30. a. DNA in *E. coli* is single long stretch of nucleotide while many RNA transcripts are synthesized using DNA as template. In this case how RNA polymerase determine the starting and ending position in DNA? Explain the process. 12 4 3 2

**(OR)**

b. Explain the process of post translational modifications of tRNA and rRNA. 12 3 3 3

31. a. Discuss in detail about import of protein in nucleus and mitochondria. 12 3 4 2

**(OR)**

b. Explain the process of translation with appropriate diagrams. 12 3 4 2

32. a. In an experiment, *E. coli* cells are grown in Flask A : lactose as carbon source Flask B : glucose as carbon source. Comment on growth of *E.coli* in both the flasks and compare their gene regulation. 12 4 5 3

**(OR)**

b. What will happen if you grow *E.coli* cells in medium without tryptophan? Will they grow? If yes, explain the process. 12 4 6 3

* * * * *



| Reg. No. | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**B.Tech. DEGREE EXAMINATION, MAY 2023**

Fourth Semester

18BTC105J – MOLECULAR BIOLOGY

*(For the candidates admitted from the academic year 2018-2019 to 2021-2022)*

**Note:**

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours Max. Marks: 100

**PART – A (20 × 1 = 20 Marks)** Marks BL CO PO

Answer **ALL** Questions

1. In Meselson-Stall experiment, the light band appears in $CsCl_2$ centrifugation after 1 2 1 1
   (A) Growing the cells in $^{15}N$ – labelled $NH_4Cl$ (B) Growing the cells in $^{14}N$ – $NH_4Cl$ for one generation
   (C) Growing the cells in $^{14}N$ – $NH_4Cl$ for two generation (D) Growing the cells in $CsCl_2$ containing medium

2. Alpha complementation is closely related to 1 2 1 2
   (A) Lac operon (B) Trp operon
   (C) Ara operon (D) His operon

3. Poly A tail with messenger RNA is added 1 2 1 2
   (A) During transcription (B) As post translational modification
   (C) As post transcriptional modification (D) During replication

4. The length of 28s rRNA is 1 2 1 2
   (A) ~ 28 kda (B) ~ 28 rNTs
   (C) ~ 4800 rNTs (D) ~ 4800 bp

5. Which of the following catalytic activity DNA polymerase III has 1 2 2 1
   (A) 5' to 3' exonuclease and 5' to 3' polymerase (B) 3' to 5' polymerase and 5' to 3' exonuclease
   (C) 5' to 3' endonuclease and 5' to 3' polymerase (D) 5' to 3' exonuclease and 5' to 3' endonuclease

6. DNA ligase can establish phosphodiester bond between 1 2 2 2
   (A) 3' OH and 5' P of incoming dNTPs (B) 5' OH and 5' O of incoming dNTPs
   (C) 3' OH AND 5' monophosphate of adjacent deoxynucleotides (D) 3' OH and 3' P of adjacent dNTPs

7. Which of the following is responsible to induce nics at the site of mismatch during DNA repair? 1 2 2 2
   (A) Mut S (B) Mut L
   (C) Helicase (D) Mut H

8. In a mismatch repair, which enzyme is involved in filling up of single stranded gap 1 2 2 2
   (A) Exonuclease VII (B) Rec J
   (C) Exonuclease VI (D) DNA polymerase III

9. Which of the following enzyme is involved in transcription of mRNA in eukaryote? 1 2 3 3
   (A) RNA polymerase I (B) DNA polymerase I
   (C) RNA polymerase II (D) RNA polymerase III

10. Which of the following statement is true in eukaryotes? 1 2 3 3
   (A) A transcription unit may include more than one gene (B) A transcription unit contains only one gene
   (C) Transcription unit is only the coding region (D) Transcription unit will start upstream of promoter

11. The role of sigma factor in transcription is to 1 2 3 3
   (A) Recognize the initiation site and initiate the transcription (B) Initiate the transcription and involve in elongation
   (C) Initiate the transcription and termination (D) Only in terminating the transcription

12. Stem loop structure that forms during transcription termination is rich in 1 2 3 3
   (A) C-G base pair (B) A-T base pair
   (C) Poly A tail (D) Poly U tail

13. Polycistronic mRNA means 1 2 4 3
   (A) The mRNA has poly A site (B) The mRNA codes for protein with more cytosine residue
   (C) The mRNA codes for more than one protein (D) The mRNA has more ply U tail

14. Peptide bond formation in translation happens between 1 2 4 3
   (A) C terminal of aminoacyl tRNA and N terminal of peptidyl tRNA (B) C terminal of peptidyl tRNA and N terminal of aminoacyl tRNA
   (C) Side chains of aminoacyl tRNA and peptidyl tRNA (D) Side chains of growing peptide

15. RNA primers in lagging strand is removed by 1 2 2 3
   (A) Helicase (B) DNA polymerase III
   (C) DNA polymerase I (D) Ligase

16. RNA polymerase synthesized in cytoplasm reaches nucleus through 1 2 4 3
   (A) Diffusion in nuclear membrane (B) RNA polymerase is synthesized in nuclease
   (C) Central transporters (D) Golgi complex



17. In negative gene regulation, 1 2 5 3
   (A) Repressor protein prevents transcription (B) Inducer protein prevents transcription
   (C) Repressor protein and inducer complex prevent transcription (D) Promoter does not activate on its own

18. Ara B gene codes for 1 2 5 3
   (A) Ribulokinase (B) Arabinose isomerase
   (C) Arabinose kinase (D) Ribulose epimerase

19. When there is sufficient amount of tryptophan in cell 1 2 6 3
   (A) *Trp* operon is repressed (B) *Trp* operon is induced
   (C) Active repressor are converted to apo repressor (D) Not enough tryptophan to function as corepressor

20. Which one of the following is regulatory gene in *lac* operon? 1 2 6 3
   (A) *lac* A (B) *lac* Z
   (C) *lac* I (D) *lac* promoter

**PART – B (5 × 4 = 20 Marks)**

Answer **ANY FIVE** Questions

| | Marks | BL | CO | PO |
|---|---|---|---|---|
| 21. Differentiate A, B and Z forms of DNA. | 4 | 3 | 1 | 1 |
| 22. Write down the role of topoisomerase in replication. | 4 | 3 | 1 | 1 |
| 23. Compare the role of DNA poly I and DNA poly III in replication process. | 4 | 3 | 2 | 2 |
| 24. Describe the transcription termination process. | 4 | 3 | 3 | 2 |
| 25. Draw schematic diagram of *E.coli* rRNA transcript. | 4 | 3 | 4 | 2 |
| 26. Write down the mechanism of protein import into the nucleus. | 4 | 2 | 4 | 2 |
| 27. List out the genes present in *Trp* operon with their gene product and function. | 4 | 2 | 5 | 3 |

**PART – C (5 × 12 = 60 Marks)**

Answer **ALL** Questions

| | Marks | BL | CO | PO |
|---|---|---|---|---|
| 28. a. Which of the following carry genetic information from one generation to the other, DNA or protein? Give experimental evidence. | 12 | 2 | 1 | 2 |
| **(OR)** | | | | |
| b. Explain the method to study the DNA topology. | 12 | 3 | 1 | 2 |
| 29. a. Draw replication fork and illustrate the mechanism of DNA replication and proofreading. | 12 | 3 | 2 | 2 |
| **(OR)** | | | | |
| b. Give experimental proof of semi-conservative mode of replication. | 12 | 3 | 2 | 3 |