

2020

MICROBIOLOGY — HONOURS

Paper : DSE-B-1

(Inheritance Biology)

Full Marks : 50

The figures in the margin indicate full marks.

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

Answer Question no. 1 and **any three** questions from the rest.

1. Answer **any ten** questions :

2×10

- (a) When a plant of chromosomal type aa pollinates a plant of type AA, what chromosomal type of embryo and endosperm is expected in the resulting seeds?
 - (b) What is co-dominance? Give one example.
 - (c) Differentiate between maternal effect and maternal inheritance.
 - (d) Mention the genetic cause of Turner syndrome.
 - (e) Mention the utility of loss-of-function alleles in genetic studies.
 - (f) What is a linked gene?
 - (g) How can you determine whether an organism is heterozygous or homozygous for a dominant trait?
 - (h) Write down the cause of Cri-du-chat syndrome.
 - (i) Why are double cross-over events expected to occur in lower frequency than do single cross-over event?
 - (j) Are sister chromatids genetically similar or identical? Explain briefly.
 - (k) How are giant Polytene chromosomes formed?
 - (l) What is incomplete penetration of an allele?
 - (m) What is haploinsufficiency?
 - (n) What is epistasis?
 - (o) Distinguish between pericentric and paracentric inversions.
2. (a) An allele in *Drosophila* produces a star-eye trait in the heterozygous individual. However, the star-eye allele is lethal in homozygotes. What would be the ratio of phenotypes of surviving offspring if star-eyed flies were crossed to each other?
- (b) Why did not any pairs of genes used by Mendel show linkage?
- (c) What is genetic pleiotropy? Mention two reasons for it.

3+3+(2+2)

Please Turn Over

3. (a) A seed dealer wants to sell four-o'clock seeds that will produce only a single colour of flowers (red, white or pink). Explain how this should be done.
- (b) A human disease known as vitamin-D resistant rickets is inherited as an X-linked dominant trait. If a male with the disease produces children with a female who does not have the disease, what is the expected ratio of affected and unaffected offspring?
- (c) Differentiate between sex-limited and sex-influenced traits with appropriate example for each. 3+3+4
4. (a) What is X-chromosome inactivation? What is its significance?
- (b) How dosage compensation is achieved in *Drosophila*?
- (c) What is monoallelic expression?
- (d) Define position effect. (1+2)+2+2+3
5. (a) Explain how maternal genes exert their effects during the early stages of development.
- (b) How many Barr bodies would you expect to find in humans with the following abnormal composition of sex chromosomes?
- (i) XXY, (ii) XYY, (iii) XXX, (iv) XO.
- (c) Certain forms of human colour blindness are inherited as X-linked recessive traits. Hemizygous males are colour blind, but heterozygous females are not. However, heterozygous females sometimes have partial colour blindness. Discuss why heterozygous females sometimes have partial colour blindness.
- (d) What is a gene family? 3+2+3+2
6. (a) What is an inversion heterozygote?
- (b) What is Robertsonian translocation? Give example.
- (c) What is haplodiploid?
- (d) In *Drosophila*, ebony body color is produced by a recessive gene (*e*) and wild type (gray) body colour is produced by its dominant allele (e^+). Vestigial wing is governed by a recessive gene *vg*, and normal wing size (wild type) is governed by its dominant allele vg^+ . If dihybrid flies are crossed and produce 256 progeny, how many of the progeny flies are expected in each phenotypic class? 2+3+2+3
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