Ph. D. Entrance Test – 2015
Subject: Biotechnology Engineering
Paper – I

Important: *Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.*

Roll No.   *In Figure*   *In Words*

O.M.R. Answer Sheet Serial No.

Signature of Candidate: *Signature of Invigilator:*

Time: 60 Minutes   Number of Questions: 50   Maximum Marks: 50

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO.

INSTRUCTIONS:

1. Write your Roll No. on the Questions Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Question Booklet Serial No. on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Ball Point/Black Gel Pen.**
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. Please check that this Question Booklet contains 50 Questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of Test.
5. Each question has four alternative answer (A,B,C,D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point/Black Gel Pen. There shall be no negative marking for wrong answers.**
6. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Booklet. No marks will be deducted in such cases.
7. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
8. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
9. For rough work only the blank sheet at the end of the Question Booklet be used.
10. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
11. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
12. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
13. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistant or found giving or receiving assistant or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
14. **Communication equipment such as mobile phones, pager, wireless set, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. Use of calculators is not allowed.**
15. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

1. DNase I is used for cutting DNA. It is

   A) Specific exonuclease
   B) Restriction endonuclease
   C) Non-specific endonuclease
   D) Non-specific exonuclease

2. The chromatin with hyperacetylation of histone tails is

   A) Transcriptionally active
   B) Transcriptionally inactive
   C) Heterochromatin
   D) Metaphase chromosome

3. Telomerase is an enzyme that prevents shortening of the telomeres. It is expressed by

   A) Post mitotic cells
   B) Cancer cells
   C) Non-dividing cells
   D) Differentiated adult tissue cells

4. Ribozymes are the molecules which are _____ in nature.

   A) RNA molecules
   B) DNA molecules
   C) Proteins
   D) Lipids

5. The denaturation temperature (Tm) of the double stranded DNA is determined by measuring absorption of ultraviolet light at 260nm. The Tm of the given DNA sample is _____ by the addition of formamide or urea.

   A) Less affected
   B) Not affected
   C) Increased
   D) Decreased

6. The RNA polymerase terminates RNA synthesis at the termination site which has

   A) UAA
   B) UAG
   C) UGA
   D) specific termination sequence

7. The _____ bonds are found in glycogen molecule.

   A) Only α-1,6 glycosidic
   B) Both α-1,6 glycosidic and α-1,4 glycosidic
   C) Only α-1,4 glycosidic
   D) Only β-1,4 glycosidic

8. The wobble position refers to the

   A) 5' base in mRNA codon and the corresponding 5' base in its tRNA anticodon
   B) 5' base in mRNA codon and the corresponding 3' base in its tRNA anticodon
   C) 3' base in mRNA codon and the corresponding 5' base in its tRNA anticodon
   D) 3' base in mRNA codon and the corresponding 3' base in its tRNA anticodon

9. The sequence 5'-ACCAUGG-3' is found in eukaryotic DNA. This sequence is -------

A) Enhancer sequence

B) Kozak sequence

C) Promoter sequence

D) The terminal sequence of acceptor stem of tRNA

10. The Klenow fragment has been generated from

A) DNA polymerase III   B) DNA polymerase I

C) DNA polymerase II   D) DNA polymerase α

11. The lateral diffusion of proteins between the apical and basolateral domains of plasma membrane is not a common feature of polarized epithelial cells. This is due to presence of _____ between the two domains.

A) Hemidesmosomes   B) Desmosomes

C) Tight junctions   D) Adherence junctions

12. Phe-Gly-Gly-Tyr-Leu is known as

A) Oligosaccharide   B) Polysaccharide

C) Tetrapeptide   D) Pentapeptide.

13. The reagent such as β-mercaptoethanol cleaves the disulfide bonds present within the polypeptide. This cleavage is

A) Reversible reduction reaction   B) Irreversible reduction reaction

C) Due to noncovalent bond disruption   D) Reversible oxidation reaction

14. In ion exchange chromatography, the _____ proteins are separated on diethylaminoethyl-cellulose column.

A) Positively charged   B) Neutral   C) Cationic   D) Anionic

15. The lectin is a specific sugar binding protein. Hence it can be purified from a mixture of proteins by using _____ technique in a single step.

A) Salting out   B) Gel filteration chromatography

C) Affinity chromatography   D) Ion exchange chromatography

16. In two Dimensional gel electrophoresis, the proteins are initially fractionated in horizontal direction by _____ followed by _____ in vertical direction.

A) Isoelectric focusing, SDS-PAGE

B) SDS-PAGE, isoelectric focusing

C) Isoelectric focusing, Native-PAGE

D) Native-PAGE, isoelectric focusing

(2)

17. The first step in X-Ray crystallography of protein requires the

   A) Precipitate of protein

   B) Crystals of protein

   C) Striking X-rays on protein solution

   D) Diffraction of X-rays by protein solution

18. Which Type of collagen is present in the basal laminae?

   A) Type-I   B) Type-II   C) Type-III   D) Type-IV

19. GLUT 1 is a transport protein present in most of the mammalian cells which transports glucose from extracellular side into the cytoplasm of the cells. The Km of GLUT1 for glucose is 1.5mM whereas its Km for D-mannose is 20mM. Hence affinity of GLUT1 is

   A) Higher for glucose than mannose   B) Less for glucose than mannose

   C) Higher for mannose than glucose   D) Same for glucose and mannose

20. The most common shuttle that mediates the indirect transfer of electrons from cytosolic NADH to NAD$^+$ in mitochondrial matrix is_____.

   A) Malate shuttle   B) Aspartate shuttle

   C) Pyruvate shuttle   D) Malate-Aspartate shuttle

21. The nuclear membrane disintegrates during mitosis due to the covalent modification of the intermediate filament namely

   A) Laminin   B) Lamin   C) Myosin   D) Actin

22. The sarcomere of the muscle cell has thick and thin filaments composed of _____ and _____ respectively.

   A) Myosin and actin   B) Actin and myosin

   C) Kinesin and actin   D) Actin and kinesin

23. Double stranded DNA has 30% Adenine. The percentage of Guanine is

   A) 20%   B) 30%   C) 40%   D) 10%

24. The genome of M13 bacteriophage is covalently closed circular single stranded DNA. The phagemid vector based on M13 phage genome

   A) Covalently closed circular single stranded DNA

   B) Covalently closed circular double stranded DNA

   C) Covalently closed circular single stranded RNA

   D) Linear double stranded DNA

25. Luria - Bertini is which kind of medium?

   A) Defined medium   B) Undefined medium

   C) Simple medium   D) Animal cell culture medium

26. The differential centrifugation is used for subcellular fractionation. Subsequently the organelle specific enzymes are assayed. For later step, the commonly used detergent is

    A) Triton-X-100
    B) SDS
    C) SDS followed by Triton-X-100
    D) Triton-X-100 followed by SDS

27. The short-term treatment of double stranded linear DNA with exonuclease III produces

    A) 5' overhangs (protruding ends)
    B) 3' overhangs
    C) Blunt ends
    D) Both 5' and 3' overhangs

28. If the initial bacterial cell number is 5. The final cell number after 10 generation cycles will be

    A) 100
    B) 320
    C) 5120
    D) 2×10^5

29. In Down syndrome, the child has trisomy of _____ chromosome.

    A) X
    B) 22nd
    C) 21st
    D) 23rd

30. Which cells are infected by HIV in AIDS?

    A) NK cells
    B) Macrophages
    C) Helper T cells
    D) B cells

31. Microencapsulation of cultured animal cells requires sodium alginate. It behaves as gel when

    A) Concentration of divalent cation is high
    B) Concentration of divalent cation is low
    C) Concentration of sodium is high
    D) Concentration of sodium is less

32. Collagenase is used in preparing the primary culture. It is sterilized by using

    A) Autoclave
    B) Filter, 0.22 µm pore size
    C) Filter, 0.44 µm pore size
    D) Steam at 100°C for 30 min

33. When a primary cell culture has been subcultured once then it is known as

    A) Cell strain
    B) Cell line
    C) Continuous cell line
    D) Continuous cell strain

34. BCG vaccine has _____.

    A) Inactivated exotoxin
    B) Killed BCG
    C) Live attenuated BCG
    D) MTB

35. The antibodies are classified as

    A) Proteoglycans
    B) Lipoproteins
    C) Glycoproteins
    D) Phosphoproteins

(4)

36. The phosphorylation of the Immuno-receptor Tyrosine Activation Motifs (ITAMs) is responsible for signal transduction from the B cell receptors subsequent to antigen binding. These motifs are present in

A) Cytosolic tails of B cell receptors

B) Membrane domain of B cell receptors

C) Cytosolic tail of one of the B cell receptor associated protein (eitherIgα or Igβ)

D) Cytosolic tails of B cell receptor associated proteins (both Igα and Igβ)

37. The Type II hypersensitive response is mediated by

A) IgM   B) IgG   C) IgE   D) T_H1

38. The radioactive labeling of probe by nick translation employs the enzyme

A) Klenow fragment   B) DNA polymerase I

C) DNA polymerase III   D) RNA polymerase

39. In PCR the desired product first appears during

A) First cycle of PCR   B) Second cycle of PCR

C) Third cycle of PCR   D) Fourth cycle of PCR

40. Which of the following is plant derived alkaloid?

A) Carvone   B) Nicotine   C) Abietic acid   D) Gossypol

41. Which operon of virulence region encodes genes responsible for endonucleolytic cleavage of T-DNA in *Agrobacterium tumefaciens*?

A) virB   B) virC   C) virF   D) virD

42. In plant tissue culture, polyethylene glycol is usually employed for

A) Protoplast isolation   B) Protoplast fusion

C) Protoplast culture   D) Cell wall regeneration

43. Bergmann's plating technique is used for

A) Single cell culture   B) Somatic embryo culture

C) Anther culture   D) Meristem tip culture

44. Tritium is a radioactive isotope. It is classified as _____ emitter.

A) α- particle   B) β- particle

C) γ- rays   D) both α and β particle

45. Which process this reaction shows

$C_6H_{12}O_6 + 2ADP + 2Pi \longrightarrow 2C_2H_5OH + 2ATP + 2H_2O + 2CO_2$

A) Fermentation   B) Glycogenolysis

C) Aaerobic metabolism   D) Propionic acid fermentation

46. In fermentation kinetics dilution rate D is defined as (F- medium flow rate, μ-specific growth rate and V_R- culture volume in reactor)

A) μ/F B) F/μ C) μ/V_R D) F/V_R

47. In continuous flow bioreactor mass of a substrate can be calculated as

A) Flow rate × volume of reactor

B) Volume of reactor × substrate Concentration

C) Flow rate × substrate concentration

D) Volume of reactor only

48. In a 6 well plate whose surface area is 9.5 cm^2 (approx.), the average cell yield is 1×10^6 cells per well. If we plate 2.5×10^6 cells in a well with doubling time of 24 hrs then in how many hours (approx.) we would get the well fully confluent.

A) 120 hrs   B) 240 hrs   C) 480 hrs   D) 144 hrs

49. Initial concentration of cells is 2×10^7 per ml. 0.75×10^5 cells have to be plated in a T25 flask in a final volume of 5 ml. How much volume of medium containing cells at initial concentration is required for achieving the requisite final cell concentration?

A) 266 μl   B) 280 μl   C) 375 μl   D) 3750 μl

50. The _____ system of referencing in the Bibliographic section of Thesis is followed.

A) Name-year   B) Citation-order

C) Citation-sequence   D) Alphabet-number

x-x-x