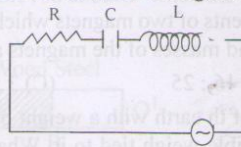


### Physics

1. In the given circuit, the phase difference between voltages across R and C is



- (A) zero                      (B)  $\pi/2$                       (C)  $\pi$                       (D)  $3\pi/2$
2. The threshold frequency for a certain metal is  $\nu_0$ . When light of frequency  $\nu = 2\nu_0$  is incident on it, the maximum velocity of photoelectrons is  $4 \times 10^6$  m/s. If the frequency of incident radiation is increased to  $5\nu_0$ , then the maximum velocity of photoelectrons (in m/s) will be  
 (A)  $(4/5) \times 10^6$                       (B)  $2 \times 10^6$                       (C)  $8 \times 10^6$                       (D)  $2 \times 10^7$
3. In Compton scattering, the energy of the incident photon is distributed between the scattered photon and the recoil electron in the ratio 2 : 3. The scattering angle is  $60^\circ$ . The energy of the incident photon is approximately  
 (A) 0.51 MeV                      (B) 1.02 MeV                      (C) 1.5 MeV                      (D) 2.1 MeV
4. Number of nuclei of a radioactive substance at time  $t = 0$  are 1000 and 900 at time  $t = 2$  s. Then number of nuclei at time  $t = 4$  s will be  
 (A) 800                      (B) 810                      (C) 790                      (D) 700
5. In a p - n junction diode made with Germanium the thickness of depletion layer is  $2 \times 10^{-6}$  m and barrier potential is 0.3 volts. The strength of electric field at the junction is  
 (A)  $0.6 \times 10^{-6} \text{ Vm}^{-1}$  from n to p side                      (B)  $0.6 \times 10^{-6} \text{ Vm}^{-1}$  from p to n side  
 (C)  $1.5 \times 10^5 \text{ Vm}^{-1}$  from n to p side                      (D)  $1.5 \times 10^5 \text{ Vm}^{-1}$  from p to n side
6. An object falls from a bridge that is 19.6 m above the water. It falls directly into a small row - boat moving with constant velocity that was 16 m from the point of impact when the object was released. The speed of the boat is  
 (A)  $4 \text{ ms}^{-1}$                       (B)  $6 \text{ ms}^{-1}$                       (C)  $8 \text{ ms}^{-1}$                       (D)  $12 \text{ ms}^{-1}$
7. de Broglie suggested that the elementary particles like electrons, protons and neutrons will exhibit  
 (A) Dual nature i.e. they behave like particle and wave  
 (B) Only particle nature (C) Only wave nature (D) Electromagnetic nature
8. A body 'X' with a momentum 'P' collides with another identical stationary body 'Y' one dimensionally. During the collision 'Y' gives an impulse 'J' to the body 'X'. Then the coefficient of restitution is  
 (A)  $\frac{2J}{P} - 1$                       (B)  $\frac{J}{P} + 1$                       (C)  $\frac{J}{P} - 1$                       (D)  $\frac{J}{2P} - 1$

*Space for Rough Work*

9. If velocity (V), acceleration (A) and force (F) are taken as fundamental quantities instead of mass (M), length (L) and time (T), the dimensions of Young's modulus would be  
 (A)  $FA^2V^{-2}$  (B)  $FA^2V^{-3}$  (C)  $FA^2V^{-4}$  (D)  $FA^2V^{-5}$
10. Compare the magnetic moments of two magnets which make 12 and 15 oscillations in a minute at a place. The dimensions and masses of the magnets are the same.  
 (A) 25 : 16 (B) 16 : 25 (C) 3 : 9 (D) 9 : 3
11. An object near the surface of the earth with a weight of 50N is accelerated vertically upward at  $4m/s^2$  with a rope of negligible weight tied to it. What is the force exerted by the rope on the object?  
 (A) 30N (B) 20N (C) 70N (D) 250N
12. The forces  $\vec{F}_1, \vec{F}_2$  and  $\vec{F}_3$  are simultaneously acting on a particle of mass 'm' and keep it in equilibrium. If  $\vec{F}_1$  force were reversed in direction only, the acceleration of the particle will be  
 (A)  $\vec{F}_1/m$  (B)  $2\vec{F}_1/m$  (C)  $-\vec{F}_1/m$  (D)  $-2\vec{F}_1/m$
13. In a double slit experiment, instead of taking slits of equal widths, one slit is made twice as wide as the other, then, in the interference pattern  
 (A) the intensities of both maxima and minima increase  
 (B) the intensity of the maxima increases and the minima have zero intensity  
 (C) the intensity of the maxima decreases and that of the minima increases  
 (D) the intensity of the maxima decreases and the minima have zero intensity
14. A non-uniform thin rod of length L is placed along x-axis such as its one end is at the origin. The linear mass density of rod is  $\lambda = \lambda_0 x$ . The distance of centre of mass of rod from the origin is  
 (A)  $\frac{L}{2}$  (B)  $\frac{2L}{3}$  (C)  $\frac{L}{4}$  (D)  $\frac{L}{5}$
15. A car running with a velocity 72kmph on a level road, is stopped after travelling a distance of 30m after disengaging its engine ( $g = 10ms^{-2}$ ). The coefficient of friction between road and the tyres is  
 (A) 0.33 (B) 4.5 (C) 0.67 (D) 0.8
16. A body of mass m is rotated at uniform speed along vertical circle with help of light string. If  $T_1, T_2$  are tensions in the string when the body is crossing highest point, lowest point of vertical circle respectively then following expression is correct.  
 (A)  $T_2 - T_1 = 6mg$  (B)  $T_2 - T_1 = 4mg$  (C)  $T_2 - T_1 = 2mg$  (D)  $T_2 - T_1 = mg$

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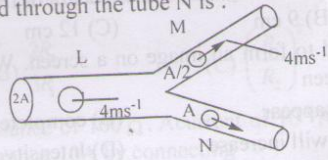
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17. A uniform meter rod consists of half wood and the remaining steel as shown in the figure.  $\alpha_1$  is the angular acceleration of the rod about O when force is applied as shown in figure A where as  $\alpha_2$  is the angular acceleration of the rod about O' when the force is applied as shown in figure B. The following choice is true.



- (A)  $\alpha_1 = \alpha_2$  (B)  $\alpha_1 < \alpha_2$  (C)  $\alpha_1 > \alpha_2$  (D)  $\alpha_1 \geq \alpha_2$
19. The escape velocity of a body on the earth's surface is  $v_e$ . A body is thrown with a speed  $3v_e$ . Assuming that the sun and planets do not influence the motion of the body, its speed at infinity would be.
- (A) zero (B)  $v_e$  (C)  $\sqrt{2}v_e$  (D)  $2\sqrt{2}v_e$
19. When a particle is performing linear SHM its K.E. is two times its P.E. at a position A and its P.E. is three times its K.E. at another position B. The ratio of K.E., at A to K.E. at B is
- (A) 8:3 (B) 2:5 (C) 2:3 (D) 2:1
20. Weights of two copper wires of length 20cm and 10cm are 20gm and 40gm. If wires are attached to two metal spheres of same material having surface areas  $90\text{ cm}^2$  and  $40\text{ cm}^2$ . If elongation in lighter wire is 27mm then that in heavier wire is
- (A) 2mm (B) 4mm (C) 1mm (D) 6mm

21. The material of a wire has specific gravity 8. If it is not wetted by water, the maximum diameter of the wire that will float on the surface of water is ( $T=70$  dyne/cm)
- (A) 0.75 cm (B) 1.5 mm (C) 0.75 cm (D) 1.5 cm
22. An incompressible liquid flows through a horizontal tube L M N as shown in the figure. Then the velocity 'V' of the liquid through the tube N is :



- (A)  $1\text{ ms}^{-1}$  (B)  $2\text{ ms}^{-1}$  (C)  $4.5\text{ ms}^{-1}$  (D)  $6\text{ ms}^{-1}$
23. A steel rod of cross section  $1\text{ mm}^2$  is prevented from expansion by heating through  $10^\circ\text{C}$ . The thermal force developed in it is ( $Y = 2 \times 10^{11}\text{ N/m}^2$ ;  $\alpha = 10^{-5}/^\circ\text{C}$ )
- (A) 20N (B) 2N (C) 200N (D) 0.2N

Space for Rough Work

24. The diameter of a metal ring is  $D$  and the coefficient of linear expansion  $\alpha$ . If the temperature of the ring is increased by  $1^\circ\text{C}$ , the circumference and the area of the ring will increase by  
 (A)  $\pi D\alpha, 2\pi D\alpha$  (B)  $2\pi D\alpha, \pi D^2\alpha$  (C)  $\pi D\alpha, \frac{\pi D\alpha}{2}$  (D)  $\pi D\alpha, \frac{\pi D^2\alpha}{2}$
25. When 100 J of heat is applied to a thermodynamic system containing monoatomic gas then the percentage of energy converted into external work done is  $\left(\gamma = \frac{5}{3}\right)$   
 (A) 30% (B) 40% (C) 60% (D) 80%
26. A Carnot engine takes 100 calories of heat in each cycle from the source at high temperature at 400K and gives 80 calories of heat in to the sink. The temperature of sink is  
 (A) 500 K (B) 300 K (C) 480 K (D) 320 K
27. A hot body is placed in cooler surroundings. When the body temperature is  $75^\circ\text{C}$ , the rate of cooling is  $4^\circ\text{C}/\text{min}$ . When it is at  $55^\circ\text{C}$ , the rate of cooling is  $2^\circ\text{C}/\text{min}$ . The temperature of the surroundings is  
 (A)  $20^\circ\text{C}$  (B)  $25^\circ\text{C}$  (C)  $30^\circ\text{C}$  (D)  $35^\circ\text{C}$
28. A string fixed at both ends is vibrating in the lowest mode of vibration for which a point at quarter of its length from one end is a point of maximum displacement. The frequency of vibration in this mode is 100 Hz. What will be the frequency emitted when it vibrates in the next mode such that this point is again a point of maximum displacement?  
 (A) 400 Hz (B) 200 Hz (C) 600 Hz (D) 300 Hz
29. A string oscillating at fundamental frequency under a tension of 225N produces 6 beats per second with a sonometer. If the tension is 256N, then again oscillating at fundamental note it produces 6 beats per second with the same sonometer. What is the frequency of the sonometer?  
 (A) 256 (B) 225 (C) 280 (D) 186
30. The focal length of objective and eye piece of a microscope are 1 cm and 5 cm respectively. If the magnifying power for relaxed eye is 45, then length of the tube is  
 (A) 6 cm (B) 9 cm (C) 12 cm (D) 15 cm
31. A converging lens is used to form an image on a screen. When the upper half of the lens is covered by an opaque screen  
 (A) half the image will disappear (B) complete image will be formed  
 (C) intensity of the image will increase (D) Intensity does not change
32. Two magnets when placed in Tan A position at the same distance deflections of  $30^\circ$  and  $60^\circ$ . The ratio of their magnetic moments is  
 (A) 3:1 (B) 1:3 (C) 1:2 (D) 2:1

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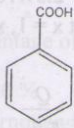
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33. Ratio of minimum kinetic energies of two projectiles of same mass is 4:1. The ratio of the maximum height attained by them is also 4:1. The ratio of their ranges would be  
 (A) 2 : 1 (B) 4 : 1 (C) 8 : 1 (D) 16 : 1
34. A.T.V tower is 150m tall. If the area around the tower has a population density of  $750 \text{ km}^{-2}$ , then the population covered by the broadcasting tower is about ( $R_e = 6400 \text{ km}$ )  
 (A)  $4.5 \times 10^6$  (B)  $2.5 \times 10^6$  (C)  $4.5 \times 10^5$  (D)  $2.5 \times 10^5$
35. An infinite number of charges each equal to 'q' are placed along the X-axis at  $x = 1, x = 2, x = 4, x = 8, \dots$ . The potential at the point  $x = 0$  due to this set of charges is  
 (A)  $\frac{Q}{4\pi\epsilon_0}$  (B)  $\frac{2Q}{4\pi\epsilon_0}$  (C)  $\frac{3Q}{4\pi\epsilon_0}$  (D)  $\frac{Q}{\pi\epsilon_0}$
36. Sixty four spherical drops each of radius 2 cm and carrying 5C charge combine to form a bigger drop. Its capacity is  
 (A)  $\frac{8}{9} \times 10^{-11} F$  (B)  $90 \times 10^{-11} F$  (C)  $1.1 \times 10^{-11} F$  (D)  $9 \times 10^{-11} F$
37. A cell of emf  $e_1$  in the secondary circuit gives null deflection for 1.5m length of potentiometer of wire length 10m. If another cell of emf  $e_2$  is connected in series with  $e_1$  then null deflection was obtained for 2.5 m length. Then  $e_1 : e_2$  is  
 (A) 3:5 (B) 5:3 (C) 3:2 (D) 2:3
38. When the cold junction at  $0^\circ\text{C}$ , the thermo emf is same whether the hot junction temperature is at  $\theta_1^\circ\text{C}$  (or)  $\theta_2^\circ\text{C}$ , then the neutral temperature is  $\theta$   
 (A)  $\theta_1 + \theta_2$  (B)  $\theta_1 - \theta_2$  (C)  $\frac{\theta_1 + \theta_2}{2}$  (D)  $\frac{\theta_1 - \theta_2}{2}$
39. Two particles X and Y having charges in 2:3 ratio, after being accelerated through the same potential difference, enter a region of uniform magnetic field and describe circular paths of radii  $R_1$  and  $R_2$  respectively. The ratio of mass of X to the mass Y is  
 (A)  $\left(\frac{R_1}{R_2}\right)^{1/2}$  (B)  $\frac{2R_2}{3R_1}$  (C)  $\left(\frac{R_1}{R_2}\right)^2$  (D)  $\frac{2R_1^2}{3R_2^2}$
40. A galvanometer has a resistance of  $100 \Omega$ . A current of  $10^{-3} \text{ A}$  pass through galvanometer. It is converted into ammeter of range 10A by connecting  
 (A) shunt resistance of  $100/9999 \Omega$  (B) shunt resistance of  $1000/999 \Omega$   
 (C) shunt resistance of  $100/999 \Omega$  (D) shunt resistance of  $10/99 \Omega$

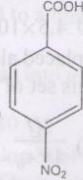
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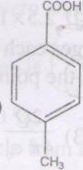
## Chemistry

41. Which of the following can undergo salt hydrolysis?  
 (A)  $\text{Na}_2\text{CO}_3$  (B)  $\text{KClO}_4$  (C)  $\text{KI}$  (D)  $\text{CsCl}$
42. Arrange the following compounds in the descending order of their acidic nature
- 


(I)



(II)



(III)
- (A) II > I > III (B) III > II > I (C) III > I > II (D) II > III > I
43.  $\text{C}_2\text{H}_5 - \text{O} - \text{C}_2\text{H}_5 + (\text{CH}_3\text{CO})_2\text{O} \xrightarrow{\text{ZnCl}_2} \text{A}$   
 $\text{C}_2\text{H}_5 - \text{O} - \text{C}_2\text{H}_5 + \text{CO} \xrightarrow[500\text{atm}]{\text{BF}_3/150^\circ\text{C}} \text{B}$
- (A) Same compounds (B) Position isomers (C) Metamer (D) Homologues
44. Which of the following compounds answer positively carbyl amine test ?
- (I)  $\text{C}_6\text{H}_5\text{NHCH}_3$



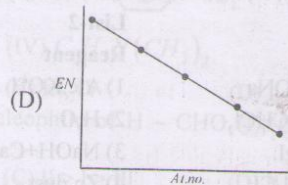
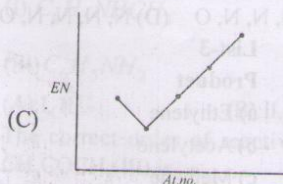
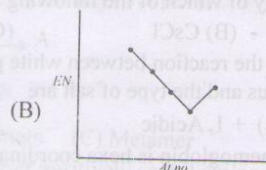
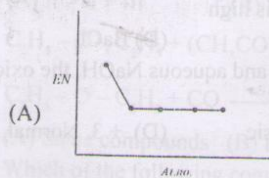
(II)  $\text{H}_3\text{C} - \text{C}_6\text{H}_4 - \text{NH}_2$
- (III)  $\text{C}_6\text{H}_5\text{NH}_2$

(IV)  $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$
- (A) I, II (B) II, III (C) III, IV (D) I, II, III
45. The correct order of reactivity towards nucleophile of  $\text{H} - \text{CHO}$  (I),  $\text{CH}_3 - \text{CHO}$  (II),  $\text{CH}_3\text{COCH}_3$  (III) is  
 (A) I > II > III (B) III > II > I (C) II > I > III (D) II > III > I
46. What is the hybridisation state of the central atom in the conjugate acid of  $\text{NH}_3$  ?  
 (A) sp (B)  $\text{sp}^3$  (C)  $\text{sp}^2$  (D)  $\text{dsp}^2$
47. Kinetic energy of an electron revolving in an orbit of hydrogen atom having de Broglie's wave length ( $\lambda$ )  $10\text{\AA}$  is  
 (A)  $-1.51\text{ eV}$  (B)  $+4.53\text{ eV}$  (C)  $-4.53\text{ eV}$  (D)  $+1.51\text{ eV}$
48. A vessel contains equal masses of Hydrogen and Helium. The fraction of partial pressure of hydrogen in the mixture is  
 (A)  $\frac{2}{3}$  (B)  $\frac{1}{3}$  (C)  $\frac{1}{2}$  (D)  $\frac{1}{4}$

Space for Rough Work



57. Number of moles of oxalate that can be oxidised by one mole of permanganate in acid medium  
 (A) 1 (B) 1.5 (C) 2 (D) 2.5
58. Vicinal dihalide ( $C_2H_4Br_2$ ) on heating with excess alc. KOH and Zinc dust gives 'y' and 'z' respectively. Both 'y' and 'z' on oxidation with Bayer's reagent gives A and B. A and B respectively are  
 (A) Oxalic acid, Acetic acid (B) Acetic acid, Ethylene glycol  
 (C) Ethylene glycol, Oxalic acid (D) Oxalic acid, Ethylene glycol
59.  $H_2O_2$  acts like reducing agent in its reaction with  
 (A)  $Cl_2$  (B) KI (C)  $K_4[Fe(CN)_6]$  (D) Hg
60. A graph which shows correct order of electro negativity of IVA group elements is



61. Chemical formula of the substance, which is called inorganic benzene  
 (A)  $C_6H_6$  (B)  $B_2H_6$  (C)  $B_3N_3H_6$  (D)  $B_2O_3$
62. Assertion (A) : Boiling points of Inert gases decreases down the group  
 Reason (R) : Moving down the group vanderwaal forces become stronger  
 (A) Both A & R are true, R is correct explanation of A  
 (B) Both A & R are true, R is not correct explanation of A  
 (C) A is true, R is false (D) A is false, R is true
63. Three pollutants X, Y and Z have T.L.V values of 0.01, 1 and 10 respectively. The more toxic pollutant is  
 (A) X (B) Y (C) Z (D) Can't be predicted

Space for Rough Work



64. Which of the following cannot form peroxides  
 (A) Ba (B) Sr (C) Be (D) K
65. PDI for PVC polymer is expected to be  
 (A) = 1 (B) < 1 (C) > 1 (D) = 0
66. All the three oxygen atoms of ozone are utilised in the oxidation of  
 (A)  $K_2MnO_4$  solution (B) Moist  $I_2$  (C) Acidified  $FeSO_4$  (D) Acidified  $SnCl_2$
67. The formula of the canary yellow precipitate produced by the action of ammonium molybdate on ortho phosphates is  
 (A)  $(NH_4)_2MoO_4$  (B)  $(NH_4)_3(12MoO_4)$   
 (C)  $(NH_4)_3PO_4 \cdot MoO_3$  (D)  $(NH_4)_3PO_4 \cdot 12MoO_3$
68. A cylinder of gas contains 14.5 kg of butane. If a family needs  $2.5 \times 10^4$  KJ of energy per day for cooking. How long will the cylinder last. (Enthalpy of combustion of butane = 2600 KJ/mole)  
 (A) 26 days (B) 52 days (C) 13 days (D) 116 days
69. RMS velocity of gas 'x' is  $5.2 \times 10^4$  cm.sec<sup>-1</sup> then the most probable and average velocities of that gas are (in cm.sec<sup>-1</sup>)  
 (A)  $42.5 \times 10^4$ ,  $47.9 \times 10^4$  (B)  $4.25 \times 10^3$ ,  $4.79 \times 10^3$   
 (C)  $4.25 \times 10^4$ ,  $4.79 \times 10^4$  (D)  $42.5 \times 10^2$ ,  $47.9 \times 10^2$
70. Observe the following statements  
 I) Bleaching powder decomposes in the presence of  $CoCl_2$  to liberate  $O_2$  gas  
 II) Aqueous  $KHF_2$  is used in the preparation of fluorine  
 III) Chlorine reacts with excess of ammonia and liberates  $N_2$  gas  
 IV) The order of bond dissociation energies of halogens is  $Cl_2 > F_2 > Br_2 > I_2$ .  
 The correct statements are  
 (A) Only I, III (B) Only II, IV (C) All (D) Only II, III, IV
71. The cost of electricity required to deposit 1 gram of Mg is Rs. 10. How much would it cost to deposit 9 gram of Al.  
 (A) Rs 90 (B) Rs 120 (C) Rs 150 (D) Rs 270
72. Statement (1): The RNA contains all the bases present in DNA except thymine and in place of thymine it contains uracil  
 Statement (2): Glycine is optically active amino acid  
 Statement (3): Chemical name of vitamin  $B_6$  is pyridoxine  
 Statement (4): Fructose is reducing sugar.  
 The number of incorrect statements  
 (A) 3 (B) 1 (C) 2 (D) 4

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Space for Rough Work

73. Match the following

**List - I (emulsion)**

- 1) olive oil in water
- 2) water in benzene
- 3) Milk
- 4) oil in water

The correct match is

- |     |   |   |   |   |
|-----|---|---|---|---|
|     | 1 | 2 | 3 | 4 |
| (A) | c | b | d | a |
| (C) | c | a | d | b |

**List - II (emulsifier)**

- a) soap
- b) caesin
- c) solid  $HgI_2$
- d) egg albumin

- |     |   |   |   |   |
|-----|---|---|---|---|
|     | 1 | 2 | 3 | 4 |
| (B) | d | c | b | a |
| (D) | a | b | c | d |

74. When equal volumes of the following solutions are mixed, precipitation of  $AgCl$  ( $K_{sp} = 1.8 \times 10^{-10}$ ) will occur only with

- |   |   |
|---|---|
| (A) $10^{-4} M [Ag^+] & 10^{-4} M [Cl^-]$ | (B) $10^{-5} M [Ag^+] & 10^{-5} M [Cl^-]$   |
| (C) $10^{-6} M [Ag^+] & 10^{-6} M [Cl^-]$ | (D) $10^{-10} M [Ag^+] & 10^{-10} M [Cl^-]$ |

75. The first order diffraction from a set of parallel planes of the crystal occurs at an angle of  $30^\circ$  ( $\theta$ ). The inter planar distance ( $D$ ) will be related to the wavelength ( $\lambda$ ) of X-rays as

- |                              |                    |                   |                    |
|------------------------------|--------------------|-------------------|--------------------|
| (A) $d = \frac{1}{2}\lambda$ | (B) $d = 2\lambda$ | (C) $d = \lambda$ | (D) $d = 4\lambda$ |
|------------------------------|--------------------|-------------------|--------------------|

76. The anodic reaction in the Castner process of extraction of Na is

- |                                     |   |
|-------------------------------------|---|
| (A) $2Cl^- \rightarrow Cl_2 + 2e^-$ | (B) $4 OH^- \rightarrow 2H_2O + O_2 + 4e^-$ |
| (C) $Na + e^- \rightarrow Na$       | (D) $2H^- \rightarrow H_2 + 2e^-$           |

77. Which of the following complex and its structure not correctly matched

- |                                   |                                       |
|-----------------------------------|---------------------------------------|
| (A) $[NiCl_4]^{2-}$ , tetrahedral | (B) $[Ni(CN)_4]^{2-}$ , square planar |
| (C) $[PdBr_4]^{2-}$ , tetrahedral | (D) $[Co(NH_3)_6]^{3+}$ , octahedral  |

78. If 25ml of 0.5 M  $AlCl_3$  solution is diluted to 250ml, the concentration of  $Cl^-$  ions in the resulting solution is

- |           |           |           |           |
|-----------|-----------|-----------|-----------|
| (A) 0.15M | (B) 0.02M | (C) 0.05M | (D) 0.50M |
|-----------|-----------|-----------|-----------|

79. Which is not arranged in the correct sequence?

- |   |  |
|---|--|
| (A) $MO, M_2O_3, MO_2, M_2O_5$ - decreasing basic strength (M is non metal) | (C) $Fe, Fe^{+2}, Fe^{+3}$ - Increasing radius       |
| (B) B, Be, C, N - Increasing I.P. values                                    | (D) Cl, F, Br, I - Decreasing in electron affinities |

80. Temperature coefficient of a reaction is 2. If the rate at  $20^\circ C$  is  $2 \times 10^{-3} ms^{-1}$ , the rate at  $40^\circ C$  is

- |                                |                                |                                |                                |
|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| (A) $4 \times 10^{-3} ms^{-1}$ | (B) $8 \times 10^{-3} ms^{-1}$ | (C) $2 \times 10^{-3} ms^{-1}$ | (D) $4 \times 10^{-6} ms^{-1}$ |
|--------------------------------|--------------------------------|--------------------------------|--------------------------------|

Space for Rough Work

### Mathematics

81. The eccentricity of the hyperbola  $x = \frac{a}{2}\left(t + \frac{1}{t}\right), y = \frac{a}{2}\left(t - \frac{1}{t}\right)$  is  
 (A)  $\sqrt{3}$  (B)  $\sqrt{2}$  (C)  $2\sqrt{3}$  (D)  $3\sqrt{2}$
82. The polar equation of  $x^3 = y^2(2a - x)$  is  
 (A)  $r \cos \theta = 2a \sin^2 \theta$  (B)  $r \cos \theta = 2a \cos^2 \theta$   
 (C)  $r \sin \theta = 2a \sin^2 \theta$  (D)  $r \sin \theta = 2a \cos^2 \theta$
83. The foot of the perpendicular from the point  $(3, 3\pi/4)$  on the line  $r(\cos \theta - \sin \theta) = 6\sqrt{2}$  is  
 (A)  $(1, \pi/3)$  (B)  $(6, 7\pi/4)$  (C)  $(-3, \pi/2)$  (D)  $(3, 2\pi/4)$
84. If  $y = \tan(3 \tan^{-1} x)$  then  $y_2(1 - 3x^2) - 12xy_1 =$   
 (A)  $6(y - x)$  (B)  $6(y + x)$  (C)  $6y$  (D)  $-6x$
85. If  $\int \frac{\cos x}{\cos 2x} dx = A \ln \left| \frac{1 + \sqrt{2} \sin x}{1 - \sqrt{2} \sin x} \right| + c$ , then  $A =$   
 (A)  $\frac{1}{2\sqrt{2}}$  (B)  $\frac{1}{2}$  (C)  $\frac{1}{\sqrt{2}}$  (D)  $\sqrt{2}$
86. If  $\int e^{3x} \sin 4x dx = e^{3x}(a \sin 4x + b \cos 4x) + c$ , then  $a - b =$   
 (A)  $\frac{3}{25}$  (B)  $\frac{4}{25}$  (C)  $\frac{-1}{25}$  (D)  $\frac{7}{25}$
87.  $\int \frac{\sin^9 x}{\cos^{11} x} dx =$   
 (A)  $\frac{\tan^9 x}{9} + c$  (B)  $\frac{\tan^{10} x}{10} + c$  (C)  $\frac{\tan^{11} x}{11} + c$  (D)  $\frac{\tan^8 x}{8} + c$

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88.  $\int_0^{\frac{\pi}{4}} (\tan^{n-2} x + \tan^n x) dx =$  (when  $n \neq 1$ ) (A)
- (A)  $\frac{1}{n-2}$  (B)  $\frac{1}{n}$  (C)  $\frac{1}{n-1}$  (D)  $\frac{1}{2n-2}$
89.  $\int_3^5 \sqrt{(5-x)(x-3)} dx =$
- (A)  $\frac{\pi}{2}$  (B)  $\frac{\pi}{6}$  (C)  $\frac{\pi}{12}$  (D)  $\frac{\pi}{4}$
90. If  $\log_{10} 100 = 2, \log_{10} 101 = 2.004, \log_{10} 102 = 2.0086, \log_{10} 103 = 2.0128$  then
- $\int_{100}^{103} \log_{10} x dx$  by Trapezoidal rule is
- (A) 6.0193 (B) 6.0019 (C) 6.1093 (D) 6.11993
91. The area of the region bounded by  $y = [x]$  and the ordinates  $x = 1, x = 2$  in sq. units is
- (A) 2 (B) 1 (C) 4 (D) 1/2
92. Degree and order of the differential equation  $\left[ \frac{d^2 y}{dx^2} \right]^{3/2} = \left( \frac{dy}{dx} + y \right)$
- (A) 2, 3 (B) 3, 2 (C) 3, 3 (D) 2, 2
93. The solution of the equation  $\log \frac{dy}{dx} = ax + by$  is
- (A)  $\frac{e^{by}}{b} = \frac{e^{ax}}{a} + c$  (B)  $\frac{e^{-by}}{-b} = \frac{e^{ax}}{a} + c$  (C)  $\frac{e^{-by}}{a} = \frac{e^{ax}}{b} + c$  (D)  $e^{ax} + e^{bx} = c$
94. Solution of  $\left( \frac{x+y-1}{x+y-2} \right) \frac{dy}{dx} = \left( \frac{x+y+1}{x+y+2} \right)$ , given that  $y = 1$  when  $x = 1$ , is
- (A)  $\log \left| \frac{(x-y)^2 - 2}{2} \right| = 2(x+y)$  (B)  $\log \left| \frac{(x-y)^2 + 2}{2} \right| = 2(x-y)$
- (C)  $\log \left| \frac{(x+y)^2 + 2}{2} \right| = 2(x-y)$  (D)  $2(y-x) + \log \left| \frac{(x+y)^2 - 2}{2} \right| = 0$

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95. If  $f: \mathbb{R} \rightarrow \mathbb{R}$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$  are defined by  $f(x) = 2x + 3$  and  $g(x) = x^2 + 7$ , then values of  $x$  such that  $g(f(x)) = 8$  are  
 (A) 1, 2 (B) -1, 2 (C) -1, -2 (D) 1, -2
96. Equations of the lines passing through (1, 1) and making an angle  $\frac{\pi}{4}$  with  $2x - y - 7 = 0$  are  
 I)  $x + 2y = 3$ ,  $2x + y = 3$  II)  $x - y = 0$ ,  $x + y = 2$   
 III)  $x + 3y = 4$ ,  $3x - y = 2$  IV)  $3x + y = 4$ ,  $x - 3y + 2 = 0$   
 (A) II, III (B) III, II (C) III, III (D) II, II
97. Statement - I: The difference of the slopes of the lines  $3x^2 - 8xy - 3y^2 = 0$  is  $10/3$   
 Statement - II: The difference of the slopes of the lines  
 Which of the above two statements are true  
 (A) only I true (B) only II only (C) both are true (D) neither I nor II
98. If  $\vec{a}$  is a unit vector,  $\vec{a} \times \vec{r} = \vec{b}$ ,  $\vec{a} \cdot \vec{r} = c$ , then  $\vec{r} =$   
 (A)  $c\vec{a} - (\vec{a} \times \vec{b})$  (B)  $c\vec{b} - (\vec{a} \times \vec{b})$  (C)  $c\vec{a} + (\vec{a} \times \vec{b})$  (D)  $c\vec{b} + (\vec{a} \times \vec{b})$
99. If the function  $f: (-\infty, \infty) \rightarrow B$  defined by  $f(x) = -x^2 + 6x - 8$  an onto function, then  $B =$   
 (A)  $[1, \infty)$  (B)  $(-\infty, 1]$  (C)  $(-\infty, \infty)$  (D)  $[\infty, -\infty]$
100. If  $10^n + 3 \cdot 4^n + k$  is divisible by 9 for all  $n \in \mathbb{N}$ , then the least value of  $k$  is  
 (A) 1 (B) 5 (C) 14 (D) 23
101. If  $\tan 3A = x$ ;  $\tan 6A = y$ ;  $\tan 9A = z$  then  $\frac{x+y-z}{xyz} =$   
 (A) 1 (B) -1 (C)  $1/2$  (D)  $-\frac{1}{2}$
102. If  $x = \sin^3 20^\circ - \frac{3}{4} \sin 20^\circ$  and  $y = \cos^3 10^\circ - \frac{3}{4} \cos 10^\circ$  then  
 (A)  $x + y = 0$  (B)  $x - y = 0$  (C)  $x + y = 1$  (D)  $x + y = 2$
103.  $A + B = 45^\circ$  then  $(1 + \tan A)(1 + \tan B) =$   
 (A) 1 (B) 2 (C) 3 (D) 4
104. The number of roots of the equation  $2 \sin^2 \theta + 3 \sin \theta + 1 = 0$  in  $(0, 2\pi)$  is  
 (A) 1 (B) 2 (C) 3 (D) 4

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105. The value of  $S \sin^{-1} \left( \frac{-\sqrt{3}}{2} \right) + 2C \cos^{-1} \left( \frac{-1}{2} \right)$  is equal to  
 (A)  $2\pi$  (B)  $\pi$  (C)  $\pi/2$  (D)  $3\pi/2$
106. If  $\tanh x = 3/5$ , then  $\tanh 3x =$   
 (A)  $64/63$  (B)  $63/65$  (C)  $53/65$  (D)  $43/65$
107. If the angles of a triangle ABC be in A.P., then  
 (A)  $c^2 = a^2 + b^2 - ab$  (B)  $b^2 = a^2 + c^2 - ac$   
 (C)  $a^2 = b^2 + c^2 - ac$  (D)  $b^2 = a^2 + c^2$
108. If in a triangle ABC,  $(s-a)(s-b) = s(s-c)$ , then angle C is equal to  
 (A)  $90^\circ$  (B)  $45^\circ$  (C)  $30^\circ$  (D)  $60^\circ$
109. The angles of elevations of the top of a tower from the points at a distance of 40, 90 meters from it are complementary. Then the height of the tower is.  
 (A) 40 (B) 50 (C) 60 (D) 20
110. The least positive integer n for which  $\frac{(1+i)^n}{(1-i)^{n-2}}$  is a real number is  
 (A) 1 (B) 2 (C) 3 (D) 4
111. If the roots of  $Z^n = 1$  are  $1, \alpha, \alpha^2, \dots, \alpha^{n-1}$  then  $1 + \alpha + \alpha^2 + \dots + \alpha^{n-1} =$   
 (A)  $i$  (B)  $-i$  (C) 0 (D)  $\alpha^n$
112. If  $1 + w + w^2 = 0$  and  $w^3 = 1$  then  $(1-w)(1-w^2)(1-w^4)(1-w^8) =$   
 (A) 9 (B) -9 (C) 4 (D) -4
113. Let 'O' be the origin and A, B be two points.  $\vec{p}, \vec{q}$  are vectors represented by  $\vec{OA}, \vec{OB}$  and their magnitudes are p, q respectively. Unit vector bisecting  $\angle AOB$  is  
 (A)  $\frac{\vec{p} + \vec{q}}{p + q}$  (B)  $\frac{\vec{p} - \vec{q}}{p - q}$  (C)  $\frac{\vec{p} + \vec{q}}{p + q}$  (D)  $\frac{\vec{p} - \vec{q}}{p - q}$

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114. If  $\vec{a}$  is a vector then  $(\vec{a} \cdot \vec{i})^2 + (\vec{a} \cdot \vec{j})^2 + (\vec{a} \cdot \vec{k})^2 =$
- (A)  $\vec{a}^2$  (B)  $2\vec{a}^2$  (C)  $3\vec{a}^2$  (D)  $4\vec{a}^2$
115. If  $\vec{a} = 3\vec{i} - \vec{j} - 2\vec{k}$ ,  $\vec{b} = 2\vec{i} + 3\vec{j} + \vec{k}$ , then  $(\vec{a} + 2\vec{b}) \times (2\vec{a} - \vec{b}) =$
- (A)  $-25\vec{i} + 35\vec{j} - 55\vec{k}$  (B)  $25\vec{i} - 35\vec{j} + 55\vec{k}$  (C)  $25\vec{i} + 35\vec{j} - 55\vec{k}$  (D)  $-25\vec{i} - 35\vec{j} - 55\vec{k}$
116. Let a, b, c be distinct non-negative numbers. If the vectors  $a\vec{i} + a\vec{j} + c\vec{k}$ ,  $\vec{i} + \vec{k}$ ,  $c\vec{i} + c\vec{j} + b\vec{k}$  lie on a plane, then 'c' is
- (A) A.M. of a and b (B) G.M. of a and b (C) H.M. of a and b (D)  $(ab)^2$
117. A :  $f(x) = \log x^3$  and  $g(x) = 3 \log x$  are equal functions  
 R : Two functions f and g are said to be equal if their domains and codomains are equal and  $f(x) = g(x) \forall x$  in their domain.
- (A) Both A and R are true and R is the correct explanation of A  
 (B) Both A and R are true but R is not correct explanation of A  
 (C) A is true but R is false (D) A is false but R is true
118. The point to which the origin should be shifted in order to eliminate x and y terms in the equation  $x^2 + y^2 - 2ax - 4ay + a^2 = 0$  is
- (A)  $(a, -2a)$  (B)  $(-a, 2a)$  (C)  $(-a, -2a)$  (D)  $(a, 2a)$
119. If the centroid of a triangle formed by the points  $(a, 0, 0)$ ,  $(0, b, 0)$ ,  $(0, 0, c)$  is  $\left(\frac{2}{3}, \frac{1}{3}, 1\right)$  then ascending order of a, b, c is
- (A) a, b, c (B) c, b, a (C) b, a, c (D) b, c, a
120. If a line makes angles  $60^\circ$ ,  $60^\circ$  with the positive x-axis and y-axis then the angle made by the line with positive z-axis is
- (A)  $0$  (B)  $45^\circ$  or  $135^\circ$  (C)  $60^\circ$  or  $120^\circ$  (D)  $90^\circ$
121. The direction ratios of a normal to the plane passing through  $(0, 0, 1)$ ,  $(0, 1, 2)$  and  $(1, 2, 3)$  are
- (A)  $(0, 1, -1)$  (B)  $(1, 0, -1)$  (C)  $(0, 0, -1)$  (D)  $(1, 0, 0)$

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122. Let  $y = mx$  and  $y = m^1x$  be the lines represented by the equation  $ax^2 + 2hxy + by^2 = 0$ . Match the following and choose the correct answer

## List - I

I)  $m + m^1$

II)  $\frac{1}{m} + \frac{1}{m^1}$

III)  $mm^1$

IV)  $|m - m^1|$

## List - II

a)  $\frac{2\sqrt{h^2 - ab}}{|b|}$

b)  $\frac{-2h}{b}$

c)  $\frac{-2h}{a}$

d)  $\frac{2}{b}$

e)  $\frac{a}{b}$

- (A) b, d, c, a      (B) b, c, d, a      (C) c, d, b, e      (D) b, c, e, a
123. The lines  $2x + 3y = 6$ ,  $2x + 3y = 8$  cut the x-axis at A, B respectively. The line 'l' drawn through the point (2, 2) meets the x-axis at C in such a way that the abscissae of A, B, C are in A.P. Then the equation of the line 'l' is . . .
- (A)  $2x + 3y = 10$       (B)  $3x + 2y = 10$       (C)  $2x - 3y = 10$       (D)  $3x - 2y = 10$
124. If  $l, m, n$  are in A.P then the lines represented by  $lx + my + n = 0$  are concurrent at the point
- (A) (1,2)      (B) (2,4)      (C) (-2,1)      (D) (1,-2)
125. If  $xy + 2x + 3y + c = 0$  represents a pair of lines then  $c =$
- (A) 2      (B) 3      (C) 4      (D) 6
126. The value of  $f$  at  $x = 0$  so that the function  $f(x) = \frac{\sin 2x}{x}$  is continuous at  $x = 0$  is
- (A) 2      (B) 4      (C) 6      (D) 0
127. If  $\lim_{x \rightarrow 0} \frac{\sin 2x + a \sin x}{x^3}$  be finite, then the value of  $a$  and the limit are given by
- (A) -2, 1      (B) -2, -1      (C) 2, 1      (D) 2, -1

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128. If  $y = \log\left(\frac{1+x}{1-x}\right)^{\frac{1}{4}} - \frac{1}{2}\tan^{-1}x$ , then  $\frac{dy}{dx}$
- (A)  $\frac{x}{1-x^2}$  (B)  $\frac{x^2}{1-x^4}$  (C)  $\frac{x}{1+x^4}$  (D)  $\frac{x}{1-x^4}$
129. Derivative of  $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$  wrt  $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$
- (A)  $\frac{1}{2}$  (B)  $\frac{1}{4}$  (C)  $-\frac{1}{2}$  (D)  $-\frac{1}{4}$
130. If  $f(a) = 2$ ,  $f'(a) = 1$ ,  $g(a) = -1$ ,  $g'(a) = 2$ , then  $\lim_{x \rightarrow a} \frac{g(x)f(a) - g(a)f(x)}{x-a}$
- (A)  $-5$  (B)  $\frac{1}{5}$  (C)  $5$  (D)  $-\frac{1}{5}$
131. A stone projected vertically upward moves according to the law  $s = 48t - 16t^2$ . The time taken by the stone to reach the point of projection is \_\_\_\_\_ (t is in sec)
- (A) 1 sec (B) 2 sec (C) 3 sec (D) 6 sec
132. The two curves  $y = \frac{x+3}{x^2+1}$ ,  $y = \frac{x^2-7x+11}{x-1}$  at (2,1)
- (A) touch each other (B) cut orthogonally (C) cut at an angle of  $45^\circ$  (D) none
133. If  $f(x) = x^2 + ax + 1 > 0 \forall x \in \mathbb{R}$  then range of a is
- (A)  $(-2, 2)$  (B)  $(0, 3)$  (C)  $(-3, 0)$  (D)  $(-\infty, -2) \cup (2, \infty)$
134. If  $u = \log(\tan x + \tan y)$  then  $\sin 2x \frac{\partial u}{\partial x} + \sin 2y \frac{\partial u}{\partial y} =$
- (A) 0 (B) 1 (C) 2 (D) -1
135. If the product of the roots of the equation  $x^2 - 3kx + 2e^{2 \log k} - 1 = 0$  is 17 then  $k =$
- (A) 5 (B) 3 (C) 2 (D) 9
136. If  $p(p-r)x^2 + q(r-p)x + r(p-q) = 0$  has equal roots then  $2/q =$
- (A)  $\frac{1}{p} + \frac{1}{r}$  (B)  $\frac{1}{p} - \frac{1}{r}$  (C)  $p+r$  (D)  $pr$

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137. If 2, 3 are the roots of the equation  $2x^3 + px^2 - 13x + q = 0$ , then  $(p, q) =$   
 (A)  $(-5, -30)$  (B)  $(-5, 30)$  (C)  $(5, -30)$  (D)  $(5, 30)$
138. If  $\alpha, \beta, \gamma$  are the roots of  $x^3 + 2x^2 - 3x - 1 = 0$ , then  $\alpha^2 + \beta^2 + \gamma^2 =$   
 (A) 8 (B) 10 (C) 14 (D) 15
139. If  $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$  then A is  
 (A) an idempotent matrix (B) nilpotent matrix  
 (C) involutory (D) orthogonal matrix
140. The system of equations  $3x - 2y + z = 0$ ,  $\lambda x - 14y + 15z = 0$  and  $x + 2y - 3z = 0$  have non-zero solution, then  $\lambda =$   
 (A) 1 (B) 3 (C) 5 (D) 0
141.  $\begin{vmatrix} (200)^2 & (201)^2 & (202)^2 \\ (201)^2 & (202)^2 & (203)^2 \\ (202)^2 & (203)^2 & (204)^2 \end{vmatrix} =$   
 (A) 1 (B) 2 (C) -8 (D) 8
142. The number of triangles formed by the vertices of a decagon such that atleast one side is in common  
 (A) 60 (B)  $10C_3 - 70$  (C) 70 (D)  $10C_3 - 10$
143. If  $a_n = \sum_{r=0}^n \frac{1}{nCr}$  then  $\sum_{r=0}^n \frac{r}{nCr} =$   
 (A)  $(n-1)a_0$  (B)  $na_n$  (C)  $\frac{1}{2}na_n$  (D)  $\frac{1}{2}a_n$
144. The number of rational numbers  $p/q$ , where  $p, q \in \{1, 2, 3, 4, 5, 6\}$  is  
 (A) 27 (B) 23 (C) 36 (D) 35

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145. When 2549 is divided by 13, the remainder is  
 (A) 12 (B) 2 (C) 6 (D) 9
146. Coefficient of  $x^6$  in  $(1+x)^6 + (1+x)^7 + \dots + (1+x)^{15}$  is  
 (A)  ${}^{16}C_{14}$  (B)  ${}^{16}C_{10}$  (C)  ${}^{16}C_8$  (D)  ${}^{16}C_9$
147. If the remainders of the polynomial  $f(x)$  when divided by  $x+1$  and  $x-1$  are 3, 7; then the remainder of  $f(x)$  when divided by  $x^2-1$  is  
 (A)  $3x+5$  (B)  $2x+7$  (C)  $2x+5$  (D)  $3x+7$
148. Coefficient of  $x^{10}$  in the expansion of  $(2+3x)e^{-x}$  is.  
 (A)  $\frac{-26}{(10)!}$  (B)  $\frac{-28}{(10)!}$  (C)  $\frac{-30}{(10)!}$  (D)  $\frac{-32}{(10)!}$
149.  $\frac{1}{2x-1} + \frac{1}{3} \cdot \frac{1}{(2x-1)^3} + \frac{1}{5} \cdot \frac{1}{(2x-1)^5} + \dots =$   
 (A)  $\frac{1}{2} \log\left(\frac{x}{x-1}\right)$  (B)  $\frac{1}{2} \log\left(\frac{x-1}{x}\right)$  (C)  $\frac{1}{2} \log\left(\frac{x}{1-x}\right)$  (D)  $\frac{1}{2} \log\left(\frac{1-x}{x}\right)$
150. Assertion ((A):  $P(A \cap \bar{B}) = P(A) - P(A \cap B)$ )  
 Reason (R): If  $B \subset A$ ,  $P(A \cap \bar{B}) = P(A) - P(B)$   
 (A) Both A and R are true and R is the correct explanation of A  
 (B) Both A and R are true but R is not correct explanation of A  
 (C) A is true but R is false (D) A is false but R is true
151. In a convex hexagon two diagonals are drawn at random. The probability that the diagonals intersect at an interior point of the hexagon is  
 (A)  $\frac{5}{12}$  (B)  $\frac{7}{12}$  (C)  $\frac{2}{5}$  (D)  $\frac{4}{5}$
152. There are 10 pair of shoes in a cup board from which 4 shoes are picked at random. The probability that there is atleast one pair is  
 (A)  $\frac{99}{323}$  (B)  $\frac{224}{323}$  (C)  $\frac{2}{5}$  (D)  $\frac{3}{5}$
153. The mean of a binomial distribution is 25. Then the standard deviation lies in the interval  
 (A)  $[0, 5)$  (B)  $(0, 0.25)$  (C)  $(0, 5)$  (D)  $(0, 25)$

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154. A random variable  $x$  has its range  $\{0, 1, 2, 3, \dots\}$ . If  $P(x=r) = \frac{c(r+1)}{2^r}$  for  $r=0, 1, 2, \dots$  then  $c=$   
 (A) 2 (B) 1/2 (C) 4 (D) 1/4
155. The equation of the diameter of the circle  $(x-2)^2 + (y+1)^2 = 16$  which bisects the chord cut off by the line  $x - 2y - 3 = 0$   
 (A)  $2x + y - 3 = 0$  (B)  $x + 2y - 3 = 0$  (C)  $x - y + 1 = 0$  (D)  $2x - y - 3 = 0$
156. The circle with centre  $(2, 3)$  and intersecting  $x^2 + y^2 - 4x + 2y - 7 = 0$  orthogonally has the radius  
 (A) 1 (B) 2 (C) 3 (D) 4
157. The equation of the normal to the circle  $x^2 + y^2 - 8x - 2y + 12 = 0$  at the point whose ordinate is '-1' is  
 (A)  $2x - y + 7 = 0$  (B)  $2x - y - 7 = 0$  (C)  $2x + y + 9 = 0$  (D)  $2x + y + 9 = 0$
158. The equation of the axis of the parabola  $9y^2 - 16x - 12y - 57 = 0$  is  
 (A)  $2x - 3 = 0$  (B)  $y - 3 = 0$  (C)  $3y - 2 = 0$  (D)  $x + 3y - 3 = 0$
159. The angle made by a common tangent of the ellipse  $\frac{x^2}{16} + \frac{y^2}{12} = 1$  and the circle  $x^2 + y^2 = 15$  with the major axis of the ellipse is  
 (A)  $\frac{\pi}{6}$  (B)  $\frac{\pi}{4}$  (C)  $\frac{\pi}{3}$  (D)  $\frac{\pi}{2}$
160. Distance between the Focii of the hyperbola  $\frac{x^2}{9} - \frac{y^2}{16} = 1$  is  
 (A) 10 (B) 12 (C) 16 (D) 9

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## Botany

81. Metal ion co-factor in IAA oxidase is  
 (A)  $Mg^{2+}$  (B)  $Fe^{2+}$  (C)  $Mn^{2+}$  (D)  $Zn^{2+}$
82. With reference to photosynthesis of  $C_4$  plants which one of the following reaction and its site of occurrence is correctively matched  
 (A)  $PEP + CO_2 + H_2O \rightarrow OAA$  -Cytosol of bundle sheath cell  
 (B)  $OAA + NADPH \rightarrow$  Malic acid - Cytosol of mesophyll cell  
 (C) Pyruvic acid  $\rightarrow$  PEP -Chloroplast of mesophyll cell  
 (D)  $RuBP + CO_2 \rightarrow 3$  PGA - Chloroplast of mesophyll cell
83. Arrange the following respiratory substrates in the descending order based on their R.Q values  
 I) Tripalmitin II) Oxalic acid III) Protein IV) Glucose  
 (A) II, III, I, IV (B) IV, III, I, II (C) II, I, IV, III (D) II, IV, III, I
84. **Assertion(A):** Emasculation prevents cross pollination  
**Reason(R):** Male sterile plants can be used directly as female parents without emasculation  
 (A) A and R are true and R is the correct explanation of A.  
 (B) A and R are true and R is not the correct explanation of A.  
 (C) A is true, R is false. (D) A is false, R is true.
85. Study the following lists  
**List-I**  
 A) Sodium hypochlorite  
 B) Mercuric chloride  
 C) Sodium alginate  
 D) Soilrite  
**List-II**  
 I) Surface sterilization of seeds  
 II) Plantation of cultured plants  
 III) Sterilization of explant  
 IV) Encapsulation of embryoids  
 The correct match is  

	A	B	C	D		A	B	C	D
(A)	III	I	IV	II	(B)	II	III	IV	I
(C)	III	II	IV	I	(D)	I	II	III	IV
86. Bacterial SCP are rich in two types of amino acids. One of them is also rich in  $H_{2A}$  and  $H_{2B}$  of nucleosome. Another is coded by AUG during protein synthesis. The two amino acids respectively are  
 (A) Serine and Glycine (B) Glycine and Tryptophan  
 (C) Lysine and Methionine (D) Serine and Phenylalanine
87. **Assertion(A):** Radio active gene specific probes are used during colony hybridization  
**Reason(R):** Radio activity helps the probe to detect complementary strand  
 (A) A and R are true and R is the correct explanation of A.  
 (B) A and R are true and R is not the correct explanation of A.  
 (C) A is true, R is false. (D) A is false, R is true.

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88. Scientific name of destroying angel is  
(A) Amanita phalloides (B) Volvariella volvacea (C) Amanita virosa (D) Lentinus edodes
89. Read the following lists and identify the correct match
- | <u>List-I</u>                    |  |  |  | <u>List-II</u> |  |  |  |
|----------------------------------|--|--|--|----------------|--|--|--|
| A) Medicinal plant               |  |  |  | I) Chlorella   |  |  |  |
| B) Used as food for astronauts   |  |  |  | II) Cinchona   |  |  |  |
| C) Biofertilizer                 |  |  |  | III) Jatropha  |  |  |  |
| D) Source of single cell protein |  |  |  | IV) Spirulina  |  |  |  |
|                                  |  |  |  | V) Anabaena    |  |  |  |
- | A      | B  | C | D   | A      | B | C   | D  |
|--------|----|---|-----|--------|---|-----|----|
| (A) II | I  | V | III | (B) II | I | III | IV |
| (C) II | IV | I | V   | (D) II | I | V   | IV |
90. Modified roots that perform photosynthesis by absorbing moisture from the atmosphere are present  
I) Trapa II) Taeniophyllum III) Avicennia IV) Vanda  
(A) I, II and III (B) I, II, III and IV (C) II and IV (D) II only
91. The nature of vascularised defensive structure in Punica resemble the structural modification of  
(A) Terminal bud of Carissa (B) Apical bud of Artabotrys  
(C) Axillary bud of Duranta (D) Stipules of Parkinsonia
92. Leaves are borne opposite to roots in modified (or) reduced stem of  
I) Allium II) Pistia III) Hydrocotyl IV) Nerium  
(A) I, II, III & IV (B) I & II only (C) I, II & III (D) III & IV only
93. Simple mechanical tissue with intercellular spaces and inflorescence with two dichasial and four scorpioid cymes are seen in  
(A) Lactuca (B) Monstera (C) Leucas (D) Poinsettia
94. **Assertion(A):** All insectivorous plants are greenish and primary producers and secondary consumers  
**Reason(R):** All insectivorous plants are greenish but feed on insects for nitrogenous matters  
(A) A and R are true and R is the correct explanation of A.  
(B) A and R are true and R is not the correct explanation of A.  
(C) A is true, R is false. (D) A is false, R is true.
95. Types of placentations found in multicarpellary, syncarpous, multilocular ovaries are  
I) Free central II) Superficial III) Parietal IV) Axile  
(A) III & IV (B) II & III (C) II & IV (D) I & IV
96. Read the following and identify the correct statements  
I) All flowers that show herkogamy will show heterostyly  
II) All flowers that show heterostyly will show herkogamy  
III) All flowers that show self pollination do not show self fertilization  
IV) All flowers that show cross pollination may show cross fertilization  
(A) II & III only (B) III & IV only (C) I, II & III only (D) II, III & IV only

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97. In which of the following plants the composite fruits develops from inflorescence having sessile flowers  
 I) Ananas sativus      II) Artocarpus      III) Morus      IV) Casuarina  
 (A) I & III      (B) I, III & IV      (C) II, III & IV      (D) I, II, III & IV
98. According to Bentham and Hooker arrange the following Taxa based on their number in correct ascending order  
 I) Total no. of sub class      II) Total No. of cohorts  
 III) Total no. of series      IV) Total no. of natural orders  
 (A) I, III, II, IV      (B) II, IV, III, I      (C) I, II, IV, III      (D) III, IV, I, II
99. This is the floral formula of a plant that has protein rich cotyledons and called as pulses  
 (A)  $\%, K_{(5)}, C_{1+2+(2)}, A_{(9)+1}, G_1 -$       (B)  $\oplus, K_{(5)}, C_{1+2+(2)}, A_{(9)+1}, G_1 -$   
 (C)  $\%, K_{(5)}, C_{1+(2)+2}, A_{(9)+1}, G_1 -$       (D)  $\%, K_{(5)}, C_{1+2+(2)}, A_{(9)+1}, \underline{G}_1$
100. Study the following table

<u>Taxon</u>	<u>Number of chromosomes present in reminent of nucellus</u>	<u>Number of chromosomes present in PEN</u>
I) Saccharam	80	120
II) Allium	24	24
III) Gossypium	26	52
IV) Zeamays	20	30

Which of the two combinations are correct

- (A) I & II      (B) I & IV      (C) II & III      (D) II & IV
101. In correct statement about golgi complex is  
 (A) It's structural components are bounded by a single unit membrane  
 (B) It forms primary lysosomes  
 (C) It plays significant role in secretion of lipids and hormones  
 (D) It is concerned with the formation of rough E.R
102. A DNA molecule has 20 coils. If the number of Thymine bases is 70, then calculate the maximum number of hydrogen bonds in that molecule  
 (A) 1060      (B) 230      (C) 470      (D) 530
103. Arrange the following in correct sequence with respect to Meiosis-I  
 I) Initiation of spindle organization  
 II) Movement of bivalents towards the periphery of Nucleus  
 III) Chromosomal congression      IV) Recombination of genetic characters  
 (A) I, II, IV, III      (B) I, IV, II, III      (C) III, II, IV, I      (D) I, III, IV, II
104. Flax, ramie and hemp fibres are obtained respectively from  
 (A) Lilium, Boehmeria and Cannabis      (B) Linum, Boehmeria and Cannabis  
 (C) Lilium, Barbedense and Cannabis      (D) Leucas, Boehmeria and Cannabis

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105. A xerophytic plant with sunken stomata that are located in abaxial surface of leaf and covered by epidermal hairs exhibit the following characters  
 I) Multiple epidermis and multiple palisade II) Whorled phyllotaxy  
 III) Polychasial cyme IV) Drought escaping life style  
 (A) I and II only (B) II, III and IV (C) I, II and III (D) I, III and IV
106. **Assertion(A):** Genetic purity of an individual can be detected by test cross  
**Reason(R):** In a test cross the female parent is homozygous and the male parent is heterozygous  
 (A) A and R are true and R is the correct explanation of A.  
 (B) A and R are true and R is not the correct explanation of A.  
 (C) A is true, R is false. (D) A is false, R is true.
107. In  $F_2$  progeny of dihybrid cross, the expected genotype proportions of individuals, homozygous for both characters is  
 (A)  $\frac{3}{16}$  (B)  $\frac{1}{16}$  (C)  $\frac{1}{4}$  (D)  $\frac{3}{4}$
108. The tissues which lie side by side in the primary structure and far separated radially during secondary growth in a dicot stem are  
 (A) Endodermis and pericycle (B) Primary phloem and pericycle  
 (C) Primary phloem and primary xylem (D) Cortex and pith
109. Read the following lists and identify the correct match
- | List-I            |  |  |  | List-II                          |  |  |  |
|-------------------|--|--|--|----------------------------------|--|--|--|
| A) Chlorobium     |  |  |  | I) Non-Sulphur purple bacterium  |  |  |  |
| B) Nitrobacter    |  |  |  | II) Non-purple sulphur bacterium |  |  |  |
| C) Rhodospirillum |  |  |  | III) Green sulphur bacterium     |  |  |  |
| D) Salmonella     |  |  |  | IV) Chemoheterotrophic bacterium |  |  |  |
|                   |  |  |  | V) Chemo autotrophic bacterium   |  |  |  |
- | A       | B   | C | D  | A      | B  | C  | D   |
|---------|-----|---|----|--------|----|----|-----|
| (A) III | V   | I | IV | (B) IV | I  | V  | III |
| (C) II  | III | V | I  | (D) V  | IV | II | I   |
110. Choose the correct descending sequence with respect to TMV  
 I) Number of nucleotides in RNA II) Number of strands in RNA  
 III) Number of capsomers in capsid IV) Number of amino acids in a capsomer  
 (A) III, I, IV, II (B) II, IV, III, I (C) I, III, IV, II (D) II, IV, I, III
111. The resting zygospore of pond scum does not differ from its vegetative cell in  
 (A) Number of nuclei (B) Nature of reserve food  
 (C) Ploidy of nucleus (D) Number of layers in cell wall
112. A '+' gametangium of *Rhizopus stolonifer* with 100 nuclei fuses with '-' gametangium having 80 nuclei. The number of diploid nuclei, degenerated nuclei, and germ spores of '-' strain formed respectively are  
 (A) 80,20,160 (B) 90,20,80 (C) 40,40,120 (D) 80,20,80

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113. The correct sequence of tissues in centripetal order present in the theca region of capsule in Funaria  
 (A) Epidermis- spongy chlorenchyma-hypodermis-sporesac-columella  
 (B) Epidermis-hypodermis-airspace-spongy chlorenchyma-columella-sporesac  
 (C) Epidermis-hypodermis-collenchyma-airspace-spore sac-columella  
 (D) Epidermis-hypodermis-spongy chlorenchyma-air space-spore sac- columella
114. In what ratio, the spores and male gametes are produced from their respective structure in Pteris  
 (A) 1:1 (B) 1:2 (C) 2:3 (D) 3:2
115. Gymnosperms and Angiosperms differ in  
 I) Type of life cycle II) Type of pollination  
 III) Type of sexual reproduction IV) Number of fertilization in an ovule  
 V) Sexuality of gametophytes VI) Ploidy level of endosperm  
 (A) I, III, V (B) I, III only (C) II, IV, VI (D) II, III, V
116. When cell of 'A' with  $\pi = -0.9 \text{ Mpa}$  and  $p=0.6 \text{ Mpa}$  and Cell 'B' with  $\pi = -0.8 \text{ Mpa}$  and  $p=0.3 \text{ Mpa}$  are placed side by side, the value of  $\psi$  of the cells at equilibrium is  
 (A) -0.4 Mpa (B) +0.4 Mpa (C) -0.3 Mpa (D) -0.1 Mpa
117. The ratio of essential mineral elements which are absorbed exclusively as anions and cations respectively  
 (A) 2:1 (B) 2:3 (C) 1:2 (D) 3:2
118. 5 enzyme molecules with a turn over number of 8 are involved in chemical reactions. After 5 minutes 150 molecules of substrate is left. What is the no. of initial substrate molecules?  
 (A) 250 (B) 200 (C) 300 (D) 350
119.  $N_2 \xrightarrow{A} NH_3 \xrightarrow{B} NO_2 \xrightarrow{C} NO_3 \xrightarrow{D} N_2$ . The organisms involved in the reaction are  
 I) Pseudomonas II) Nitrosomonas III) Nostoc IV) Nitrobacter  
 Then A, B, C and D are respectively  
 (A) III, II, IV, I (B) II, III, IV, I (C) III, IV, II, I (D) I, II, III, IV
120. Study the following table
- | <u>Oxidation of one molecule of</u>            | <u>No. of H<sup>+</sup> removed matrix</u> | <u>No. of H<sup>+</sup> translocated to intermembrane space</u> | <u>No. of ATP Synthesized</u> |
|--|--|---|-------------------------------|
| I) Cytosolic NADH                              | 10   | 8   | 2                             |
| II) NADH of Glycolysis                         | 8  | 6   | 2                             |
| III) FADH <sub>2</sub> of mitochondrial matrix | 12   | 10  | 3                             |
| IV) Mitochondrial NADH                         | 12   | 10  | 3                             |
- The correct combinations are  
 (A) I and III (B) III and IV (C) I and II (D) II and IV

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## Zoology

121. People who need long term glucocorticoid therapy to prevent rejection of a transplanted organ may develop.  
 (A) Grave's disease (B) Turner's syndrome (C) Addison's disease (D) Cushing's syndrome
122. The vitamin that helps in the formation of Methionine is absorbed through the  
 (A) Wall of Caecum (B) Lining of stomach (C) Wall of Ileum (D) Wall of Colon
123. Study the following:
- | Vaccine                              | Component   | Example               |
|--------------------------------------|---|-----------------------|
| (I) Sub - unit vaccine               | has only surface protein of the virus               | HAV                   |
| (II) Attenuated whole agent vaccine  | contain live microbe which is disabled of virulence | Rubella               |
| (III) Toxoid vaccine                 | contain inactivated exotoxins of microbes           | Tetanus               |
| (IV) Inactivated whole agent vaccine | virulent microbe that have been killed by chemicals | Haemophilus influenza |
- Which of the above are correct?  
 (A) All the above (B) I, II and III (C) I, III and IV (D) II and III only
124. Following are the events in cardiac cycle.  
 (I) Intra - ventricular pressure decreases (II) Opening of Bicuspid and Tricuspid valves  
 (III) Ventricular filling (IV) Closure of Aortic and pulmonary valves
- All the above occur during  
 (A) Ventricular systole (B) Production of Lubb sound  
 (C) Complete cardiac diastole (D) Atrial systole.
125. Ligand - gated ion channels are responsible for the generation of  
 (A) Post synaptic potentials which are graded (B) Resting membrane potential  
 (C) Refractory period (D) Undershoot
126. Following are involved in the digestion of fats in the alimentary canal of Rabbit in various phases.  
 (I) Monoglycerides (II) Chylomicrons (III) Micelles (IV) Diglycerides
- The correct sequence is  
 (A) I-IV-III-IV (B) IV-I-III-II (C) IV-I-II-III (D) IV-II-III-I
127. Limbed and tailed amphibians are characterized by  
 (A) Scaleless skin (B) Procoelous vertebrae (C) Copulatory Organ (D) Absence of Teeth
128. The most primitive cell - like chemical aggregates capable of growth and division are  
 (A) Chemo autotrophs (B) Prokaryotes (C) Coacervates (D) Eubionts

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129. The earliest of the two or more names published for the same organism is called as  
 (A) Junior synonym (B) Junior homonym (C) Senior synonym (D) Senior homonym
130. Following are the taxa to which man belongs, arrange them in an increasing order of hierarchy of taxa.  
 (I) Hominidae (II) Mammalia (III) Animalia (IV) Primates (V) Chordata  
 The correct sequence is  
 (A) I-IV-II-V-III (B) I-II-III-IV-V (C) V-IV-III-II-I (D) III-V-II-IV-I
131. A microsporidean intracellular parasite that causes Pebrine disease in silk worms is  
 (A) Plasmodium vivax (B) Nosema bombycis  
 (C) Schistosoma haematobium (D) Pila globosa
132. Following are the statements regarding leeches.  
 (I) These are sanguivorous ectoparasites with only external segmentation  
 (II) Clitellum is absent  
 (III) These are copulating hermaphrodites with a penis  
 (IV) Coelom is filled with botryoidal tissue.  
 The correct ones are  
 (A) All the above (B) I, II and III (C) I, III and IV (D) II, III and IV
133. Assertion (A): Adult gastropods are secondarily asymmetrical.  
 Reason (R): The larva of gastropods exhibit torsion.  
 (A) Both A and R are true and R explains A.  
 (B) Both A and R are true and R doesn't explain A.  
 (C) Only A is true and R is false. (D) Both A and R are false.
134. In the evolution of animals a tube within a tube arrangement is seen for the first time in  
 (A) Schizocoelomates (B) Pseudo coelomates (C) A coelomates (D) Entero coelomates.
135. Match the following:  
 (A) Transitional epithelium (I) Nasal septum  
 (B) Mucous connective tissue (II) Urinary bladder  
 (C) Hyaline cartilage (III) Carpals  
 (D) Short bone (IV) Wharton's Jelly  
 (V) Oesophagus
- |         |    |   |     |        |     |     |    |
|---------|----|---|-----|--------|-----|-----|----|
| A       | B  | C | D   | A      | B   | C   | D  |
| (A) II  | IV | I | III | (B) IV | III | II  | I  |
| (C) III | II | V | IV  | (D) V  | IV  | III | II |
136. The muscle which has almost no regenerative capacity in adults is  
 (A) Striated and voluntary (B) Striated and involuntary  
 (C) Unstriated and voluntary (D) Unstriated and involuntary

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137. Arrange the following organisms in the decreasing order of the number of flagella.  
 (I) Euglena (II) Giardia (III) Trypanosoma gambiense (IV) Trichomonas  
 The correct sequence is  
 (A) I - II - III - IV (B) I - III - II - IV (C) IV - III - I - II (D) II - IV - I - III
138. The total number of nuclei that disappear in the micro conjugant of vorticella during conjugation.  
 (A) Seven (B) Eight (C) Ten (D) Three
139. Diagnostic feature of the infection of Entamoeba histolytica is the presence of the following in the stools of man.  
 (A) Meta cystic form (B) Pre cystic form (C) Tetra nucleate cysts (D) Daughter amoebulae
140. Assertion(A): The erythrocyte of man exhibits hypertrophy in the erythrocytic phase of Plasmodium vivax.  
 Reason(R): Plasmodium vivax feeds on the contents of RBC and increases in size.  
 (A) Both A and R are true and R explain A. (B) Both A and R are true and R doesn't explain A.  
 (C) Only A is true and R is false. (D) Both A and R are false.
141. Infective stage of Taenia solium to man is  
 (A) Cysticercus larva (B) Oncosphere (C) Hexacanth larva (D) Goette's larva
142. In the body of pheretima, septa are absent in  
 (A) Between 10 and 11 segments (B) Between 14 and 15 segments  
 (C) Only in first 4 segments (D) First four segments and between 9 and 10 segments.
143. In pheretima the blood vessels containing digested food materials are called as  
 (A) Commissural blood vessels (B) Dorso - intestinals  
 (C) Ventral blood vessel (D) Subneural vessel
144. Read the following statements regarding Periplaneta americana.  
 (I) Frons is the largest and sclerite in the head. (II) Femur is the strongest podomere in the leg.  
 (III) Frontal ganglion is connected to the hypo cerebral ganglion by recurrent nerve.  
 The correct ones are:  
 (A) All the above (B) I and II only (C) II and III only (D) I and III only
145. Match the following:
- |                               |                    |
|-------------------------------|--------------------|
| (A) Piercing and sucking type | (I) Grass hopper   |
| (B) Siphoning type            | (II) Tse - tse fly |
| (C) Biting and chewing type   | (III) Moths        |
| (D) Sponging type             | (IV) Horse flies   |
|                               | (V) Honey Bee      |
- |        |     |     |    |        |    |    |     |
|--------|-----|-----|----|--------|----|----|-----|
| A      | B   | C   | D  | A      | B  | C  | D   |
| (A) V  | IV  | III | II | (B) I  | II | IV | III |
| (C) II | III | I   | IV | (D) IV | I  | II | V   |

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