Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Sc.(BT)/SEM-2/MSBT-204/2013

2013

GENETICS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) A gene that affects more than one phenotype is

a) Modifier gene b) Epistatic gene

c) Pleiotropic gene d) none of these.

ii) Absence of recombinant classes means

a) incomplete linkage

b) deletion of genes

c) complete linkage

d) independent assortment.

iii) A 1:1 F2 phenotypic ratio is a

a) monohybrid ratio b) dihybrid ratio

c) test cross ratio d) back cross ratio.

iv) A mother of blood group *O* has a group *O* child. The father could be

a) *A* or *B* or *O* b) *O* only

c) *A* or *B* d) *AB* only.

v) When a monohybrid is crossed with a recessive parent, the cross is described as a

a) test cross b) monohybrid cross

c) dihybrid cross d) none of these.

vi) The absence of pigment from the eyes, hair and skin is referred to as

a) colourblindness b) nightblindness

c) albinism d) phenylketonuria.

vii) How many linkage groups are present in human male ?

a) 22 b) 24

c) 23 d) none of these.

viii) The different forms of a gene are called

a) gametes b) loci

c) homologues d) alleles.

ix) A mating that is expected to produce 50% homozygous and 50% heterozygous is

a) $BB \times Bb$

b) $Bb \times Bb$

c) $bb \times Bb$

d) mating a, b and c of these.

x) Genetic loci on the same chromosome are genetically

a) inert b) linked

c) codominant d) none of these.

xi) Absence of recombinant classes means

a) incomplete linkage

b) deletion of genes

c) complete linkage

d) independent assortment.

xii) The best example of *X*-linked trait in man is

a) Albinism b) Down syndrome

c) Haemophilia d) Epistasis.

xiii) Examples of diseases caused by recessive lethal alleles are

a) Huntington's diseases

b) haemophilia

c) thalassemia

d) cystic fibrosis.

xiv) Height in humans is a

a) codominant

b) dominant

c) polygenic

d) epistatic trait.

xv) Coat colour variation in Himalayan rabbits depends on enzymatic activity influenced by

a) temperature

b) high altitude air pressure

c) alteration in blood sugar level

d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. A girl of normal vision marries a boy of normal vision. Fathers of both girls and boys are colourblind. What type of vision you expect in their offsprings ?

3. What is genomic imprinting ? Explain it with suitable example. 1 + 4

4. What are the methods for isolating bacterial mutants ?

5. Write a brief account on Ames test.

6. In a population of 1000 diploid individuals with 353 *AA*, 494 *Aa* and 153 *aa* individuals calculate the frequencies of '*A*' and '*a*' allele in two different ways.

7. How can you calculate multiple allele frequencies ?

8. Describe the types of mutation in human genome.

9. What are the roles of Molecular organization of chromosomal parts ?

10. What is the function of Telomere in cell cycle ?

11. What are the differences in molecular organization of prokaryotic and eukaryotic chromosomes ?

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

12. Distinguish between the following, giving the location of the gene, the mode of transmission and relationship to sex :

    a) Sex influenced and holandric characters

    b) Sex-limited and sex influenced characters

    c) Sex linked and sex limited characters. 5 + 5 + 5

13. a) Thalassemia is a hereditary disease of the blood of humans resulting in anaemia. Severe anaemia (Thalassemia major) is found in homozygotes $\left(T^M T^M \right)$ and a milder form of anaemia (thalassemia minor) is found in heterogygotes $\left(T^M T^N \right)$. Normal individuals are homozygous $T^N T^N$. If all the individuals with thalassemia major die before sexual maturity :

        i) What proportion of the adult F1 from marriages with thalassemia minors by minors would be expected to be normal ?

        ii) What fraction of the adult F1 from marriages of minors by normal would be expected to be anaemic ?

    b) Write essential features of sex linked inheritance and autosomal inheritance. $5 + 5 + 2 \times 2\frac{1}{2}$

14. What do you mean by 'pedigree analysis' ? How human pedigree can be constructed ? What are the limitations of a pedigree to draw conclusion about the mode of inheritance ? Describe a pedigree of 'sex-linked Dominant' inheritance with suitable diagram. 2 + 3 + 3 + 7

15. The following genotypes were observed in a population :

Genotype	Number
HH	40
Hh	45
hh	50

Using a chi-square test, determine whether the population is in Hardy-Weinberg equilibrium.

16. Distinguish between allele frequency and genotype frequency. Discuss how allele frequencies can be calculated from number of genotypes and genotype frequencies. How can you calculate allele frequencies of multiple alleles ?

2 + 8 + 5

17. What is an STS ? What are the criteria of an STS ? Discuss how the STSs can be used for sequencing human genome. How does this techinque differ from whole genome shortgun technique for genome sequencing ? 2 + 3 + 5 + 5

18. What is chromosome ? How it was discovered as a physical basis of inheritance ? Explain Chromosome Theory of Inheritane. 3 + 5 + 7

19. What is Aneuploidy ? What are the causes of Aneuploidy in human ? Describe some known chromosomal syndromes in human. 3 + 4 + 8