KATHMANDU UNIVERSITY
End Semester Examination [C]
November/December, 2023

Marks Scored:

Level : B.Tech.
Year : III
Course : BIOT 315
Semester : II

Exam Roll No.:
Time: 30 mins.
F. M. : 20

Registration No.:
Date : 04 DEC 2023

SECTION "A"

Mark [X] in the most appropriate box. [20 Q. × 0.5 =10 marks]

1. Reticular dysgenesis is an immunodeficiency disease due to a defect in which of the following gene?
[ ] AK 2 gene [ ] BTK gene [ ] PSEN-1 gene [ ] PARK 2 gene

2. Cell-wall biosynthesis is inhibited by antibiotics by inhibiting the biosynthesis of which of the following?
[ ] Lipopolysaccharide [ ] Cellulose
[ ] Peptidoglycan [ ] Proteins

3. The point mutation in sickle cell anemia leads to change in codon. Identify the correct change
[ ] UGA to UAA [ ] GUG to GAG [ ] GAG to GUG [ ] UAA to UGA

4. Which of the following is not a type of β-lactam antimicrobial?
[ ] Penicillins [ ] Glycopeptides [ ] Cephalosporins [ ] Monobactams

5. Endotoxin (LPS) is an important constituent of
[ ] Gram positive bacteria [ ] Gram negative bacteria
[ ] Some protozoa [ ] Fungi

6. Nezelof's Syndrome is an immunodeficiency disease which occurs due to:
[ ] T cell defects [ ] B cell defects
[ ] Both B and T cell defects [ ] Disorder of Complement

7. Which of the following antibiotic prevent bacterial transcription by directly binding to bacterial RNA polymerase?
[ ] Puromycin [ ] Streptomycin [ ] Rifampicin [ ] Polymixin

8. Phenoxymethylpenicillin is the chemical name for which of the following penicillin?
[ ] Penicillin V [ ] Penicillin G [ ] Penicillin F [ ] Phenethicilin

9. In the human karyotype of 47, XXY leads to
[ ] Klinefelter syndrome [ ] Turner syndrome
[ ] Jacob's syndrome [ ] Downs syndrome

10. Embryonic stem cells are derived from the _____ of the blastocyst.
[ ] inner cell mass [ ] ectoderm [ ] blastocoel [ ] mesoderm

11. Which one of the following genes was NOT part of transcription factors used to generate induced pluripotent stem (iPS) cells from mouse skin fibroblasts?
[ ] Oct4 [ ] Sox2 [ ] c-jun [ ] Klf4

12. Zinc-finger nucleases is
[ ] natural restriction enzyme [ ] type of helicase enzyme
[ ] artificial restriction enzyme [ ] type of polymerase enzyme

13. The first clinical gene therapy was done for the treatment of:
[ ] AIDS [ ] Cancer [ ] Cystic fibrosis [ ] ADA-SCID

14. Human epididymis protein 4 is a promising biomarker for diagnosis of
[ ] ovarian carcinomas [ ] melanoma
[ ] Cystic fibrosis [ ] Thalassemia

15. LEU 2 gene is a gene of the yeast chromosome which codes for enzyme that convert pyruvic acid to leucine. The enzyme is
[ ] pyruvate dehydrogenase [ ] enolpyruvyl transferase
[ ] β-isopropyl-malate dehydrogenase [ ] phosphonopyruvate hydrolase

16. Protein glycosylation does not have significant effects on which of the following?
[ ] Protein folding [ ] Protein distribution
[ ] Protein stability [ ] Protein synthesis

17. The envelope of a virus is derived from the host's
[ ] nucleic acids [ ] membrane structures
[ ] cytoplasm [ ] genome

18. In N-glycosylation, glycan binds to the amino group of which of the following amino acid?
[ ] Lysine [ ] Asparagine [ ] Arginine [ ] Histidine

19. *PARK2* gene that encodes parkin protein is located in
[ ] chromosome 2 [ ] chromosome 7 [ ] chromosome 6 [ ] chromosome 4

20. Method of gene transfer that involve use accelerated microprojectile to deliver DNA into intact tissues or cells is
[ ] Microinjection [ ] Electroporation [ ] Biolistics [ ] Lipofections

SECTION "B"

Fill in the blanks [10 Q. ×1=10 marks]

21. The mechanism by which bacteria regulate gene expression in accordance with population density through the use of signal molecules is _____.

22. Envelope of Influenza A virus contains a spike protein known as _____ that interacts with a sialic acid residue on a glycoprotein in the membranes of secretory cells of the respiratory tract.

23. Immunodeficiency disease due to microdeletion of chromosome 22q11.2 is _____

24. Consider an autosomal dominant trait. If an unaffected parent and an affected heterozygous parent are expecting a child, what is the chance of them having an unaffected child?_____

25. Cells that are characterized by the ability to self-renew and produce progenitor cells which are committed to give rise to fully differentiated cells are known as _____

26. An in vitro fertilization procedure in which sperm is injected directly inside the egg nucleus is _____

27. Single-stranded catalytic DNA that are synthesized through in vitro selection processes from a large pool of random DNA libraries that selectively cleave RNA strands at specific sites are known as_____

28. In a Real Time PCR, number of cycles required for the fluorescent signal to exceed background levels is called _____

29. Enzyme that catalyzes the formation of disulfide bonds between cysteine amino acids that are nearby in the folded protein is _____

30. The CFTR gene provides instructions for making a protein called the _____ _____

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SECTION "B"

[3Q. × 8 = 24 marks]

Attempt *ANY THREE* questions.

1. Explain the mechanism of bacterial pathogenesis?

2. Explain the pathological changes and genetic risk factors for Alzheimer's disease.

3. Define antibiotics. Describe the mode of action of cell wall synthesis inhibitors. [1+7]

4. Compare and contrast indirect and sandwich ELISAs. Describe an application of real time PCR in the diagnosis of an infectious disease. [2+6]

SECTION "D"

[31 marks]

Attempt *ANY SIX* questions. **(Q5 is compulsory)**

5. Write short notes on: [2 Q. × 3 = 6]
   a. SELEX
   b. RNA interference

6. Define induced pluripotent stem (iPS) cells? Classify stem cells based on their source of origin. Explain in brief? [2+3]

7. Explain the principal clinical manifestations of HIV infection. [5]

8. Describe the mechanisms of bacterial resistance to antibiotics. [5]

9. Describe the post-translational modification of protein in a eukaryotic expression system. [5]

10. Explain impact of molecular diagnostic tools on human disease? [5]

11. Explain the process of virus assembly and release? [5]