PG/IIIS/ZOO-304/18(CBCS)

# M.Sc. 3rd Semester Examination, 2018

## ZOOLOGY

PAPER – ZOO-304

*Full Marks* : 40

*Time* : 2 hours

*The figures in the right-hand margin indicate marks*

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

## GROUP – A

( *Genetics* )

1. Answer any *two* of the following : 2 × 2

   (*a*) When the goodness-of-fit chi-square test is used ?

   (*b*) What is the sexual phenotype of a fruit fly that has XXYYY sex chromosomes and two sets of autosomes ?

(*c*) A three point test cross is carried out between three linked genes. The resulting recombinant progeny are $s^+r^+c^+$ and src and the double cross over progeny are $src^+$ and $s^+r^+c$. Which is the middle locus ?

(*d*) What does it indicate when the interference is −0·23 from a three point test cross :

(*i*) Fewer double cross over took place

(*ii*) More double cross over took place

choose the correct option.

2. Answer any *two* of the following : 4 × 2

(*a*) In guineapig white colour(w) is recessive to black colour(W) and wavy hair (v) is recessive to straight hair(V). A breeder crosses a guineapig. That is homozygous for white coat and wavy hair with a guineapig that is black with straight hair. The F1 are then crossed with guineapig having white coat and wavy hair. The following progeny are produced from the test crosses !

| | |
|---|---|
| (WV) black straight | 30 |
| (Wv) black wavy | 10 |
| (wV) white straight | 12 |
| (wv) white wavy | 31 |
| Total – | 83 |

(*i*) Are the genes that determine coat color and hair type assorting independently ?

(*ii*) What is the recombination frequency between them. $2\frac{1}{2}+1\frac{1}{2}$

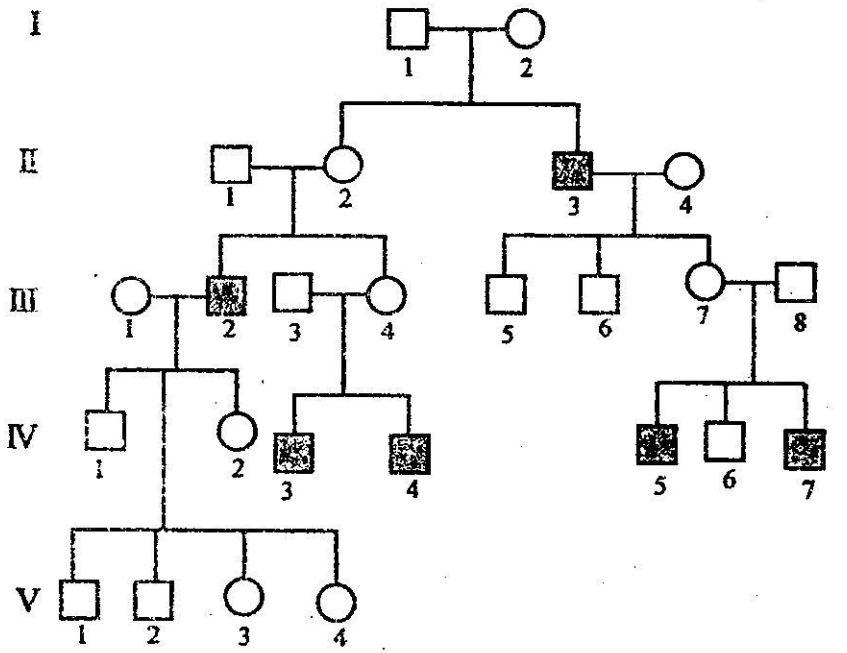
(*b*) Voles are trapped in old fields in Indiana and were genotyped for a transferrin locus. The following number of genotypes were recorded where $T^E$ and $T^F$ represent different alleles.

| $T^ET^E$ | $T^ET^F$ | $T^FT^F$ |
|---|---|---|
| 407 | 170 | 17 |

Calculate the genotypic and allelic frequencies of transferrin locus. 2 + 2

(*c*) The following pedigree illustrates the

inheritance of Nance-Horan Syndrome, a rare genetic condition in which affected persons have cataracts and abnormally shaped teeth.




On the basis of this pedigree, what do you think is the most likely mode of inheritance for Nance-Horan syndrome ? Explain. 4

(*d*) A series of Hfr strains that have genotypes $m^+n^+o^+p^+q^+r^+$ are mixed with $F^-$ strain that has genotype $m^-n^-o^-p^-q^-r^-$. Conjugation is interrupted at regular intervals and the order appearence of genes from the Hfr strain is determined in the recipient cells. The order of gene transfer for each Hfr strain is :

Hfr 5 $m^+ q^+ p^+ n^+ r^+ o^+$
Hfr 4 $n^+ r^+ o^+ m^+ q^+ p^+$
Hfr 1 $o^+ m^+ q^+ p^+ n^+ r^+$
Hfr 9 $q^+ m^+ o^+ r^+ n^+ p^+$

what is the order of genes on the circular bacterial chromosome ? For each Hfr strain, give the location of the *F* factor in the chromosome and its polarity. 4

3. Answer any *one* of the following : 8 × 1

(*a*) Priscilla Lane and Margaret Green studied the linkage relations of three genes affecting coat color in mice : mahogany(mg), agouti(a) and ragged(Rg). They carried out a series of three-point crosses, mating mice that were heterozygous at all three loci with mice that

were homozygous for the recessive alleles at these loci. The following table lists the results of the test-crosses.

| Phenotype | Number |
|---|---|
| a Rg + | 1 |
| + + mg | 1 |
| a + + | 15 |
| + Rg mg | 9 |
| + + + | 16 |
| a Rg mg | 36 |
| a + mg | 76 |
| + Rg + | 69 |
| | 213 |

Determine the order of loci that encode mahogany, agouti and ragged on the chromosome, the map distances between them, and the interference and coefficient of coincidence for these genes. 8

(*b*) In the European land snail cepaea nemoralis, multiple alleles at a single locus determine shell color. The allele for brown ($C^B$) is

dominant to pink($C^P$) and yellow ($C^Y$). The dominance hierarchy is $C^B > C^P > C^Y$. In one population sample the following color phenotype recorded.

| | |
|---|---|
| Brown | 236 |
| Pink | 231 |
| Yellow | 33 |
| Total – | 500 |

Assuming that this population is in Hardy-Weinberg Equilibrium. Calculate the frequency of $C^B$, $C^P$ and $C^Y$ allele. 3 + 3 + 2

## GROUP – B

## ( *Haematology* )

1. Answer any *two* of the following questions : 2 × 2

   (*a*) How you determine the age of neutrophils from human blood film ?

   (*b*) From where you may collect the haemolymph cells from insects to demonstrate blood cells-types.

(*c*) Mention the name of lymphopoietic sites in mammalian species.

(*d*) Write a short note on : 'Hassall's Corpuscles'.

2. Answer any *two* questions from the following : $4 \times 2$

(*a*) How you prepare the blood smear for 'Differential count' (DC) of an animal ?

(*b*) Discuss the general protocol about erythrocyte differentiation.

(*c*) Briefly explain the mechanism of Blood coagulation with the help of a short scheme.

(*d*) Write short notes on :

(*i*) Determine the 'Hb'-percentage.

(*ii*) ABO-Blood Group.

3. Answer any *one* question from the following : $8 \times 1$

(*a*) What is Anemia ? State the symptoms and

major causes of Anemia. Mention the probable treatment of an anemic patient in a specialized hospital. 2 + 2 + 4

(*b*) Write short notes of the following (any *four*) : 2 × 4

(*i*) Anticoagulants

(*ii*) Fish polymorphic granulocytes

(*iii*) Extramedullary erythropoiesis

(*iv*) Haemocytoblast to thrombocytes

(*v*) Haemin Crystals

(*vi*) Clotting time of Blood.