

**2021****ZOOLOGY****[HONOURS]****Paper : X**

Full Marks : 50

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.*

1. Answer any **five** questions:  $2 \times 5 = 10$
- State the components of lac operon.
  - What is frameshift mutation?
  - What is Kornberg enzyme? State its two functions.
  - What do you mean by 'Self Splicing'?
  - Specify the Characteristic features of the Yeast Artificial Chromosome (YAC).
  - What is wobble hypothesis?
  - What is pseudoallele? Why it is called so?

- h) Write down the causes and symptoms of the Cri-du-chat syndrome.

2. Answer any **two** questions:  $5 \times 2 = 10$
- What is f-met tRNA? 'Genetic code is almost universal'– Describe it.  $2 + 3 = 5$
  - What is DNA fingerprinting? On which technique DNA fingerprinting is based on?  $4 + 1 = 5$
  - Provide a short account of sex-determining mechanism in *Drosophila* sp.  $5$
  - What do you understand by blunt cut and staggered cut? Name one restriction endonuclease for each type of cut. What do you mean by C-value paradox? Mention its importance in molecular biology.  $2 + 1 + 1 + 1 = 5$
3. Answer any **three** questions:  $10 \times 3 = 30$
- 'Origin of cancer is a multistep process'– Briefly discuss it with suitable example. Distinguish between oncogenes and tumor suppressor genes. Why tumor suppressor genes expected to be recessive?  $6 + 2 + 2 = 10$
  - In *Drosophila* Dichaete (D) is a mutation on Chromosome III with a dominant effect on

wing shape. It is lethal when homozygous. The genes ebony body (e) and pink eye (p) are recessive mutation on Chromosome III. Flies from dichaete stock were crossed to homozygous ebony, pink flies and the F1 progeny, with a dichaete phenotype were backcrossed to the ebony, pink homozygotes. Using the results of this backcross shown in the table.

- i) Draw this cross, showing the genotypes of the parent and offsprings of both the crosses.
- ii) What is the sequence and inter locus distance between these three genes?

$$4+6=10$$

Phenotype	Number
Dichaete	401
Ebony, pink	389
Dichaete, ebony	84
Pink	96
Dichaete, pink	2
Ebony	3
Dichaete, ebony, pink	12
Wild type	13

- c) Briefly state the role of CAP-cAMP complex in lac-operon in *E.coli*.

Briefly describe the Glucose effect in lac operon. What type of products would you expect with the following partial heterozygotes of *E.coli* for lac operon in presence or in absence of Lactose and why?

The partial heterozygotes are:

$$i) \frac{i^+ o^- z^+ y^+}{i^- o^+ z^- y^-}$$

$$ii) \frac{i^+ o^c z^+ y^-}{i^- o^+ z^- y^+} \quad 2+2+(1+2)+(1+2)=10$$

- d) Write names of the four major arms of tRNA molecule. What is tRNA charging? How did Messelson & Stahl (1957-58) establish that the "DNA synthesis is semi-conservative in nature" – Explain.  $2+3+5=10$
- e) Define point mutation. Compare and contrast between mutagen and carcinogen. What are transition and transversion type mutation? Mention the chromosomal abberations related to Down Syndrome. Name two chemical and two physical mutagens.  $2+2+2+2+2=10$