

Nature-Inspired Computing

Computer Science · Answer Key · 10 Questions

1. Which optimization algorithm is inspired by the foraging behavior of ants to find the shortest path between a food source and their nest?

- A) Ant Colony Optimization**
- B) Genetic Algorithm
- C) Simulated Annealing
- D) Particle Swarm Optimization

2. In neural network architecture, what biological concept is directly mimicked by the 'weights' of connections between neurons?

- A) Dendritic branching
- B) Synaptic plasticity**
- C) Myelination
- D) Axonal transport

3. Which environmental computing technique mimics the cooling process of molten metal to help an algorithm avoid local minima?

- A) Stochastic Gradient Descent
- B) Simulated Annealing**
- C) Breadth-First Search
- D) Dynamic Programming

4. What is the primary inspiration for the 'crossover' operator used in genetic algorithms?

- A) Bacterial conjugation
- B) Chromosomal recombination**
- C) Binary fission
- D) Viral transduction

5. Particle Swarm Optimization (PSO) is a population-based stochastic optimization technique inspired by the collective movement patterns of which biological groups?

- A) Schooling fish and flocking birds**
- B) Herd migration patterns
- C) Hive collective intelligence
- D) Bacterial colony expansion

6. In the context of artificial life and computing, what does the 'L-system' (Lindenmayer system) primarily simulate?

- A) The growth patterns of plants**
- B) The migration of apex predators
- C) The fluid dynamics of oceans
- D) The erosion rates of mountain ranges

7. Which computing model is based on the biological process of DNA transcription and translation to perform data processing?

- A) Quantum computing
- B) DNA computing**
- C) Optical computing
- D) Neuromorphic computing

8. What biological process serves as the inspiration for the 'selection' phase in evolutionary computation, where weaker solutions are discarded?

- A) Natural selection**
- B) Genetic drift
- C) Sympatric speciation
- D) Convergent evolution

9. The artificial immune system (AIS) in computer science is modeled after which specific vertebrate biological mechanism?

- A) Endocrine signaling
- B) T-cell and B-cell responses**
- C) Circadian rhythm regulation
- D) Neuron firing threshold

10. What specific biological phenomenon do swarm intelligence algorithms use to explain how complex global behavior emerges from simple local rules?

- A) Stigmergy**
- B) Photosynthesis
- C) Homeostasis
- D) Osmoregulation