

## PART-A

**Instructions: Part-A consists of 25 questions. Questions No. 1 -10 (English) and Questions No. 11-25 (General Knowledge and Numerical Ability)**

1. The underlined word is an example of  
Sam took a large slice of the luscious cake.  
(A) Adjective (B) Noun  
(C) Adverb (D) Verb
2. Which of the following is correctly spelt?  
(A) Cemetary (B) Cemetry  
(C) Cementery (D) Cemetery
3. Select the correct option of the given sentence in passive voice.  
*He had committed a mistake*  
(A) A mistake had committed by him.  
(B) A mistake was committed by him.  
(C) A mistake had been committed by him.  
(D) A mistake has been committed by him.
4. Choose the most appropriate alternative which can best substitute the given sentence.  
*That which cannot be captured*  
(A) Impregnable (B) Incurable  
(C) Imperishable (D) Invincible
5. Which part of the following sentence contains an error?  
(A) Kunal was with Ramesh (B) In his last working  
(C) Day of the company (D) To share his future goals.
6. Raju got a present from \_\_\_\_\_ old friend on his fiftieth birthday.  
(A) A (B) An  
(C) The (D) None of the above
7. Select the correct plural of 'Premises'  
(A) Premiso (B) Premiseses  
(C) Primesco (D) Premises
8. Which of the following best expresses the meaning of 'Complement'?  
(A) Praise (B) Companion  
(C) Tribute (D) Fraction
9. Which of the following is opposite in meaning to the word 'Dissent'?  
(A) Ascent (B) Line of ancestry  
(C) Agree (D) Increase
10. He picked up a piece of cloth \_\_\_\_\_ the drawer.  
(A) for (B) from  
(C) of (D) on
11. India's only active volcano is located at which among the following places?  
(A) Car Nicobar (B) Barren Island  
(C) Maya Bunder (D) Lakshdweep
12. Which of the following is the highest peak of Satpura Range?  
(A) Gurushikhar (B) Pachmarhi  
(C) Dhupgarh (D) Mahendragiri

13. Which among the following is "Fool's Gold"?
- (A) Copper sulphate (B) Iron sulfide  
(C) Brass (D) Silver bromide
14. If A is to the South of B and C is to the east of B, in what direction is A with respect to C ?
- (A) North - East (B) North - West  
(C) South - East (D) South - West
15. If DELHI is coded as 7 3 5 4 1 and CALCUTTA as 8 2 5 8 9 6 6 2, how can CALCUT be coded ?
- (A) 5 2 7 9 4 3 1 (B) 5 9 7 8 2 1 3  
(C) 8 2 5 1 8 9 6 (D) 8 2 5 1 8 9 2
16. 240 is what percent of 90 ?
- (A)  $37\frac{1}{2}\%$  (B)  $26\frac{2}{3}\%$  (C)  $133\frac{1}{3}\%$  (D)  $266\frac{2}{3}\%$
17. A runner completes a race of 200 meters in 24 seconds. His speed in Km/hour is,
- (A) 20 (B) 24 (C) 28.5 (D) 30
18. How many square in given figure?
- |  |  |  |
|--|--|--|
|  |  |  |
|  |  |  |
|  |  |  |
- (A) 16 (B) 14 (C) 10 (D) 12
19. Ramesh ranks seventh from the top and twenty-sixth from the bottom in a class. How many students are there in the class?
- (A) 31 (B) 34  
(C) 32 (D) 33
20. The amount of interest of Rs. 4800, rate 5% simple interest and time 2.5 years will be
- (A) Rs. 400 (B) Rs. 450  
(C) Rs. 500 (D) Rs. 600
21. What is the sum of first 20 natural odd numbers?
- (A) 210 (B) 300  
(C) 400 (D) 420
22. If  $\frac{144}{0.144} = \frac{14.1}{x}$ , then the value of x will be
- (A) 144 (B) 14.2  
(C) 1.44 (D) 0.0144
23. A bag contains 2 yellow, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?
- (A)  $\frac{1}{2}$  (B)  $\frac{10}{21}$   
(C)  $\frac{9}{11}$  (D)  $\frac{7}{11}$
24. The square root of 0.000441 is:
- (A) 0.00021 (B) 0.0021  
(C) 0.021 (D) 0.21
25.  $(8 \div 88) \times 8888088 = ?$
- (A) 808008 (B) 808080  
(C) 808088 (D) 8008008

## PART-B

Instructions: **Part-B** consists of four sections i.e. **Physics, Chemistry, Mathematics and Biology** comprising 25 questions each. A candidate must answer Section – I (Physics) and Section – II (Chemistry). From Section – III (Mathematics) and Section –IV (Biology) ONLY one Section either Mathematics (Section –III) or Biology (Section – IV) should be attempted and answered.

### SECTION – I (PHYSICS)

26. Four point masses, each of value  $m$ , are placed at the corners of a square ABCD of side  $L$ . the moment of inertia of this system about an axis through A and parallel to BD is,  
(A)  $mL^2$  (B)  $3mL^2$   
(C)  $2mL^2$  (D)  $\sqrt{3}mL^2$
27. If the volume of a fixed amount of an ideal gas is doubled while its temperature is quadrupled. Then the pressure,  
(A) Remains the same (B) Decreases by a factor of 2  
(C) Decreases by a factor of 4 (D) Increases by a factor of 2
28. The electromagnetic theory of light failed to explain,  
(A) Photoelectric effect (B) Polarization  
(C) Diffraction (D) Interference
29. The refractive index of a prism whose angle  $A = 60^\circ$  is  $\sqrt{2}$ . Then the angle of minimum deviation  $\delta m$  will be  
(A)  $60^\circ$  (B)  $15^\circ$   
(C)  $30^\circ$  (D)  $45^\circ$
30. X-rays, gamma rays and microwaves travelling in vacuum have  
(A) Same wavelengths but different velocities (B) Same frequency but different velocities  
(C) Same velocity but different wavelengths (D) Same velocity and same frequency
31. An astronaut on a strange planet finds that acceleration due to gravity is twice as that on the surface of earth. Which of the following could explain this?  
(A) Both the mass and radius of the planet are half as that of earth  
(B) Radius of the planet is half as that of earth, but the mass is the same as that of earth  
(C) Both the mass and radius of the planet are twice as that of earth  
(D) Mass of the planet is half as that of earth, but radius is same as that of earth
32. A square loop and a circular loop are formed from the same wire and the same current is passed through them. The ratio of their dipole moments is  
(A)  $4\pi$  (B)  $\pi$   
(C) 1 (D)  $\pi/4$
33. If the change in value of  $g$  at height  $h$  above the surface of the earth is the same as at a depth  $d$  below the surface of the earth, when both  $d$  and  $h$  are much smaller than the radius of the Earth, then which one of the following is true?  
(A)  $d = h$  (B)  $d = 2h$   
(C)  $d = \frac{h}{2}$  (D)  $d = \frac{3h}{2}$
34. A series LCR circuit contains inductance 5 mH, capacitance  $2\mu F$  and resistance  $10 \Omega$ . If a frequency A.C. source is varied, what is the frequency at which maximum power is dissipated?  
(A)  $\frac{5}{\pi} \times 10^3$  Hz (B)  $\frac{10^{-5}}{\pi}$  Hz (C)  $\frac{10^5}{\pi}$  Hz (D)  $\frac{2}{\pi} \times 10^5$  Hz

35. The centre of mass of a body  
 (A) Lies always inside the body  
 (B) Lies always outside the body  
 (C) May lie within, outside, on the surface of the body  
 (D) Lies always on the surface of the body
36. A conducting sphere of radius  $R$  is given a charge  $Q$ . The electric potential and the electric field at the centre of the sphere respectively are  
 (A)  $\frac{Q}{4\pi\epsilon_0 R}$  and zero  
 (B)  $\frac{Q}{4\pi\epsilon_0 R}$  and  $\frac{Q}{4\pi\epsilon_0 R^2}$   
 (C) Zero and  $\frac{Q}{4\pi\epsilon_0 R^2}$   
 (D) Both are zero
37. In a CE transistor amplifier, the audio signal voltage across the collector resistance of  $2\text{ k}\Omega$  is  $2\text{ V}$ . If the base resistance is  $1\text{ k}\Omega$  and the current amplification of the transistor is  $100$ , the input signal voltage is  
 (A)  $0.1\text{ V}$   
 (B)  $1.0\text{ V}$   
 (C)  $1\text{ mV}$   
 (D)  $10\text{ mV}$
38. The displacement of a particle from its mean position is given by  $x = 4 \sin(10\pi t + 1.5\pi) \cos(10\pi t + 1.5\pi)$ . The motion of the particle is  
 (A) Simple harmonic motion with period  $10\pi\text{ s}$   
 (B) Non-periodic  
 (C) Simple harmonic motion with period  $0.1\text{ s}$   
 (D) Simple harmonic motion with period  $0.2\text{ s}$
39. If  $|\vec{A} \times \vec{B}| = \sqrt{3} \vec{A} \cdot \vec{B}$  then the value of  $|\vec{A} + \vec{B}|$  is  
 (A)  $\sqrt{A^2 + B^2 + AB}$   
 (B)  $\sqrt{A^2 + B^2 + \frac{1}{2} AB}$   
 (C)  $\sqrt{A^2 + B^2 + \frac{1}{\sqrt{3}} AB}$   
 (D)  $\sqrt{A^2 + B^2 + \sqrt{3} AB}$
40. Pick out the statement which is incorrect  
 (A) The electric field lines forms closed loop.  
 (B) Field lines never intersect.  
 (C) The tangent drawn to a line of force represents the direction of electric field.  
 (D) A negative test charge experiences a force opposite to the direction of the field.
41. Two metal wires of identical dimensions are connected in parallel. If  $\sigma_1$  and  $\sigma_2$  are the conductivities of the metal wires respectively, the effective conductivity of the combination is  
 (A)  $\sigma_1 + \sigma_2$   
 (B)  $\frac{\sigma_1 + \sigma_2}{2}$   
 (C)  $2(\sigma_1 + \sigma_2)$   
 (D)  $\frac{\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$
42. Two radioactive substances A and B have decay constants  $3\lambda$ , and  $\lambda$  respectively. At  $t=0$  they have the same number of nuclei. The ratio of number of nuclei of A to those of B will be  $\frac{1}{e}$  after a time interval:  
 (A)  $\frac{1}{\lambda}$   
 (B)  $\frac{2}{\lambda}$   
 (C)  $\frac{1}{2\lambda}$   
 (D)  $\frac{1}{5\lambda}$

43. The ground state energy of hydrogen atom is  $-13.6$  eV. When its electron is in the first excited state, its excitation energy is
- (A) 3.4 eV  
 (B) 10.2 eV  
 (C) 6.8 eV  
 (D) 13.6 eV
44. A thin circular ring of mass  $M$  and radius  $R$  is rotating about its axis with a constant angular velocity  $\omega$ . Two objects each of mass  $m$  are attached gently to the opposite ends of diameter of the ring. The ring will now rotate with an angular velocity:
- (A)  $\omega \frac{(M + 2m)}{M}$  (B)  $\omega \frac{(M - 2m)}{(M + 2m)}$   
 (C)  $\frac{\omega M}{(M - 2m)}$  (D)  $\frac{\omega M}{(M + 2m)}$
45. A nucleus  ${}_y Y^x$  emits one  $\alpha$  and two  $\beta$  particles. The resulting nucleus is
- (A)  ${}_y Y^{x-4}$  (B)  ${}_{y-2} Y^{x-4}$   
 (C)  ${}_{y-2} Y^{x-2}$  (D)  ${}_y Y^{x-2}$
46. The twinkling effect of star light is due to:
- (A) Total internal reflection  
 (B) High dense matter of star  
 (C) Constant burning of hydrogen in the star  
 (D) Fluctuating apparent position of star being slightly different from the actual position of star
47. A  $p$ - $n$  photodiode is fabricated from a semiconductor with a band gap of 2.5 eV. It can detect a signal of wavelength
- (A) 6000  $\text{Å}$  (B) 4000 nm  
 (C) 6000 nm (D) 4000  $\text{Å}$
48. A resistor, capacitor, and inductor are connected in series across an AC generator. Which of the following statements is false?
- (A) The instantaneous voltage across the capacitor lags the current by  $90^\circ$   
 (B) The instantaneous voltage across the inductor leads the current by  $90^\circ$   
 (C) The voltages across the resistor, capacitor, and inductor are not in phase  
 (D) The RMS voltage across the combination of the three elements equals the algebraic sum of the RMS voltages across each element separately
49. A window air conditioner is placed on a table inside a well-insulated apartment, plugged in and turned on. What happens to the average temperature of the apartment?
- (A) It increases.  
 (B) It decreases.  
 (C) It remains constant.  
 (D) The answer depends on the initial temperature of the apartment.
50. The electric field in a region is given by  $\vec{E} = 4\hat{i} + 10\hat{j}$  N/C. The flux of this field through a square of 10 cm on a side whose plane is parallel to the XZ plane
- (A) 4 Vm  
 (B) 10 Vm  
 (C) 1 Vm  
 (D) 0.4 Vm

## SECTION – II (CHEMISTRY)

51. Which one of the following does not achieve an octet of electrons in the central atom?  
(A)  $\text{BiH}_3$  (B)  $\text{PH}_3$   
(C)  $\text{BH}_3$  (D)  $\text{AsH}_3$
52. How many radial nodes for 3p orbital?  
(A) 0 (B) 1 (C) 2 (D) 3
53. Which one of the following homo-diatomic molecule is *paramagnetic*?  
(A)  $\text{O}_2$  (B)  $\text{N}_2$  (C)  $\text{C}_2$  (D)  $\text{F}_2$
54. What is the oxidation state of nitrogen atom in hydrazine,  $\text{N}_2\text{H}_4$ ?  
(A) +3 (B) +2 (C) -2 (D) -3
55. Which of the statement given below is incorrect about  $\text{H}_2\text{O}_2$ ?  
(A) Pale blue liquid (B) Contain O–O single bond  
(C) Planar molecule (D) Powerful oxidizing agent.
56. What is the conjugate acid of  $\text{HSO}_4^-$ ?  
(A)  $\text{SO}_4^{2-}$  (B)  $\text{H}_2\text{SO}_4$   
(C)  $\text{H}_3\text{O}^+$  (D)  $\text{OH}^-$ .
57. How can you best describe the elongated octahedral structure of blue vitriol,  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ?  
(A) Square planar  $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$  unit with one sulfate O atom and one water molecule  
(B) Square planar  $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$  unit with two sulfate O atoms  
(C) Square planar  $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$  unit with two water molecules  
(D) Square planar  $[\text{Cu}(\text{H}_2\text{O})_3(\text{SO}_4)]$  unit with two water molecules.
58. Which among the oxoacids of phosphorus contain two P–OH bonds, one P=O and one P–H bond?  
(A)  $\text{H}_3\text{PO}_2$  (B)  $\text{H}_3\text{PO}_3$   
(C)  $\text{H}_3\text{PO}_4$  (D)  $\text{H}_4\text{P}_2\text{O}_7$
59. How many times more hydrogen ions in a solution with a pH of 3 than in a solution with a pH of 6?  
(A) 1000 (B) 100  
(C) 10 (D) 10000
60. Which of the following species is an odd electron intermediate?  
(A) Radical-cation (B) Carbene  
(C) Nitrene (D) Carbanion
61. The products obtained in the Cannizzaro reaction are  
(A) Alcohol and alkaline salt of carboxylic acid (B) Alcohol and ketone  
(C) Ketone and aldehyde (D) Alcohol and ester
62. Which of the following is *not* aromatic?  
(A) Benzene (B) Cyclopentadienylcation  
(C) Cyclopentadienyl anion (D) Cycloheptatrienylcation
63. The relationship between compound (i) and (ii) is
- |   |  |
|---|--|
| $\begin{array}{c} \text{CH}_3 \\   \\ \text{H} - \text{C} - \text{OH} \\   \\ \text{H} - \text{C} - \text{Cl} \\   \\ \text{CH}_3 \end{array}$ <p>(i)</p> | $\begin{array}{c} \text{CH}_3 \\   \\ \text{HO} - \text{C} - \text{H} \\   \\ \text{H} - \text{C} - \text{Cl} \\   \\ \text{CH}_3 \end{array}$ <p>(ii)</p> |
|---|--|
- (A) Enantiomers (B) Diastereomers  
(C) Mesocompounds (D) Identical

64. Buna-N is a co-polymer of 1,3-butadiene and  $\underline{X}$ . What is  $\underline{X}$ ?
- (A)  $\text{CH}_2=\text{CH-CN}$  (B)  $\text{CH}_2=\text{CH-Cl}$   
 (C)  $\text{CH}_2=\text{CH-C}_6\text{H}_5$  (D)  $\text{CH}_2=\text{CH-CH}_3$
65. Which of the following compound can form a zwitterion?
- (A) Benzoic acid (B) Acetanilide  
 (C) Aniline (D) Glycine
66. What is Lucas reagent?
- (A) Anhydrous  $\text{ZnCl}_2/\text{Conc. HCl}$  (B)  $\text{Zn-Hg}/\text{Conc. HCl}$   
 (C) 2,4-dinitrophenylhydrazine (D) Bromine water
67. Reaction of Grignard reagent with aromatic aldehyde and subsequent aqueous treatment produces
- (A)  $1^\circ$ -alcohol (B)  $2^\circ$ -alcohol  
 (C) Ketones (D) Esters
68. The standard electrode potential of the two half cells are given below:  
 $\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni}$ ,  $E_0 = -0.25$  Volt  
 $\text{Zn}^{2+} + 2\text{e}^- \rightarrow \text{Zn}$ ,  $E_0 = -0.77$  Volt  
 The voltage of cell formed by combining the two half cells would be?
- (A) -0.52 Volt (B) -1.02 Volt  
 (C) +0.52 Volt (D) +1.02 Volt
69. In the presence of acid, the initial concentration of cane-sugar was reduced from 0.2 M to 0.1 M in 5 hours and to 0.05 M in 10 hours. The reaction must be of?
- (A) Zero order (B) Second order  
 (C) First order (D) Fractional order
70. The concentration of water molecules in pure water at 298 K is?
- (A) 7.26 M (B)  $1 \times 10^{-7}$  M  
 (C)  $10^7$  M (D) 55.5 M
71. The heat of neutralization for the reaction  
 $\text{KOH} + \text{HNO}_3 \rightleftharpoons \text{KNO}_3 + \text{H}_2\text{O}$   
 When 0.5 mole of  $\text{HNO}_3$  is mixed with 0.2 moles of  $\text{KOH}$  is:
- (A) +57.1 kJ (B) -11.4 kJ  
 (C) +11.4 kJ (D) +28.5 kJ
72. The enthalpy change of a reaction does not depend upon?
- (A) Different intermediate reactions  
 (B) Nature of reactant and products  
 (C) The state of reactant and products  
 (D) Initial and final enthalpy change of the reaction
73. Evaporation of water is?
- (A) An exothermic change (B) A process where no heat exchange involves  
 (C) An endothermic change (D) A process accompanied by chemical change
74. Osmotic pressure of a solution increases if?
- (A) Number of solute particles increased (B) Temperature is increased  
 (C) Volume is increased (D) Solution constant is increased
75. A catalyst in a reaction changes which of the following?
- (A) Equilibrium constant (B) Rate constant  
 (C) Entropy (D) Nature of product

**SECTION – III (MATHEMATICS)**

76. The remainder obtained when  $1! + 2! + 3! + \dots + 10!$  is divided by 6 is,  
(A) 0  
(B) 3  
(C) 1  
(D) 6
77.  $x \in R: |\cos(x)| \geq |\sin(x)| \cap [0, 2\pi] =$   
(A)  $\left[0, \frac{\pi}{4}\right] \cup \left[\frac{3\pi}{4}, \pi\right]$   
(B)  $\left[\frac{\pi}{4}, \frac{\pi}{2}\right] \cup \left[\frac{3\pi}{4}, \pi\right]$   
(C)  $\left[0, \frac{\pi}{4}\right] \cup \left[\frac{3\pi}{4}, 2\pi\right]$   
(D)  $\left[\frac{3\pi}{4}, \pi\right] \cup \left[\frac{5\pi}{2}, 2\pi\right]$
78. The value of  $\lambda$ , such that the following system of equations has no solution, is  
 $2x - y - 2z = -5$   
 $x - 2y + z = 2$   
 $x + y + \lambda z = 3$   
(A) 3  
(B) 1  
(C) 0  
(D) -3
79. If A, B are two events such that  $\frac{1}{8} \leq P(A \cap B) \leq \frac{3}{8}$  then  
(A)  $P(A) \cdot P(B) \leq \frac{3}{8}$   
(B)  $P(A) + P(B) \leq \frac{11}{8}$   
(C)  $P(A) + P(B) \leq \frac{3}{8}$   
(D)  $P(A) \cdot P(B) \leq \frac{11}{8}$
80. The equation  $x^2 + yx^2 + x + y = 0$  represents  
(A) A parabola and two straight lines  
(B) A hyperbola and two straight lines  
(C) A circle and a straight line  
(D) A straight line
81. The point  $P(2, 4)$  is first reflected on the line  $y = x$  and then the image point  $Q$  is again reflected on the line  $y = -x$  to get the image point  $Q'$ . Then the circumcentre of the  $\Delta PQQ'$  is  
(A) (0,0)  
(B) (-2, -4)  
(C) (4,2)  
(D) (4, -2)
82. Let A be the foot of the perpendicular from focus P of hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  on the line  $bx - ay = 0$  and let C be the centre of hyperbola. Then the area of the rectangle whose sides are equal to that of PA and CA is,  
(A)  $\frac{a}{2}$   
(B)  $ab$   
(C)  $\frac{(a^2 + b^2)}{2}$   
(D)  $2ab$



83. If  $f'' = C$ ,  $C \neq 0$ , where  $C$  is a constant, then the value of  $\lim_{x \rightarrow 0} \frac{f(x) - 2f(2x) + 3f(3x)}{x^2}$  is
- (A) 0 (B)  $2C$   
(C)  $20C$  (D)  $10C$
84. If the sum of two-unit vectors is a unit vector, then the magnitude of their difference is
- (A)  $\sqrt{2}$  units (B)  $\sqrt{5}$  units  
(C)  $\sqrt{3}$  units (D) 0 units
85.  $\int \cos(\log x) dx = F(x) + C$  where  $C$  is arbitrary constant. Here  $F(x) =$
- (A)  $x[\cos(\log x) - \sin(\log(x))]$   
(B)  $\frac{x}{2}[\cos(\log x) + \sin(\log(x))]$   
(C)  $x[\cos(\log x) + \sin(\log(x))]$   
(D)  $\frac{x}{2}[\cos(\log x) - \sin(\log(x))]$
86. Two equal forces acting at a point with an angle of  $60^\circ$  between them, if the resultant is equal to  $30\sqrt{3}N$ , the magnitude of the force will be
- (A) 20N (B) 0  
(C) 30N (D) 60N
87. In a third order matrix  $B$ ,  $b_{ij}$  denotes the element in the  $i^{\text{th}}$  row and  $j^{\text{th}}$  column. If
- $b_{ij} = 0$  for  $i = j$   
 $= 1$  for  $i > j$   
 $= -1$  for  $i < j$
- Then the matrix is,
- (A) Invertible (B) Skew-symmetric  
(C) Symmetric (D) Non-singular
88. The order of set  $A$  is 3 and that of set  $B$  is 2. What is the number of relations from  $A$  to  $B$ ?
- (A) 4 (B) 6  
(C) 32 (D) 64
89. The relation  $>$  (greater than) on the set of real numbers is
- (A) Reflexive (B) Symmetric  
(C) Transitive (D) Both (A) & (B)
90. Let  $f: \mathbb{R} \rightarrow \mathbb{R}^+ \cup \{0\}$  be defined by  $f(x) = x^2$ ,  $x \in \mathbb{R}$ . The mapping is
- (A) Injective but not surjective  
(B) Surjective but not injective  
(C) Both injective & surjective  
(D) Neither injective nor surjective
91.  $f: \{1,2,3\} \rightarrow \{4,5\}$  is not a function, if it is defined by which of the following?
- (A)  $\{(2,4), (1,5), (3,5)\}$  (B)  $\{(3,4), (1,4), (2,5)\}$   
(C)  $\{(1,4), (2,5), (3,4)\}$  (D)  $\{(1,4), (2,5), (1,5), (3,5)\}$
92. Let  $f(x) = \begin{cases} 1, & \text{if } x \text{ is rational number} \\ 0, & \text{if } x \text{ is irrational number} \end{cases}$
- The value of  $f \circ f(\sqrt{3})$  is
- (A) 0 (B) 1  
(C) Both 0 and 1 (D) None of these

93. The limit of the function defined by  $f(x) = \begin{cases} \frac{|x|}{x}, & \text{if } x \neq 0 \\ 0, & \text{otherwise} \end{cases}$  is
- (A) Exists and equals 1  
 (B) Exists and equals -1  
 (C) Doesn't exist  
 (D) None of the above
94. The function  $f(x) = [x]$ , where  $[x]$  = greater integer of  $x$ , is
- (A) Continuous everywhere  
 (B) Continuous at finite points  
 (C) Discontinuous at integral values  
 (D) Discontinuous everywhere
95. The value of the integral  $\int_{-1}^2 [x] dx$  is
- (A)  $\frac{5}{2}$  (B) 3  
 (C) 1 (D) 0
96. Three horses A, B, C are in a race. A is twice as likely to win as B, and B is twice as likely to win as C. The probability that C wins,  $P(C)$  is
- (A)  $\frac{1}{7}$  (B)  $\frac{2}{7}$   
 (C)  $\frac{1}{3}$  (D)  $\frac{2}{3}$
97. In year 2019, the probability of getting 53 Sundays is
- (A)  $\frac{1}{7}$  (B)  $\frac{2}{7}$   
 (C)  $\frac{3}{7}$  (D)  $\frac{4}{7}$
98. The probability of getting qualified in JEE-Mains and JEE-Advanced by a student are  $\frac{1}{5}$  and  $\frac{3}{5}$  respectively. The probability that the students gets qualified for one of these tests is
- (A)  $\frac{1}{5}$  (B)  $\frac{3}{5}$   
 (C)  $\frac{3}{25}$  (D)  $\frac{17}{25}$
99. A system of linear equations represented in matrix form  $Ax = 0$ ,  $A$  is  $n \times n$  matrix, has a non-zero solution if the determinant of  $A$  (i.e.,  $\det(A)$ ) is
- (A) 0 (B) non-zero  
 (C) 1 (D) -1
100. If  $f: R \rightarrow \{0,1\}$  is a continuous surjection map then  $f^{-1}(0) \cap f^{-1}(1)$  is:
- (A)  $\phi$   
 (B)  $R$   
 (C)  $\{0,1\}$   
 (D) None of these.

## SECTION – IV (BIOLOGY)

101. The idea of mutation was brought forth by  
(A) Hugo de Vries (B) Gregor J. Mendel  
(C) Hardy Weinberg (D) Charles Darwin
102. Which of the following term used for defining a viral genome incorporated into host DNA?  
(A) Prophase (B) Prophage  
(C) Bacteriophage (D) Coliphage
103. Flagella are present both in prokaryotic and eukaryotic cells, however, they differ in  
(A) Type of movement and placement in cell  
(B) Location in cell and functioning  
(C) Microtubular organization and types of movements  
(D) Microtubular organization and function
104. What is the fundamental basis of classification of protozoa?  
(A) Size (B) Shape  
(C) Locomotion (D) Number of nuclei
105. What will happen when a fresh water protozoan is placed in marine water?  
(A) The contractile vacuole will become larger in size  
(B) The number of contractile vacuole will increase  
(C) The contractile vacuole will disappear  
(D) The contractile vacuole will remain unchanged
106. Presence of metameric segmentation is one of the most significant characteristics of  
(A) Mollusca and Chordata (B) Annelida and Arthropoda  
(C) Echinodermata and Annelida (D) Platyhelminthes and Arthropoda
107. Flame cells in invertebrates are mainly associated with  
(A) Respiration (B) Blood circulation  
(C) Absorption of nutrients (D) Excretion
108. Which of the following respiratory pigment is present in the blood of cockroach?  
(A) Haemozoin (B) Haemocyanin  
(C) Haemoglobin (D) none
109. Which of following condition favours the dissociation of oxyhaemoglobin into oxygen and deoxyhaemoglobin?  
(A) Low  $O_2$  pressure in tissue  
(B) High  $O_2$  pressure in tissue  
(C) Equal  $O_2$  pressure inside and outside tissue  
(D) All times irrespective of  $O_2$  pressure
110. Which of the following is correct?  
(A) Plasma= Blood –lymphocytes  
(B) Lymph= Plasma+ RBCs+WBCs  
(C) Neuron= Cyton+Dendrites+Axon+Synapse  
(D) Blood= Plasma+WBCs+RBCs+Blood Platelets
111. Crypts of Lieberkuhn are absent in  
(A) Esophagus (B) Duodenum  
(C) Jejunum (D) Ileum
112. Which of the following hormone is not steroid?  
(A) Androgen (B) Vasopressin  
(C) Aldosterone (D) Testosterone

113. Nucleic acids are the infective substances in viruses were discovered by  
 (A) De Herelle (B) Hershey and Chase  
 (C) Stanley (D) Iwanowsky
114. Which of the following methods of reproduction in bacteria involves participation of virus?  
 (A) Transformation (B) Transfection  
 (C) Transduction (D) Conjugation
115. Which of the following organ is essential for photorespiration?  
 (A) Endoplasmic reticulum (B) Mitochondria  
 (C) Peroxysome (D) Glyoxysome
116. Nucleolus is a major center for  
 (A) Replication of DNA  
 (B) Replication of RNA  
 (C) Formation of Ribosomes  
 (D) Separation of Chromatids
117. A peptide chain assumes secondary structure through formation of  
 (A) Interchain ionic bonds  
 (B) Intrachain hydrogen bonds  
 (C) Intrachain disulphide bonds  
 (D) Peptide bonds
118. Verticillaster inflorescence is a characteristic feature of  
 (A) Euphorbiaceae (B) Compositae  
 (C) Labiatae (D) Liliaceae
119. Parthenocarpic fruit formation would not be desirable in the cultivation of  
 (A) Guava (B) Cucurbits  
 (C) Apples (D) Pomegranates
120. Osmotic concentration of cell sap use to be maximum in  
 (A) Hydrophytes (B) Plants submerged in water  
 (C) Mesophytes (D) Halophytes
121. The maximum photosynthesis takes place in  
 (A) Orange light (B) Green light  
 (C) Red light (D) Yellow light
122. Filiform apparatus is a highly thickened structure commonly present in  
 (A) Synergids cells (B) Egg cells  
 (C) Antipodal cells (D) Secondary nucleus
123. In a tree ecosystem the pyramid of numbers is  
 (A) Always Upright (B) Always inverted  
 (C) Both (A) & (B) are possible (D) None is correct
124. Most abundantly distributed organic substance of the biosphere is  
 (A) Proteins (B) Fats and lipids  
 (C) Carbohydrates (D) Nucleic acids
125. The vascular bundles, which are usually surrounded by a well-developed sclerenchymatous sheath present in  
 (A) Monocot roots (B) Dicot root  
 (C) Dicot stems (D) Monocot stems