BioNB 2210 Fall 2013 First Name: _____ Last Name:_____

Game Theory Quiz

Guidelines

- Use your knowledge from Kern Reeve's two lectures on game theory and from the GameBug website to answer these five questions. This quiz constitutes 10% of your score for Prelim 2.
- You must complete this take-home exam part of the exam by yourself.
- Please type your answers or write neatly in pen **AND STAPLE PAGES TOGETHER**.
- The deadline for completing this quiz is 12:20pm on Monday, November 4th. Hand in your assignment before the exam.

1. What will be the evolutionarily stable outcome of a game with the following pay-off matrix? Show all work.

	Q	R
Q	4	6
R	5	3

2. Cornell undergraduates have two tactics for picking up mates in the College Town bar scene. They can serve as a "Wingman" or they can be a "Smooth-talker." Two Wingmen can only attract 1 mate (M), so each Wingman only gets a mate half of the time. Two Smooth-talkers can attract 3 mates, and they must split each mate between the two of them. Being a Smooth-talker isn't easy, so each Smooth-talker also pays a cost (C). A Smooth-talker with a Wingman can attract 2 mates, and he/she gets to keep both of them (i.e. the Smooth-talker doesn't share mates with the Wingman). A Wingman that accompanies a Smooth-talker will attract a mate only 2/3 of the time. Assuming random pairings, fill in the payoff matrix for this bar game with expressions using the variables M & C.

	Wingman	Smooth-talker
Wingman		
Smooth-talker		

Assuming M and C are positive, under what conditions is Smooth-talker an ESS?

For the following multiple choice questions, clearly circle the correct answer(s)

3. In the mating game, males and females experience different pay-offs. A stable strategy consists of a pair of tactics, one for each sex. In this payoff matrix, the first value in each cell corresponds to the male's payoff, the second to the female's. What mating system(s) do you expect to evolve in this game?

		Female	
		Monogamy	Multiple mating
Male	Monogamy	4, 4	3, 5
	Multiple mating	7, 3	6, 4

A. Male Monogamy/Female Monogamy
B. Male Multiple Mating/Female Monogamy
C. Male Monogamy/Female Multiple Mating
D. Male Multiple Mating/Female Multiple Mating
E. There is no pure ESS

4. You and your room-mate are trying to work out a dish-washing system that doesn't leave your kitchen or your friendship in shambles. If both you and your room-mate do dishes every night, then you gain the benefit (B) of having a clean kitchen, but you both share the cost (C). If you do the dishes every night, but your room-mate only does them on weekends, then you still gain the benefit, but carry the whole cost. If your roles are reversed, and your roommate does the dishes every night while you only clean on the weekends, then you gain the benefit but pay no cost. Finally, if you both decide to slack-off and only clean on weekends, you gain no benefit and pay no cost. Use the concept of evolutionarily stable strategies (ESS's) to predict what you should do.

A. Do the dishes every night
B. Do the dishes every night with probability $B - C/2$
C. Do the dishes every night with probability $2(B\text{-}C)/(2B\text{-}C)$
D. Do the dishes only on the weekend with probability B/C
E. Only do the dishes on the weekend

5. The scale-eating cichlid feeds on the scales of larger fish for a benefit (B). To minimize detection, cichlids approach the larger fish from the side, but any individual fish can only feed on the left OR right side. A genetic polymorphism controls whether the mouth develops on the right or left side of the body, allowing cichlids to feed on only one side of their prey. Prey learn from which side cichlids most commonly approach in their population, and are preferentially vigilant on that side. Cichlids that feed on the right in a population dominated by right-mouthed cichlids will pay a cost C because they risk being detected and severely bitten. On the other hand, a left-mouthed cichlid in the same population will feed on scales undetected, and pay no cost. Which of the following strategies is an ESS? Circle all that apply.

		Cichlid	
		Left-sided Mouth	Right-sided Mouth
Cichlid	Left-sided Mouth	B-C	B
	Right-sided Mouth	B	B-C

A. Always develop a left-sided mouth
B. Develop a left-sided mouth with probability 0.5, and a right-sided mouth with probability 0.5
C. Develop a left-sided mouth with probability C/[2(B+C)], and a right-sided mouth with probability 1- C/[2(B+C)]
D. Develop a left-sided mouth with probability B/C, and a right-sided mouth with probability (1-[B/C])
E. Always develop a right-sided mouth