

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2022

Subject Code: 3140409

Date: 29-06-2022

Subject Name: Molecular Biology and Genetics

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

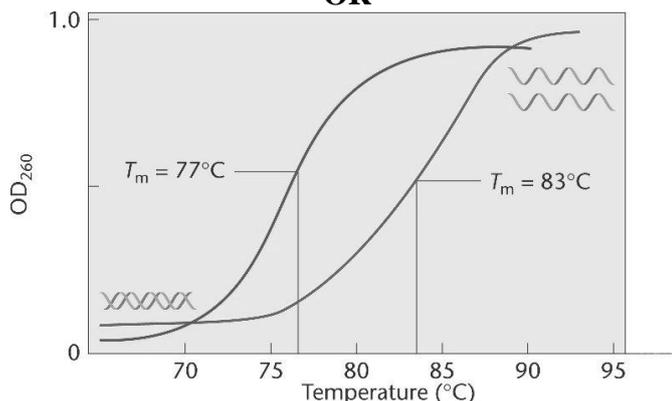
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

- Q.1**
- (a) Explain the terms allele, cistron, homozygous **03**
- (b) Explain Law of Segregation with a suitable illustration. **04**
- (c) In a mice, dominant allele C must be present in order for any pigment to be developed in the coat. The kind of pigment depends on another locus thus B- produces black and bb produces brown. Genotype cc produces no pigment called albinos. A homozygous black female is test crossed with albino male. What phenotypic ratio is expected in F1 and F2? **07**
- Q.2**
- (a) Define the terms mutation, mutants, mutagen. **03**
- (b) Draw diagram of Messelson and Stahl's experiment if DNA replication was conservative. (Assume that it is not semi-conservative). (draw diagrams for 1st, 2nd and 10th generation) **04**
- (c) Differentiate between epistasis and dominance. Also explain dominant epistasis with suitable illustration. **07**

OR

- (c) **07**



The above graph is the absorbance of two DNA solutions (A and B) of same number of base pairs (same bp length fragments) v/s temperature of the solution. Please find out the approximate melting temperatures of A and B. Which of the DNA fragments, A or B has higher cytosine content, give reason for your answer

- Q.3**
- (a) Explain the Hypochromic and Hyperchromic effect of DNA. **03**
- (b) How does the repair system discriminate between parent and daughter strand for repair? **04**
- (c) If proteins were the genetic material in nature, what would the data from Hershey and Chase's famous blender experiment look like? Explain with diagrams. **07**

OR

- Q.3** (a) Prokaryotes or Eukaryotes, which type of organisms have a gene structure with less information density compared to another? Why can one type afford to have less information density in its gene compared to another? **03**
- (b) Write a short note on one gene one protein hypothesis. **04**
- (c) Explain post transcriptional modification of mRNA, tRNA and rRNA. **07**
- Q.4** (a) Explain wobble hypothesis in detail. **03**
- (b) Explain role of helicase and topoisomerase in prokaryotic replication. **04**
- (c) Explain suppression of mutation with example **07**
- OR**
- Q.4** (a) Write a note on prokaryotic RNA polymerase. **03**
- (b) Explain the formation of initiation complex in prokaryotic translation. **04**
- (c) Explain mismatch repair with a neat diagram. **07**
- Q.5** (a) Write a note on pleiotropy. **03**
- (b) From what substrates is RNA made? Does it require primer? Does it require template? Which enzyme plays key role in transcription? **04**
- (c) Explain functions of all the enzymes involved in prokaryotic replication. **07**
- OR**
- Q.5** (a) Differentiate between dominance And epistasis. **03**
- (b) Explain the concept of replisome and primosome. **04**
- (c) Explain transcription termination in prokaryotes by formation of hairpin loop structure. How does termination happen if a hairpin structure is not formed? **07**
