KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

Marks Scored:

Level : B.Tech.
Year : III

Course : BIOT 315
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 12 AUG 2024

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose and mark [X] the most appropriate option from each set of choices

1. Which of the following is a spot pattern evaluation/annotation software?
[ ] Melaine 4 [ ] ImageMaster 2D [ ] PDQuest 6.1 [ ] All of the above

2. His tagged proteins can be captured on a _____ column.
[ ] Nickel [ ] Glutathione [ ] Affinity [ ] Sepharose

3. Hind III enzyme recognizes which DNA sequence?
[ ] TAGCTT [ ] AAGCTA [ ] AAGCTT [ ] AACGTT

4. Which derivative of the amino acid glycine, exhibited significantly elevated levels in metastatic tumors compared to localized prostate cancer tissue
[ ] Porcine [ ] Sarcosine [ ] Glycerin [ ] Glutamine

5. Which of the following CAG repeat lengths would indicate an individual will develop Huntington disease?
[ ] 41 [ ] 35 [ ] 33 [ ] 30

6. BRAF gene mutation is a prognostic biomarker for diagnosis of which disease?
[ ] Melanoma [ ] Sickle cell anemia
[ ] Cystic fibrosis [ ] Thalassemia

7. Which of the following is not a feature of pUC19 plasmid?
[ ] LacZ [ ] lac I [ ] Ampr [ ] Tet A

8. To convert mRNA into double-stranded DNA for cloning, which enzyme synthesizes complementary DNA (cDNA) from the RNA template.
[ ] DNA polymerase [ ] RNA polymerase
[ ] Reverse transcriptase [ ] Restriction enzyme

9. Genes encoding enzymes breaking down _____ has been isolated from a metagenomic library of DNA sourced from microbes in the human intestinal tract.
[ ] Carbohydrate [ ] Dietary fiber [ ] Fats [ ] Proteins

10. Which of the following is not a process of microarray
[ ] Hybridization [ ] Probe labelling
[ ] DNA isolation [ ] cDNA production

11. What is the length of binding domain of GAL 4 transcriptional activator?
[ ] 1-147 [ ] 148-768 [ ] 769 -881 [ ] 1-881

12. If a certain _____ is found to be conserved across divergent genomes, the encoded proteins are functionally coupled.
[ ] Domain fusion [ ] Protein Fusion
[ ] Gene linkage [ ] Sequence homology

13. Trisomy 13, characterized by an extra copy of chromosome 13, results in which disease?
[ ] Down syndrome [ ] Edward syndrome
[ ] Patau syndrome [ ] All of the above

14. _____ require only one mutated allele, often inherited from an affected parent with a 50% chance of passing it on, like Huntington's disease?
[ ] Autosomal dominant disorders [ ] Autosomal recessive disorders
[ ] X linked disorders [ ] Y linked disorders

15. The cystic fibrosis transmembrane regulator (CFTR) protein comprises _____ amino acids.
[ ] 480 [ ] 1280 [ ] 1480 [ ] 1880

16. Recessive mutations in_____, a serine/threonine-type protein kinase encoded by a nuclear gene, lead to a familial form of early-onset Parkinson disease.
[ ] PINK1 [ ] PARK2 [ ] SNCA [ ] LRRK2

17. _____ is formed when a protein, called sigma factor, combines with the core proteins (i.e., two α, one β, and one β′ subunit) of RNA polymerase.
[ ] Polymerase [ ] Transcriptase [ ] Holoenzyme [ ] lac promoter

18. The bacterial neo gene, encoding neomycin phosphotransferase, is commonly employed in mammalian cell selection, where _____ replaces neomycin as the selective agent.
[ ] G-218 [ ] N-218 [ ] G-418 [ ] N-418

19. Which of the following is not a feature of Clinical Trials Phase 1?
[ ] Assess safety of drugs [ ] Pharmacokinetics study
[ ] Pharmacodynamics study [ ] Patients volunteers

20. Which of the following is the temperature sensitive version of GAL transcription activator?
[ ] GAL 4 [ ] GAL 40 [ ] GAL 60 [ ] GAL 80

SECTION "B"
[10 Q. × 1 = 10 marks]

Fill in the blanks

21. _____ system is a technique in molecular biology to discover protein-protein and protein-DNA interactions in yeast model.

22. The process of taking up DNA into a bacterial cell is called transformation, and a cell that is capable of taking up DNA is said to be _____.

23. Nucleases like S1 nuclease and _____ nuclease degrade single-stranded extensions to create blunt ends when complementary sticky end recognition sequences are unavailable.

24. _____ , also known as gene expression profiling, involves quantifying the levels of gene transcription across the entire genome in specific conditions.

25. Phenyl methyl sulfonyl fluoride (PMSF) is a _____ protease inhibitor, commonly used in the preparation of cell lysates.

26. GWAS stands for _____ .

27. _____ mutations in the fragile X mental retardation 1 (FMR1) gene cause Fragile X syndrome, which encodes the FMRP protein crucial for synaptic plasticity and neuronal development.

28. To increase plasmid copy numbers and thus target gene copies, _____ cells have been engineered to express the SV40 large-T antigen or Epstein–Barr virus nuclear antigen 1.

29. In clinical trials, _____ trial is the therapeutic exploratory trial.

30. In drosophila melanogaster, flies with apterous mutation has _____ .

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F. M. : 55

SECTION "C"
[3 Q. × 8 = 24 marks]

Attempt *ANY THREE* questions.

1. What is molecular cloning? Write down the protocol of molecular cloning? [1+7]

2. Discuss in detail the different steps involved in 2D gel electrophoresis? [8]

3. Elaborate genetic basis of diseases from the view point of chromosomal abnormalities?[8]

4. What is single gene disorder? Explain about different single gene disorders? [1+7]

SECTION "D"
[21 marks]

Attempt *ANY SIX* questions. **(Q.N. 7 is compulsory)**

5. What is microarray? Explain the basic features of microarray? [1+4]

6. What is the use of Immunoprecipitation in Medical Biotechnology? Discuss the principal of Immunoprecipitation? [1+4]

7. Discuss why drosophila is used as a model organism for medical biotechnology? [6]

8. Enlist different molecular diagnostic techniques used in medical biotechnology? Describe how ELISA can be used as a molecular diagnostic tool? [1+4]

9. What are the different steps of clinical trials? Discuss phase III trials in detail? [1+4]

10. Describe in brief techniques used to modulate gene expression? [5]

11. Write short notes on ***ANY TWO*** [2×2.5=5]
    a. GWAS
    b. Pull down assay
    c. Alzheimers disease