QP Code : 50134

(3 Hours) **[Total Marks : 100**

N.B. : (1) Attempt **all** sections.
(2) **Figures** to the **right** indicate **full** marks.

Section - I **40**

1. Asn and Gln are examples of
   (a) Polar and charged amino acids
   (b) Polar and uncharged amino acids
   (c) Non polar and uncharged amino acids
   (d) Hydrophobic amino acids

2. The sulphur containing amino acids are
   (a) Met and Val
   (b) Tyr and Cys
   (c) Cys and Met
   (d) Ala and Cys

3. The amino acids that can be phosphorylated are
   (a) Lys, Asp, Glu
   (b) His, Phe, Trp
   (c) Ser, Thr, Tyr
   (d) Ala, Ile, Leu

4. Which of the following statements is false?
   (a) The aromatic side chains of amino acids are responsible for UV light absorbance
   (b) Some amino acids are more abundant in proteins than other amino acids
   (c) All amino acids except Glycine are optically inactive
   (d) Cysteine residues can participate in disulphide bridges

5. High resolution protein structures can be determined by
   (a) X-ray crystallography
   (b) NMR spectroscopy
   (c) Homology modelling
   (d) All the above

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6. The most prominent covalent bonds in tertiary structures are
   (a) Hydrogen bonds
   (b) Ionic bonds
   (c) Disulfide bonds
   (d) Hydrophobic interactions

7. The unit of a protein that is structurally and functionally independant is
   (a) Motif
   (b) Helix
   (c) Domain
   (d) Residue

8. Which of the following statement is true?
   (a) Formation of disulphide bonds occur in reducing environment, such as cytosol
   (b) All proteins have a quaternary structure
   (c) Denaturation includes breaking of non-covalent and covalent bonds
   (d) All the above

9. Which of the following statements is false?
   (a) Molecules precipitate when the pH of the solution is equal to its pI
   (b) At a pH below their pI, proteins carry a net positive charge
   (c) When pH equals the pI, repulsive electrostatic forces are increased and the attraction forces reduce between proteins
   (d) All the above

10. Which of the following statement is NOT TRUE?
   (a) Gap opening penalty is higher than gap extension penalty in BLAST
   (b) ClustalW and sequence logos are used for multiple sequence alignment
   (c) Mutations that involve conserved residues have lower probability of being deleterious
   (d) Proteins with similar sequences tend to have similar structures

11. The probability of getting a random (nonspecific) hit when queried is
   (a) Same for nucleotide and protein sequences
   (b) Higher for nucleotide as compared to protein sequences
   (c) Lower for nucleotide as compared to protein sequences
   (d) Not dependant on the nature of the query sequence

12. Which of the below does not perform local alignment
    (a) BLAST
    (b) Smith-Waterman
    (c) Needleman-Wunsch
    (d) All the above

13. Literature databases include
    (a) PubMed and PDB
    (b) PubMed and RefSeq
    (c) PubMed and MEDLINE
    d) PDB and UniProtKB

14. All of the following are involved in translating information into proteins EXCEPT:
    (a) rRNA
    (b) siRNA
    (c) tRNA
    (d) snRNA

15. Which histone is NOT part of the nucleosome?
    (a) H1
    (b) H2A
    (c) H2B
    (d) H3

16. Which out of the following is an inhibitor of prokaryotic transcription?
    (a) Ciprofloxacin
    (b) Puromycin
    (c) Erythromycin
    (d) Rifampicin

17. Choose the nucleoside analogue is used as an anticancer drug out of the following
    (a) Methotrexate
    (b) 6- Mercaptopurine
    (c) Vinblastine
    (d) Cytosine Arabinoside

18. Which amino acid residue is in abundance in histones?
    (a) Arginine
    (b) Aspartic acid
    (c) Tryptophan
    (d) Phenylalanine

19. Which out of the following techniques is used for the detection of gene of interest
    (a) Southern Blotting
    (b) Western Blotting
    (c) Northern Blotting
    (d) DNA Foot printing

20. The vectors commonly used for sequencing in human beings.
    (a) YACs
    (b) Plasmid
    (c) CMV vectors
    (d) M13 vectors

21. Which of the following is a required substrate for purine biosynthesis?
    (a) 5- methyl thymidine
    (b) Ribose phosphate
    (c) Ara C
    (d) PRPP (5- phosphoribosylpyrophosphate)

22. Triple repeat sequence disease occurs in:
    (a) Alzheimer's disease
    (b) Cystic fibrosis
    (c) Ataxia telangectasia
    (d) Huntington's chorea

23. Northern blotting is used for separation of:
    (a) DNA
    (b) mRNA
    (c) Protein
    (d) Protein DNA interactions

24. The distortion in DNA helix due to pyrimidine dimer formation is called as
    (a) nick
    (b) single stranded breaks
    (c) kink
    (d) none of these

25. umu C, umu D gene family and Rec A proteins are involved in
    (a) BER
    (b) NER
    (c) SOS repair
    (d) Recombinational repair

26. The lac operon in E. coli is involved in
    (a) Regulating the expression of a gene
    (b) Controlling DNA replication
    (c) Regulating the translation of mRNA
    (d) Controlling the formation of ribosomes

27. Genetic variation can be introduced into bacteria by all of the following methods except :
    (a) Transduction
    (b) mutation
    (c) transformation
    (d) DNA amplification

28. Expression vectors differ from a cloning vector in having
    (a) an origin of replication
    (b) suitable marker genes
    (c) unique restriction sites
    (d) control elements

29. Bacterial conjugation was discovered by
    (a) Griffith
    (b) Watson and Crick
    (c) Lederberg and Tatum
    (d) Milstein and Saiki

30. During the Ras pathway :
    (a) Cytoplasmic protein kinases are activated
    (b) Growth factor receptor is inactivated
    (c) Growth factors bind to receptors in the cytoplasm
    (d) Leads to the production of translational factors

31. A vaccine contains :
    (a) white blood cells that fight infection
    (b) antibodies that recognize invading microbes
    (c) a hormone that boosts immunity
    (d) inactivated disease causing microbes

32. Virus and bacteria in body fluids are attacked by :
    (a) Antibodies from B cells
    (b) Cytotoxic T cells
    (c) Complement proteins
    (d) Helper T cells

33. Which one of the following sequences is most likely to be a restriction enzyme recognition site :
    (a) CGGC
    (b) CGC
    (c) GTAATG
    (d) GTCGAC

34. What is true of proto-oncogenes :
    (a) Cells produce proto-oncogene as a product of mitosis
    (b) Proto-oncogenes are necessary for the normal control of cell division
    (c) Proto-oncogenes are genetic junk that has not been eliminated by natural selection
    (d) Proto-oncogenes are unavoidable environmental carcinogens

35. All of the following statements are true of telomerase except:
    (a) The RNA component acts as a template for the synthesis of a segment of DNA
    (b) It adds telomeres to the 5' ends of the DNA strand
    (c) It provides a mechanism for replicating the ends of linear chromosomes in most eukaryotes
    (d) It is a reverse transcriptase

36. Diphtheria Toxin :
    (a) Releases incomplete polypeptide chains from the ribosomes
    (b) Activates translocase
    (c) Prevents the release factors from recognising termination signals
    (d) Attacks the RNA of the large subunit

37. DNA fragments from a gel are transferred to a membrane via a procedure called Southern blotting. The purpose of this is to :
    (a) Analyse the RFLP in the DNA
    (b) Denature DNA
    (c) Attach DNA to the membrane
    (d) Separate the two complementary strands

38. A particular allele can have different effects if it was inherited from a male rather than a female. This phenomenon is known as:
    (a) Extra nuclear inheritance
    (b) Genome imprinting
    (c) Sex-linkage
    (d) Prader-Willi syndrome

39. Dosage compensation in case of humans is achieved by :
    (a) Hyper activation of X chromosome
    (b) Hyper activation of Y chromosome
    (c) Hetero chromatinisation of X chromosome
    (d) Hetero chromatinisation of Y chromosome

40. Ubiquitin binds to–residues therefore targeting proteins for degradation by–
    (a) Lysine, proteosomes
    (b) Arginine, lysosomes
    (c) Lysine, lysosomes
    (d) Arginine, proteosomes

Section II **3x 10 = 30**

Attempt the following : (**any three**)

(a) What is a cloning vector? How many different kinds of vectors are there ? Explain in detail giving examples.

(b) Differentiate between global and local alignment of proteins.

(c) Discuss the nature and characteristics of the genetic code

(d) Describe in detail the different types of polymerses involved in genetic manipulation.

(e) Explain the one gene one enzyme hypothesis citing a suitable example.

Section - III **2 x 15 = 30**

Answer the following: (**any two**)

(a) Discuss protein sorting in the cell.

(b) Describe in detail the different enzymes involved in genetic manipulation

(c) Genetic mapping in bacteria can be done using conjugation and interrupted mating. Comment.

(d) What is the test which demonstrates that mutations are spontaneous and random? Explain in detail.

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