SYLLABUS
JRF Admission Test, 2007: Biological Anthropology
RBAI &RBAII

PART I

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

2. Human evolution : Theories of evolution; taxonomic principles; man's place in the animal kingdom; comparative anatomy of anthropoid apes; structural and functional specialisations of man; bio-cultural 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 variation and adaptation to environment: Causes of variation; short- and long-term adaptation to different climatic, biotic and socio-cultural environments.

5. 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.

6. Ethnic and Biological diversity among the Indian populations.

PART II

1. Biological basis of inheritance: Cell, nucleus, chromosomes; DNA (structure, replication, recombination, repair, rearrangement etc.,); RNA(structure, transcription, translation, operon concept 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. a) 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).

b) Non-Mendelian inheritance: Multiple allelism; Co-dominance; sex linked, limited and influenced traits; epistasis; variable penetrance and expressivity; Cytoplasmic inheritance.

3. Population genetics and biostatistics: Measures of central tendency and dispersion; Probability; Correlation and regression; Chi- square and 't' test; Hardy-Weinberg equilibrium law; mutation; random genetic drift; selection; inbreeding; admixture; assortative mating; isolation; genetical structure; Linkage Disequilibrium.

4. Genetic polymorphisms: Distributions, balanced and transient polymorphisms; Conventional (Blood groups etc,) and Molecular Genetic markers (DNA).

5. Role of heredity and environment in human genetics: Different types of twins; twin diagnosis; heritability.

RBA I

1. What is hominization process? Discuss with particular reference to erect posture and bipedalism.

2. Describe adaptive responses of humans to high altitude stresses and cite evidences from earlier studies.

3. Is *Homo habilis* a link between the genus Australopithecus and Homo? Discuss.

4. What are various causes for human variation?

5. Outline important types of non-random mating (marriages) in the Indian cultural context. Briefly describe genetic consequences of those matings.

6. Outline the existing theories on the origin of modern man.

7. What are the methods of studying health in Anthropology? What is the relation between culture and health?

8. Outline different methods in Forensic Anthropology. Explain/describe application of any one method to a hypothetical situation and try if you can justify use of traditional forensic anthropological methods in the age of DNA.

9. Write short notes on <u>any four</u> of the following:

      (i)   Demographic transition
      (ii)   Asymmetry of bilateral characters
      (iii)   Assortative mating & consanguinity
      (iv)   Age & environmental stability of dermal ridges
      (v)   Hypoxia
      (vi)   Body Mass Index
      (vii)   Adaptive radiation
      (viii) Secular trend in stature

RBA II

Group A

1. Because of its population structure and rich diversity India is considered a natural laboratory for human/ population geneticist. Substantiate this statement.

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

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.

5a. 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   :

5b. Explain the principle of Hardy-Weinberg Equilibrium. Illustrate how a population can depart from this equilibrium with a hypothetical example.

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

   (i)   Erythroblastosis fetalis
   (ii)   Penetrance and Expressivity
   (iii)   Genetic load and Fitness
   (iv)   Replication and Transcription
   (v)   Heterosis
   (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. Explain Linkage Disequilibrium and illustrate its consequences using a suitable example.

3. If you are asked to investigate the effect of urbanization on the incidence of hypertension and cardiovascular diseases in India, how would you design your project? Give a schematic representation of particularly 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.

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

3. Eight mice injected with a 1.5 mg of medication took an average 10.6 seconds to fall asleep with a standard deviation of 2.0 seconds, while eight other mice injected with 0.5 mg of the medication took on the average 15.4 seconds to fall asleep with a standard deviation of 2.0 seconds. The question is whether this study indicates that decreasing the dosage increases the time taken to fall asleep?
 Suggest a suitable statistical test for this problem and find the value of the test statistic on the basis of the observed data. How will you carry out the test and draw your conclusion?