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Unit 9 - Week 5

Assignment 5

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment. **Due on 2018-09-12, 23:59 IST.**

1) Consider an enzymatic reaction following Michaelis–Menten kinetics. When the substrate concentration is doubled, the K_m value is: ***1 point***

- twice the initial value
- half the initial value
- 1.5 times the initial value
- the same as the initial value
- remains the same

No, the answer is incorrect.
Score: 0

Accepted Answers:
remains the same

2) Cost function in a parameter estimation problem is ***1 point***

- the measure of difference between the observed and the predicted parameters
- the function that describes the model system
- the cost associated with framing the equations for the model system
- also known as objective function and is always minimised

No, the answer is incorrect.
Score: 0

Accepted Answers:
the measure of difference between the observed and the predicted parameters
also known as objective function and is always minimised

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- Greedy search algorithms always produce the minimum set of solutions.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Greedy search algorithms try to find the local optimum at every step

4) Given a chemical reaction: ***1 point***

$5A+3B \rightarrow 2C+D$

What is the equilibrium constant of the reaction?

- $K_eq = \frac{[A][B]}{[C][D]}$
- $K_eq = \frac{[A]^5[B]^3}{[C]^2[D]}$
- $K_eq = \frac{[C]^2[D]}{[A]^5[B]^3}$
- $K_eq = \frac{[C][D]}{[A][B]}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$K_eq = \frac{[C]^2[D]}{[A]^5[B]^3}$

5) Which of the following statements are true? ***1 point***

- Optimization usually leads in identifying the global optimum
- Least squares formulation is equivalent to Maximum Likelihood formulation, if the errors are assumed to follow a Gaussian distribution
- Structurally identifiable models are those whose parameters can be uniquely estimated by fitting the model to experimental data
- Noisy data does not affect estimating parameters for a model

No, the answer is incorrect.
Score: 0

Accepted Answers:
Least squares formulation is equivalent to Maximum Likelihood formulation, if the errors are assumed to follow a Gaussian distribution
Structurally identifiable models are those whose parameters can be uniquely estimated by fitting the mo to experimental data

6) Linear regression ***1 point***

- assumes non-linear correlation between explanatory variables and scalar dependent variable
- can often be fitted using least squares approach
- models the relationship between a scalar dependent variable and explanatory variables
- is sensitive to the presence of outliers in the data

No, the answer is incorrect.
Score: 0

Accepted Answers:
can often be fitted using least squares approach
models the relationship between a scalar dependent variable and explanatory variables
is sensitive to the presence of outliers in the data

7) Dynamic modelling quantifies change of biological systems with time. Since models are specific to their assumptions, it is necessary to know the assumptions. Which of the following assumptions are true for Michaelis-Menten? ***1 point***

- [ ] Substrates are in a heterogeneous mixture
- [ ] Substrates are in a homogenous mixture
- [ ] It is an isothermal system
- [ ] The concentration of substrate is high

No, the answer is incorrect.
Score: 0

Accepted Answers:
Substrates are in a homogenous mixture
It is an isothermal system
The concentration of substrate is high

8) Which of the following statements is/are true about parameter estimation? ***1 point***

- [ ] Experimental data is required for parameter estimation
- [ ] Experimental data is not required to estimate parameters
- [ ] Parameters are estimated by setting up an optimisation problem
- [ ] 'Least squares' is the only objective function that is used for parameter estimation

No, the answer is incorrect.
Score: 0

Accepted Answers:
Experimental data is required for parameter estimation
Parameters are estimated by setting up an optimisation problem

9) Biological replicates are ___ ***1 point***

- ( ) Multiple tests on the same sample
- ( ) Multiple tests on multiple samples
- ( ) Multiple samples in the same experimental conditions
- ( ) Multiple samples in different experimental conditions

No, the answer is incorrect.
Score: 0

Accepted Answers:
Multiple samples in the same experimental conditions

10) Given the following table showing the values for Y for different values of X. Two different sets of parameters, Param 1 and Param 2 are used to predict the values of Y.

X	$Y_{observed}$	$Y_{predicted}$ (Param 1)	$Y_{predicted}$ (Param 2)
10	20	21	21
20	25	24.5	23
30	30	28	30
40	33	30	38
50	36	35.5	34

The best parameter set for describing this model is ____

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 1

1 point

11) Answer this question based on the data given in question 10

The least square error (unweighted) is ____.

Hint

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0.0158

1 point

12) Consider the following model for competitive inhibition

$$v = \frac{v_{max} * [S]}{[S] + k_m(1 + \frac{1}{K_i})}$$

Calculate the value of parameters v_{max}, K_m, K_i using grid search consisting of 50 points with a step size of 1. Assume all the parameters are integers and the error for every data point δ = 0.1. (Enter your answers separated by commas without any space e.g., 10, 13, 20)

	I=10
S	v
1	1.8
2	2.2
3	6.1
4	5.5
5	7.1
6	9.3
7	9
8	9.4
9	11.2
10	10.6
11	11.7
12	11.5
13	11.2
14	13
15	12.2
16	12.4
17	12.6
18	14.8
19	14.2
20	16.5

Hint: Choose the parameters that gives the minimum error – use the error function

$$E = \sum\left((x_m - x_{p(\theta)})/(x_m \times \delta)\right)\text{^}2)$$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) 27,13,46

1 point

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