MIZORAM PUBLIC SERVICE COMMISSION

COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF FOREST RANGER UNDER ENVIRONMENT, FORESTS & CLIMATE CHANGE DEPARTMENT, GOVERNMENT OF MIZORAM, JUNE, 2024.

GENERAL SCIENCE - I

Time Allowed : 2 hours   Full Marks : 200

All questions carry equal marks of 2 each.
Attempt all questions.

1. Which of the following is not a characteristic of the sporophyte generation in the life cycle of Bryophyta?
   - (a) Produces spores
   - (b) Dominant and photosynthetic
   - (c) Develops from the zygote
   - (d) Grows on the gametophyte

2. The phenomenon of mixotrophy, where an organism combines autotrophy and heterotrophy, is most commonly observed in which group of algae?
   - (a) Diatoms
   - (b) Euglenoids
   - (c) Dinoflagellates
   - (d) Green algae

3. The unique water-conducting cells found in the stems of some mosses are called:
   - (a) Tracheids
   - (b) Vessels
   - (c) Hydroids
   - (d) Leptoids

4. The arrangement of flowers on an inflorescence can provide insights into the plant's evolutionary strategy for:
   - (a) Maximizing pollen dispersal
   - (b) Attracting specific pollinators
   - (c) Facilitating vegetative reproduction
   - (d) Allowing self-pollination

5. The stimulating compound found in coffee that shares similarities with caffeine is:
   - (a) L-theanine
   - (b) Theobromine
   - (c) Nicotine
   - (d) Ephedrine

6. The primary advantage of CAM photosynthesis is its ability to:
   - (a) Capture more light energy
   - (b) Fix CO_2 more efficiently than C_3 plants
   - (c) Minimize water loss
   - (d) Produce oxygen at night

7. Which enzyme is responsible for fixing CO_2 in the mesophyll cells of C4 plants?
   - (a) Rubisco
   - (b) PEP carboxylase
   - (c) ATP synthase
   - (d) Pyruvate kinase

8. The CO_2 fixed by CAM plants is stored in the form of:
   - (a) Glucose
   - (b) Starch
   - (c) Malic acid
   - (d) Ribulose-1, 5-bisphosphate

9. The new DNA strand synthesized continuously in the 5' to 3' direction during DNA replication is called the:
   - (a) Leading strand
   - (b) Lagging strand
   - (c) Okazaki strand
   - (d) Template strand

10. The bond formed between two amino acids during protein synthesis is called a:

    (a) Glycosidic bond   (b) Peptide bond

    (c) Ionic bond   (d) Hydrogen bond

11. Epistasis refers to the phenomenon where the expression of one gene masks the expression of another gene at a different locus. The gene that does the masking is referred to as the:

    (a) Epistatic gene   (b) Hypostatic gene

    (c) Dominant gene   (d) Recessive gene

12. The enzyme responsible for catalyzing the conversion of atmospheric nitrogen (N_2) to ammonia (NH_3) is called:

    (a) Nitrate reductase   (b) Ammonia synthase

    (c) Nitrogenase   (d) Nitrite reductase

13. Quinolone antibiotics, such as ciprofloxacin, target bacterial:

    (a) Cell wall synthesis   (b) DNA gyrase

    (c) RNA polymerase   (d) Protein synthesis

14. Apomixis refers to a mode of reproduction where seeds are produced:

    (a) Through fertilization by pollen   (b) Without fertilization

    (c) By vegetative propagation   (d) By self-pollination

15. Which plant, known for its potential anti-diabetic properties, is widely used in traditional Indian medicine systems?

    (a) Lavender   (b) Aloe vera

    (c) Eucalyptus   (d) Lemongrass

16. The energy available to a trophic level for consumption is often referred to as the:

    (a) Gross primary productivity   (b) Net primary productivity

    (c) Energy budget   (d) Trophic efficiency

17. Secondary succession occurs when an ecosystem:

    (a) Undergoes primary succession   (b) Experiences a natural disaster

    (c) Transitions from aquatic to terrestrial   (d) Undergoes changes in climate

18. Acid rain primarily forms due to the emission of sulfur dioxide (SO_2) and nitrogen oxides (NOx) from industrial processes and vehicles. In the atmosphere, these compounds react with:

    (a) Oxygen (O_2)   (b) Carbon dioxide (CO_2)

    (c) Water vapor (H_2O)   (d) Methane (CH_4)

19. The "albedo effect" pertains to the Earth's surface reflecting solar radiation. Which of the following surfaces has the highest albedo?

    (a) Snow-covered terrain   (b) Rainforest canopy

    (c) Desert sand   (d) Open ocean

20. The "biotic homogenization" phenomenon in biodiversity conservation refers to:

    (a) The gradual loss of species diversity

    (b) The introduction of invasive species to restore ecosystems

    (c) The rapid expansion of protected areas

    (d) The migration of endangered species to new habitats

21. Binomial nomenclature consists of two words
    (a) Genus & Species
    (b) Genus & Subspecies
    (c) Genus & Family
    (d) Species & Variety

22. Which of the following cell organelles is absent in animal cells and present in a plant cell?
    (a) Cell wall
    (b) Cytoplasm
    (c) Vacuoles
    (d) Mitochondria

23. Which of the following cell organelles is called a suicidal bag?
    (a) Lysosomes
    (b) Golgi bodies
    (c) Cell membrane
    (d) Mitochondria

24. Chromosome structure can be observed best during ____
    (a) Anaphase
    (b) Metaphase
    (c) Prophase
    (d) None of the above

25. The fragments of DNA are joined together by which of the following enzymes?
    (a) Endonuclease
    (b) DNA polymerase
    (c) Primase
    (d) Ligase

26. The process by which protein synthesis from genetic code occurs is best described by
    (a) transcription
    (b) translation
    (c) replication
    (d) reproduction

27. Mendel took _____ contrasting characteristics of pea plants.
    (a) eight
    (b) seven
    (c) six
    (d) five

28. What is the substitution of a purine base with a pyrimidine base known as?
    (a) Deletion
    (b) Transition
    (c) Addition
    (d) Transversion

29. What are the small peaks achieved by the repetitive DNA during the density gradient centrifugation process of DNA finger printing known as?
    (a) Non repetitive DNA
    (b) Trough
    (c) Satellite DNA
    (d) Histone DNA

30. The reason why the right kidney is slightly lower than the left is
    (a) the left kidney is bigger than right
    (b) considerable space occupied by the heart
    (c) considerable space occupied by the liver on the right side
    (d) the right kidney is bigger than the left

31. For the first time, research on nerve cells was carried out on this organism
    (a) Grasshopper
    (b) Drosophila melanogaster
    (c) Octopus
    (d) Giant squid

32. If a disease jumps from a non-human animal to a human, then it is termed as
    (a) Zoonotic disease
    (b) Infectious disease
    (c) Congenital disease
    (d) Iatrogenic disease

33. Which of the following is most important for speciation ?
    (a) Seasonal isolation
    (b) Reproductive isolation
    (c) Behavioural isolation
    (d) Tropical isolation

34. The theory of natural selection was given by
  (a) Lamarck
  (b) Alfred Wallace
  (c) Charles Darwin
  (d) Oparin and Haldane

35. In the 28 day human ovarian cycle, the ovulation takes place typically on
  (a) day 14 of the cycle
  (b) day 28 of the cycle
  (c) day 1 of the cycle
  (d) day 5 of the cycle

36. An important drug used for the treatment of malaria – Quinine is extracted from
  (a) Red ants
  (b) Calyx of *cinnamon*
  (c) Bark of tulsi
  (d) Bark of *Cinchona*

37. Swine flu is caused by?
  (a) H1N1 virus
  (b) HIV
  (c) Mumps virus
  (d) Protozoa

38. The natural place of an organism or community is known as
  (a) Niche
  (b) Biome
  (c) Habitat
  (d) Habit

39. Which of the following term defines the ability of the individual in the population to produce new individuals?
  (a) Dispersion
  (b) Mortality
  (c) Natality
  (d) Population dispersal

40. What is the name of the species whose population has recently declined and continues to decline?
  (a) Endangered
  (b) Rare
  (c) Vulnerable
  (d) Indeterminate

41. When 3p orbitals are completely filled, the newly entering electron goes in to
  (a) 3d
  (b) 4s
  (c) 4p
  (d) 2d

42. The electronic configuration of Chromium can be written as
  (a) $[Ar] 4s^2$
  (b) $[Ar] 3d^6 4s^2$
  (c) $[Ar] 3d^5 4s^1$
  (d) $[Ar] 3d^4 4s^2$

43. The shape of the orbital with the value of $l = 2$ and $m = 0$ is
  (a) dumb-bell
  (b) spherical
  (c) diffuse
  (d) trigonal planar

44. Heisenberg's uncertainty principle rules out the exact simultaneous measurement of
  (a) probability and intensity
  (b) energy and velocity
  (c) charge density and radius
  (d) position and velocity

45. The number of sp^2-s sigma bond in benzene is
  (a) 3
  (b) 4
  (c) 6
  (d) 12

46. In a covalent solid, the lattice points are occupied by
  (a) ions
  (b) atoms
  (c) molecules
  (d) electrons

47. In which of the following S-atom does not assume sp^3 hybridisation?
    (a) SF_2
    (b) SO_4^{2-}
    (c) SF_4
    (d) S_8

48. The equilateral shape has
    (a) sp-hybridisation
    (b) sp^2-hybridisation
    (c) sp^3-hybridisation
    (d) sp^3d-hybridisation

49. Which of the following isotope of Uranium is most radioactive?
    (a) U-238
    (b) U-235
    (c) U-248
    (d) U-226

50. The half-life of a radioactive substance is 100 days. After 400 days, 1 g of element is reduced to
    (a) 0.5 g
    (b) 0.25 g
    (c) 0.0625 g
    (d) 0.125 g

51. The arrangement used to carry out the fission reaction in a controlled manner is called
    (a) moderator
    (b) nuclear reactor
    (c) nuclear fusion
    (d) thermonuclear fission

52. A gas expands isothermally and reversibly. The work done by the gas is
    (a) minimum
    (b) maximum
    (c) zero
    (d) cannot be determined

53. Which of the following describes the criterion of spontaneity?
    (a) $\Delta S_{(TOTAL)} = 0$
    (b) $\Delta S_{(TOTAL)} > 0$
    (c) $\Delta G_{(T,P)} > 0$
    (d) $\Delta H_{(T,P)} > 0$

54. Which one of the following is correct?
    (a) $-\Delta G = \Delta H - T\Delta S$
    (b) $\Delta S = 1/T\,[\Delta H - \Delta G]$
    (c) $\Delta H = \Delta G - T\Delta S$
    (d) $\Delta S = 1/T\,[\Delta G - \Delta H]$

55. Which of the following has highest entropy?
    (a) graphite
    (b) mercury
    (c) hydrogen
    (d) water

56. The transition of electron in hydrogen atom that will emit maximum energy is
    (a) $n_3 \rightarrow n_2$
    (b) $n_4 \rightarrow n_3$
    (c) $n_5 \rightarrow n_4$
    (d) $n_6 \rightarrow n_5$

57. The dual nature of radiation was proposed by
    (a) Max Planck
    (b) de-broglie
    (c) Einstein
    (d) Niel-Bohr

58. A region in space around the nucleus of an atom where the probability of finding the electron is maximum is called
    (a) orbital
    (b) orbit
    (c) nucleus
    (d) electron shell

59. The two electrons occupying an orbital are distinguished by
    (a) principal quantum number
    (b) azimuthal quantum number
    (c) magnetic quantum number
    (d) spin quantum number

60. No two electrons in an atom will have all the four quantum numbers same. This statement is known as
    (a) uncertainty principle
    (b) Hund's rule
    (c) Aufbau principle
    (d) Pauli's exclusion principle

61. Let $S = \{0,1,5,4,7\}$. Then the total number of subsets of S is
    (a) 64
    (b) 32
    (c) 40
    (d) 20

62. Let $f : X \to Y$ be a given function, then f^{-1} exist (or f is invertible) if
    (a) f is one-one
    (b) f is onto
    (c) f is one-one but not onto
    (d) f is one-one and onto

63. In a class of 100 students, 55 students have passed in Mathematics and 67 students have passed in Physics. Then the number of students who have passed in Physics only is
    (a) 22
    (b) 33
    (c) 10
    (d) 45

64. Read the following statement and choose the correct answer :
    (i) Every rational and irrational numbers are real numbers.
    (ii) A number of the form $\dfrac{p}{q}$, where $q \neq 0$ are rational numbers.
    (iii) A number of the form $a + ib, a, b \in \mathbb{R}$, are complex numbers.
    (iv) non-terminating, non-repeating decimals are irrational numbers.
    (a) all are correct
    (b) only (i) is correct
    (c) only (iv) is incorrect
    (d) (ii) & (iii) are incorrect

65. The number $1 + i$ in De-moivre's form is
    (a) $\sqrt{2}\left(\cos\dfrac{\pi}{2} + i\sin\dfrac{\pi}{2}\right)$
    (b) $2\left(\cos\dfrac{\pi}{4} + i\sin\dfrac{\pi}{4}\right)$
    (c) $\sqrt{2}\left(\cos\dfrac{\pi}{4} + i\sin\dfrac{\pi}{4}\right)$
    (d) $2\left(\cos\dfrac{\pi}{2} + i\sin\dfrac{\pi}{2}\right)$

66. If $A = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$, then the co-factor of the element a_{23} will be given by

    (a) $-\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}$
    (b) $-\begin{vmatrix} a_{11} & a_{12} \\ a_{31} & a_{32} \end{vmatrix}$

    (c) $-\begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix}$
    (d) $\begin{vmatrix} a_{11} & a_{12} \\ a_{31} & a_{32} \end{vmatrix}$

67. The the number of 4 letter words, with or without meaning, which can be formed out of the letters of the word ROSE, where the repetition of the letters is not allowed is
    (a) 16
    (b) 12
    (c) 20
    (d) 24

68. If $\tan A = \dfrac{a}{a+1}$ and $\tan B = \dfrac{1}{2a+1}$, then the value of $A+B$ is

(a) 0

(b) $\dfrac{\pi}{2}$

(c) $\dfrac{\pi}{3}$

(d) $\dfrac{\pi}{4}$

69. The value of $\dfrac{\sin(-660°)\tan1050°\sec(-420°)}{\cos(225°)\cos ec(315°)\cos(510°)} =$

(a) $\dfrac{2}{\sqrt{3}}$

(b) $\dfrac{\sqrt{3}}{2}$

(c) $\dfrac{4}{\sqrt{3}}$

(d) $\dfrac{\sqrt{3}}{4}$

70. If the function $f(x) = \begin{cases} kx^2 & , \text{If } x > 2 \\ 3 & , \text{If } x \le 2 \end{cases}$ is continuous at $x = 2$, then the value of k is :

(a) 3

(b) 2

(c) 3/4

(d) 3/2

71. If $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$ then $\dfrac{dy}{dx}$ is

(a) $\tan\theta$

(b) $-\tan\theta$

(c) $Cot\ \theta/2$

(d) $\tan \theta/2$

72. The function $f(x) = 2x^3 - 15x^2 + 36x + 4$ has a maximum value at

(a) $x = 3$

(b) $x = 2$

(c) $x = 4$

(d) $x = 0$

73. On uniform heating, the side of a square sheet of metal is increasing at the rate of 0.02 cm/sec. The rate at which the area is increasing when the side is 10cm long is

(a) $0.4\ \text{cm}^2/\text{sec}$

(b) $0.2\ \text{cm}^2/\text{sec}$

(c) $4.0\ \text{cm}^2/\text{sec}$

(d) $40\ \text{cm}^2/\text{sec}$

74. The value of the integral $\int \dfrac{e^{\tan^{-1}x}}{\left(1+x^2\right)}dx$ is

(a) $\dfrac{1}{2}\log x + C$

(b) $e^{\tan^{-1}x} + C$

(c) $\dfrac{1}{3}\tan x + C$

(d) $\tan^{-1}(1+x^2) + C$

75. The value of the definite integral $\displaystyle\int_{1}^{\sqrt{3}} \dfrac{dx}{\sqrt{4-x^2}}$ is equal to

(a) $\dfrac{\pi}{2}$

(b) $\dfrac{\pi}{3}$

(c) $\dfrac{\pi}{6}$

(d) $\dfrac{\pi}{4}$

76. The area bounded by the two parabolas $y = x^2$ and $y^2 = x$ is
    (a) 1/2 Sq. Units
    (b) 1/3 Sq. Units
    (c) 1/4 Sq. Units
    (d) 2/3 Sq. Units

77. The solution of differential equation xdy - ydx = 0 represents
    (a) a rectangular hyperbola
    (b) Straight line passing through origin
    (c) Parabola whose vertex is at the origin
    (d) Circle whose centre is at origin

78. If the value of the mode is 65 and the median = 61.6, then the value of the mean is
    (a) 29.1
    (b) 58.2
    (c) 19.4
    (d) 59.9

79. The variance of the following scores in an exam is 92, 95, 85, 80, 75, 50
    (a) 1317.50
    (b) 263.5
    (c) 219.58
    (d) 79.5

80. In World Wide Web, HTTP stands for
    (a) Hyper Text Transfer Protocol
    (b) Hyper Tranport Text Protocol
    (c) Hyper Text Tranport Protocol
    (d) None of these

81. An earthquake starts at the initial point of rupture is called ….
    (a) Epicenter
    (b) Focus
    (c) Focal depth
    (d) Seismic center

82. According to Indian Seismic Zone Map as per IS: 1893 (Part 1)-2002, NE India falls in...
    (a) Zone II
    (b) Zone III
    (c) Zone IV
    (d) Zone V

83. The age of the Universe in the Big Bang theory is....
    (a) 4.6 billion years
    (b) 8.7 billion years
    (c) 13.7 billion years
    (d) 18.6 billion years

84. Which Scientist proposed the Nebular Hypothesis?
    (a) Pierre Laplace
    (b) Albert Einstein
    (c) James Jean
    (d) Isaac Newton

85. The topographically highest point of a fold, which need not coincide with the fold hinge is called …
    (a) Fold axis
    (b) Crest
    (c) Amplitude
    (d) Trough

86. In practice, heavy minerals are usually considered to be those with specific gravities greater than ….
    (a) 0.8
    (b) 1.8
    (c) 2.8
    (d) 3.8

87. The study of the processes leading to fossilization is known as ….
    (a) ichnology
    (b) moulds
    (c) taxonomy
    (d) taphonomy

88. In fossils preservation, If the original spaces in the shell are impregnated with extra minerals is said….
    (a) permineralized
    (b) replacement
    (c) carbonization
    (d) body fossil

89. The instrument used for measuring a magnetic intensity of rock is called…
    (a) Gravitometer
    (b) Intensity meter
    (c) Magnetometer
    (d) Anomaly meter

90. On every occasion, the first step to acquire in any mineral exploration programme is …
   (a) Geological map
   (b) Geophysical exploration
   (c) Occam's razor
   (d) Road making

91. Which is an example of active sensor for procuring remote sensing data?
   (a) Multispectral Scanner (MSS)
   (b) Landsat Thematic Mapper (TM)
   (c) Reflection Radiometer (ASTER)
   (d) Radar (microwave)

92. When the conditions depart from average conditions for a particular place at a given time of year shown by a map is called.....
   (a) Assay map
   (b) Anomaly map
   (c) Isograde map
   (d) Temperature map

93. The process of water movement through a plant and its evaporation is called..
   (a) Discharge
   (b) Gradient
   (c) Precipitation
   (d) Transpiration

94. A well-sorted sedimentary deposit having...
   (a) small porosity
   (b) low porosity
   (c) high porosity
   (d) no porosity

95. About 98% of Coal annually produced in India comes from the formation of …
   (a) Tertiary
   (b) Lower Gondwana
   (c) Upper Gondwana
   (d) Miocene

96. About 82-87% of Petroleum is compost by …...
   (a) Carbon
   (b) Hydrogen
   (c) Oxygen
   (d) Nitrogen

97. The migration of hydrocarbon from source rock into reservoir rock is called…
   (a) Ordinary migration
   (b) Primary migration
   (c) Secondary migration
   (d) Tertiary migration

98. In the financial year 2022, which state is the leading producer of Iron ore in India?
   (a) Jharkhand
   (b) Chhatisgarh
   (c) Karnataka
   (d) Odisha

99. On which area ONGC has found good quantity of Natural gas deposits in Mizoram?
   (a) Bilkhawthlir
   (b) Meidum
   (c) Keifang
   (d) Maubuang

100. In which category Mizoram is included on Hydrocarbon prospectivity of Indian sedimentary basins?
   (a) Category –I
   (b) Category –II
   (c) Category –III
   (d) Category –IV

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