

Rani Rashmoni Green University

M.Sc.3rd Semester Examination, 2025

Subject: Nutrition and public health

Course code: GNPHT - 34B (Unit 1: Microbial genetics; Unit 2: Animal and human genetics)

Time: 2hrs

FM= 40 marks

1. Answer any four out of six questions from the followings: 4×2=8

- a) If a DNA strand has the sequence 5'-ATGCAG-3', what will be the sequence and polarity of the complementary RNA strand transcribed from it? What is polycistronic mRNA? 1+ 1
- b) Define euchromatin and heterochromatin. 1+ 1
- c) What are F plasmids? What is their major function? 1+ 1
- d) What is represented by the "beads-on-a-string" appearance in chromatin structure?
- e) Why is Turner syndrome associated with low bone density and other bone-related problems?
- f) What is nuchal translucency?

2. Answer any four out of six questions from the following: 4x4=16

- a) What is an operon? Name the components of the trp operon in *E. coli*. Explain the regulation of the lac operon under different conditions (glucose present/absent, lactose present/absent). 1+1+2
- b) What is the function of DNA gyrase, sliding clamp, topoisomerase and SSB in replication of prokaryotes? What are introns and exons? 2+2
- c) Name any two metabolic disorders that can be detected by the heel-prick blood spot method during postnatal screening. Write the full forms of the single-gene disorders SMA and DMD. 2+2
- d) Write one difference between a nucleoside and a nucleotide. Compare A-DNA, B-DNA, and Z-DNA with respect to their general structural characteristics, mentioning any two points of difference. 1+3
- e) What is Amniocentesis during prenatal diagnosis? What are the major risks or complications associated with the procedure of amniocentesis? 1+3
- f) Describe the 10 nm and 30 nm chromatin fibres, highlighting their structural organization and significance in chromatin compaction.

3. Answer any two out of four questions from the following: 2x8=16

- a) What is 5' capping of mRNA? Explain the steps of translation in prokaryotes with diagram. Explain the role of sigma (σ) factor in transcription. 1+6+1
- b) What is meant by the "C-value paradox"? In a double-stranded DNA molecule, if cytosine constitutes 32% of the total bases, calculate the percentage of thymine, based on complementary base-pairing rules. Describe the Hershey and Chase experiment that demonstrated DNA as the genetic material of the T2 bacteriophage. 1+2+5

c) Write the differences between gas chromatography and liquid chromatography. What is the advantage of MRI over CT scan? What is the purpose of ethidium bromide in DNA visualization?

What is the retention factor (R_f value)? Why is 280 nm used for protein measurement? 2+2+1+2+1

d) What is Chorionic villi? What is Chorionic Villus Sampling (CVS)? What are the two types of procedures in Chorionic Villus Sampling (CVS)? 2+2+2+2