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Unit 5 - Week 4

Week 4 Assessment

The due date for submitting this assignment has passed. Due on 2017-08-23, 23:59 IST.
As per our records you have not submitted this assignment.

1) When would the Mutation matrix Q resemble an identity matrix? Tick all correct. ***1 point***

- [ ] When DNA replication is guaranteed to be error-free
- [ ] When mutations are very common
- [ ] Mutations are not permitted
- [ ] Never

No, the answer is incorrect.
Score: 0

Accepted Answers:
When DNA replication is guaranteed to be error-free
Mutations are not permitted

2) _____ aids induction of diversity, _____ weeds out diversity. ***1 point***

- ( ) Reproduction, Selection
- ( ) Selection, Mutation
- ( ) Selection, Reproduction
- ( ) Mutation, Selection

No, the answer is incorrect.
Score: 0

Accepted Answers:
Mutation, Selection

3) What determines if the population will evolve into a local peak or a global peak? Tick all correct. ***1 point***

- [ ] Ruggedness of the landscape
- [ ] Position of the starting genotype of the population
- [ ] The mutations that fix initially, determine the future mutations the population may evolve into
- [ ] The population carrying capacity

No, the answer is incorrect.
Score: 0

Accepted Answers:
Position of the starting genotype of the population
The mutations that fix initially, determine the future mutations the population may evolve into
Ruggedness of the landscape

4) Why is it extremely difficult to obtain a fitness landscape experimentally? Tick all correct. ***1 point***

- [ ] The fraction of neighbour nodes from a node on a sequence space decreases exponentially with sequence length L

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- [ ] The size of the sequence space increases exponentially with the length of the sequence
- [ ] The number of experiments to obtain the fitnesses associated with the entire landscape is very large
- [ ] It is not difficult

No, the answer is incorrect.
Score: 0

Accepted Answers:
The size of the sequence space increases exponentially with the length of the sequence
The number of experiments to obtain the fitnesses associated with the entire landscape is very large

5) Would a population evolving on a single peaked fitness landscape ever be composed entirely of only the fittest genotype, i.e. $X_{fittest}$ = 1? Tick all correct. ***1 point***

- ( ) Yes, if the population is small
- ( ) No, not on a single peaked landscape
- ( ) No, because of new mutations emerging, a steady-state $X_{fittest}$ will always be less than 1
- ( ) Yes, when the optimal genotype is reached, $X_{fittest}$ = 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
No, because of new mutations emerging, a steady-state $X_{fittest}$ will always be less than 1

6) What are the assumptions in the NK Model? ***1 point***

- [ ] There is no relationship between sequences in the sequence space
- [ ] The landscape is rugged
- [ ] Fitness of the organism is the sum of individual contribution from components
- [ ] Binary String

No, the answer is incorrect.
Score: 0

Accepted Answers:
Fitness of the organism is the sum of individual contribution from components
Binary String

7) What is controlled by the tuneable parameter K in the NK model? ***1 point***

- ( ) The fitness contribution of one block is dependent on K length of the sequence
- ( ) The fitness contribution of one block is dependent on K other sequences
- ( ) Nothing
- ( ) The fitness contribution of one block is dependent on K other blocks

No, the answer is incorrect.
Score: 0

Accepted Answers:
The fitness contribution of one block is dependent on K other blocks

8) Find the fitness of the sequence 010101, given that K=0, and fitness contribution of 0 is 5, for 1 is 2. ***1 point***

- ( ) 21
- ( ) 20
- ( ) 19
- ( ) 22

No, the answer is incorrect.
Score: 0

Accepted Answers:
21

9) Which property of the fitness landscape, does the value of K describe? ***1 point***

- Amount of Ruggedness. As K increases, ruggedness increases.
- Amount of sequence neighbours. As K increases, neighbours increase.
- Amount of Ruggedness. As K increases, ruggedness decreases
- Amount of sequence neighbours. As K increases, neighbours decrease.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Amount of Ruggedness. As K increases, ruggedness increases.

10) Find the hamming distance between 123456789 and 123465789. ***1 point***

- 1
- 2
- 4
- 0

No, the answer is incorrect.
Score: 0

Accepted Answers:
2

11) Is it possible to mutate into a sequence that is 2 Hamming distance away in one step? Justify. ***1 point***

- No, because only one mutation can happen at a time.
- Yes, by acquiring 2 mutations in one replication cycle. Possible only if the genotype has high fitness
- Yes, by acquiring 2 mutations in one replication cycle. However since the probability of mutation is low, such an occurrence will be very rare.
- No, because selection will not favour it.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Yes, by acquiring 2 mutations in one replication cycle. However since the probability of mutation is low, such an occurrence will be very rare.

12) What is the hamming distance between two distinct sequences that are at 1 Hamming distance away from one parent sequence? ***1 point***

- 0
- 2
- 3
- 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
2

13) Why is it reasonable to assume that mutant genotypes do not mutate back into the parent genotype, when all genotypes have same fitness? ***1 point***

- The parent genotype too far away, other mutant sequences are closer to access.
- It is not a reasonable assumption, because the absolute probability is non-zero and will lead to a wrong conclusion.
- The parent genotype is only one possibility among the many other genotypes the mutant species could mutate into. Thus, relatively the probability is very low, and assumed as zero.
- The parent genotype is less fit, therefore such a back mutation is not favoured by selection.

No, the answer is incorrect.
Score: 0

Accepted Answers:

The parent genotype is only one possibility among the many other genotypes the mutant species could mutate into. Thus, relatively the probability is very low, and assumed as zero.

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