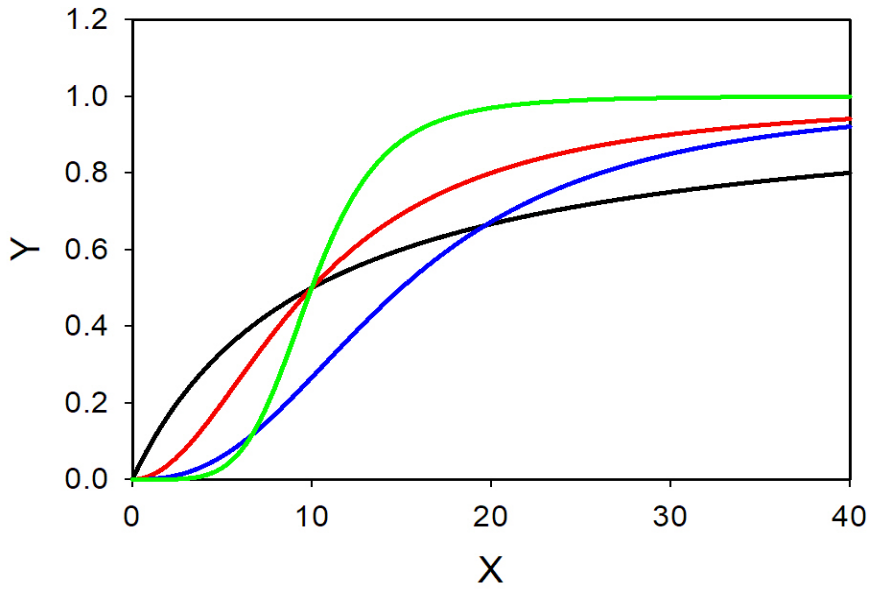
- The substrate does not bind to enzyme.
- The product does not bind to the enzyme.
- All the steps in the enzymatic reaction are reversible.

The enzyme changes the equilibrium point.

No, the answer is incorrect.
Score: 0

Accepted Answers:
The product does not bind to the enzyme.

6) Four Hill functions are shown in the following figure. Which of those has the lowest Hill Coefficient? ***2 points***



The green curve
The black curve
The red curve
The blue curve

No, the answer is incorrect.
Score: 0

Accepted Answers:
The black curve

7) L binds to its receptor, R to form a complex C. E is an enzyme that catalyzes degradation of C. This enzymatic reaction follows Michaelis–Menten kinetics. Which of the following ODEs is correct for this system? ***2 points***

$$\frac{d[C]}{dt} = k_1.[\mathrm{L}].[R] - k_2 \frac{[\mathrm{E}]_\mathrm{T}[C]}{K_m + [C]}$$

$$\frac{d[C]}{dt} = k_2 \frac{[\mathrm{E}]_\mathrm{T}[C]}{K_m + [C]} - k_1.[\mathrm{L}].[R]$$

$$\frac{d[\mathrm{R}]}{dt} = k_1[L][\mathrm{R}] - k_2 \frac{[\mathrm{E}]_\mathrm{T}[C]}{K_m + [C]}$$

$$\frac{d[\mathrm{R}]}{dt} = k_1.[\mathrm{L}].[R] - k_2[C]$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$\frac{d[C]}{dt} = k_1.[\mathrm{L}].[R] - k_2 \frac{[\mathrm{E}]_\mathrm{T}[C]}{K_m + [C]}$$

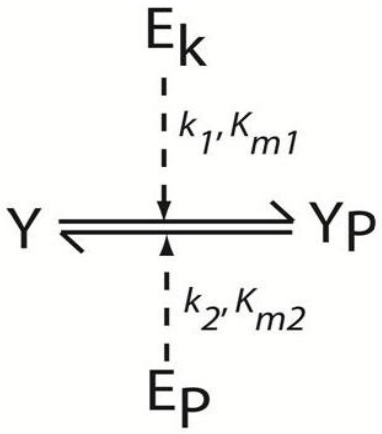
8) While modeling expression of a gene, the steps of transcription and translation are often clubbed together and the gene expression is modeled using a single ODE representing rate of change of concentration of the protein. Such reduction in the model involves a critical assumption. Which of the following is that assumption? **2 points**

- The signal inducing gene expression controls only translation.
- Translation and degradation of a protein is more important than transcription and stability of an mRNA.
- The only factor that controls rate of protein production is stability of mRNA
- The rate of transcription is much higher than the rate of translation and amount of mRNA reaches the steady state very fast.

No, the answer is incorrect.
Score: 0

Accepted Answers:
The rate of transcription is much higher than the rate of translation and amount of mRNA reaches the steady state very fast.

9) A reversible reaction scheme following Michaelis–Menten kinetics is shown below. Which of the following parameter sets will make this system to act like an ultra-sensitive switch? Here, Km1 and Km2 are Michaelis–Menten constants. **2 points**



- $K_{m1} = 2, \quad K_{m2} = 2, \quad (Y_P + Y) = 10$
- $K_{m1} = 2, \quad K_{m2} = 2, \quad (Y_P + Y) = 1000$
- $K_{m1} = 20, \quad K_{m2} = 20, \quad (Y_P + Y) = 10$
- $K_{m1} = 20, \quad K_{m2} = 20, \quad (Y_P + Y) = 100$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$K_{m1} = 2, \quad K_{m2} = 2, \quad (Y_P + Y) = 1000$$

10) Which of the following statements is wrong? **2 points**

- A mono-stable gene expression system would give rise to bimodal distribution in gene expression in a population of cells.
- A mono-stable gene expression system would give rise to unimodal distribution in gene expression in a population of cells
- A bistable gene expression system may give rise to bimodal distribution in gene expression in a population of cells.
- Bifurcation in a gene expression circuit may give rise to multimodal distribution in gene expression in a population of cells

No, the answer is incorrect.
Score: 0

Accepted Answers:
A mono-stable gene expression system would give rise to bimodal distribution in gene expression in a population of cells.

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