MSc(2Yr)(Microbial Biotechnology)

1. The theme of 'World Intellectual Property Day-2018' was
A) Innovation - improving lives
B) Powering change: Women in innovation and creativity
C) Digital creativity: Cuture reimagined
D) Visionary innovators

2. The term Bioinformatics was coined by
A) Paulien Hogeweg and Ben Hesper B) David Lipman
C) Elvin A. Kabat D) David Richard

3. Which of the following fermentation products is a precursor of aspartame?
A) Alanine B) Phenylalanine C) Arginine D) Histidine

4. Aqueous two phase separation is biospecific partitioning by attaching ligands to the polymers in order to alter the partitioning of a
A) Carbohydrate B) Lipid C) Fat D) Protein

5. Red tides are often caused by blooms of
A) Zooplankton B) *Rhodospirillium* C) Trichodesmium D) Navicula

6. Pepsin digestion of IgG yields
A) $F(ab)_2$ fragment and low molecular weight fragments
B) 2 Fab fragments and Fc fragment
C) One heavy chain and one light chain
D) Only light chains

7. All the following apply to the negative stain procedure except
A) It utilizes a dye such as nigrosin B) Microorganisms repel the dye
C) Microorganisms stain deeply D) An acidic dye is used

8. Who invented Insulin?
A) Christian Bernard B) Stenach
C) Edward and Stepto D) Frederick Banting

9. Glomerulonephritis is a type of inflammation in the kidney usually due to
A) *Salmonella typhi* B) *Streptococcus pyogenes*
C) *Staphylococcus epidermidis* D) Fungi such as *Candida albicans*

10. According to the Clonal Selection theory
A) An antibody changes its shape according to the antigen it meets
B) An individual animal contains only one type of B cells
C) The animal contains many types of B cells, each producing one kind of antibody
D) Each B cell produces many types of antibodies

11. In a cross between two individuals with the genotypes AaBbccDdEeFf and AaBbCCDDeeff, the probability that an offspring will be heterozygous at all these loci is

A) 0 B) 1/16 C) 1/32 D) 1/64

12. The oncoprotein *Ras* is a

A) Kinase B) ATPase C) GTPase D) Phosphatase

13. Which of the following are produced during the light reactions of photosynthesis?

A) ADP, $NADP^+$, O_2 B) ATP, NADPH, CO_2

C) Glucose, ADP, $NADP^+$, O_2 D) ATP, NADPH, O_2

14. The principal of yeast two-hybrid system is

A) The detection of protein-protein interactions by assembling a functional transcription factor from two fusion proteins

B) The detection of protein-protein interactions in a pair of hybrid yeast strains

C) The detection of protein-protein interactions by studying the hybridization of two cDNA sequences

D) The detection of protein-protein interactions between phage coat protein and target protein

15. All of the following are non-enveloped DNA virus except

A) Herpes virus B) Adeno virus C) Parvo virus D) Papova virus

16. During the reduction of FAD^+

A) A flavin group is transferred

B) An equivalent of a hydride ion is transferred

C) The isoalloxazine becomes charged

D) Two hydrogen atoms are added to the isoalloxazine ring

17. Which of the following statements are correct?

P. Cri-du-chat syndrome is due to the chromosomal change involving deletion

Q. Formation of multivalents in meiosis is due to reciprocal translocation

R. Klinefelter's syndrome has 44+XXY condition

S. Down's syndrome is an outcome of chromosomal deletion

A) P and Q B) Q and R C) P, Q and R D) P, Q, R and S

18. Which is true of an *r-selected* (opportunistic) species?

A) They invest little energy in parental care of young

B) They are primarily regulated by density-dependent factors

C) They exhibit type I survivorship

D) They live in a stable environment where resource availability is predictable

19. Which of the following statements about rhodopsin is correct?

A) Rhodopsin is the primary photoreceptor of both rods and cones

B) The prosthetic group of rhodopsin is *all-trans-retinol* derived from β-carotene

C) Rhodopsin is located in the cytosol of the cell
D) Absorption of a photon by rhodopsin causes an isomerization of 11-*cis-retinal* to *all-trans-retinol*

20. Even in short day plants, a period of bright light is required in the leaf in order to induce flowering. This is because
A) The floral stimulus is phloem mobile and photosynthesis is required for translocation
B) Phytochrome needs high light to record day length
C) Part of the flowering stimulus is actually part of the photosynthetic apparatus
D) Oxidation of phytochrome (via-photosynthetically released active oxygen) is involved in the Pr to Pfr transition

21. Plasmid A and plasmid B were digested with BamHI and analyzed by agarose gel electrophoresis. If the plasmid A gave two fragments and plasmid B gave three fragments, then which of the following inferences are correct?
P. Plasmid A has three sites and is circular
Q. Plasmid B has three sites and is circular
R. Plasmid A has two sites and is linear
S. Plasmid B has two sites and is linear
A) P and Q B) Q and R C) P and S D) Q and S

22. What is the best method to identify the cellular location of a protein?
A) Place a reporter gene next to the promoter of the gene encoding the protein, and identify the cellular location of the reporter protein
B) Use of labeled antibody to identify the cellular location of the protein
C) Separate the cellular compartments by centrifugation and screen the different compartments with an antibody
D) Tag the protein with fluorescent amino acids and identify the cellular location with fluorescent microscope

23. The clinical use of recombinant DNA technology is to have rapidly replicating bacteria produce large amounts of specific proteins (e.g. hormones). Expression of a eukaryotic gene in prokaryotes involves
A) A Shine-Dalgarno (SD) sequence in mRNA
B) Absence of introns
C) Regulatory elements upstream of a gene
D) All of the above

24. During which phase of cellular respiration does substrate-level phosphorylation take place?
A) Citric acid cycle B) Oxidative phosphorylation
C) Glycolysis D) Glycolysis and citric acid cycle

25. In a diploid organism, the genes A, B and C are present on the same chromosome in that order. The AB interval is 10 map units and BC interval is 20 map units. In an AaBbCc

heterozygous individual, what will be the proportion of gametes that carry the genotype AbC?

A) 1% B) 10% C) 20% D) 30%

26. Which of the following statements regarding efficiency of energy transfer through food webs is *false*?

A) A trophic level can support more herbivores than carnivores
B) Birds and mammals have low production efficiency
C) The efficiency of energy transfer depends on the total production at a particular trophic level
D) Herbivores are less efficient with respect to assimilation efficiency than carnivores

27. In what way, if any, the chromosomal determination of sex differ in *Drosophila* and humans?

A) In humans, the Y-chromosome determines maleness, with female development being a default process, but in *Drosophila,* the presence of two X- chromosomes determines femaleness, and male development is the default process
B) In humans, the Y-chromosome determines maleness, but in *Drosophila,* the ratio of X-chromosomes to autosomes determines maleness or femaleness
C) In humans, it is the presence of only one X-chromosome that triggers male development and two X-chromosomes triggers female development, just as occurs in *Drosophila*
D) In human males, a single Y-chromosome is present in the absence of an X-chromosome, while in *Drosophila,* a single X-chromosome is present in the absence of a Y-chromosome

28. With respect to the Wobble hypothesis all of these are correct except

A) The anticodon show both standard and non-standard base pairing with the codon at wobble position
B) An inosine nucleotide in the tRNA molecule can base-pair with A, C and U in the mRNA
C) An inosine nucleotide in the mRNA molecule can base-pair with A, C and U in the tRNA
D) Guanine can base-pair with uracil

29. The isoelectric point of an enzyme is 6. It was observed that at this point there are 5 positively and 5 negatively charged side chains of amino acids. When the enzyme solution was titrated with HCl to pH 3, it was observed that two ionized aspartate chains got protonated. The net charge on the enzyme at pH 3 would therefore be

A) +3 B) +2 C) --3 D) --2

30. Myoglobin shows a hyperbolic response, while hemoglobin shows a sigmoidal response for oxygen binding. Which of the following statements are true with respect to this observation?

P. Hemoglobin binds 2,3-BPG while myoglobin does not
Q. Hemoglobin exists in two different conformational states while myoglobin does not
R. Hemoglobin is a tetramer while myoglobin is a monomer
S. Hemoglobin is present in RBCs while myoglobin is present in muscles

A) R and S B) S and P C) P and Q D) Q and R

31. Which of the following covalent bond types are found in the structure of ATP?
A) N-glycosidic, thioester, phosphodiester bond
B) Phosphoanhydride, phosphomonoester, N-glycosidic bond
C) Ester, ether, phosphoanhydride bond
D) Ether, thioester, phosphomonoester bond

32. Which of the following fatty acids has the lowest melting point?
A) Fatty acids with sites of unsaturation with *cis* double bond
B) Fatty acids with sites of unsaturation with *trans* double bond
C) Fatty acids with no sites of unsaturation
D) Fatty acids with longer hydrophobic tails

33. Which of the following statements about the reversible enzyme inhibition is incorrect?
A) Non-competitive inhibition occurs when a substrate and an inhibitor binding site is same
B) Competitive inhibition occurs when a substrate and an inhibitor compete for the same active site on the enzyme
C) Non-competitive inhibition of an enzyme cannot be overcome by adding large amounts of substrate
D) Competitive inhibitors are often similar in chemical structure to the substrate of the inhibited enzyme

34. One of the carbon atoms of a glucose molecule is [^{14}C] labeled. If the $^{14}CO_2$ is released during the conversion of pyruvate to acetyl-CoA, which of the carbon atom of glucose was radiolabeled?
A) C3 but not C4 B) C3 or C4 C) C1 or C6 D) C1 but not C6

35. The difference between the proton motive force across the inner mitochondrial membrane and across the thylakoid membrane of chloroplast is that
A) The first is mainly due to voltage gradient, while the second is largely due to pH gradient
B) The first is mainly due to pH gradient, while the second is largely due to voltage gradient
C) It is due to an electron transport system in the first case, but not the second
D) It drives the synthesis of ATP in the first case but not in the second

36. The cell cycle is an ordered series of events by which the cell duplicates its genome and eventually divides into two daughter cells. It is controlled by

P. Cyclin synthesis and degradation
Q. Phosphorylation of G-protein
R Binding of CDK inhibitor protein
S. Dephosphorylation of cyclin-dependent kinases

A) P and Q B) R and S C) P, R and S D) P, Q, R and S

37. How do steroid hormone estrogen modulate gene expression in responsive cells?
A) By binding to enhancer sequences
B) By binding to receptors in the cytoplasm which then migrate to the nucleus where they bind to the DNA to regulate gene expression
C) By binding to receptors in the nucleus which then bind to the DNA to regulate gene expression
D) By binding to receptors in the cell membrane, the signal is then transduced to the nucleus through a signaling pathway

38. A bacterial culture contained 32 x 10^6 cells after 2.5 hours of exponential growth. If the doubling time was 30 min, what was the initial population size of this culture?
A) 20 x 10^4 cells B) 10 x 10^5 cells C) 40 x 10^5 cells D) 16 x 10^6 cells

39. The microbia used in paper industry are
A) *Pseudomonas putida* B) *Klebsiella plantiola*
C) *E. coli* D) *Phanerochaete chrysosporium*

40. Biodiversity hotspots are recognized on the basis of
A) Their proximity to national parks and reserves
B) The number of endemic species they contain
C) The degree to which the included species are threatened with extinction
D) Both B and C

41. Which of the following statements about prostaglandins are incorrect?
A) Prostaglandins have a very short half-life
B) Prostaglandins are synthesized only in the liver and the adrenal cortex
C) Prostaglandins generally act locally on or near the tissue that produced them
D) The common precursor of the prostaglandins is arachidonic acid

42. Sex chromosome-based dosage compensation in human is brought about by
A) Inactivity of one X-chromosome in females
B) Hyperactivity of single X-chromosome in males
C) Hypoactivity of both X-chromosome in females
D) Hyperactivity of autosome in females

43. What is a pseudogene?
A) A gene that is only expressed at certain developmental stages
B) A nonfunctional gene

C) A gene that contains a mutation but is still functional
D) A sequence of DNA that is slowly evolving to become an active gene

44. A homogenous protein of native molecular weight 100,000 gave a single band of molecular weight 50,000 on SDS-PAGE in presence of β-mercaptoethanol. N-terminal analysis gave two amino acids alanine and leucine in equal proportions. Hence the
A) Protein is a homodimer
B) Protein is contaminated with another protein
C) Protein has two polypeptides linked by disulfide bridges
D) Protein has three polypeptides linked by disulfide bridges

45. The physical similarity of body shape in dolphins, sharks, and penguins results from
A) Parallel evolution B) Geographic isolation
C) Convergent evolution D) Divergent evolution

46. You have homogenized plant tissue and would like to separate chloroplast from nuclei. Which of the following methods would be most suitable?
A) Polyacrylamide gel electrophoresis
B) Differential centrifugation using sucrose gradients
C) Equilibrium density gradient centrifugation on CsCl gradients
D) Gel filtration

47. Colchicine is an inhibitory chemical, which
A) Prevents microtubule polymerization
B) Prevents microtubule depolymerization
C) Stops the functioning of centriole
D) Prevents attachment of spindle fibre with kinetochore

48. How many DNA molecules are present in the nucleus of human somatic cell in G2 stage of cell cycle?
A) 23 B) 46 C) 69 D) 92

49. An isolated population of humans, with approximately equal numbers of blue-eyed and brown-eyed individuals was decimated by an earthquake. Only a few brown-eyed people remained to form the next generation. This kind of change in the gene-pool is called a
A) Hardy-Weinberg equilibrium B) Blocked gene flow
C) Bottleneck effect D) Founder effect

50. How are eight human globin genes organized?
A) They are randomly distributed on the human chromosomes
B) They are in two clusters, one on chromosome 11 and the other on chromosome 16
C) They are in a single cluster on chromosome 16
D) They are in four clusters, alpha, beta, gamma and delta

51. If there is a deletion mutation in the operator for the *Lac* operon, the expression of *Lac* structural gene will be

A) Permanently stopped
B) Constitutively stopped
C) Not expressed
D) Resistant to catabolite expression

52. siRNA

A) Forms a complex in spliceosome
B) Recruits histone acetyl transferases to the nucleus
C) Forms a complex with RISC proteins to inhibit translation or cause degradation of the complementary mRNA
D) Is not transmitted to daughter cells after division

53. Zinc finger protein and helix-turn-helix proteins are

A) Types of DNA-binding proteins
B) Involved in the control of translation
C) Subunits of RNA polymerases
D) Members of metal binding proteins

54. A type I survivorship curve is characteristic of the species with a rapid increase in mortality in old age. This type of curve is

A) Typical of many invertebrates that produce a large number of offspring
B) Typical of humans and other large animals
C) Almost never found in nature
D) Typical of large species of birds

55. Which of the following gene is defective in patients suffering from severe combined immune-deficiency syndrome (SCID)?

A) CFTR
B) Adenosine deaminase
C) Ribonucleotide reductase
D) α2-microglobulin

56. If you discovered a bacterial cell that contained no restriction enzymes, which of the following would you expect to happen?

A) The cell would be unable to replicate its DNA
B) The cell would create incomplete plasmids
C) The cell would be easily infected and lysed by bacteriophages
D) The cell would become an obligate parasite

57. When human genome draft sequence was released, which of the following was least expected?

A) The large amount of repetitive DNA
B) The size of the total genome
C) The size of the individual chromosomes
D) The small number of protein-coding genes

58. In the production of penicillin by *Penicillium chrysogenum*, the major mass transfer resistance in the supply of oxygen lies in the

A) Bulk liquid phase
B) Gas liquid interphase
C) Gas phase
D) Solid phase (pellets)

59. Which factor is responsible for detoxification of drugs in case of humans?

A) P450 B) P550 C) P430 D) P230

60. Which is the first drug to be produced by mammalian cell culture?

A) Tissue plasminogen activator
B) IgG
C) Insulin
D) Streptavidin

61. The secretory IgA was electrophoresed on SDS-PAGE under reduced and denaturing condition. The number of polypeptide bands detected on the gel is/are

A) 2 B) 3 C) 4 D) 5

62. Who got the Nobel prize in medicine for their discovery of 'G-proteins' and the role of these proteins in the cell

A) Robert and Philip Sharp
B) Gilman and Rodebell
C) Fischer and Krebs
D) Ervin nahar and Bert Sakmann

63. First bacterial genome sequenced was

A) *E. coli*
B) *Bacillus subtilis*
C) *Haemofilus influenza*
D) *Pseudomonas aeruginosa*

64. Toll-like-receptors (TLRs) play an important role in immune defense by recognizing

A) Microbial components
B) Conformational differences in antigenic proteins
C) MHC-peptide complexes
D) Anti-idiotypic immunoglobulins

65. Which of the following statements about succession is correct?

A) Secondary succession occurs where no soil exists
B) Primary succession occurs in areas where soil remains after a disturbance
C) Secondary succession can occur where disturbance has left soil intact
D) Some cases of succession involve facilitation, a phenomenon in which local species inhibit the growth of newcomers

66. Cases of Syphilis may be diagnosed by observing

A) Viruses from the chancre
B) Tangled threads of hyphae from the blood
C) Spirochetes from the skin lesions
D) Gram-negative rods from the urethral discharge

67. Development of T cells that reacts strongly with self-peptides bound to self-MHC molecules are

A) Eliminated in the thymus
B) Eliminated in the bone marrow
C) Allowed to function normally
D) Are suppressed in peripheral blood circulation

68. The viruses of the following diseases are known to remain in the body tissues for long periods of time

A) Commom cold and polio
B) Herpes simplex and chicken pox
C) Smallpox and boils
D) Scarlet fever and warts

69. The antibiotics kanamycin, streptomycin and gentamycin all belong to the group known as

A) Cephalosporins B) Beta-lactams C) Aminoglycosides D) Tetracyclins

70. Which of the following correctly describes the structure of MHC class I gene products

A) A bimolecular structure comprising two glycosylated polypeptide chains encoded by MHC
B) The molecule has a polypeptide chain of molecular mass 45kD which is anchored through the cell membrane and is covalently bound to β2 microglobulin
C) Polypeptide chain has 3 extracellular domains, one transmembrane domain & one cytoplasmic region
D) β2 microglobulin is encoded by MHC and is membrane bound

71. Which of the following is the most likely explanation for the rapid spread of drug resistant bacterial strain?

A) Drug induced mutation that produces resistant strains
B) Genetic variability that results from increased recombination of homologous chromosomes during meiosis
C) Plasmid mediated exchange of resistance genes
D) Gene conversion that results in evolution of resistance genes

72. The Entner-Doudoroff pathway degrades two molecule of glucose to two pyruvate molecules and yields

A) One ATP and one NADH
B) One ATP, one NADH and one NADPH
C) One ATP and two NADH
D) Two ATP and two NADH

73. World cancer day to raise awareness of cancer and encourage its prevention is marked every year on

A) September 4 B) February 4 C) March 8 D) June 6

74. Ebola virus particles contains

A) Negative-sense ssRNA
B) Positive-sense dsRNA
C) Negative-sense ssDNA
D) Negative-sense dsRNA

75. The allele associated with sickle cell anemia apparently reached a high frequency in some human populations due to

A) Random mating
B) Superior fitness of heterozygotes in areas where malaria was present
C) Migration of individuals with the allele into other populations
D) A high mutation rate at that specific gene

x-x-x