175/2025

Question Booklet Alpha Code **A**

Question Booklet Serial Number

Total No. of questions : 100 Time : 1 Hour 30 Minutes

Maximum : 100 Marks

INSTRUCTIONS TO CANDIDATES

1. The question paper will be given in the form of a Question Booklet. There will be four versions of question booklets with question booklet alpha code viz. A, B, C & D.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the question booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a question booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your question booklet is un-numbered, please get it replaced by new question booklet with same alpha code.
6. The question booklet will be sealed at the middle of the right margin. Candidate should not open the question booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the question booklet supplied to him contains all the 100 questions in serial order. The question booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the question booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball-Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

175/2025

Maximum : 100 marks

Time : 1 hour and 30 minutes

1. Which glycosidic linkage is typical of animal glycogen?

(A) $\beta - 1,4$ (B) $\alpha - 1,4$ with $\alpha - 1,6$ branching

(C) $\alpha - 1,2$ (D) $\beta - 1,6$ branching

2. Which analytical technique is most commonly used to determine the secondary structure content of proteins?

(A) MALDI-TOF (B) IR spectroscopy

(C) Circular Dichroism (D) X-ray crystallography

3. The optical rotation of amino acids arises from :

(A) The α – carbon being chiral (B) Peptide bond resonance

(C) Hydrogen bonding (D) Side-chain polarity

4. In fluorescence microscopy, why does the light emitted by a fluorophore have a longer wavelength than the light used for excitation?

(A) Thermal expansion of fluorophore

(B) Stokes shift due to energy loss in the excited state

(C) Use of a dichroic mirror

(D) Photobleaching

5. In agarose gel electrophoresis, the migration distance of linear DNA fragments decreases as the fragment size increases. Since electrophoretic mobility is approximately inversely proportional to the logarithm of DNA fragment length (in kb), what happens to the mobility when the fragment size is doubled?

(A) Mobility is halved

(B) Mobility doubles

(C) No change in mobility

(D) Mobility decreases by approximately a constant factor ($\sim\log_2$)

6. In a PCR reaction, you accidentally omitted Mg^{2+} from the reaction buffer. What is the most likely outcome?

(A) The DNA polymerase will work normally.

(B) The DNA polymerase will have reduced activity or fail to extend.

(C) The annealing temperature will decrease.

(D) The denaturation temperature must be increased.

7. Which of the following amino acids is most likely to be found in the interior of a globular protein?

(A) Glutamate

(B) Arginine

(C) Lysine

(D) Leucine

8. A patient with chronic liver disease shows elevated AST, ALT, and GGT, with AST/ALT ratio > 2. This pattern is most characteristic of :

(A) Viral hepatitis

(B) Alcoholic liver disease

(C) Non-alcoholic fatty liver disease (NAFLD)

(D) Biliary obstruction

9. The biological value (BV) of dietary protein depends primarily on :

(A) Total caloric content of the protein source

(B) Total nitrogen intake irrespective of amino acid pattern

(C) Proportion of essential amino acids and their utilization

(D) Amount of saturated vs. unsaturated fat present in the protein source

10. The predominant metabolic adaptation in marasmus is :

(A) Increased insulin secretion with fat deposition

(B) Increased gluconeogenesis from muscle proteins alone

(C) Enhanced lipolysis and ketone body production for energy

(D) Reduced dependence on fat metabolism with increased glucose oxidation

11. A child presents with chronic diarrhea, steatorrhea, abdominal distension, and poor weight gain. Duodenal biopsy shows villous atrophy. Which condition is most likely?

(A) Lactase deficiency

(B) Cystic fibrosis

(C) Celiac disease

(D) Pancreatic cancer

12. Rifampicin acts by :

(A) Inhibiting bacterial topoisomerase II

(B) Blocking bacterial RNA polymerase and inhibiting transcription

(C) Interfering with thymidylate synthase

(D) Inhibiting peptidoglycan precursor synthesis

13. During severe hypoxia, which change in hemoglobin – oxygen dissociation curve and metabolic parameter is MOST characteristic?

(A) Shift to the right with decreased 2,3-BPG (2,3- biphosphoglycerate)

(B) Shift to the left with increased pH

(C) Shift to the right with increased H^+ and 2,3- BPG (2,3-biphosphoglycerate)

(D) Shift to the left with increased CO_2

14. In nephrotic syndrome, which of the following plasma proteins shows the greatest proportional increase as a compensatory hepatic response?

(A) Albumin

(B) Transferrin

(C) α_2-macroglobulin

(D) Immunoglobulin A

15. Which of the following B vitamins is not correctly matched with its role in the citric acid cycle?

(A) Riboflavin (B2) – as FAD, cofactor for succinate dehydrogenase.

(B) Niacin (B3) – as NAD^+, electron acceptor for isocitrate dehydrogenase.

(C) Thiamin (B1) – as thiamin disphosphate, coenzyme for the decarboxylation step in α- ketoglutarate dehydrogenase.

(D) Pyridoxine (B6) – as pyridoxal phosphate, essential for the formation of acetyl-CoA from pyruvate.

16. Which of the following statements about the reciprocal regulation of glycogen synthase and glycogen phosphorylase is correct?

(A) cAMP-dependent protein kinase (PKA) activates glycogen synthase by phosphorylating it, converting glycogen synthase b→a.

(B) Protein phosphatase-1 (PP1) dephosphorylates glycogen synthase b, activating it, and this PP1 activity is enhanced by PKA via direct phosphorylation.

(C) One of the kinases that phosphorylates glycogen synthase is phosphorylase kinase, which is Ca^{2+}/calmodulin-dependent, contributing to inactivation of synthesis when breakdown is promoted.

(D) Insulin promotes glycogenesis by activating cAMP-dependent protein kinase, which in turn dephosphorylates glycogen synthase b.

17. Which of the following metabolic disorders correctly matches the toxin or defect with its biochemical consequence?

(A) Jamaican vomiting sickness – caused by hypoglycin, which activates medium – and short-chain acyl-CoA dehydrogenase, leading to ketotic hypoglycemia.

(B) Dicarboxylic aciduria – due to deficiency of long-chain acyl-CoA dehydrogenase, leading to urinary excretion of C6 – C10 ω-dicarboxylic acids and ketotic hypoglycemia.

(C) Refsum disease – accumulation of phytanic acid because of a defect in peroxisomal α-oxidation; leading to neuro symptoms like ataxia and retinitis pigmentosa.

(D) Zellweger syndrome – caused by overactive β oxidation in peroxisomes, leading to depletion of very-long-chain fatty acids (C26 – C38) in brain tissue.

18. Which of the following statements is correct regarding the cyclooxygenase (COX) pathway and prostaglandin synthesis?

(A) Cyclooxygenase (PGH synthase) converts arachidonate into PGH_2 using only its peroxidase activity.

(B) Cyclooxygenase is a suicide enzyme.

(C) 15-Hydroxyprostaglandin dehydrogenase stabilizes prostaglandins in tissue by reducing their rate of degradation.

(D) Thromboxane A_2 (TXA_2) and prostacyclin (PGI_2) are produced by the same cell type.

19. A patient presents with elevated plasma tyrosine, liver failure, and elevated succinylacetone on newborn screening. Which of the following enzyme defects is most likely responsible?

(A) Tyrosine aminotransferase

(B) 4-Hydroxyphenylpyruvate dioxygenase

(C) Fumary lacetoacetate hydrolase

(D) Homogentisate 1,2-dioxygenase

20. In Lesch – Nyhan syndrome, deficiency of hypoxanthine-guanine phosphoribosyl-transferase (HGPRTase) leads to hyperuricemia. Which of the following best explains why PRPP level rise in this condition, contributing to purine overproduction?

(A) HGPRTase normally degrades PRPP directly, so its absence causes PRPP accumulation.

(B) Due to HGPRTase deficiency, feedback inhibition of PRPP amidotransferase by IMP and GMP decreases, increasing PRPP production.

(C) PRPP amidotransferase is inhibited in HGPRTase deficiency, so PRPP accumulates because it cannot enter de novo synthesis.

(D) Loss of HGPRTase causes hypoxanthine and guanine to accumulate, which allosterically activate PRPP synthetase to increase PRPP synthesis.

21. In the mitochondrial electron transport chain, which of the following statements is correct?

(A) Electrons from succinate enter the respiratory chain at Complex I and are transferred via FMN to ubiquinone (Q).

(B) Complex II (succinate-Q reductase) pumps protons across the inner mitochondrial membrane, contributing to the proton gradient.

(C) Coenzyme Q (ubiquinone) is a mobile electron carrier that accepts electrons from both Complex I and Complex II.

(D) Cytochrome c is embedded in the inner mitochondrial membrane and transfers electrons directly to ubiquinone (Q).

22. Which of the following statements best describes allosteric regulation?

(A) Most allosteric effectors structurally resemble the enzyme's substrates or products, and thus bind to the active site.

(B) Allosteric effectors always raise the V_{max} of an enzyme by binding at the catalytic site.

(C) Allosteric effectors bind at a regulatory site distinct from the active site and can influence enzyme kinetics by changing either K_m, V_{max}, or both.

(D) Changes in enzyme levels via gene expression are a faster mechanism of regulation than allosteric control.

23. Which of the following statement is / are CORRECT about EPIGENETICS

(i) Currently, there are three major types of epigenetic modifications:

(1) DNA methylation,

(2) Histone modification and

(3) noncoding RNAs.

(ii) DNA methylation is as well-known epigenetic change. Methylation of Adenine occurs frequently; Cancer is the most common human disease associated with aberrant DNA modification.

(iii) Noncoding RNAs also function in the regulation of translation. In addition to noncoding ribosomal and tRNAs, there are many forms of noncoding RNA, including long (> 200 nucleotides) and short (20-200 nucleotides) noncoding RNAs

(A) only (i) and (ii)

(B) only (ii) and (iii)

(C) only (i) and (iii)

(D) All of the above (i), (ii) and (iii)

24. Which of the following statement is / are CORRECT about Flow cytometry?

(i) This is the fluorescence technique used to identify and enumerate cells bearing a particular antigen(s) or the surface markers by suspending them in a stream of fluid and passing them through and electronic detection apparatus.

(ii) It allows simultaneous multiparametric analysis of the physical and / or chemical characteristics of up to thousands of particles per second.

(iii) Different populations of molecules can be differentiated by charge using forward and right-angle light scatter.

(A) only (i) and (ii)
(B) only (ii) and (iii)
(C) only (i) and (iii)
(D) All of the above (i), (ii) and (iii)

25. Which of the following statement is / are CORRECT about artificial active immunity?

(i) Artificial active immunity is the resistance induced by vaccines.

(ii) Vaccines are preparations of live or killed microorganisms or their products used for immunisation.

(iii) Live vaccines initiate infections without causing any injury or disease. The immunity caused by live vaccines lasts for several years but booster doses may be necessary.

(A) only (i) and (ii)
(B) only (ii) and (iii)
(C) only (i) and (iii)
(D) All of the above (i), (ii) and (iii)

26. Which of the following statement is / are INCORRECT Primary immunodeficiency syndrome?

(i) The primary immunodeficiency may be due to humoral immunodeficiency {B cell defects}, cellular immunodeficiency {T cell defects} or combined immunodeficiency {B cell & T cell defects}

(ii) DiGeorge syndrome is an example of humoral immunodeficiency.

(iii) Ataxia Telangiectasia an example of cellular immunodeficiency

(A) only (i) and (ii)
(B) only (ii) and (iii)
(C) only (i) and (iii)
(D) All of the above (i), (ii) and (iii)

27. Which of the following statement is / are CORRECT about MICRO RNA?

(i) The number of bases in micro RNA is 50 – 70.

(ii) They have RNA hairpin structure and are called short hairpin RNA.

(iii) These are transported through nuclear pores into the cytoplasm, where out of the two stands, one is broken by dicer nuclease.

(A) only (i) and (ii)
(B) only (ii) and (iii)
(C) only (i) and (iii)
(D) All of the above (i), (ii) and (iii)

28. Which of the following statement is / are INCORRECT about inhibitors of translation in Bacteria?

(i) Tetracycline inhibits the peptidyl transferase activity of bacterial ribosomes.

(ii) Erythromycin bind to the 30S subunit of the bacterial ribosome and so inhibit attachment of amino acyl tRNA to the A site of ribosomes.

(iii) Chloramphenicol prevents the translocation process.

(A) only (i) and (ii)
(B) only (ii) and (iii)
(C) only (i) and (iii)
(D) All of the above (i), (ii) and (iii)

29. Which of the following statement is / are CORRECT about Repair of DNA?

(i) In Nucleotide excision-repair mechanism is used to replace regions of damaged between two GATC sequences.

(ii) Faulty mismatch repair has been linked to hereditary non-polyposis colon cancer {HNPCC}

(iii) In Base excision-repair, specific enzymes recognize a depurniated site and replace the appropriate purine directly, without interruption of the phospho-diester backbone

(A) only (i) and (ii)
(B) only (ii) and (iii)
(C) only (i) and (iii)
(D) All of the above (i), (ii) and (iii)

30. Which of the following statement is / are CORRECT hypersensitivity reactions?

(i) In Type I hypersensitivity reactions, the antigen combines with the cell-fixed antibody, leading to release of pharmacologically active substances.

(ii) In Type II hypersensitivity reaction, the damage is caused by antigen antibody complexes. These may precipitate in and around small blood vessels, causing damage to cells secondarily, or on membranes, interfering with their function.

(iii) In Type IV hypersensitivity reaction, is a cell-mediated response. The antigen activates specifically sensitised CD4 and CD8 T cells, leading to the secretion of lymphokines and phagocyte accumulation.

(A) only (i) and (ii)
(B) only (ii) and (iii)
(C) only (i) and (iii)
(D) All of the above (i), (ii) and (iii)

31. For a low-spin octahedral d^5 complex, which electronic transition is Laporte-allowed but spin-forbidden?

(A) $^2T_{2g} \rightarrow ^2 E_g$ (B) $^2T_{2g} \rightarrow ^4 T_{1g}$

(C) $^2T_{2g} \rightarrow ^2 A_{1g}$ (D) $^2T_{2g} \rightarrow ^4 E_g$

32. Which of the following organometallic fragments is NOT isolobal with methyl radical?

(A) $Fe(CO)_4$ (B) $Co(CO)_3$

(C) BH_3 (D) $Mn(CO)_5^+$

33. A π-cyclopentadienyl $(\eta^5 - Cp)$ complex of a Group-6 metal shows a temperature-dependent NMR pattern that collapses from 10 signals to 2 signals at 320 K. What fluxional process is most consistent?

(A) Berry pseudorotation

(B) Ring-whizzing ($\eta^5 \leftrightarrow \eta^1 \leftrightarrow \eta^3$ interchange)

(C) Agostic hydrogen migration

(D) $\eta^5 - Cp \leftrightarrow \eta^3 - Cp$ hapticity shift

34. The most stable sulphur-nitrogen compound among the following is :

(A) S_2N_2 (B) S_4N_4

(C) S_3N_6 (D) S_8N_4

35. A crystal shows strong reflections only when h, k, l are either all even or all odd. The Bravais lattice is :

(A) Simple cubic (B) Body-centered cubic

(C) Face-centered cubic (D) Hexagonal primitive

36. Inverse spinel Fe_3O_4 has :

(A) Fe^{2+} in tetrahedral sites, Fe^{3+} in octahedral

(B) Fe^{3+} split between tetrahedral and octahedral sites, Fe^{2+} in tetrahedral

(C) Fe^{3+} in tetrahedral, Fe^{2+} and Fe^{3+} in octahedral

(D) Fe^{2+} split equally between tetrahedral and octahedral

37. The photoconductivity of a solid increases sharply when irradiated with photons of energy slightly above the band gap because :

(A) Carrier concentration increases exponentially

(B) Lattice vibrations decrease

(C) Lattice vibrations increase

(D) Fermi level shifts into conduction band

38. Atropisomerism results from :

(A) Rapid rotation

(B) Planar chirality

(C) Restricted rotation around a single bond

(D) Hyper conjugation

39. The two α-hydrogen atoms in 3-chlorobutanoic acid are :

(A) homotopic

(B) enantiotropic

(C) diastereotopic

(D) conformational isomers

40. Thermal electrocyclic ring closure of (2*E*, 4*Z* 6*K*)-octatriene gives :

(A) trans-5,6-dimethyl-1,3-cyclohexadiene

(B) cis-5,6-dimethyl-1,3-cyclohexadiene

(C) 1,3-cyclooctadiene

(D) 1,3-cyclohexadiene

41. When a photo excited ketone is treated with an alkene an oxetane is produced. This reaction is known as :

(A) Paterno-Buchi reaction

(B) Norrish type I reaction

(C) Norrish type II reaction

(D) Photo-Fries reaction

42. The C=O stretching vibration for acetyl chloride occurs approximately at :

(A) 1800 cm^{-1}

(B) 1600 cm^{-1}

(C) 1700 cm^{-1}

(D) 1750 cm^{-1}

43. An organic compound shows a ^{13}C NMR chemical shift value above 200 ppm. The compound is most probably a/an :

(A) Carbonyl compound

(B) Alkane

(C) Alkene

(D) Alcohol

44. What is the product formed when erythro dl pair of 3-bromo-2-butanol is treated with HBr?

(A) dl pair of 2,3-dibromobutane

(B) Meso-2,3-dibromobutane

(C) 2-bromobutane

(D) 2,3-dihydroxybutane

45. How many radial and angular nodes are possible for 4d orbital?

(A) 2 radial nodes and 1 angular node

(B) 1 radial nodes and 2 angular nodes

(C) 3 radial nodes and 2 angular nodes

(D) 4 radial nodes and 2 angular nodes

46. Which statistics is commonly applied for dilute systems?

(A) Maxwell-Boltzmann (B) Bose-Einstein

(C) Fermi-Dirac (D) All the above

47. Which among the following statements are correct regarding transition moment integral $\int \psi_i \hat{p}\ \psi_f d\bar{i}$?

(i) The ground state ψ_i need not be totally symmetrical.

(ii) The magnitude of transition moment integral for allowed transition must be non zero

(iii) For MW spectra, the transition moment operator is the dipole moment vector

(iv) If the direct product representation of transition moment integral is obtained as B_1 ie $\int \psi_i \hat{p}\ \psi_f dT = B_1$ in C_2V point group, it is considered as an allowed transition.

(A) (i), (iv) (B) (i), (iii)

(C) (ii), (iii) (D) (iii), (iv)

48. How many ESR lines are possible for 1, 4-Benzosemiquinone radical anion?

(A) 3 (B) 5

(C) 4 (D) 6

49. Which of the following statements are correct about Mossbauer spectra?

(i) Isomer Shift depends on 5 electron density of the excited and ground state nuclei.

(ii) Quadrupole splitting does not occur for symmetrical field gradient at the nucleus.

(iii) Doppler effect and recoil energy are not affecting Mossbauer spectra.

(iv) The energy of the γ-ray must be ideally between 100 – 1000 keV

(A) (i), (iv) (B) (i), (iii)

(C) (iii), (iv) (D) (i), (ii)

50. The expression for mean free path of a molecule is :

(A) $\frac{K_b T}{\sqrt{2}\pi\sigma^2 P}$ (B) $\frac{K_b T}{\sqrt{2}\pi\sigma P}$

(C) $\frac{P}{\sqrt{2}\pi\sigma^2 K_b T}$ (D) $\frac{K_b P}{\sqrt{2}\pi\sigma^2 T}$

51. Among the following methods, which one is suitable for studying the kinetics of gas phase fast reactions in which wall effects interfere?

(A) Flash photolysis (B) Shock tube method

(C) Flow method (D) Pulse radiolysis

52. For the reaction between $S_2O_3^{2-}$ and I^- ion, which statements are correct?

(i) Rate constant increases with increases in ionic strength

(ii) Rate constant decreases with increases in ionic strength

(iii) Rate constant is independent of ionic strength

(iv) Volume of activation for this reaction is negative (–ve)

(A) (i), (ii) (B) (i), (iii)

(C) (i), (iv) (D) (iii), (iv)

53. In neutron activation analysis, the primary radiation detected is :

(A) Alpha particles (B) Beta rays

(C) Gamma rays (D) X-rays

54. The function of a supporting electrolyte in polarography is to suppress :

(A) Diffusion current (B) Migration current

(C) Residual current (D) Convection current

55. The technique in which the emission of photons from analytes are brought to an excited state by the use of high energy plasma is :

(A) ICP AES
(B) AAS
(C) FES
(D) SEM

56. When the number of theoretical plates is large, the column will be more?

(A) heavy
(B) efficient
(C) costly
(D) light

57. Which thermal method is used to study difference in temperature of reference and sample, measured as a function of same applied temperature?

(A) TG
(B) DSC
(C) DTA
(D) TT

58. In analytical chemistry, a coulometer measures the :

(A) colour changes in a solution
(B) volume of a solution
(C) temperature of the solution
(D) quantity of electricity required for a chemical change of the analyte

59. A voltammetric technique in which current is measured as a function of time at constant potential is :

(A) Amperometry
(B) Cyclic voltammetry
(C) Normal polarography
(D) Square wave polarography

60. The most widely used signals in SEM are from :

(A) Auger electrons
(B) Characteristic X-rays
(C) Back scattered electrons
(D) Secondary electrons

61. Which historical development significantly improved the accuracy of suspect identification in the early twentieth century?

(A) Introduction of lie detectors
(B) Digital microscopy
(C) Discovery of fingerprint individuality
(D) Development of chromatography

62. _____ courts function as *Mahila* courts.

(A) Principal Sessions courts

(B) Additional Sessions courts

(C) District and Sessions courts

(D) Assistant Sessions courts

63. In the context of Locard's principle of exchange, which of the following scenarios most accurately demonstrates a secondary transfer that can still be considered significant evidence during reconstruction of crime scene?

(A) Fibres from a suspect's jacket found directly on the victim's torn clothing during physical contact

(B) Soil from the crime scene found embedded in the soles of the suspect's shoes immediately after the crime

(C) Glass shards from a broken window found on the suspect's gloves used during the burglary

(D) A victim's hair found on the upholstery of a taxi that the suspect boarded after fleeing the crime scene

64. Which Forensic Laboratory in India is uniquely placed under the CBI instead of the ministry of Home Affairs?

(A) CFSL Pune

(B) CFSL Delhi

(C) CFSL Kolkata

(D) CFSL Guwahati

65. Which one of these is a search method particularly suited for complex crime scenes where fine trace evidence might be missed by visual inspection?

(A) Wide angle photography

(B) Sketching the scene by hand

(C) Handful soil sampling

(D) Alternate light source (ALS) examination

66. During microscopic examination of a hair sample, a forensic scientist observes pigment granules that vary in shape, size and distribution along the shaft. Which structural layer is being analyzed and why is it critical for forensic comparison?

(A) Cuticle: because its scale pattern determines species-specific origin

(B) Medulla: because its index indicates hair growth phase

(C) Cortex: because its pigment granules provide individualized color and pattern characteristics

(D) Hair root: because it contains mitochondrial DNA suitable for identification

67. Which of the following statements about forensic soil evidence is false?

(A) All soils are chemically identical in a given region, so differentiation is impossible

(B) Soil can adhere to a suspect's clothing and shoes, linking them to a crime scene

(C) Soil analysis includes examination of mineral content, organic matter and trace particles

(D) Soil evidence is considered class evidence but can provide probative information

68. Which instrumental technique is most definitive for identifying the chemical composition of individual layers in a multilayered paint sample?

(A) Micro Spectro Photometry (MSP)- for color comparison

(B) Fourier Transform Infrared Spectroscopy-(FTIR)-for molecular fingerprinting

(C) Polarising Light Microscopy (PLM)- for refractive index and layer thickness

(D) Scanning electron microscope with EDX (SEM-EDX)-for chemical composition

69. Correct statement regarding lip prints according to Suzuki and Tsuchihashi classification:

(A) Type I lip prints are the most common pattern in the general population.

(B) Type II lip prints represents the branched grooves.

(C) Type III lip prints represents the reticular pattern.

(D) Type IV lip prints are commonly seen among children.

70. All the following statement are correct regarding adolescent dental age estimation between 10 to 18 yrs.

(i) Demirjian method is based on eight developmental stages of calcification of seven left mandibular permanent teeth.

(ii) Cameriere's method is based on the relationship between age and the degree of open apices in tooth roots.

(iii) Olze method is based on visual radiographic comparison of tooth development and alveolar eruption on the right side of the jaw with standard figures

(A) Only (ii) and (iii)

(B) All of these (i), (ii) and (iii)

(C) Only (i) and (iii)

(D) Only (i) and (ii)

71. All are true regarding Bayard's spots except:

(A) It can be seen in electrocution and coronary thrombosis.

(B) It is most commonly seen anterior and basal portions of lungs in cases of hanging.

(C) It is pathognomonic of asphyxial death.

(D) Occur due to increased venous pressure in the thorax caused compressing of the neck.

72. Incorrect statement regarding new amendments of sexual offense law in the Bharatiya Nyaya Sanhita, 2023 (BNS):

(A) Section 79 of BNS criminalizes disclosure of identity of the victims of sexual offences.

(B) Section 77 of BNS criminalizes watching or capturing images/videos of a woman in private acts where she expects not to be seen.

(C) Section 75 of BNS defines sexual harassment is the unwelcome touching or other physical contact

(D) Section 74 of BNS criminalizes assault or use of criminal force to woman with intent to outrage her modesty.

73. All are true regarding Paraquat poisoning except:

(A) Delayed respiratory failure is the classical cause of death.

(B) It produces reactive oxygen-free radicals causing pulmonary fibrosis.

(C) It is rapidly but incompletely absorbed and largely eliminated unchanged in urine.

(D) It is a bipyridinium herbicide which causes miosis and cholinergic crisis.

74. Which among the following statement is/are false with respect to aconite poison?

(i) Aconite species contain diterpene (C20) and norditerpene (C 19) alkaloids.

(ii) C 20 has high toxicity and esterified C 19 has low toxicity.

(A) None (B) Only (i)

(C) Only (ii) (D) Both (i) and (ii)

75. True statement regarding cocaine metabolism:

(i) Benzoylecgonine is a major metabolite produced by liver esterases and plasma cholinesterase.

(ii) Benzoylecgonine assays may be successful in urine up to 2 to 3 days due to the long elimination half-life.

(iii) Cocaine benzoylecgonine can be analysed in hair samples by GC-MS and RIA.

(A) All of these (i), (ii), (iii)
(B) Only (ii) and (iii)
(C) Only (i) and (ii)
(D) Only (ii)

76. Incorrect statement with respect to analytical methods used in toxicology:

(A) Enzyme mediated immunoassay technique (EMIT) works on the principle that the amount of drug present is inversely proportional to the inhibition of an enzyme-substrate reaction.

(B) High Performance Liquid Chromatography (HPLC) movement of the specimen through the columns packed with chromatographic adsorbent is facilitated by a high-pressure pump.

(C) Neutron Activation Analysis (NAA) is a method based on the principle that many substances become radioactive when exposed to bombardment by neutrons.

(D) Ultraviolet-Visible (UV-Vis) Spectrophotometry is based on the principle that many drugs when in solution will absorb UV radiation.

77. Which of the following statement is/are true with respect to classical signs of asphyxia?

(i) Tardieu spots are due to increased venous pressure in small venules and arterioles.

(ii) Engorgement of right side of heart is due to diminished suction power of left ventricle.

(iii) Increased fluidity of blood is due to fibrinolysis triggered by a surge of catecholamines during the agonal period.

(A) Only (ii) and (iii)
(B) Only (i) and (ii)
(C) Only (i) and (iii)
(D) All of these (i), (ii) and (iii)

78. Features of early post-mortem changes in the eye after death is/are:

(i) Intraocular pressure becomes 10 mm Hg after 3 hours after clinical death.

(ii) Outline of optic disk becomes blurred within 6 hours after clinical death.

(iii) Tache noir formation within 30 minutes of death.

(A) All of these (i), (ii), (iii)
(B) Only (i) and (iii)
(C) Only (i) and (ii)
(D) Only (ii)

79. All are true regarding 'Harvard criteria 1969' to diagnose brain stem death, except:

(A) EEG is mandatory.

(B) Duration of testing of respiration is 6 minutes.

(C) Repetition of test after 24 hours.

(D) Spinal reflexes are important.

80. Which bone has highest sex determination accuracy?

(A) Clavicle (B) Femur

(C) Mandible (D) Pelvis

81. Abrin, the toxin from Abrusprecatorius, causes:

(A) Gastrointestinal haemorrhage and bowel oedema

(B) Loss of inhibition of Renshaw cells

(C) Paralysis due to neuromuscular blockade

(D) Severe central anticholinergic syndrome

82. All are true regarding carbamates poisoning, except:

(A) Carbamylate serine moiety of acetyl choline esterase

(B) Irreversible binding to acetyl choline esterase

(C) Miosis occurs late in severe poisoning

(D) Shorter duration of action

83. Which sedative-hypnotic most commonly produces a bullous skin lesions?

(A) Alprazolam (B) Phenobarbital

(C) Lorazepam (D) Zolpidem

84. Choose the incorrect statement regarding breath alcohol estimation:

(A) Acetone in diabetics may cause interference in infrared based breath analyzers.

(B) Classical chemical breath test for alcohol is based on oxidation of ethanol by potassium dichromate.

(C) Ratio of blood alcohol concentration to breath alcohol concentration used in breath analyzers is 2100:1.

(D) Tidal air is the most accurate portion of expired air for breath alcohol estimation.

85. After seizure, a mobile device is kept in a ———————— to avoid remote wiping, data tampering, and network connectivity:

(A) Faraday bag
(B) Gamma-ray bag
(C) Electromagnetic bag
(D) Radioactive bag

86. Dynamic Host Configuration Protocol (DHCP) was developed to provide automated IP address assignments, reducing manual work for administrators. DHCP logs can show an investigator exactly which ———————— was assigned the IP address in question during the specified time.:

(A) conceptual network card
(B) virtual network card
(C) logical network card
(D) physical network card

87. The Viola-Jones algorithm is primarily used to detect ———————— in biometrics.:

(A) fingerprint
(B) faces
(C) gait
(D) iris

88. The presence of VMWare virtual machine artifacts on a hard disk image is often confirmed by identifying files such as the .vmdk (virtual hard drive for the guest operation system) and the .vmem (backup of the virtual machine's paging file), what does .vmss file depicts:

(A) virtual machine snapshot file
(B) virtual machine suspended state file
(C) virtual machine snapshot metadata
(D) virtual machine supplemental team configuration file

89. Brain and kidney have which LDH isoenzymes?

(A) LDH1
(B) LDH3
(C) LDH2
(D) None of the above

90. Which is the most abundant and universally distributed unusual base present in t-RNA?

(A) Pseudouridine
(B) Ribothymidine
(C) Inosine
(D) 5-methylcytosine

91. Prostaglandins are present in semen; which is derived from which fatty acids?

(A) Arachidonic acid
(B) Prostate
(C) Butenoic Acids
(D) Linoleic acids

92. Who stabilizes the helical structure of DNA and RNA, protecting genetic information and enabling proper function?

(A) Nucleotides
(B) Codon-anticodon interaction
(C) Base stacking
(D) None of the above

93. A corpse was found in an open field. The first wave of insects from *Calliphoridae* family were present and were actively ovipositing. These insects are most likely to be:

(A) Silphid beetle
(B) Rove beetles
(C) Blow flies
(D) Muscid flies

94. Which of the following statements are true regarding DNA barcoding of species?

(i) DNA barcoding has been shown to be particularly effective in identifying a wide range of northern hemisphere bird species

(ii) In DNA barcoding, cytochrome oxidase I (COI) gene works well for both plant and animal species.

(iii) Scientists identified combination of matK and rbcL genes as barcode for plants.

(A) (i) and (ii)
(B) (i) and (iii)
(C) (ii) and (iii)
(D) Only (i)

95. Of the methods used to remove numbers punched on metals, which of the following will permanently remove all recoverable traces of original number?

(A) Filing and Drilling
(B) Drilling and Peening
(C) Peening and Welding
(D) Welding and Drilling

96. Which of the following are the essential components of Mac Naughten's Standard?

(i) The presence of psychopathology: disease of the mind, resulting in

(ii) A defect of reason, such that the person

(iii) Lacks knowledge concerning the nature, quality and/or wrongfulness of the act

(iv) There must be no evidence of planning or premeditation by the defendant before the criminal act was committed.

(A) (i), (ii) and (iii)
(B) (i) and (iv)
(C) (ii), (iii) and (iv)
(D) (i), (ii) and (iv)

97. Which of the following strategies are found to be common for disguised handwriting but not for disguised signatures?

(i) Greater pen stops and pen lifts

(ii) Unusual letter form

(iii) Change of slope

(A) (i), (ii) and (iii)
(B) (i) and (ii)
(C) (ii) and (iii)
(D) Only (i)

98. The formation of halo of ink around the character (called ink squash) is a characteristic property of :

(i) Letterpress printing

(ii) Flexography

(iii) Stamp impression

(iv) Planographic printing

(A) (i), (ii) and (iii)
(B) (i), (iii) and (iv)
(C) (ii), (iii) and (iv)
(D) (i), (ii) and (iv)

99. Which of the following problem generally arises while analyzing ink sample by Raman spectrophotometer?

(A) Two different samples showing similar patterns

(B) The quantity of detected compound cannot be determined

(C) Some chemicals do not readily form gases

(D) Occurrence of fluorescence signal

100. Which of the following water marking techniques gives a sharp edge definition?

(i) Wire mark.

(ii) Shaded mark

(iii) Mollete process

(iv) Embossed watermark

(A) (i), (ii) and (iii)
(B) (i), (iii) and (iv)
(C) (ii), (iii) and (iv)
(D) (i), (ii) and (iv)

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