M.E. Biotechnology

1. Which one of the following is the unit of heat transfer coefficient
   A. Wm^2K^{-1}
   B. $Wm^{-2}K$
   C. $Wm^{-2}K^{-1}$
   D. Wm^2K

2. The bacteria known to be naturally competent for transformation of DNA is
   A. *Escherichia Coli*
   B. *Bacillus Subtilis*
   C. *Mycobacterium tuberculosis*
   D. *Yersinia pestis*

3. Major stimulus for spore formation in bacteria is
   A. Nutrition limitation
   B. Heat stress
   C. Cold stress
   D. pH stress

4. Secondary sewage treatment involves
   A. Physical removal of solids from polluted water by filteration and sedimentation
   B. Removal of chemical remains by precipitation
   C. Removal of dissolved organic compounds by activated sludge or trickling filters
   D. Removal of microbial pathogens by chlorination or ozonation

5. The study of evolutionary relationships is known as
   A. Genomics
   B. Proteomics
   C. Phylogenetics
   D. Genetics

6. Thermal death of microorganisms in the liquid medium follows first order kinetics. If the initial cell concentration in the fermentation medium is 10^8 cells/ml and the final acceptable contamination level is 10^{-3} cells, for how long should 1 m^3 medium be treated at temperature of 120°C to achieve acceptable load. Thermal deactivation rate constant is 0.23/min
   A. 59 min
   B. 80 min
   C. 120 min
   D. 149 min

7. What amount of 11 N HCl is required to make 50 ml of 2 N HCl
   A. 2 ml
   B. 6.03 ml
   C. 9.09 ml

D. 11 ml

8. An enzyme that hydrolyses starch to maltose is
A. Alpha amylase
B. Beta amylase
C. Glucoamylase
D. Cyclodextrin glcanotransferase

9. How many fold would the g number of a centrifuge increase by doubling both the spinning speed and the bowl diameter
A. 2
B. 4
C. 8
D. 10

10. Which of the following is not a plant hormone
A. Corticosterone
B. Ethylene
C. Jasmonic acid
D. Abscisic acid

11. An equimolar mixture of species 1 and 2 is in equilibrium with its vapour at 300 K. At this temperature, the vapour pressures of the species are p_1^{sat} = 150 kPa and p_2^{sat} = 110 kPa. Assuming that Raoult's law is valid, the value of y_1 is
A. 0.33
B. 0.45
C. 0.50
D. 0.57

12. Bacteria used in biogas plant
A. Methanogens
B. Nitrifying bacteria
C. Denitrifying bacteria
D. Ammonifying bacteria

13. 12 moles of O_2 is added to 12 moles of H_2. How many moles of H_2O will it produce?
A. 6
B. 12
C. 18
D. 24

14. The dimensionless group in mass transfer that is equivalent to Prandlt number in heat transfer is

A. Nusselt number
B. Sherwood number
C. Schmidt number
D. Stanton number

15. Which amongst the following is not a polymer
A. Vinyl alcohol
B. Rubber
C. Polystyrene
D. Polyethylene

16. In an experimental population the birth rate is 16 per 1000 and death rate is 10 per 1000. If the size of the population is 10,000 at time, t, what will be the size of the population at time, t+1
A. 10,000
B. 10,060
C. 10,600
D. 11,600

17. Which part of a fermenter is used for thorough mixing of medium and inoculum
A. Sparger
B. Shaft
C. Headspace
D. Impeller

18. Flow cytometer is used to measure the number of
A. Cells
B. RNA
C. DNA
D. Proteins

19. What amongst the following does not affect the K_{La} value in fermentation vessel
A. Rheological properties of the medium
B. Presence of chelating agents
C. Air flow rate
D. Degree of agitation

20. Hydrolysis of a peptide involves cleavage of the bond between the atoms
A. N and C_α
B. C and O
C. C_α and C
D. N and C

21. An air lift fermenter uses _____ for mixing
A. Impeller
B. Air bubbles
C. Differential density

D. Sparger

22. Mass spectrometer separates ions on the basis of which of the following?
A. Mass
B. Mass to charge ratio
C. Molecular weight
D. Charge

23. Before freezing, the blanching of vegetables is done to
A. Denature enzymes
B. Maintain colour
C. Improve texture
D. Prevent microbial activity

24. Which property of polymeric sutures helps them keep the wound closed?
A. Low melting point
B. High thermoplasticity
C. High tensile strength
D. Low coefficient of friction

25. Lineweaver-Burk plot is a plot between
A. $\frac{1}{V_o} and \frac{1}{[S]}$
B. $V_o and [S]$
C. $V_o and \frac{1}{[S]}$
D. $\frac{1}{V_o} and [S]$

26. The ability of the immune system to recognize self antigens versus nonself antigen is an example of:
A. Specific immunity
B. Tolerance
C. Cell mediated immunity
D. Antigenic immunity

27. Nitrogenase reduces N_2 to NH_3. Metal co-factors required for this activity are _____
A. Fe & Cu
B. Mo & Fe
C. Mo & Mn
D. Cu & Mn

28. In gas chromatography, the separation of components is based on the difference in
A. Molarity
B. Molecular weight
C. Partition coefficient

D. Conductivity

29. Organic solvent used for yeast cell lysis

A. Toluene
B. Acetonitrile
C. Methanol
D. Dichloromethane

30. A Fab fragment

A. Is produced by pepsin treatment
B. Has no inter chain disulfide bond
C. Is produced by separation of heavy and light chains
D. Binds antigen

31. The process useful in harvesting microbial cells from fermentation broth is

A. Dialysis
B. Ultra filtration
C. Microfiltration
D. Reverse osmosis

32. For a chemical reaction the ratio of the rate constant at 600 K and 500 K is 3. The value of activation energy is

A. 10.5 kJ mol^{-1}
B. 12 kJ mol^{-1}
C. 20.2 kJ mol^{-1}
D. 27.4 kJ mol^{-1}

33. Teflon is used as coating on mechanical heart valves as it

A. Increases strength
B. Enhances rigidity
C. Lowers friction
D. Prevent wear resistance

34. The primary structure of proteins is maintained by

A. Peptide bonds
B. Hydrogen bonds
C. Ionic bonds
D. Disulphide bonds

35. Tear drops are rich in

A. Amylase
B. Lysozyme
C. Phosphates

D. Protease

36. In order to allow for bone ingrowth, the surface of the implants should be
A. Abrasive
B. Smooth
C. Porous
D. Adhesive

37. The antibody molecule is held together by _____ bonds
A. Sodium
B. Hydrogen
C. Amino acid
D. Disulfide

38. In a contnous ferementer if input supply is decreased, what would be effect on standing biomass and rate of production?
A. Standing biomass decrease and productivity increase
B. Standing biomass increase and productivity increase
C. Both decreases
D. Both increases

39. Gene mapping provides useful information about chance of
A. Inheritance of disorders
B. Inheritance of genes
C. Inheritance of recessive gene
D. Inheritance of dominant gene

40. Recombinant proteins are
A. Proteins synthesized in animals
B. Proteins synthesized by transgene in host cell by rDNA technology
C. Protein synthesized in cells that are produced by protoplast fusion
D. Proteins synthesised in mutated cell lines

41. What material coating helps the body to accept titanium implants?
A. Hydrogenated fat
B. Hydroxyapatite
C. Hydrangea
D. Hydrochloric acid

42. B and T cells are produced by stem cells that are formed in_____
A. Bone marrow
B. Liver
C. Spleen
D. lymph nodes

43. IgE:

A. Is abundant in saliva
B. Binds strongly to mast cells
C. Cannot bind to macrophages
D. Activates the complement cascade

44. Biofilm produced by bacteria is detected by
A. Saffranin
B. Malachite green
C. Basic fuchsin
D. Congo red

45. The dilution rate, D is defined as
A. Volumetric flow rate/ total volume of culture in the reactor
B. Total volume of culture in the reactor/ volumetric flow rate
C. Specific growth rate/ volumetric flow rate
D. Volumetric flow rate/ specific growth rate

46. A culture of *Rhizobium* is grown in a chemostat (100 m^3 bioreactor). The feed contains 12 gL^{-1} sucrose, K_s for the organism is 0.2 gL^{-1} and μ_m=0.3 h^{-1}. Flow rate required for steady state sucrose concentration of 1.5 gL^{-1} in the reactor will be
A. 2.6 m^3h^{-1}
B. 15 m^3 h^{-1}
C. 26 m^3 h^{-1}
D. 150 m^3 h^{-1}

47. Which device is used to measure the flow rate of a fluid
A. Orifice meter
B. Venture meter
C. Rotameter
D. Weir

48. Which of the following valves is used in an autoclave
A. Gate valve
B. Diaphragm valve
C. Safety valve
D. Globe valve

49. B cells that produce and release large amounts of antibody are called_____
A. Plasma cells
B. Memory cells
C. Basophils
D. Neutrophils

50. Purines in RNA are
- A. Adenine and Guanine
- B. Adenine and Thymine
- C. Adenine and Uracil
- D. Adenine and Cytosine

51. The complementary strand of 5'-ATCGAG-3' is
- A. 5'-TAGCTC-3'
- B. 5'-CTCGAT-3'
- C. 5'-ATCGAG-3'
- D. 5'-GAGCTA-3'

52. Carbohydrates binding proteins are called
- A. Lectins
- B. Alexins
- C. Polysacch-proteins
- D. Glycoproteins

53. Which of the following substances will not stimulate an immune response unless they are bound to a larger molecule?
- A. Antigen
- B. Hapten
- C. Antibody
- D. Virus

54. Wash out condition in seady state fermentation occurs when
- A. Cell concentration reaches maximum
- B. Substrate concentration is maximum
- C. Specific growth rate is maximum
- D. All of these

55. The homologue of β-catenin in *Drosophila* is
- A. Fushi Tarazu
- B. Engrailed
- C. Armadillo
- D. Cubitus Interruptus

56. How many overlapping trinucleotide units can be obtained for a DNA sequence of length 15 nucleotides
- A. 12
- B. 13
- C. 14
- D. 15

57. For moist heat sterilization, steam is used in the range of temperatures
- A. 100-120 °C

B. 121-140 °C
C. 141-160 °C
D. 161-180 °C

58. First developed database from protein sequences is
A. SWISS-PROT
B. TrEMBL
C. UniProt
D. PIR

59. *E.Coli* proliferates faster on GLUCOSE that it does on LACTOSE because lactose is
A. Taken up slowly as compared to glucose
B. Not hydrolyzed by *E.Coli*
C. Taken up faster as compared to glucose
D. Toxic to the cells

60. A chromosome aberration leads to change in the order of genes in a genetic map but does not alter its linkage group due to
A. Inversion
B. Transposition
C. Recombination
D. Translocation

61. What amongst the following is not favourable for protein folding?
A. Hydrophobic interaction
B. Hydrogen bonding
C. Van der Waals interaction
D. Conformational entropy

62. Mycobacterium Tuberculosis is an intra-cellular bacterium. It prefers to infect
A. B cells
B. T cells
C. Neutrophils
D. Macrophages

63. B lymphocytes develop immune competence in the
A. Thymus
B. Spleen
C. Lymph nodes
D. Bone marrow

64. The protein in eukaryotes subjected to degradation undergoes
A. Phosphorylation
B. Ubiquitation
C. Carboxylation
D. Methylation

65. In an exponentially growing batch culture of *Saccharomyces cerevisiae*, the cell density is 15 gL^{-1} (DCW), the specific growth rate(μ) is 0.2 $h^{-1}$and substrate uptake rate (ν) is 15 $gL^{-1}h^{-1}$. The cell yield coefficient $Y_{x/s}$ will be

A. 0.20
B. 0.35
C. 0.45
D. 0.50

66. The standard enthalpies of formation of H_2O (g) , CH_4 (g), CO_2 (g) are -241.8 kJ/mol, -74.52 kJ/mol, -393.5 kJ/mol respectively. Determine the heat of reaction for the following reaction

$$CH_4(g) + 2H_2O(g) \rightarrow CO_2(g) + 4\,H_2(g)$$

A. 164.62 kJ mol^{-1}
B. -77.18 kJ mol^{-1}
C. -164.62 kJ mol^{-1}
D. +77.18 kJ mol^{-1}

67. Which of the following is employed for the repeated use of enzymes in bioprocesses?

A. Polymerization
B. Ligation
C. Isomerisation
D. Immobilization

68. In a batch culture of *Penicillium chrysogenum*, maximum penicillin synthesis occurs during the

A. Exponential phase
B. Stationary phase
C. Lag phase
D. Death phase

69. The unit of reaction rate constant for a second order reaction is

A. $Conc^{-1}$ $time^{-1}$
B. $Time^{-1}$
C. Concentration $time^{-1}$
D. $Concentration^{-1}$

70. Under steady state conditions _____ is zero

A. Rate of disappearance of substrate
B. Rate of output of substrate
C. Rate of accumulation of substrate
D. All of these

71. The yield coefficient $Y_{\frac{X}{S}}$ *is defined as*

A. Grams of biomass produced per gram of substrate added
B. Grams of biomass produced per gram of substrate consumed

C. Rate of biomass production pe gram of substrate consumed
D. None of these

72. A continuous reactor has a dilution rate of 0.5 per hour. The hydraulic retention time would be
A. 0.5 h B. 1 h C. 1.5 h D. 2 h

73. At constant temperature and pressure, the molar density of a binary mixture is given by V = $1+x_2$, where x_2 is the mole fraction of component 2. The partial molar volume at infinite dilution for component 1, $\overline{V}_{1_\infty}$ is
A. 0.5 B. 1.0 C. 1.5 D. 2.0

74. The most effective method for air sterilization for the fermenter is
A. Heat
B. UV rays
C. Filtration
D. Chemical spray

75. The following is not a product of anaerobic digestion process
A. Antibiotics
B. Biogas
C. Hydrogen sulphide
D. Biofertilizer

x-x-x