ISI Admission Test, 2010
JRF in Biological Anthropology

Test Codes: RBA I [short answer type] and
RBA II [short answer type]

SYLLABUS

RBAI

1. Introduction: Definition and scope; subdivisions of anthropology; inter-relationship between anthropology and other disciplines.

2. Human evolution: Theories of evolution, taxonomic principles; man's place in the animal kingdom; structural and functional specialization; biocultural interactions.

3. Man as a social animal: choice of mate, monogamy; polygamy; exogamy; endogamy; inbreeding; family; clan ; kin group; social stratification and society; role of social factors in influencing genetic and environmental variations.

4. Human biological variation and adaptation to environment: Causes of variation, short- and long-term adaptation to different climatic, biotic and socio-cultural environments.

5. Anthropological dimensions of population/community health and health care: lifestyles and its relationship with health and disease; ecological variation and health and disease; biocultural dimensions of physical growth and development; energy balance; thinness, overweight and obesity.

6. Demographic studies in anthropology: Basic concepts of demography (population structure, age and sex composition, fecundity, fertility, sterility, morbidity, mortality, marriage, family, migration, population growth); anthropological demography.

7. Ethnic and biological diversity of the Indian populations.

RBA II

1. Biological basis of inheritance: Cell, nucleus, chromosome, DNA (structure, replication, recombination, repair, rearrangement, etc.); genetic code; gene action; cell division; normal chromosome structure and number; functions of X and Y chromosomes; autosomal and sex chromosomal aberrations and application to evolution and disease.

2. Mendelian genetics: Laws of Mendel; basic terminology (gene, allele, genotype, phenotype, homozygote, heterozygote, linkage, crossing over, etc.); Mendelian inheritance (single factor and multifactorial inheritance, polygenic inheritance).

3. Non-Mendalian inheritance: Multiple allelism; co-dominance; sex-linked, sex-limited, sex-influenced traits; epistasis; variable penetrance and expressivity; cytoplasmic inheritance.

4. Population genetics and biostatistics: measures of central tendency, and dispersion; probability; correlation and regression; chi- squire and t- test; Hardy- Weinberg equilibrium; mutation; random genetic drift; selection; inbreeding; admixture; assortative mating; isolation; linkage disequilibrium.

5. Genetic polymorphisms: Distributions; balanced and transient polymorphisms; variation in genes; simple genetic traits and DNA markers.

6. Role of heredity and environment in human biological traits: Different types of twins; twin diagnosis; heritability.

7. Statistical methods used in biomedical research: Frequency distribution, measures of central tendency and dispersion, hypothesis testing, correlation and regression, analysis of variance, logistic regression etc.

Sample Questions for RBA I

Answers should be very brief and precise

Full Marks 100

1. Define adaptation. The more generalized a species, the less adapted it is to a particular environment. Is the previous statement correct? Discuss the conditions for the evolutionary success of a specialized and generalized species.
2. Is *Homo habilis* a link between the genus Australopithecus and Homo? Discuss.
3. What is synthetic theory of evolution? How is it different from Darwin's theory of organic evolution? Discuss.
4. Can population pyramids indicate the trends of population growth? Explain giving hypothetical examples of different population pyramids.
5. What is culture? Did culture play a role in human evolution? Discuss.
6. Outline important types of non-random mating (marriages) in the Indian cultural context. Briefly describe genetic consequences of those types of mating.

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7. Outline the existing theories on the origin of modern man.
8. What are the methods of studying health in Anthropology? What is the relation between culture and health?

9. Write short notes on <u>any four</u> of the following:
   (i) Demographic transition
   (ii) Fertility and fecundity
   (iii) Assortative mating and consanguinity
   (iv) Skin colour as adaptive response to environment
   (v) Hypoxia
   (vi) Body Mass Index
   (vii) Acclimatization
   (viii) Secular trend in stature

Sample Questions for RBA II

Answers should be very brief and precise

Group A

1. Outline the basic evolutionary mechanisms that effect change in gene frequency of a population. Describe briefly the way these evolutionary forces operate.

2. Describe Hardy-Weinberg Equilibrium and its significance.

3. What is Genetic Code? Explain the process of protein synthesis.
4. What is heritability? Outline briefly the twin and family methods in determining the heritability of biological characters in man.
5 (a). The blood groups of four babies who were born on the same night in a hospital were found to be B, A, O & AB. Assign the babies to the respective biological parents given their blood groups:
   a. O & O :
   b. AB & O :
   c. A & B :
   d. B & B :

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5 (b). Provide a brief note on the geographic distribution of sickle cell allele.

6. Write short notes on any ***five*** of the following:

(i) Erythroblastosis fetalis
(ii) Penetrance & expressivity
(iii) Genetic load and fitness
(iv) Replication and transcription
(v) RFLPs
(vi) Mendelian population
(vii) Pleiotropy and Epistasis
(viii) DNA Repair
(ix) Phenocopy and genocopy

Group B

1. Draw genealogies showing the offspring of each of the Uncle-Niece, First Cousin (FSD & MBD) and 2nd Cross Cousin marriages. Determine inbreeding/consanguinity coefficient for offspring of each of the marriage types and describe the method by which you calculate this coefficient.
2. How the sex linked mode of inherence is different from autosomal mode of inheritance? Differentiate between sex linked, sex limited, and sex influenced traits.
3. If you are asked to investigate the effect of education and income on fertility in your State, how would you design your project? Give a schematic representation of the type of subjects or populations to be considered, the type of different variables to be considered.

Group C

1. The following are the fasting blood glucose levels of 10 children:

72 68 65 66 71
65 62 67 69 65

Compute the mean, median and variance of the above data.

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2. The following table contains air pollution data as reported for 30 large cities. Prepare the following: (a) a frequency distribution; (b) a histogram; (c) a frequency polygon curve.

City	Value	City	Value	City	Value
1.	68	11.	22	21.	42
2.	63	12.	24	22.	32
3.	72	13.	25	23.	31
4.	27	14.	44	24.	28
5.	30	15.	15	25.	17
6.	36	16.	43	26.	54
7.	28	17.	35	27.	14
8.	32	18.	74	28.	47
9.	59	19.	51	29.	32
10.	27	20.	36	30.	45