

Biological Game Theory

Game Theory · Answer Key · 15 Questions

1. In the context of the Hawk-Dove game, what does a 'Hawk' strategy represent?

- A) Aggressive fighting until victory or injury**
- B) Consistently sharing resources equally
- C) Fleeing immediately upon spotting a competitor
- D) Attempting to resolve conflicts through displays

2. The concept of an Evolutionarily Stable Strategy (ESS), coined by John Maynard Smith, describes a strategy that:

- A) Can be learned by all individuals in a population
- B) Cannot be successfully invaded by alternative strategies**
- C) Ensures the survival of the individual indefinitely
- D) Always results in the highest possible population density

3. Which phenomenon in nature is often modeled using the 'Prisoner's Dilemma' to explain the evolution of cooperation?

- A) Predation on solitary prey
- B) Mutual grooming in primates**
- C) Individual camouflage
- D) Migration patterns

4. In 'Tit-for-Tat' strategy, an animal's next move is determined by:

- A) Random chance
- B) The opponent's previous action**
- C) The total resources available
- D) Its own genetic dominance

5. The 'War of Attrition' model is most often used to explain animal behavior during:

- A) Migration across continents
- B) Contests over mates or resources where cost is time**
- C) Foraging in nutrient-poor environments
- D) Establishing dominance hierarchies through size

6. Why is 'altruism' in social insects like honeybees considered a game-theoretic puzzle?

- A) It requires higher-level intelligence
- B) It seemingly contradicts individual fitness maximization**
- C) It only occurs in artificial environments
- D) It is a myth unsupported by genetic data

7. The 'Tragedy of the Commons' in ecology frequently occurs when:

A) Resources are overexploited by individuals acting in self-interest

- B) Predators go extinct due to lack of prey
- C) The environment remains pristine
- D) Species evolve to be exclusively herbivorous

8. What is the primary factor that makes the 'Iterated' Prisoner's Dilemma different from the one-shot version in nature?

A) The reduction of total population size

B) The potential for future interaction and retaliation

- C) The presence of multiple predators
- D) The change in climate conditions

9. In signaling theory, the 'Handicap Principle' suggests that honest signals of quality are:

A) Easy to fake by weak individuals

B) Costly to produce, ensuring they are reliable

- C) Only used by nocturnal species
- D) Purely accidental genetic mutations

10. A 'Mixed Strategy' equilibrium in biological games occurs when:

A) An individual changes its strategy during a single fight

B) Individuals choose between different strategies with specific probabilities

- C) All members of a species act exactly the same way
- D) The population size stays constant

11. Which evolutionary game theory model explains why some animals share food despite the immediate cost to themselves?

A) Kin selection

- B) Sexual dimorphism
- C) Niche partitioning
- D) Genetic drift

12. In the 'Scramble Competition' model, what determines the success of an individual?

A) Fighting ability

B) Priority of access or speed in acquisition

- C) Ability to signal strength
- D) Agreement on territory lines

13. The 'Dear Enemy' effect in territorial animals is a game-theoretic observation where neighbors:

- A) Attack each other constantly
- B) Show reduced aggression toward familiar individuals**
- C) Migrate away from each other immediately
- D) Share offspring

14. What is the stable result in a 'Coordination Game' between two species living in mutualistic symbiosis?

- A) Both species defecting simultaneously
- B) Both species providing benefits to the other**
- C) One species consistently dominating the other
- D) Periodic extinction of both species

15. Why do many species engage in ritualized combat rather than all-out fighting?

- A) They lack the physical capacity for violence
- B) The cost of injury outweighs the benefit of winning**
- C) They are constrained by environmental law
- D) They possess altruistic morality