MIZORAM PUBLIC SERVICE COMMISSION

COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF SOIL CONSERVATION RANGER UNDER LAND RESOURCES, SOIL & WATER CONSERVATION DEPARTMENT, GOVERNMENT OF MIZORAM, MARCH, 2019

PAPER - I (BASIC SCIENCES)

Time Allowed : 2 hours | Full Marks : 150

Attempt all questions.

All questions carry equal marks of 2 each.

1. Agar-agar is obtained from

(a) *Nostoc* (b) *Laminaria*

(c) *Polysiphonia* (d) *Gelidium*

2. Which type of root-stem-transition is rarely found and known only in few monocotyledons?

(a) *Fumaria* type (b) *Cucurbita* type

(c) *Lathyrus* type (d) *Anemarrhena* type

3. The first stable product of C_3 pathway is

(a) Ribulose 1, 5-diphosphate (b) Oxaloacetic acid

(c) 3 – phosphoglyceric acid (d) 3 – phosphoglyceraldehyde

4. The conversion of winter variety of wheat into spring variety by low temperature or chilling treatment was termed as

(a) Photoperiodism (b) Vernalization

(c) Photorespiration (d) Adaptation

5. Initiation codon is

(a) AUG (b) UGA

(c) UAG (d) AGU

6. Which of the following cell organelle is called 'suicidal bag'?

(a) Ribosome (b) Lysosome

(c) Mesosome (d) Centrosome

7. Crossing over occurs in

(a) Leptotene (b) Zygotene

(c) Pachytene (d) Diplotene

8. The term 'ecosystem' was coined by

(a) A.G. Tansley (b) E.P. Odum

(c) P.D. Sharma (d) E.J. Kormondy

9. Roots are poorly developed in

(a) Mesophytes (b) Epiphytes

(c) Xerophytes (d) Hydrophytes

10. Gases mainly responsible for green house effect are

(a) CO_2 & SO_2 (b) CO_2 & N_2O

(c) CO & H_2 (d) CO_2 & CO

11. Adaptation of birds for flight is:

(a) Pointed peak (b) Hollow bones

(c) Muscles in the chest (d) All of these

12. Crossing over in Linked genes are responsible for:

(a) Segregation of alleles (b) Linkage between genes

(c) Recombination of linked genes (d) All of these

13. The distance between two loci on a chromosome is 18.6 cM. Which of the following is indicated?

(a) Approximately 19% of the gametes formed are recombinant

(b) Approximately 19% of the gametes formed are parental

(c) Two loci are on opposite sides of the centromere

(d) None of these

14. Mendel's law includes the following except one

(a) Linkage (b) Inherritence

(c) Purity of gamates (d) Dominance and recessive

15. The Age of Reptiles in Evolution and Geoogical time scale is known as

(a) Cenozoic era (b) Paleozoic era

(c) Mesozoic era (d) None of these

16. This is known as a relationship in which one organism benefits, while the other is unaffected.

(a) Parasitism (b) Mutualism

(c) Symbiosis (d) Commensalism

17. The main difference between a primary vs. secondary succession?

(a) secondary occurs where there was no previous community

(b) they are the same

(c) secondary occurs in an area that was only partially destroyed

(d) primary ocurs in an area that was only partially destroyed

18. Examples of Ex-situ Conservation

(a) National Parks (b) Wild Life sanctuaries

(c) Biosphere reserve (d) None of these

19. The mutation which will not affect the length of a protein is,

(a) nonsense mutation (b) missense mutation

(c) frameshift mutation (d) all of these

20. In the hydrolysis of ethyl acetate given below:

$CH_3COOC_2H_5 + H_2O$ (large excess) $\longrightarrow CH_3COOH + C_2H_5OH$

Molecularity and order of the reaction is respectively

(a) 2 and 2 (b) 2 and 1

(c) 1 and 1 (d) 1 and 2

21. The second law of thermodynamics introduced the concept of

(a) Work (b) Internal energy

(c) Entropy (d) third law of thermodynamics

22. The unit of rate constant for *n*th-order reaction can be written as

(a) $(dm^3)^{n-1}\ mol^{1-n}\ s^{-1}$ (b) $(dm^3)^{1-n}\ mol^{1-n}\ s^{-1}$

(c) $(dm^3)^{n-1}\ mol^{n-1}\ s^{-1}$ (d) $(dm^3)^{1-n}\ mol^{n-1}\ s^{-1}$

23. Among the following polymer the one which is prepared with ethylene glycol is

(a) Nylon-66 (b) Polystyrene

(c) PVC (d) Terylene

24. Which one of the following is an example of oxidation?

(a) $Cl \longrightarrow Cl^-$ (b) $Fe^{2+} \longrightarrow Fe^{3+}$

(c) $Cu^{2+} \longrightarrow Cu$ (d) $Cr^{3+} \longrightarrow Cr^{2+}$

25. The oxidation number of Cl in $HClO_4$ is

(a) -1 (b) +3

(c) +5 (d) +7

26. The following reaction takes place when zinc is placed in a copper sulfate solution:

$Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$

The oxidising agent is

(a) Zn (b) Cu^{2+}

(c) Zn^{2+} (d) Cu

27. Which type of bonding is responsible for the secondary structure of proteins?

(a) Hydrogen bonding (b) Disulphide bridges

(c) Peptide bonds (d) Salt bridges

28. The metal present in vitamin B_{12} is

(a) Fe (b) Mg

(c) Co (d) Zn

29. The IUPAC name of $[CoCl(H_2O)_2(NH_3)_3]Cl_2$ is

(a) Cobalt(III)chlorodiaquatriammine chloride

(b) Triamminediaquachlorocobaltate(III) chloride

(c) Chlorodiaquatriamminecobalt(III) dichloride

(d) Triamminediaquachlorocobalt(III) chloride

30. $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH_3)_4Br_2]Cl_2$ represents

(a) Conformation isomerism (b) Coordination isomerism

(c) Ionisation isomerism (d) Ligand isomerism

31. Choose the wrong statement with regard to $[Co(CN)_6]^{3-}$.

(a) It is high spin complex. (b) It is inner-orbital complex.

(c) It is paramagnetic. (d) The central metal ion is d^2sp^3 hybridized.

32. Among the following complex ions, the highest magnetic moment will be observed in

(a) $[Fe(CN)_6]^{4-}$ (b) $[Ni(NH_3)_6]^{2+}$

(c) $[FeF_6]^{3-}$ (d) $[Co(H_2O)_6]^{2+}$

33. Which one of the following ion will be colourless?

(a) Sc^{3+} (b) Ti^{3+}

(c) V^{3+} (d) Co^{3+}

34. Chromium is mainly added to steel to increase

(a) Hardness (b) Resistance to corrosion

(c) Malleability and ductility (d) Electrical and magnetic properties

35. The IUPAC name of $(CH_3)_2CHCH_2CH_2OH$ is

(a) 2-Methyl-butan-4-ol (b) 3,3-Dimethyl-propan-1-ol

(c) 1-Pentanol (d) 3-Methyl-butan-1-ol

36. Which of the following characteristics is not correct for physisorption?

(a) It is reversible. (b) It occurs in multilayer.

(c) It is highly specific. (d) Enthalpy of adsorption is low.

37. The size of colloidal particle ranges between

(a) 0.1 nm to 1 nm (b) 0.1 nm to 10 nm

(c) 1 nm to 10 nm (d) 1 nm to 1000 nm

38. Tyndall effect is due to

(a) Scattering of light (b) Polarization of light

(c) Reflection of light (d) Refraction of light

39. The total yearly world consumption of energy is approximately 4.0×10^{20} J. How much mass would have to be completely converted into energy to provide this amount of energy?

(a) 4.4×10^3 kg (b) 1.3×10^4 kg

(c) 2.4×10^5 kg (d) 5.4×10^6 kg

40. How many specific heat are there for an ideal gas?

(a) 1 (b) 2

(c) 3 (d) 4

41. The quantized energy of Black Body Radiation is called

(a) Xenon (b) Phonon

(c) Photon (d) Proton

42. The amount of heat required to raise the temperature of 1 kg of a solid by 1°C is termed as

(a) Heat Capacity (b) Specific Heat

(c) Latent Heat (d) Specific Latent Heat

43. The root mean square current (RMS) I_v and the value of peak current I_o of alternating current are related as

(a) $I_V = I_O \times \sqrt{2}$ (b) $I_V = I_O \div \sqrt{2}$

(c) $I_v = I_o \times 2$ (d) $I_v = I_o \div 2$

44. Through which of the following elements transients will not occur in LCR circuit?

(a) R (b) L

(c) C (d) All of them

45. In LCR series circuit at resonance condition, the value of current is

(a) Maximum (b) Minimum

(c) Zero (d) Infinite

46. To obtain high efficiency, network is designed with which of the following?

(a) High Q-Factor (b) Low Q-Factor
(c) Unity Q-Factor (d) Zero Q-Factor

47. Phenomena of radioactivity was discovered by Henri Becquerel in

(a) 1893 (b) 1895
(c) 1894 (d) 1896

48. $^{238}U_{92}$ disintegrate by emitting one alpha particle followed by two beta particles, the new element will have atomic number and mass number of

(a) 90 & 234 (b) 92 & 235
(c) 92 & 234 (d) 90 & 235

49. Activity of sample of radioactive material decreases to one-eighth of original in 15 days. It's half-life is

(a) 15 days (b) 10 days
(c) 5 days (d) 2 days

50. Lifetime of unstable nuclei is

(a) Unlimited (b) Limited
(c) Twice its half life (d) Four times its half life

51. Alpha particles have relatively

(a) low kinetic energy (b) high potential energy
(c) high kinetic energy (d) low potential energy

52. Which of the following would be attracted toward a positively charged sheet of metal?

(a) alpha particle (b) beta particle
(c) gamma particle (d) x-ray

53. Rate of change of momentum is equal to

(a) Acceleration (b) Work Done
(c) Force (d) Impulse

54. Gold color of resistance shows tolerance up to the

(a) 20% (b) 15%
(c) 10% (d) 5%

55. Two 10 Ohm resistors are connected in parallel, their equivalent resistance is

(a) 5 Ohm (b) 10 Ohm
(c) 20 Ohm (d) 0.2 Ohm

56. Out of the following options which one can be used to produce a propagating electromagnetic wave?

(a) chargeless particle (b) stationary charge particle
(c) charge moving with uniform velocity (d) charge moving with acceleration

57. What type of waves are used to transmit cellular telephone messages?

(a) gamma rays (b) radio waves
(c) microwaves (d) visible light

58. If an urn contains 8 balls then the number of ordered sample of size 3 without replacement is

(a) 512 (b) 336
(c) 24 (d) 56

59. In how many ways can a committee consisting of 3 men and 2 women be choosen from7 men and 5 women?

(a) 350 (b) 6

(c) 210 (d) 150

60. In how many ways you can choose one or more data from six eligible data?

(a) 64 (b) 720

(c) 63 (d) 65

61. The value of tan 15° is

(a) $\frac{\sqrt{3}}{4}$ (b) $\frac{1}{2\sqrt{3}}$

(c) $\frac{\sqrt{3}+2}{4}$ (d) $2-\sqrt{3}$

62. $\frac{\cos x+\sin x}{\cos x-\sin x}=$.....

(a) tan $2x$ (b) 2 tan $2x$

(c) 2 tan x (d) $\tan\frac{x}{2}$

63. The circle with radii 3, 5 and 9 cm are externally tangent. What is the area of the triangle formed by joining their centres?

(a) 35 (b) 67.5

(c) 135 (d) 48

64. The solution of trigonometric equation $\sin 2x + \cos x = 0$ is

(a) $\frac{7\pi}{6}$ (b) $\frac{3\pi}{4}$

(c) $\frac{\pi}{6}$ (d) $\frac{2\pi}{3}$

65. The value of $\lim_{x\to 0}\frac{1-\cos x}{x^2}$ is

(a) 1 (b) $\frac{1}{2}$

(c) 0 (d) 2

66. The value of $\lim_{x\to\infty}\left(\sum\frac{1}{3^n}\right)$

(a) $\frac{1}{3}$ (b) 1

(c) $\frac{1}{2}$ (d) 0

67. The function

$$f(x)=\begin{cases} -x & for \quad x\le 0 \\ x & for\ 0<x<1 \\ 2-x & for\ 1<x\le 2 \\ 1 & for \quad x>2 \end{cases},$$

Then which of the following is correct

(a) $f(x)$ is continuous at $x=0$ but discontinuous at $x=1$,

(b) $f(x)$ is continuous at $x=1$ and at $x=2$,

(c) $f(x)$ is not continuous at $x=0$ and at $x=1$,

(d) $f(x)$ is continuous at $x=0$ and at $x=1$.

68. Choose the correct answer. If $y=\sin ax$, then y_n is equal to

(a) $\sin\left(ax+\frac{1}{2}n\pi\right)$ (b) $a^n\sin\left(ax+\frac{1}{2}n\pi\right)$

(c) $a^n\cos\left(ax+\frac{1}{2}n\pi\right)$ (d) none of these

69. $\frac{dy}{dx}$ for the function $xy=e^y$ is

(a) $\frac{1}{xy}$ (b) $\frac{x}{y}$

(c) $\frac{y-1}{x}$ (d) $\frac{y}{x(y-1)}$

70. If $y=\sin(\sin x)$, then the relation between y_2, y_1 and y is

(a) $y_2+y_1+y\sin x=0$ (b) $y_2+y_1\tan x+y\cos^2 x=0$

(c) $y_2+y_1\sin x+y\sin^2 x=0$ (d) $y_2\sin x+y_1+y\cos x=0$

71. The value of integral $\int_0^{\pi/2}\frac{dx}{1+\cot^n x}$ is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$

(c) π (d) $\frac{3\pi}{2}$

72. The value of integral $\int\frac{dx}{5+4\cos x}$ is

(a) $\frac{2}{3}\tan^{-1}\left(\frac{1}{3}\tan\frac{x}{2}\right)$ (b) $\frac{2}{3}\sin^{-1}\left(\frac{1}{3}\tan\frac{x}{2}\right)$

(c) $\frac{2}{3}\tan^{-1}\left(\frac{1}{3}\cot\frac{x}{2}\right)$ (d) $\tan^{-1}\left(\frac{1}{3}\cot\frac{x}{2}\right)$

73. What is the median of the following data

Cinsumption (in units)	Bellow 10	Bellow 20	Bellow 30	Bellow 40	Bellow 50	Bellow 60
Number of Consumers	4	9	17	19	20	30

(a) 19 (b) 25.5

(c) 27.5 (d) 18.5

74. A die is tossed 10 times. The following table lists numbers and frequency with which each number appeared

Number	1	2	3	4	5	6
Frequency	2	1	2	3	1	1

Then what will be the relative frequency of the event that a prime number appears

(a) 1 (b) 0.4

(c) 0.5 (d) 0.6

75. The collection of data A contains 8 samples of which 3 are defected and data B contain 5 samples of which 2 are defected. If an sample is drawn at random from each data then what will be the probability that one sample is defected and one not?

(a) $\frac{3}{20}$ (b) $\frac{3}{8}$

(c) $\frac{19}{40}$ (d) $\frac{5}{6}$

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