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1. The symbol 'S' associated with 40S and 60S ribosome parts stands for
A) Size B) Subunit C) Siemens D) Svedbergs
2. Choose the statement which is NOT true about cancer stem cells (CSCs):
A) Epithelial-mesenchymal transition (EMT) may enhance CSC metastasis.
B) miRNAs are involved in the regulation of CSCs properties.
C) CSCs play important roles in cancer relapse and metastasis.
D) The characteristics of CSCs are different from normal cells.
3. The enzyme responsible for removing the primers after the complementary strand of DNA has been synthesized:
A) DNA polymerase B) RNase H
C) Primase D) Helicase
4. A pseudogene is:
A) a gene with no exons
B) a DNA sequence with numerous mutations and their expression product inhibit the function of a normal gene product
C) a DNA sequence resembling a functional gene but containing numerous mutations that prevent its expression
D) a gene that express a protein that cannot fold properly and consequently unable function
5. Match Group I with Group II
- | Group I | Group II |
|-------------------|-------------------------|
| a) Nalidixic acid | 1. RNA polymerase |
| b) Tetracycline | 2. DNA gyrase |
| c) Erythromycin | 3. DNA polymerase |
| d) Rifampin | 4. 50S ribosomal submit |
| | 5. Aminoacyl tRNA |
- A) a-3, b-4, c-5, d-1 B) a-5, b-1, c-4, d-2
C) a-2, b-5, c-4, d-1 D) a-2, b-5, c-1, d-4
6. In almost all mammalian cells, glucose transport occurs by
A) Active transport B) Facilitated Diffusion
C) Simple diffusion D) None of the above

14. Haemophilia is caused by X-linked recessive allele. In a particular population the frequency of males with Haemophilia is $1/5000$. Calculate the expected frequency of females with Haemophilia:
 A) 0.0002 B) $(0.0002)^2$ C) 0.0004 D) 0.0001
15. Immediately after the synthesis of mRNA:
 A) Methyl guanosine is added to 5' end and Poly (A) tail is added to 3' end of mRNA
 B) Methyl guanosine is added to 3' end and Poly (A) tail is added to 5' end of mRNA
 C) Methyl cytosine is added to 3' end and Poly (A) tail is added to 5' end of mRNA
 D) None of the above reactions will happen
16. Choose the statements which is/are correct about protein glycosylation:
 1) The N-linked glycosylation begins in the ER and continues in the Golgi-complex
 2) The N-linked glycosylation takes place exclusively in the Golgi-complex
 3) The O-linked glycosylation begins in the ER and continues in the Golgi-complex
 4) The O-linked glycosylation takes place exclusively in the Golgi-complex
 A) 1 only B) 2 & 3 C) 4 only D) 1 & 4
17. During cancer treatment hair loss is a common. The reason behind this is:
 1) Skin is comparatively more vascularized than other tissues
 2) The therapeutic agent is a keratin inhibitor
 3) The therapeutic agent inhibits the proliferating cells in the hair
 4) The therapeutic agent activates new hair formation
 A) Only 1 is correct B) Only 2 & 3 are correct
 C) Only 3 is correct D) Only 3 & 4 are correct
18. Slow-twitch (type I fibers) are thinner, with a denser capillary web, and appear red owing to the existence of a great amount of-----.
 A) Myoglobin B) Haemoglobin
 C) Low glycogen levels D) High mitochondrial numbers
19. When freshly isolated intact mitochondria were incubated with ADP and inorganic phosphate neither the oxygen consumption nor the ATP synthesis could be detected. Addition of succinate resulted in increased oxygen consumption as well as ATP synthesis with time. Subsequent addition of cyanide to this system will result in which one of the following?
 A) Both oxygen consumption and ATP synthesis are inhibited
 B) Oxygen consumption continues but ATP synthesis is inhibited
 C) Oxygen consumption is inhibited but ATP synthesis continues
 D) Both oxygen consumption and ATP synthesis continue

20. Saccharose is a synonym for-----.
- A) Glucose B) Sucrose C) Fructose D) Starch
21. Maximum number of **voltage gated calcium channels** can be found at:
- A) postsynaptic membrane of an electrical synapse
 B) presynaptic membrane of an electrical synapse
 C) postsynaptic membrane of a chemical synapse
 D) presynaptic membrane of a chemical synapse
22. 'HeLa' is a well-known-----used in research labs.
- A) High Efficiency Low particle filter
 B) First continuous fed fermenter
 C) Thermopolymerase
 D) Cell line
23. Find the weakest interaction among the following:
- A) Covalent bonding B) Hydrogen bonding
 C) Electrostatic attractions D) Van der Waals attractions
24. The proteins which help in the process of fusion of the transport vesicle to target membrane and cargo delivery is:
- A) Agglutinin B) CRP C) SNARE D) HRP
25. Triglycerides serve as major energy reservoir because they are-----.
- A) Oxidized and anhydrous B) Reduced and hydrated
 C) Reduced and anhydrous D) Oxidized and hydrated
26. When the outermost high energy phosphate bond in ATP is hydrolysed under standard conditions, the energy released is equal to-----.
- A) 7.3 kcal/mole B) 21.9 kcal/mole
 C) 7.3 J/mole D) 21.9 J/mole
27. Match Group I with Group II
- | Group I | Group II |
|---|-------------------------|
| a. Bt gene | 1. Golden rice |
| b. β -carotene biosynthetic genes | 2. Insect resistance |
| c. ACC deaminase | 3. Herbicide resistance |
| d. EPSP synthase | 4. Fruit ripening |
- A) a-1, b-2, c-3, d-4 B) a-2, b-1, c-4, d-3
 C) a-3, b-1, c-2, d-4 D) a-2, b-1, c-3, d-4

28. Choose the statements about glycolysis:
1. Total of 4 ATP produced per one fructose 1,6-diphosphate
 2. Total of 2 ATP produced per one fructose 1,6-diphosphate
 3. The phosphorylation step of glucose is reversible in liver cells
 4. In liver the phosphorylation of glucose is promoted by Glucokinase
- A) Only 1 is correct B) Only 2 and 4 are correct
 C) Only 2, 3 and 4 are correct D) Only 1, 3 and 4 are correct
29. Which of the following statements are correct?
1. Each myofibril is composed of myosin and actin filaments at a ratio of 1:2
 2. The light bands in the myofibrils contain only actin filaments and thus called *A bands*
 3. The ends of the myosin filaments are attached to a *Z disk*
 4. The part of the myofibril that comes between two successive *Z disks* is call a *Sarcomere*
- A) 1, 2 and 3 only are correct B) 1 and 4 only are correct
 C) Only 1 and 2 are correct D) Only 4 is correct
30. Determine the correctness or otherwise of the following Assertion (a) and Reason (r).
 Assertion (A): Glycine is the highly conserved amino acid residue in the evolution of proteins
 Reason (R) : Glycine has the smallest side chain of any amino acids
- A) Both A and R are correct and R is the correct reason for A
 B) A and R are correct but R is not the correct reason for A
 C) A and R are false
 D) A is false but R is true
31. The absorption coefficient of a protein at 600nm is $12000 \text{ M}^{-1} \text{ cm}^{-1}$. What is the absorbance of 1mg/ml ($4.5 \times 10^{-5} \text{ M}$) solution across a 1-cm path length?
- A) 0.870 B) 0.720 C) 0.540 D) 0.420
32. Assertion(A): Phosphoenolpyruvate has a high phosphoryl-transfer potential
 Reason (R) : The phosphoryl group traps the molecule in its unstable enol form
- A) A and R are correct and R is the reason for A
 B) A is correct and R is wrong
 C) A is wrong but R is correct
 D) A and R are wrong

33. If glucose is labelled with ^{14}C at C-6, where we can find the radioactive label after oxidative phase of pentose phosphate pathway
 A) C-2 of ribulose 5- phosphate B) C-1 of ribulose 5- phosphate
 C) C-5 of ribulose 5- phosphate D) C-6 of ribulose 5- phosphate
34. Assertion (A) : Treatment of carbonic anhydrase with high concentrations of EDTA results in loss of enzyme activity
 Reason(R) : EDTA will bind and remove Mg^{2+} , which is required for Carbonic anhydrase enzyme activity
 A) A and R are true and R is the reason for A
 B) A and R are true and R is not the reason for A
 C) A is true but R is false
 D) A and R are false
35. Choose the correct statements about noncompetitive inhibition of enzymes
 1) An inhibitor and a substrate can bind simultaneously to an enzyme
 2) K_M is unchanged
 3) Can be overcome by increasing the substrate concentration
 4) V_{max} is increased
 A) Only 1,3 & 4 are correct B) Only 1 & 2 are correct
 C) Only 1 & 4 are correct D) Only 1, 2 & 4 are correct
36. Psychrophiles are organisms that grow at:
 A) high salt concentration B) high sugar concentration
 C) low temperature D) low humidity
37. Vesicular-Arbuscular Mycorrhizae (VAM) is found in -----.
 A) Plant roots
 B) Tooth lichens
 C) AIDS and other immunodeficiency conditions
 D) Phylloplane
38. Which of the following is a tissue specific macrophage?
 A) Osteoclasts B) Osteoblasts
 C) Melanocytes D) Dendritic cells
39. The Papain enzyme digestion of IgG will yield:
 A) Two Fab fragments and one Fc fragment
 B) One Fab fragment and two Fc fragments
 C) One Fab fragment and one Fc fragment
 D) Two heavy chains and two light chains

40. A complete virus particle, consisting of one or more molecules of DNA or RNA enclosed in a coat protein, is called a -----.
- A) Viroid B) Virion C) Virusoid D) Prion
41. The time required to kill 90% of the microorganisms or spores in a sample under specified conditions is
- A) L value B) D value C) K value D) M value
42. Choose the correct statement about T lymphocytes:
- A) Both CD4 and CD8 glycoproteins are expressed on the surface of all T lymphocytes
- B) T cells displaying CD4 generally functions as T_H cells, whereas those displaying CD8 generally functions as T_C cells
- C) T cells displaying CD4 generally functions as T_C cells, whereas those displaying CD8 generally functions as T_H cells
- D) Neither CD4 nor CD8 is expressed on T lymphocytes
43. Choose the correct statements:
- 1) T_H cells are class II MHC restricted and T_C cells are class I MHC restricted
- 2) T_H cells are class I MHC restricted and T_C cells are class II MHC restricted
- 3) All nucleated cells express class II MHC molecules and expression of class I MHC molecule is limited to antigen-presenting cells
- 4) All nucleated cells express class I MHC molecules and expression of class II MHC molecule is limited to antigen-presenting cells
- A) Only 1 & 3 B) Only 2 & 3 C) Only 1 & 4 D) Only 2 & 4
44. Choose the statements which are correct about monoclonal antibody:
- 1) They are specific for a single epitope
- 2) Comprises a mixture of antibodies, each specific for a particular epitope, produced from a variety of B-cell clones
- 3) It is easy to purify monoclonal antibody from polyclonal antibody preparation
- 4) Have research, diagnostic and therapeutic applications
- A) Only 1 & 4 B) Only 1, 2 & 4 C) Only 1 & 3 D) All are correct
45. The drug, aminopterin, in the HAT medium blocks -----.
- A) DNA repair mechanism B) Cell-cell fusion
- C) Nucleotide synthesis D) Antibody production
46. A patient with myasthenia gravis disease produce auto-antibodies that bind with:
- A) Histone proteins B) Acetylcholine receptor
- C) TSH receptor D) Fc region of IgG

47. The method that can be employed effectively to analyse the diffusion rate of membrane proteins:
- A) Patching and capping B) Immuno diffusion
C) FRAP D) Patch-clamp
48. Individual variations in response to a drug are responsible for the high failure rates of new drug molecules at the clinical trial stage. What might be the reason for this individual variation?
- A) Variations in the structure of the target molecule
B) Differences in the way that a particular drug is adsorbed and distributed
C) Differences in their metabolism and excretion
D) All of the above
49. After a certain dosage level of the drug, any further increase in the dosage of the drug, shows no additional effect. This is known as-----.
- A) Ceiling effect B) Null effect
C) Threshold effect D) Dose effect
50. Resistance of a population to the infection and pathogen spread due to the immunity among the large percentage of the population is called:
- A) Passive immunity B) Acquired immunity
C) Secondary immunity D) Herd immunity
51. Assertion (A): Although antigen-antibody reactions are highly specific, in some cases antibody elicited by one antigen can cross-react with an unrelated antigen
Reason (R) : Two different antigens can have equal number of epitopes
- A) A is true and R is the reason for A
B) A and R are true but R is not the reason for A
C) A is true but R is not true
D) A and R are not true
52. An example for toxoid vaccine:
- A) BCG B) HBsAg
C) Tetanus vaccine D) Salk vaccine
53. Which of the following statement about primer conditions are correct for a successful PCR experiment?
- 1) Primers with less than 20% GC content is ideal
2) Sequence with long runs of a single nucleotide should be avoided
3) Primers with significant secondary structures are undesirable
4) The two primers should be complementary to each other
- A) 1 & 3 only B) 2 & 3 only C) 1 & 4 only D) 1,2 & 3 only

54. Nested PCR is a modification of PCR in which:
- A) Adding DNA polymerase after the heat-denaturation step of the first cycle
 - B) Products of initial PCR amplification are used to seed a second PCR amplification
 - C) cDNA serves as the template for DNA polymerase
 - D) mRNA can be directly used in the amplification reaction
55. Assertion (A) : phage that survive one cycle of growth upon the restrictive host can become protected from restriction enzyme and can subsequently reinfect that host efficiently
Reason (R) : their DNA becomes glycosylated by modifying enzymes in host
- A) A and R are true and R is the reason for A
 - B) A is true but R is wrong
 - C) A and R are true but R is not the reason for A
 - D) A and R are wrong
56. A single-stranded DNA vector:
- A) pBR322
 - B) pUC18
 - C) Bacteriophage λ
 - D) M13
57. The enzyme terminal deoxynucleotidyltransferase catalyze:
- A) the formation of phosphodiester bonds between blunt-ended fragments
 - B) synthesis of homopolymeric 3' single-stranded tails
 - C) covalent joining of annealed cohesive ends produced by certain restriction enzymes
 - D) modification of internal cytosine residues
58. An affinity column containing immobilized divalent nickel can be used to purify fusion proteins with:
- A) Biotin tag
 - B) Glutathione-S-transferase
 - C) Polyhistidine tag
 - D) MalE protein
59. Assertion (A) : Despite the success of microbes in biotechnology, mammalian cells are widely used in biopharmaceutical industry.
Reason (R) : Only mammalian cells can glycosylate human proteins in the correct manner
- A) A is true but R is wrong
 - B) A and R are correct but R is not reason for A
 - C) A and R are wrong
 - D) A and R are correct and R is the reason for A

60. Choose the correct statements about primary cell culture of animal cells
- 1) Freshly isolated cell culture
 - 2) Usually homogenous cultures
 - 3) More representative of the tissue of the origin
 - 4) Very fast growth rate
- A) Only 1, 2 & 4 are correct B) Only 1 & 4 are correct
 C) Only 1 & 3 are correct D) Only 2 & 4 are correct
61. Common origin of primary tumors of reticulo endothelial system is due to:
- A) Impaired CM1 B) Hyper gamma globulinemia
 C) Abuse of cortico steroid D) Acquired hemolytic anemia
62. Browning on culture medium often occurs in plant tissue culture experiments due to the presence of:
- A) Certain antibiotics B) Excess sugar in medium
 C) Microbial contamination D) Phenolic compounds
63. Shoots developed from *in vitro* appear brittle, glassy, and water-soaked, this is called
- A) Vitrification B) Somaclonal variation
 C) Somatic embryogenesis D) Recalcitrance
64. The most commonly used fusogen for protoplast fusion is-----.
- A) Sorbitol B) Macerozyme
 C) Polyethylene glycol D) 50-100mM CaCl₂
65. The procedures or systems designed to minimize accidental release of organisms during laboratory operations, their dissemination and survival in the environment and accidental infections to persons is:
- A) Containment B) Quarantine
 C) Filtration D) None of the above
66. Which of the following is a selectable marker?
- A) genes conferring resistance to kanamycin
 B) β -galacturinidase gene
 C) luciferase gene
 D) nopaline synthase gene
67. Find the missing value
- 1,1
 1,2,1
 1,3,3,1
 1,4,-,4,1
- A) 4 B) 5 C) 6 D) 7

68. The 'S' in the 'https://' stands for:
 A) safe B) secure C) stable D) secret
69. Choose the correct statements related with the human genome project:
 1. There are more than 1 million SNPs.
 2. We have some genes which might have come from bacteria
 3. Most mutations occur in females
 4. Most mutation occur in males
 5. No correlation between mutation rate and gender
 6. Not more than 60 % of our DNA is junk
- A) Only 2, 4 and 6 are correct B) Only 1, 3 and 6 are correct
 C) Only 1, 2 and 5 are correct D) Only 1, 2 and 4 are correct
70. Collagen protein consists of three helical chains containing glycine and proline in each chain. The overall structure of each polypeptide in the molecule is a:
 A) Polyproline I B) Polyglycine 1
 C) Polyproline II D) α - helix
71. $A=\{4,6,8,9\}$ $B=\{6,7,8,9\}$.What is the set difference $A-B$?
 A) 4,7 B) {7} C) {4,7} D) {4}
72. In 200 meters running race 8 participants had the following finishing times in seconds: 28,22,26,29,21,23,24,29. Calculate the Mode, Median, and Mean of this running race results and Identify the correct answer from the following options
 A) Mode>Median=Mean B) Mode >mean>median
 C) Mode >mean<median D) Mode <mean>median
73. Which of the following statement is true?
 A) The larger the p-value, the more strongly the data contradict null hypothesis.
 B) The smaller the p-value, the more strongly the data contradict alternative hypothesis.
 C) The smaller the p-value, the more strongly the data contradict null hypothesis.
 D) The larger the p-value, the more strongly the data contradict alternative hypothesis.
74. Choose the statement which is true about Python and SPSS:
 A) Both Python and SPSS are statistical software
 B) Python is a statistical software and SPSS is a non-parametric paired t test
 C) Python is a programming language and SPSS is a non-parametric paired t test
 D) Python is a programming language and SPSS is statistical software
75. Which of the following is not a stop codon?
 A) UAG B) UAC C) UAA D) UGA

76. When you study the gene expression analysis of a stem cell population, which of the following strategies will be useful for avoiding false positive results?
- Treating the sample with RNase H
 - Treating the sample with RNase free DNase
 - Using an exon spanning primer
 - All of the above
77. ----- is NOT a bioinformatic method to study gene expression.
- t-SNE
 - PCA
 - Hierarchical Clustering
 - MALDI-TOF
78. The first patent was given for a living organism in connection with a genetically engineered-----.
- Bacteria
 - Drosophila*
 - Maze plant
 - Bacteriophage
79. Plant breeder's right are granted by a government to:
- The breeder to exclude others from producing or commercializing the propagating material of the protected variety
 - Breeders to use a protected variety in breeding programmes without any obligation to the party holding the PBR title of the initial variety
 - Farmers/farming communities, who provided the genetic resources for the varieties, to share the profit earned by seed corporations
 - A farmer to use a part of the material produced on his farm, from protected variety, for planting his own fields without any obligation to the PBR title of holder
80. The currently operative patent act in India is:
- Indian Patents Act 1985
 - Indian Patents Act 2014
 - Indian Patents Act 1992
 - Indian Patents Act 1970
81. The definition which best suits for 'trademark':
- is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin
 - is a word or symbol adopted and used by a manufacturer or merchant to identify his goods and distinguish them from those manufactured or sold by others
 - Private proprietary information or physical material that allows a definite advantage to the owner
 - the rights that creators have over their literary and artistic works
82. PDB is an example for:
- Primary nucleotide sequence database
 - Protein sequence database
 - Macromolecular 3D structure database
 - Sequence motif database

102. The diagram that shows the relationship among the members of a family is-----.
- A) Karyotype B) Heat map C) Pedigree D) Mammogram
103. Choose the statements which are correct about Riboswitches:
- 1) are mRNAs
 - 2) are tRNAs
 - 3) bind to a metabolite and allow to alter the gene expression
 - 4) bind to repressor and allow to alter the gene expression
- A) 2 & 3 only B) 2 only C) 1 & 3 only D) 2 & 4 only
104. Translate the following amino acid sequence into one letter code
Val-Ile-Asn-Glu-Leu-Val-Ile-Ser-Ile-Ser-Leu-Ile-Gly-Ala-Ser-Gly-Ile-Asn-Leu-Ala-TYR- Val-Trp
- A) VIAGLVISISLIGASGIALAYVT
B) VINELVISISLIGASGINLAYVW
C) VINGLVISISLIGASGINLATVR
D) VINELVISISLIGASGINLAYVT
105. Choose the statement which is true about gel permeation chromatography:
- A) Large molecules flow more rapidly through the column and emerge first
 - B) Small molecules flow more rapidly through the column and emerge first
 - C) The separation is not based on the size of the molecules
 - D) None of the above
106. Identify the amino acid, which are not involved in the building blocks of proteins:
- 1) Ornithine 2) Cystein 3) Citrulline 4) Methionine
- A) 1 & 2 B) 1 & 3 C) 2 only D) 3 & 4
107. *Mycobacterium tuberculosis* is an example for the---
- A) Alcohol fast B) Acid fast
C) Alcohol and acid fast D) None of the above
108. The selection of B cells and their differentiation to plasma cells occurs at....
- A) Primary lymphoid organs B) Secondary lymphoid organs
C) Bone marrow D) Thymus
109. The sugar derivatives which is/are present in the peptidoglycan layer of bacteria:
- 1) N-acetylneuraminic acid 2) N-acetyl-glucosamine
 - 3) N-acetylmuramic acid 4) N-acetyl-galactosamine
- A) 1&2 B) 2&3 C) 1&4 D) 4 only

110. Which of the following is a recently developed technique in biotechnology?
 A) Hydrogel B) MRI C) CRISPR D) PCR
111. Most useful restriction-modification system for gene manipulation is
 A) Type I B) Type II C) Type III D) Type IIs
112. Choose the correct statements about YACs
 1) much larger size than λ replacement vectors
 2) large genes are less likely to be contained within a single clone
 3) widely used for the construction of libraries of large genomes
 A) 1 & 2 only B) 1 & 3 only C) 2 only D) 2 & 3 only
113. Choose the statements which are true about chloroplast transformation:
 1) There is no risk of the transgene being transmitted through pollen
 2) Transgene integrated into chloroplast genome show very low levels of expression
 3) Transformation frequencies are much higher than those for nuclear genes
 4) Products of transgene ordinarily accumulates in green parts
 A) 1, 2 & 3 only B) 2 & 3 only C) 3 & 4 only D) 1 & 4 only
114. Recombinant therapeutic proteins are produced commercially in:
 A) Bacteria B) Yeast
 C) Mammalian cells D) All of the above
115. When 'c' is a real number larger than or equal to 2 and 'q & r' are positive real numbers, which of the following is a correct formula?
 A) $\log_c(1)=0$ B) $\log_c(1)=1$
 C) $\log_c(q.r)=\log_c(q) \cdot \log_c(r)$ D) $\log_c(c)=c$
116. Suppose you have a number locker which work on combination (order is not important) and your code to open the locker is 8925. How many combinations could be used to open that locker?
 A) 720 B) 24 C) 1 D) None of these
117. The ChIP-Seq technology is a way to find out the interactions between:
 A) DNA and RNA B) DNA and telomerase
 C) DNA and proteins D) proteins and proteins

118. The post patent grant opposition should be made by the opponent within from the date of publication of grant.
A) 6 months B) 12 months C) 24 months D) 5 years
119. Choose the greenhouse gases which occur naturally
1) Carbon dioxide 2) Methane
3) Water vapour 4) Chlorofluorocarbons
A) 1 & 2 B) 1,2&3 C) 1 only D) 2 only
120. Bio diesel, an alternative fuel is provided by the technique:
A) Fermentation B) Esterification
C) Transesterification D) High pressure oxidation
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