

COURSE NO : EC 302
COURSE-TITLE : EVOLUTION, BEHAVIOUR AND SOCIOBIOLOGY
CREDITS : 2:1

ANSWER ALL QUESTIONS
(MAXIMUM TIME : 2 HOURS)

1) Until some years ago Behaviourists and Ethologists held apparently irreconcilable views on the relative roles of learning and instinct in animal behaviour. Make a brief statement (approximately 200 words) with some examples on how today's ethologists have struck a compromise between these views.

2) A population of spiders at Hardy Weinberg equilibrium and with a male to female sex ratio of 2:1 is the subject of a study. If the quality of silk in these spiders is determined by a single bi-allelic gene and the "superior silk" allele is at a frequency of 0.2, what proportion of the individuals would produce superior silk if,

- a) the "superior silk" allele is dominant and
- b) if it is recessive ?

If 80 % of the spiders that spin superior silk survive to reproduce but only 60 % of those that produce inferior silk do so, what would be the frequency of the "superior silk" allele be at the end of two generations. Compute this both for the case of the "superior silk" allele being

- c) dominant and
- d) recessive.

3) In a polygynous ant species 4 queens are laying eggs. All of them have been inseminated by the same 2 males (unrelated to each other and to the queens) who have contributed sperm in the ratio of 1:3. Each queen produces 1000 male offspring and 2000 female offspring. Calculate the average genetic relatedness between 2 female offspring in the colony. 0.71

4) Define and give examples of the technical terms used to describe different levels of insect social evolution.

5) Make a brief statement (approximately 200 words) about the different theories put forward to explain the evolution of sociality in animals and their current status.

6) The following table gives the minimum conditions for the evolution of sterility in a diploid population where alpha and beta are full sisters. Rewrite the table so as to give the minimum conditions for a haplodiploid population.

		alpha	beta	Remarks
	Number of offspring	10	10	
A	Classical individual fitness	5	5	Solitary
	Inclusive fitness	7.5	7.5	Nesting
	Number of offspring	20	0	Sterility
B	Classical individual fitness	10	0	will not be
	Inclusive fitness	10	5	selected
	Number of offspring	21	0	Parental
C	Classical individual fitness	10.5	0	manipulation
	Inclusive fitness	10.5	5.25	
	Number of offspring	31	0	Kin selection
D	Classical individual fitness	15.5	0	
	Inclusive fitness	15.5	7.75	
	Number of offspring	21 or 0	0 or 21	Classical
E	Classical individual fitness	10.5 or 0	0 or 10.5	Individual
	Inclusive fitness	10.5 or 5.25	5.25 or 10.5	selection