M.E. Biotechnology

1. The hydrolytic enzymes found in lysosomes work most effectively under conditions of
(A) Low pH (B) High pH
(C) High saline (D) Neutral pH

2. Autoclave is primarily used for
(A) Lyophilization (B) Crystallization
(C) Polarization (D) Sterilization

3. Endotoxins produced by gram negative bacteria is present in
(A) Inner cell membrane (B) Lipopolysacharide
(C) Ribosomes (D) Peptidoglycan

4. In an exponentially growing batch culture of *Saccharomyces cerevisiae*, the cell density is 30 gl^{-1} (DCW), the specific growth rate (μ) is 0.5 and substrate uptake rate (v) is 20 $gl^{-1}h^{-1}$. The cell yield coefficient, $Y_{x/s}$, will be
(A) 0.05 (B) 0.25
(C) 0.50 (D) 0.75

5. Which one of the following is a sulfur containing amino acid?
(A) Tryptophan (B) Valine
(C) Cysteine (D) Arginine

6. A hapten is:

(A) A small chemical group which reacts with preformed antibodies (B) A strong immunogen
(C) An antibody (D) A region of antibody

7. Adenine and Thymine in complementary DNA strands are joined by …… hydrogen bonds
(A) One (B) Two
(C) Three (D) Four

8. The bond in subsequent amino-acids responsible for primary structure of proteins is

(A) Ionic Bond (B) Phosphodiester Bond
(C) Glycosidic bond (D) Peptide Bond

9. Which of the following is NOT present in RNA?

(A) Uracil (B) Adenine
(C) Thymine (D) Cytosine

10. Vitamins are:
(A) Organic substances that cannot be synthesized by animals
(B) Inorganic substances that cannot be synthesized by animals
(C) Inorganic substances that can be synthesized by animals
(D) Organic substances that can be synthesized by animals

11. Which of the following is the nucleotide database?

(A) BLASTn (B) PROSITE
(C) CATH (D) GenBank

12. Which of the following CANNOT be grown on artificial culture medium?

(A) *Escherichia coli* (B) Tobacco Mosaic Virus
(C) *Saccharomyces cerevisiae* (D) *Aspergillus niger*

13. *Penicillium chrysogenum* is industrially used to produce the antibiotic penicillin. In a batch culture of *Penicillium chrysogenum*, the maximum penicillin synthesis occurs during the

(A) Lag phase (B) Exponenetial phase
(C) Stationary phase (D) Death phase

14. During bacterial conjugation the genetic material is transferred from the donor bacteria to the recipient through

(A) Cell wall (B) Pili
(C) Medium (D) Capsule

15. According to Oparin's Theory, atmosphere of earth just before the origin of life consisted of
(A) Water vapors, reducing environment (CH_4, NH_3, H_2) without oxygen
(B) Water vapors, reducing environment (CH_4, NH_3, H_2) with oxygen
(C) Reducing environment (CH_4, NH_3, H_2) without oxygen and water vapours
(D) Reducing environment (CH_4, NH_3, H_2) with oxygen and without water vapours

16. The bacterial cells having F plasmid integrated in their chromosome are termed as
(A) P+ (B) F^-
(C) Hfr (D) Hbr

17. Which of the following organelle is called "suicide bags" of cells?
(A) Nucleolus (B) Ribosome
(C) Chloroplast (D) Lysosome

18. α–D-Glucose and β–D-glucose are……of each other

(A) Epimers (B) Anomers
(C) Multirotation pair (D) Ketoenol pair

19. The unit of chromosome map is
(A) Millimendel (B) Decibarr
(C) Centimorgan (D) Femtostern

20. The process for the synthesis of RNA from a DNA template is known as

(A) Replication (B) Translation
(C) Transcription (D) Mutation

21. An organism which has two identical alleles of a gene is called
(A) Dominant (B) Hybrid
(C) Heterozygous (D) Homozygous

22. Which of the following is the SI unit of Absorbance (A) of light by a solution?
(A) Absorbance (A) is a unitless quantity.
(B) Candela
(C) Candela/ m^2 (Candela per square meter)
(D) Candela/s (Candela per second)

23. Which of the following molecular genetic techniques is used to identify protein-protein interactions?

(A) Southern hybridization analysis (B) Polymerase chain reaction

(C) Fluorescence in situ hybridization (D) Yeast two-hybrid system

24. At a pH below its isoelectric point, an amino acid exists as

(A) Anion (B) Cation

(C) Undissociated molecule (D) Zwitterion

25. Which of the following is the immediate source of energy for active transport?

(A) Carbohydrates (B) Lipids

(C) ATP (D) NADP

26. Which of the following is NOT a method to introduce genetic variation into bacteria?

(A) DNA amplification (B) Transduction

(C) Transformation (D) Directed Mutagenesis

27. Match the vitamins in Group I with the processes/reactions in Group II.

Group I	**Group II**
P. Pantothenic acid	1. Electron transport
Q. Riboflavin (Vitamin 2)	2. Transfer of 1-C units
R. Vitamin B6	3. Decarboxylation
S. Folic acid	4. Fatty acid metabolism
	5. Hydrolysis

(A) P-5, Q-2, R- 4, S-1 (B) P- 4, Q-1, R-3, S-2

(C) P- 4, Q- 2, R-1, S-5 (D) P- 2, Q- 1, R-3, S-5

28. Which of the following represents a dihybrid?

(A) WsSs (B) WsSS

(C) WWSs (D) wwSs

29. Which technique is most frequently employed for repeated use of enzymes in bioprocesses?

(A) Polymerization (B) Isomerization

(C) Ligation (D) Immobilization

30. Match the entries in Group I with the most suitable methods of sterilization in Group II.

Group I	**Group II**
P. Serum	1. Autoclave
Q. Luria broth	2. Membrane filtration
R. Biological safety cabinets	3. UV irradiation
	4. Gamma irradiation

(A) P-4, Q-2, R-3 (B) P-1, Q-4, R-2

(C) P-2, Q- 1, R-3 (D) P-1, Q- 1, R-4

31. Which of the following processes is involved during the identification of blood groups?

(A) Precipitation (B) Immunization

(C) Opsonization (D) Agglutination

32. Independent assortment of genes occurs due to the orientation of chromosomes at
(A) Metaphase I of meiosis (B) Metaphase II of meiosis
(C) Metaphase of mitosis (D) Telophase of mitosis

33. Which one of the following is a known protoplast fusion inducing agent?
(A) Nucleotides (B) ATP
(C) Polyethylene glycol (D) Colchicine

34. Given is the sequence of one strand of DNA - 5' TCGATC 3'.Which of the following is the sequence of the complementary strand?
(A) AGCTAG (B) TCGATC
(C) CTAGCT (D) ACTAGC

35. A solute binds with an adsorbent with a dissociation constant K_D. The retention time of the solute in a chromatography column containing this adsorbent
(A) Influences K_D
(B) Increases with increasing K_D
(C) Decreases with increasing K_D
(D) Is independent of K_D

36. Heat inactivation of serum is carried out to inactivate
(A) Prions (B) Pathogenic bacteria
(C) Mycoplasma (D) Complement

37. Nude mice are a type of laboratory animal with a genetic mutation that results in an inhibited immune system due to a greatly reduced number of T cells. Nude mice refers to
(A) Mice without thymus (B) Mice without skin
(C) Knockout mice (D) Transient mice

38. Which of the following protects cells by preventing crystallization of water during cryopreservation of mammalian cells?
(A) Dimethyl Sulfoxide (B) Polyvinyl Alcohol
(C) Ethanol (D) Ethylene oxide

39. Which of the following organelle is found only in plants but not in animals?
(A) Nucleus (B) Plastids
(C) Mitochondria (D) Ribosomes

40. The catalytic efficiency for an enzyme is defined as
(A) K_{cat} (B) V_{max}/K_{cat}
(C) K_{cat}/ K_m (D) K_{cat}/ V_{max}

41. Endogenous antigens are presented on to the cell surface along with
(A) MHC-I (B) MHC-II
(C) Fc receptor (D) Folic acid receptor

42. In steady state fermentation, the washout stage occurs if
(A) Dilution rate is less than the maximum specific growth rate
(B) Dilution rate is higher than the maximum specific growth rate
(C) Cell concentration becomes maximum
(D) Substrate concentration becomes minimum

43. In a thin layer chromatography experiment using a silica gel plate, the solvent front and a compound showed migration of 20 cm and 15 cm, respectively. What would be the R_f value for the compound?

(A) 0.25 (B) 0.33
(C) 0.75 (D) 1.33

44. Prior exposure to pathogens is known to increase resistance to future pathogen attacks. This phenomenon is known as

(A) Systemic acquired resistance (B) Hypersensitive response
(C) Innate immunity (D) Antibody mediated response

45. Match the entries in the Group I with the elution conditions in Group II.

Group I	Group II
P. Ion-exchange chromatography	1. Isocratic solvent
Q. Hydrophobic column chromatography	2. Ampholytes
R. Gel filtration chromatography	3. Increasing gradient of salt
S. Chromatofocusing	4. Decreasing gradient of polarity

(A) P-4, Q-1, R-2, S-3 (B) P-4, Q-3, R-1, S-2
(C) P-3, Q-4, R-2, S-1 (D) P-3, Q-4, R-1, S-2

46. During sterilization of a fermentation medium in a given bioreactor, $\square_{heating}$ = 12.56, $\square_{cooling}$ = 7.48 and the total value of $\square$ required for whole sterilization process is 52, where $\square\square$ is the design criteria. What is the value of $\square_{holding}$?

(A) 31.96 (B) 72.04
(C) 46.92 (D) 57.08

47. Cell lysis needs to be carried out as a downstream process if the product of interest is

(A) Extracellular (B) Intracellular
(C) Toxic (D) Heat labile

48. Which of the following features is NOT required in a prokaryotic expression vector?

(A) Origin of replication (B) Selection Marker
(C) Ribosome binding site (D) CMV promoter

49. Which of the following is a sequence alignment tool?

(A) BLAST (B) PRINT
(C) NCBI (D) EMBL

50. For an enzymatic reaction, K_m is the defined as the substrate concentration at which

(A) The reaction rate is double of the maximum
(B) The reaction rate is one half of the maximum
(C) The enzyme is completely saturated with substrate
(D) The enzymatic reaction stops

51. The helix content of a protein can be determined using

(A) A high resolution electron microscope
(B) A fluorescence spectrometer
(C) A circular dichroism spectrometer
(D) A UV-Visible spectrophotometer

52. Which of the following is a protein sequence database?

(A) GenBank (B) PIR
(C) DDBJ (D) FASTA

53. When a cell is about to divide, before cell division, the amount of DNA in cell becomes

(A) One fourth (B) Half
(C) Less than Half (D) Double

54. The use of living organisms to degrade the pollutants present in environment is called

(A) Clarification (B) Centrifugation
(C) Bioremediation (D) Amplification

55. The process of introducing DNA into cells by exposing them to high voltage electric pulse is known as

(A) Electrofission (B) Electrofusion
(C) Electrosonication (D) Electroporation

56. The effect of a reversible competitive inhibitor on an enzyme can be nullified by

(A) Increasing the concentration of reactant (B) Increasing the concentration of product
(C) Increasing the temperature of reaction (D) Increasing the salt concentration

57. The specific activity of an enzyme in a crude extract of *S. Cerevisiae* is 10 units/mg of protein. The extract is passed through an ion-exchange column. After this purification step, the specific activity of the enzyme changes to 68 units/mg of protein. The fold purification for this step is:

(A) 0.14 (B) 6.8
(C) 680 (D) 58

58. An apoenzyme is

(A) Vitamin (B) Amino Acid
(C) Carbohydrate (D) Inactive Protein

59. Protoplasts are the cells which are lacking in

(A) Cell wall (B) Cell Membrane
(C) Cytoplasm (D) Periplasm

60. Primary mediator in anaphylaxis reactions is

(A) Histamine (B) Seratonin
(C) Heparin (D) Aspargine

61. Proteomics is the study of

(A) Regulatory proteins of an organism (B) Structural proteins of an organism
(C) Catalytic proteins of an organism (D) All proteins of organism

62. Which one of the following is an RNA dependent DNA synthetase (an enzyme that synthesizes DNA using RNA as a template)?

(A) DNA Polymerase I (B) DNA Polymerase II
(C) Reverse Transcriptase (D) Deoxy ribonuclease

63. Using monod's model, determine the dilution rate at the cell wash out condition for a chemostat with the given parameters $\mu_{max} = 1\ h^{-1}$; $Y_{x/s} = 0.55\ gg^{-1}$; $K_s = 0.2\ gL^{-1}$; $S_0 = 10\ gL^{-1}$

(A) $0.98\ h^{-1}$ (B) $1.98\ h^{-1}$

(C) $0.49\ h^{-1}$ (D) $1.49\ h^{-1}$

64. Association of nitrogen fixing bacteria with the leguminous roots is an example of

(A) Parasitism (B) Neutralism

(C) Mutualism (D) Communalism

65. IPR stands for

(A) Indian Patent Rights (B) International Patent Rights

(C) International Property Rights (D) Intellectual Property rights

66. Which statement is *true* of both prokaryotic and eukaryotic cells?

(A) Prokaryotic cells are generally much larger than eukaryotic cells

(B) Eukaryotic cells have ribosomes but prokaryotic cells do not

(C) Both have DNA as their primary genetic material

(D) Eukaryotic cells have plasma membrane and prokaryotic cells do not

67. Which of the following biomolecules is likely to have buffering action?

(A) Carbohydrates (B) Proteins

(C) DNA (D) Lipids

68. Resolving power of a microscope is determined by

(A) Wavelength of light source

(B) Intensity of light source

(C) Power of light source

(D) Does not depend on any feature of light source

69. The soil bacteria most commonly used for transformation in plants is

(A) *Rhizobacterium* (B) *Escherichia coli*

(C) *Agrobacterium tumifaciens* (D) *Mycorrhizae*

70. During fermentation, the top portion inside the reactor is left free without broth. This portion is called

(A) Shaft (B) Head space

(C) Impeller (D) Sparger

71. The sugar moiety present in DNA is

(A) Deoxyribose (B) Ribose

(C) Fructose (D) Ribulose

72. The micro-organism most commonly used for industrial production of amylase enzyme is

(A) *Saccharomyces cerevisiae* (B) *Aspergillus niger*

(C) *Bacillus subtilis* (D) *Penicillium chrysogenum*

73. Analysis of protein antigen is carried out by which of the following techniques

(A) Southern blot (B) Northern blot

(C) Eastern blot (D) Western blot

74. Batch fermentation is an example of

(A) Closed system (B) Open system

(C) Fed-batch system (D) Equilibrium system

75. The enzyme usually used in Polymerase Chain Reaction is

(A) RNA polymerase (B) Taq polymerase

(C) Ribonuclease (D) Endonuclease

x-x-x