KATHMANDU UNIVERSITY
End Semester Examination
May/June, 2022

Marks Scored:

Level : B.Tech.
Year : III

Course : BIOT 306
Semester : II

Exam Roll. No.

Time: 30 mins

F.M. : 20

Registration No.

Date : May-30 022

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SECTION "A"
[20Q. × 0.75 = 15 marks]

Mark [×] in the most appropriate answer box.

1. A method used to distinguish DNA of one individual from another is.
   [ ] PCR [ ] RFLP [ ] cDNA [ ] Reverse transcriptase

2. In PCR synthetic sequence of nucleotides are involved in
   [ ] Denaturing [ ] Heating [ ] Priming [ ] Copying

3. In the screening process, clones that metabolize X-gal turns
   [ ] Yellow [ ] Blue [ ] White [ ] Red

4. In attempts to confer special characteristics upon plants, genetic engineers find *Agrobacterium tumefaciens* to be an effective vector for use with
   [ ] Corn [ ] Rice [ ] Soyabeans [ ] Wheat

5. One of the most useful methods for identifying a specific gene is
   [ ] Thin layer chromatography [ ] Northern Blot
   [ ] Southern Blot [ ] Western Blot

6. Telomeric sequences are found in
   [ ] HAC [ ] YAC [ ] PAC [ ] BAC

7. In a technique called virus-induced gene silencing the viral _____ is degraded.
   [ ] mRNA [ ] DNA [ ] cDNA [ ] RNA

8. The gene of yeast 2 μm plasmid that codes for a protein which converts A-form of the plasmid to B-form.
   [ ] Gene D [ ] REP1 [ ] REP2 [ ] FLP

9. The gene that acts as selectable marker in yeast replicative plasmid YRp7
   [ ] URA3 [ ] TRP1 [ ] LEU2 [ ] REP2

10. The temperature required for the action of DMSO in Maxam-Gilbert sequencing is
    [ ] 80°C [ ] 85°C [ ] 90°C [ ] 95°C

11. The bacteria having limited glycosylation activity is
    [ ] *Campylobacter jejuni* [ ] *E. coli*
    [ ] *Lactococcus lactis* [ ] *Pseudomonas sp.*

12. The AOX promoter is induced by
[ ] Galactose [ ] Starch [ ] Cellulose [ ] Methanol

13. The delta endotoxin CryIV is effective against
[ ] Lepidoptera [ ] Coleoptera [ ] Diptera [ ] Nematodes

14. The most common type of STR found in human genome is
[ ] TA [ ] TC [ ] CA [ ] GA

15. Transformation carried out using a particle gun is known as biolistic transformation. It falls under which category of transformation?
[ ] Physical [ ] Chemical [ ] Electroporation [ ] Natural

16. Isolation of genomic DNA follows the same principles as that of obtaining plasmid from *E. coli.* Which of the following is not included in it?
[ ] Cell lysis [ ] Removal of proteins
[ ] Removal of chromosomal DNA [ ] Dissolving plasmid in water

17. Which gene transfer technique involves the use of a fatty bubble to carry a gene into a somatic cell?
[ ] electroporation [ ] liposome transfer
[ ] microinjection [ ] particle bombardment

18. The polymerase chain reaction was developed by
[ ] James Watson and Francis Crick [ ] Gregor Mendel
[ ] Kary Mullis [ ] Barbara McClintock

19. Both the restriction enzymes produce GATC sticky ends.
[ ] BamHI and BglII [ ] PvuI and PvuII
[ ] HindIII and HinfI [ ] AluI and TaqI

20. Cultured animal cells are transformed, especially if the DNA is precipitated onto the cell surface with
[ ] Sodium chloride [ ] Calcium phosphate
[ ] Calcium chloride [ ] Potassium phosphate

SECTION "B"
[10Q. × 0.5 = 5 marks]

Fill in the blank.

21. DNA fragment containing protein binding site can be identified by gel electrophoresis as the DNA-protein complex migrate slowly in the gel and the process is known as _____.

22. MALDITOF mass spectrometry is used to identify peptides up to _____ amino acids in length.

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SECTION "C"

(Long answer questions)
[3Q. × 7 = 21 marks]

Attempt *ANY THREE* questions.

1. What are the significant features of restriction enzymes? A DNA when restricted with restriction enzyme A creates a fragment of size 17 kb. The same DNA when cleaved with restriction enzyme B creates fragments of size 10 kb and 7 kb respectively. Whereas double digestion creates fragments of size 7 kb, 6 kb and 4 kb. Draw restriction map on the basis of information provided. [2+5]

2. Design 18-mer forward and reverse primer for the following sequence of DNA starting from 5'-3'end. The sequence of the template DNA is as shown below:
3'ATGCCCTATTGGTAGTGTACTGATGCATGAATTCGCGTACGTCGT5'.
Also calculate the *Tm* of both the primers that you have designed. [5+2]

3. What is DNA sequencing? Describe the various steps involved in the library preparation of next generation sequencing. [1+6]

4. Why recombinant pharmaceuticals are important? Describe the process of production of recombinant insulin. [2+5]

SECTION "D"

(Short answer questions)

5. Write short notes on (*ANY FOUR*): [4Q. × 3.5 = 14]
   a. EtBr-CsCl density gradient centrifugation.
   b. Methods of identification of genes from genome sequences.
   c. Strategies for the selection of recombinant phage.
   d. S1 nuclease mapping.
   e. Terminator technology.

6. Write down TWO differences between (*ANY FOUR*): [4Q. × 2 = 8]
   a. Dimethylsulphoxide (DMSO) and Polyethylene glycol (PEG).
   b. Conjugation and Compatibility.
   c. Direct selection and Marker rescue.
   d. Asymmetric PCR and Nested PCR.
   e. Gene therapy and Gene subtraction.

7. Give reasons why/ how? (*ANY FOUR*): [4Q. × 3 = 12]
   a. Hybrid genes brings about efficient expression of cloned genes.
   b. The production of somatotrophin is more complex than the production of somatostanin.
   c. Calcium chloride is used for the preparation of competent E.coli cells.
   d. Right and left repeat sequences are important for the production of transformed plants.
   e. Genes cloned in chloroplast genome cannot transfer to weed species.

23. Bacterial DNA is not cleaved by their own restriction enzymes because bacteria add __ _____ to their own DNA.

24. In the third generation sequencing each nucleotide addition is detected with a _____ waveguide.

25. If a protein does not fold properly then usually it is insoluble and are secreted as _____ within a bacteria.

26. For the production of recombinant protein in milk the gene is attached to promoter of _____ gene.

27. The gene whose modification can lead to prevention of discoloration in fruits and vegetables is _____.

28. 2μg of DNA needs to be completely digested by Bgl-II which is obtained at a concentration of 4 units/μl. The volume of the restriction enzyme that will be needed to carry out the digestion is _____ μl.

29. pBR327 is made from pBR322 by changing the replicative and conjugative abilities and therefore cannot direct its own transfer to other *E.coli* cells, this is important for a phenomenon called _____.

30. Sex identification by PCR of part of the amelogenin gene produces_____ bands in males.