MARKS: 720 **FULL TEST – 3** **TIME: 3 Hrs**

PART A – PHYSICS

SECTION A

1. The scientific principle involved in radio and TV broadcast is
(1) Superconductivity (2) Propagation of electromagnetic waves
(3) Electromagnetic induction (4) Amplification by population inversion

2. The volume of a cube having sides 1.2 m is appropriately expressed as
(1) 1.728×10^6 cm^3 (2) 1.7×10^6 cm^3 (3) 1.8×10^6 cm^3 (4) 1.73×10^6 cm^3

3. Thickness of a pencil measured by using a digital screw gauge (least count 0.001 cm) comes out to be 0.802 cm. The percentage error in the measurement is
(1) 0.125% (2) 2.43% (3) 4.12% (4) 2.14%

4. The position of a particle moving along x-axis is given by $x = 10t - 2t^2$. Then the time at which it will come to rest is
(1) 0 (2) 2.5 s (3) 5 s (4) 10 s

5. The frequency of a light wave in a material is 2×10^{14} Hz and wavelength is 5000 A^0. The refractive index of the material will be
(1) 1.50 (2) 3.00 (3) 1.33 (4) 1.40

6. Which one of the following pair cannot be the rectangular components of force vector of 10 N?
(1) 6 N & 8 N (2) 7 N & $\sqrt{51}$ N (3) $6\sqrt{2}$ N & $2\sqrt{7}$ N (4) 9 N & 1 N

7. If vectors $\vec{A} = 2\hat{i} + 3\hat{j} + p\hat{k}$ and $\vec{B} = 3\hat{i} - 8\hat{j} + 2\hat{k}$ are perpendicular to each other, then value of p is
(1) 2 (2) –8 (3) –9 (4) 9

8. A 10 g bullet moving at 200 m/s stops after penetrating 5 cm of wooden plank. The average force exerted on the bullet will be
(1) 2000 N (2) –2000 N (3) 4000 N (4) –4000 N

9. A man of mass 50 kg carries a bag of weight 40 N on his shoulder. The force with which the floor pushes up his feet is
(1) 882 N (2) 530 N (3) 90 N (4) 600 N

10. A tall man of height 6 feet, want to see his full image. Then required minimum length of the mirror will be
(1) 12 feet (2) 3 feet (3) 6 feet (4) Any length

11. The displacement of a particle executing S.H.M. is given by $x = 0.01 \sin 100\pi(t + 0.05)$. The time period is
(1) 0.01 s (2) 0.02 s (3) 0.1 s (4) 0.2 s

12. The position x of a particle moving along x-axis at time (t) is given by the equation $t = \sqrt{x} + 2$, where x is in metre and t in second. The work done by the force in first four second is
(1) Zero (2) 2 J (3) 4 J (4) 8 J

13. If a convex lens of focal length 80 cm and a concave lens of focal length 50 cm are combined together, the resulting power shall be
(1) + 7.5 D (2) – 0.75 D (3) + 6.5 D (4) – 6.5 D

14. A force $\vec{F} = (2\hat{i} + 3\hat{j} - 5\hat{k})$ N acts at a point $\vec{r}_1 = (2\hat{i} + 4\hat{j} + 7\hat{k})$ m. The torque of the force about the point $\vec{r}_2 = (\hat{i} + 2\hat{j} + 3\hat{k})\,m$ is
(1) $(17\hat{j} + 5\hat{k} - 3\hat{i})$ Nm (2) $(2\hat{i} + 4\hat{j} - 6\hat{k})$ Nm (3) $(12\hat{i} - 5\hat{j} + 7\hat{k})$ Nm (4) $(13\hat{j} - 22\hat{i} - \hat{k})$ Nm

15. A thin uniform wire of mass m and length l is bent into a circle. The moment of inertia of the wire about an axis passing through its one end and perpendicular to the plane of the circle is
(1) $\frac{2mL^2}{\pi^2}$ (2) $\frac{mL^2}{\pi^2}$ (3) $\frac{mL^2}{2\pi^2}$ (4) $\frac{mL^2}{3\pi^2}$

16. The angular velocity of a body changes from ω_1 to ω_2 without applying a torque but by changing the moment of inertia about its axis of rotation. The ratio of its corresponding radii of gyration is
(1) $\omega_1 : \omega_2$ (2) $\sqrt{\omega_1} : \sqrt{\omega_2}$ (3) $\omega_2 : \omega_1$ (4) $\sqrt{\omega_2} : \sqrt{\omega_1}$

17. Two planets have same density but different radii. The acceleration due to gravity would be
(1) Same on both planets (2) Greater on the smaller planet
(3) Greater on the larger planet (4) Dependent on the distance of planet from the sun

18. If earth suddenly stops rotating, then the weight of an object of mass m at equator will be *[ω is angular speed of earth and R is its radius]*
(1) Decreasing by $m\omega^2R$ (2) Increasing by $m\omega^2R$ (3) Decreasing by $m\omega R^2$ (4) Increasing by $m\omega R^2$

19. A steel wire is 1 m long and 1 mm^2 in area of cross-section. If it takes 200 N to stretch this wire by 1 mm, how much force will be required to stretch a wire of the same material as well as diameter from its normal length of 10 m to a length of 1002 cm?
(1) 1000 N (2) 200 N (3) 400 N (4) 2000 N

20. The volume of an air bubble is doubled as it rises from the bottom of lake to its surface. The atmospheric pressure is 75 cm of mercury. The ratio of density of mercury to that of lake water is 40/3 . The depth of the lake in metre is
(1) 10 (2) 15 (3) 20 (4) 25

21. The readings of a bath on Celsius and Fahrenheit thermometers are in the ratio 2:5. The temperature of the bath is
(1) –26.66°C (2) 40°C (3) 45.71°C (4) 26.66°C

22. In a thermodynamic process pressure of a fixed mass of a gas is changed in such a manner that the gas releases 20 J of heat when 8 J of work was done on the gas. If the initial internal energy of the gas was 30 J, then the final internal energy will be
(1) 2 J (2) 18 J (3) 42 J (4) 58 J

23. The temperature inside and outside a refrigerator are 273 K and 300 K respectively. Assuming that the refrigerator cycle is reversible, for every joule of work done, the heat delivered to the surrounding will be nearly
(1) 11 J (2) 22 J (3) 33 J (4) 50 J

24. A hydrogen cylinder is designed to withstand an internal pressure of 100 atm. At 27°C, hydrogen is pumped into the cylinder which exerts a pressure of 20 atm. At what temperature does the danger of explosion first sets in?
(1) 500 K (2) 1500 K (3) 1000 K (4) 2000 K

25. Two Carnot engines A and B are operated in series. The engine A receives heat from the source at temperature T_1 and rejects the heat to the sink at temperature T. The second engine B receives the heat at temperature T and rejects to its sink at temperature T_2. Then the value of T for which the efficiency of the two engines is equal is
(1) $\frac{T_1+T_2}{2}$ (2) $\frac{T_1-T_2}{2}$ (3) T_1T_2 (4) $\sqrt{T_1T_2}$

26. A sphere of radius r has electric charge uniformly distributed in its entire volume. At a distance d from the centre inside the sphere (d < r) the electric field intensity is directly proportional to
(1) 1/d (2) $1/d^2$ (3) d (4) d^2

27. If atmospheric electric field is approximately 150 volt/m and radius of the earth is 6400 km, then the total charge on the earth's surface is
(1) 6.8×10^5 C (2) 6.8×10^6 C (3) 6.8×10^4 C (4) 6.8×10^9 C

28. An air filled parallel plate capacitor has a capacitance 1 pF. If the separation between the plates is doubled and wax is inserted between the plates, the capacitance becomes 2 pF. The dielectric constant of the wax is
(1) 4 (2) 2 (3) 10 (4) 8

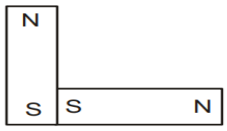
29. A current of 10 A is maintained in a conductor of cross-section 1 cm^2. If the number density of free electrons be 9×10^{28} m^{-3}, the drift velocity of free electrons is
(1) 6.94×10^{-6} m/s (2) 5.94×10^{-2} m/s (3) 1.94×10^{-3} m/s (4) 2.94 × 10–4 m/s

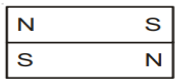
30. A piece of wire is cut into four equal parts and the pieces are bundled together side by side to form a thicker wire. Compared with that of the original wire, the resistance of the bundle is
(1) the same (2) $1/16^{th}$ (3) $1/8^{th}$ (4) $1/4^{th}$

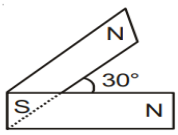
31. When equal current is passed through two coils, equal magnetic field is produced at their centres. If the ratio of number of turns in the coils is 8 : 15, then the ratio of their radii will be
(1) 1 : 1 (2) 15 : 8 (3) 8 : 15 (4) 1 : 2

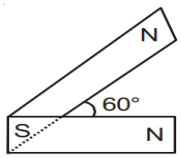
32. A proton and an alpha particle enter the same magnetic field which is perpendicular to their velocity. If they have same kinetic energy then ratio of radii of their circular path is
(1) 1 : 1 (2) 1 : 2 (3) 2 : 1 (4) 1 : 4

33. Following figures show the arrangement of bar magnets in different configurations. Each magnet has magnetic dipole moment m. The configuration that has the highest net magnetic dipole moment is

a. 

b. 

c. 

d. 

(1) a (2) b (3) c (4) d

34. A flat coil of 500 turns, each of area 50 cm^2, rotates in a uniform magnetic field of 0.14 Wb/m^2 about an axis normal to the field at an angular speed of 150 rad/s. The coil has a resistance of 5 Ω. The induced e.m.f. is applied to an external resistance of 10 Ω. The peak current through the resistance is

(1) 1.5 A (2) 2.5 A (3) 3.5 A (4) 4.5 A

35. The current passing through a choke coil of self-inductance 5 H is decreasing at the rate of 2 A/s. The e.m.f. developed across the coil is

(1) 10 V (2) – 10 V (3) – 2.5 V (4) 2.5 V

SECTION B

36. In an LCR circuit L = 8.0 henry, C = 0.5 μF and R = 100 Ω are in series. The resonant angular frequency is

(1) 500 rad/s (2) 600 rad/s (3) 800 rad/s (4) 1000 rad/s

37. The following can be arranged in the decreasing order of wave number as:

A. AM radio B. TV and FM radio C. Microwave D. Short radio wave

(1) A > B > D > C (2) C > D > B > A (3) A > B > C > D (4) D > C > B > A.

38. In an interference pattern produced by two identical slits, the intensity at the site of the central maximum is I. The intensity at the same spot when either of the two slits is closed is Io, then

(1) I = Io (2) I = 2 Io (3) I = 4 Io (4) I and Io are not related to each other

39. In Young's double slit interference experiment, the slit separation is made 3 folds. The fringe width becomes

(1) 1/3rd time (2) 1/9th time (3) 3 times (4) 9 times

40. Ultraviolet radiations of 6.2 eV fall on an aluminium surface (work function 4.2 eV). The kinetic energy (in joule) of the fastest electron emitted is approximately

(1) 3.2×10^{-21} (2) 3.2×10^{-19} (3) 3.2×10^{-17} (4) 3.2×10^{-15}

41. If a radioactive material remains 25% after 16 days, then its half life will be

(1) 32 days (2) 8 days (3) 64 days (4) 28 days

42. The current gain β of a transistor is 50. The input resistance of the transistor, when used in the common emitter configuration, is 1 kΩ . The peak value of the collector AC current for an alternating peak input voltage 0.01V is

(1) 100 μA (2) 250 μA (3) 500 μA (4) 800 μA

43. Slit widths in a Young's double slit experiment are in ratio 9:4. Ratio of intensity at minima to that at maxima is

(1) 4:9 (2) 16:81 (3) 1:25 (4) 1:16

44. An object is placed in front of two convex lenses one by one at a distance u from the lens. The focal lengths of the lenses are 30 cm and 15 cm respectively. If the size of image formed in the two cases is same, then u is

(1) 15 cm (2) 20 cm (3) 25 cm (4) 30 cm

45. The two spheres, one of which is hollow and other solid, have identical masses and moment of inertia about their respective diameters. The ratio of their radii is given by the square root of

(1) 5 : 7 (2) 5 : 3 (3) 3 : 5 (4) 3 : 7

46. By increasing temperature of a gas by 6 K its pressure increases by 0.4 %, at constant volume. Then initial temperature of gas is

(1) 1000 K (2) 1500 K (3) 2000 K (4) 750 K

47. In resonance tube two successive positions of resonance are obtained at 15 cm and 48 cm. If the frequency of the fork is 500 hertz, the velocity of sound is

(1) 330 m/s (2) 300 m/s (3) 1000 m/s (4) 360 m/s

48. A particle moves along X-axis from x = 0 to x = 1 m under the influence of a force given by . $F = 3x^2 + 2x - 10$

Work done in the process is

(1) +4 J (2) –4 J (3) +8 J (4) –8 J

49. A microscope is focussed on a coin lying at the bottom of a beaker. The microscope is now raised by 1 cm. To what depth should the water be poured into the beaker so that the coin is again in focus? (the refractive index of water is 3/4)

(1) 1 cm (2) 4/3 cm (3) 3 cm (4) 4 cm

50. The primary and secondary coils of a transformer have 50 and 1500 turns respectively. If the magnetic flux ϕ linked with the primary coil is given by $\phi = \phi_0 + 4t$ where ϕ is in weber, t is time in second and ϕ_0 is a constant, the output voltage across the secondary coil is

(1) 120 volt (2) 220 volt (3) 30 volt (4) 90 volt

PART B – CHEMISTRY

SECTION A

51. Lucas reagent is used to distinguish among primary, secondary and tertiary:

a) Alkyl halides b) Alcohols c) Aliphatic amines d) Aromatic amines

52. The major organic product in the reaction, $CH_3—O—CH(CH_3)_2 + HI \longrightarrow$ Product is:

a) $CH_3OC(CH_3)_2$ with I b) $CH_3I + (CH_3)_2CHOH$ c) $CH_3OH + (CH_3)_2CHI$ d) $ICH_2OCH(CH_3)_2$

53. $CH_3CH_2 - CHO \xrightarrow[\text{alkali}]{\text{Dil.}}$ product

The product in the above reaction is

a) CH_3CH_2COOH b) $CH_3CH_2 - CH_2OH$

c) $CH_3—CH_2—CH(OH)—CH_2—CHO$ d) $CH_3—CH_2—CH(OH)—CH(CH_3)—CHO$

54. The reaction, $CH_3CHO + H_2N—NH_2 \longrightarrow CH_3CH=N\text{-}NH_2$ is:

a) Elimination b) Addition c) Addition-elimination d) None of these

55. Arrange the following CH_3NH_2 (I); $(CH_3)_2NH$ (II); $C_6H_5NH_2$ (III); $(CH_3)_3N$ (IV) in increasing order of basic nature in aqueous medium:

a) II < I < IV < III b) III < IV < I < II c) I < II < III < IV d) II < III < I < IV

56. The reaction, $RCOOH \xrightarrow{NaN_3/conc.H_2SO_4} RNH_2 + N_2 + CO_2$ is known as

a) Curtius reaction b) Lossen reaction c) Schmidt reaction d) Hofmann reaction

57. Which one of the following is an example of a non-reducing sugar?

a) Sucrose b) Lactose c) Maltose d) Cellobiose

58. Which is electron deficient compound?

a) C_2H_4 b) B_2H_6 c) C_2H_6 d) $NaBH_4$

59. The correct order of bond angles is:

a) $PF_3 < PCl_3 < PBr_3 < PI_3$ b) $PF_3 < PBr_3 < PCl_3 < PI_3$

c) $PI_3 < PBr_3 < PCl_3 < PF_3$ d) $PF_3 > PCl_3 < PBr_3 < PI_3$

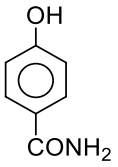
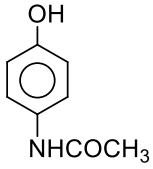
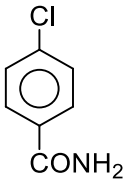
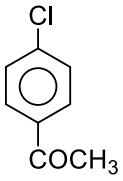
60. What is the formula to find value of $t_{1/2}$ for a zero order reaction?

a) $\frac{k}{[R]_0}$ b) $\frac{2k}{[R]_0}$ c) $\frac{[R]_0}{2k}$ d) $\frac{0.693}{k}$

61. $CH_3COOC_2H_5 + H_2O \xrightarrow{H+} CH_3COOH + C_2H_5OH$ is an example of …… order

a) Zero b) Second c) Third d) Pseudo first order

62. The correct structure of the drug paracetamol is

a)  b)  c)  d) 

63. Which of the following oxides is most acidic in nature?
a) BeO b) MgO c) CaO d) BaO

64. Atomic radii of fluorine and neon in angstrom unit are respectively given by:
a) 0.72, 1.60 b) 1.60, 1.60 c) 0.72, 0.72 d) 1.60, 0.72

65. Standard reduction potentials of the half reactions are given below :
$F_2(g) + 2e^- \longrightarrow 2F^-(aq)$; $E° = +2.85$ V
$Cl_2(g) + 2e^- \longrightarrow 2Cl^-(aq)$; $E° = +1.36$ V
$Br_2(l) + 2e^- \longrightarrow 2Br^-(aq)$; $E° = +1.06$ V
$I_2(s) + 2e^- \longrightarrow 2I^-(aq)$; $E° = +0.53\ V$
The strongest oxidising and reducing agents respectively are :
a) F_2 and I^- b) Br_2 and Cl^- c) Cl_2 and Br^- d) Cl_2 and I_2

66. The relationship between Gibbs' free energy change (ΔG) and emf (E) of a reversible electrochemical cell is given by
a) $\Delta G = nFE$ b) $\Delta G = nF/E$ c) $\Delta G = -nFE$ d) $\Delta G = E/nF$

67. Green chemistry involves
a) Production of chemicals of our daily use from green house gases
b) Such chemical processes in which green plants are used
c) Those reactions which are of biological origin
d) Use of non toxic reagents and solvents to produce environment friendly products

68. What is the equilibrium expression for the reaction, $P_4(s) + 5O_2(g) \rightleftharpoons P_4O_{10}(s)$?
a) $K_c = \frac{1}{[O_2]^5}$ b) $K_c = [O_2]^5$ c) $K_c = \frac{[P_4O_{10}]}{5[P_4][O_2]}$ d) $K_c = \frac{[P_4O_{10}]}{[P_4][O_2]^5}$

69. At a given temperature the K_c for the reaction, $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ is 2.4×10^{-3}. At the same temperature, the K_p for the reaction $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$ is :
a) 2.4×10^{-3} b) -2.4×10^{-3} c) $4.2 \times 10^{+2}$ d) 4.8×10^{-2}

70. The solubility product of barium sulphate is 1.5×10^{-9}at 18°C. Its solubility in water at 18°C is
a) 1.5×10^{-9} b) 1.5×10^{-5} c) 3.9×10^{-9} d) 3.9×10^{-5}

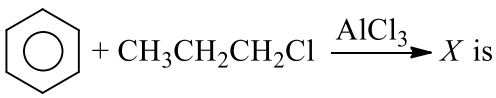
71. van-Arkel method of purification of metals involves converting the metal to a
a) Volatile stable compound b) Non-volatile stable compound
c) Volatile unstable compound d) None of the above

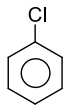
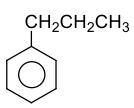
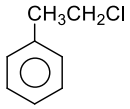
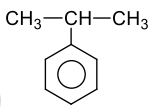
72. The order of reactivities of methyl halides in the formation of Grignard reagent is
a) $CH_3I > CH_3Br > CH_3Cl$ b) $CH_3Cl > CH_3Br > CH_3I$
c) $CH_3Br > CH_3Cl > CH_3I$ d) $CH_3Br > CH_3I > CH_3Cl$

73. Which one of the following compound reacts with chlorobenzene to produce DDT?
a) Acetaldehyde b) Nitrobenzene c) *m*-chloroacetaldehyde d) Trichloroacetaldehyde

74. $CH_3—C \equiv CH$ reacts with HCI to give:
a) 2,2-dichloropropane b) 1,1-dichloropropane c) 1,2-dichloropropane d) 1-chloropropene

75. Predict structure of X in following reaction



a)  b)  c)  d) 

76. $TiH_{1.73}$ is an example of :
a) Ionic hydride b) Covalent hydride c) Metallic hydride d) Polymeric hydride

77. Caprolactam is used to prepare which of the following polymer?
a) Nylon-6, 6 b) Malamine c) Nylon-6 d) PMMA

78. The value of n in $MnO_4^- + 8H^+ + ne^- \rightarrow Mn^{2+} + 4H_2O$ is
a) 5 b) 4 c) 2 d) 3

79. Which of the following solution highest boiling point?
a) 0.1 M urea b) 0.1 M sucrose c) 0.1 M $NaNO_3$ d) 0.1 M $Al(NO_3)_3$

80. 6.02×10^{20}molecules of urea are present in 100 mL of its solution. The concentration of urea solution is
a) 0.1 M b) 0.01 M c) 0.001 M d) 0.02 M

81. The maximum number of molecules is present in:
a) 15 L of H_2 gas at STP b) 5 L of N_2 gas at STP c) 0.5 g of H_2 gas d) 10 g of O_2gas

82. An organic compound has an empirical formula (CH_2O) its vapour density is 45. The molecular formula of the compound is
a) CH_2O b) C_2H_5O c) C_2H_2O d) $C_3H_6O_3$

83. The density of neon will be highest at
a) STP b) 0°C, 2 atm c) 273°C, 1 atm d) 273°C, 2 atm

84. The ionisation enthalpy of hydrogen atom is 1.312×10^6Jmol^{-1}. The energy required to excite the electron in the atom from $n_1 = 1$ to $n_2 = 2$ is
a) 8.51×10^5 J mol^{-1} b) 6.56×10^5 J mol^{-1} c) 7.56×10^5 J mol^{-1} d) 9.84×10^5 J mol^{-1}

85. If $n = 6$, the correct sequence for filling of electrons will be:
a) $ns \rightarrow np \rightarrow (n-1)d \rightarrow (n-2)f$ b) $ns \rightarrow (n-2)f \rightarrow (n-1)d \rightarrow np$
c) $ns \rightarrow (n-1)d \rightarrow (n-2)f \rightarrow np$ d) $ns \rightarrow (n-2)f \rightarrow np \rightarrow (n-1)d$

SECTION B

86. Which of the following is true in respect of adsorption?
a) $\Delta G < 0; \Delta S > 0; \Delta H < 0$ b) $\Delta G < 0; \Delta S < 0; \Delta H < 0$
c) $\Delta G > 0; \Delta S > 0; \Delta H < 0$ d) $\Delta G < 0; \Delta S < 0; \Delta H > 0$

87. Which of the following will be the most effective in the coagulation of $Fe(OH)_3$ sol?
a) KCN b) $BaCl_2$ c) NaCl d) $Mg_3(PO_4)_2$

88. Lanthanide contraction is due to increase in
a) Shielding by $4f$-electrons b) Atomic number
c) Effective nuclear charge d) Size of $4f$-orbitals

89. The X—Xbond dissociation energy is minimum in:
a) F_2 b) Cl_2 c) Br_2 d) I_2

90. H_2SO_4 reacts with sugar and acts as:
a) A dehydrating agent b) An oxidizing agent c) A sulphonating agent d) None of these

91. The correct Lewis acid order for boron halides is:
a) $BF_3 > BCl_3 > BBr_3 > BI_3$ b) $BCl_3 > BF_3 > BBr_3 > BI_3$
c) $BI_3 > BBr_3 > BCl_3 > BF_3$ d) $BBr_3 > BCl_3 > BI_3 > BF_3$

92. Among the following substituted silanes the one which will give rise to cross linked silicone polymer on hydrolysis is
a) R_4Si b) $RSiCl_3$ c) R_2SiCl_2 d) R_3SiCl

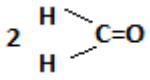
93. Which pair of the following chlorides do not impart colour to the flame?
a) $BeCl_2$ and $SrCl_2$ b) $BeCl_2$ and $MgCl_2$ c) $CaCl_2$ and $BaCl_2$ d) $BaCl_2$ and $SrCl_2$

94. The solubility of alkali metal hydroxide is
a) $LiOH < KOH < NaOH < RbOH < CsOH$ b) $LiOH < NaOH < KOH < RbOH < CsOH$
c) $CsOH < RbOH < KOH < NaOH < LiOH$ d) None of the above

95. The limiting radius ratio for tetrahedral shape is
a) 0 to 0.155 b) 0.255 to 0.414 c) 0.155 to 0.225 d) 0.414 to 0.732

96. If NaCl is dopped with 10^{-4} mole % of $SrCl_2$ the concentration of cation vacancies will be:
a) 6.02×10^{16} mol^{-1} b) 6.02×10^{17} mol^{-1} c) 6.02×10^{14} mol^{-1} d) 6.02×10^{15} mol^{-1}

97. Pick the correct statement with respect to $[Mn(CN)_6]^{3-}$
a) It is sp^3d^2 hybridized & tetrahedral
b) It is d^2sp^3 hybridized & octahedral
c) It is dsp^2 hybridized & square planar
d) It is sp^3d^2 hybridized & octahedral

98. $HOCH_2CH_2OH$ on heating with periodic acid gives
a) 2HCOOH b)  c)  d) $2CO_2$

99. How many grams of Cobalt will be deposited when a solution of Cobalt II chloride is electrolyzed with a current of 10 amperes for 109 minutes? [1 Faraday = 96500 coloumb, Atomic Mass of Co = 59 u]
a) 4.0 b) 20.0 c) 40.0 d) 0.66

100. Equimolar solutions of the following substance were prepared separately, which one of these will record the highest pH value?
a) $BaCl_2$ b) $AlCl_3$ c) LiCl d) $BeCl_2$

PART C – BOTANY
SECTION A

101. The category which includes related families is
a) Class b) Phylum c) Order d) Kingdom

102. The ascending or descending arrangement of taxonomic categories is called as
a) Classification b) Taxonomy c) Hierarchy d) Key

103. Identify the correctly matched pair

Class	Example	Feature
a) psilopsida	lycopoduim	Seed habit
b) sphenopsida	selaginella	strobilus
c) Lycopsida	psilotum	homosporous
d) Pteropsida	Dryopteris	Macrophylly (Frond)

104. How many meiotic divisions would be required to produce 101 female gametophytes in an Angiosperm?
a) 101 b) 26 c) 127 d) 202

105. An algal plant showing diplontic life cycle is dissimilar with the following plant in relation to morphology of gametes.
a) Funaria b) Pteris c) cycas d) cladophora

106. An important criterion for modern day classification is
a) Resemblances in morphology
b) Anatomical and physiological traits
c) Breeding habits
d) Presence or observe of notochord

107. Assertion (A): Dinoflagellate are called whirling whips.
Reason (R): Flagella produce spinning movements in Dinoflagellate
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 the correct explanation of A
c) A is true but R is false
d) A is false but R is true.

108. Mycelium is aseptate and coenocytic in
I. Mucor II. Albugo III. Rhizopus IV. Claviceps
a) I, II, IV b) I, III, IV c) I, II, IV d) I, II, III

109. The cell wall of both bacteria and cyanobacteria contains
a) Lipid b) plastids c) protein d) Muramic acid (Peptidoglycan)

110. In cell cycle DNA replication take place in
a) G1 phase b) G2 phase c) Mitotic metaphase d) S phase

111. Cladode is the modification of
a) Whole stem b) axillary bud c) Leaf d) Leaflets

112. A root cap is usually absent in the roots of
a) Hydrophytes b) Epiphytes c) Parasites d) All of the above

113. Bonds that do not exist in Tertiary structure of proteins
a) Covalent bonds b) Phosphodiester bonds c) Hydrophobic entractional d) Ionic bonds

114. The catalytic efficiency of two different enzymes can be compared by the
a) Formation of the product b) pH optimum value c) Km value d) Molecular size of the enzyme

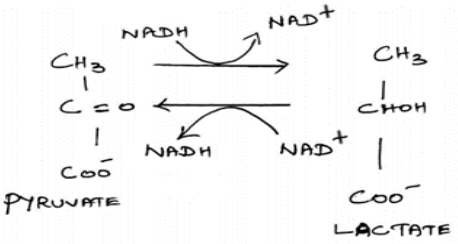
115. Which element is required in the germination of pollen grain?
a) Chlorine b) Potassium c) Boron d) Calcium

116. Calvin cycle expends the following for fixation of 3 – molecules of CO_2
a) 9 ATP and 6 $NADPH_2$ b) 8 ATP and 6 $NADPH_2$
c) 9 ATP and 3 $NADPH_2$ d) 6 ATP and $NADPH_2$

117. Activate urease, induce disease resistance in some plants.
a) Ni^{2+} b) Fe^{3+} c) Cu^{2+} d) Cl^-

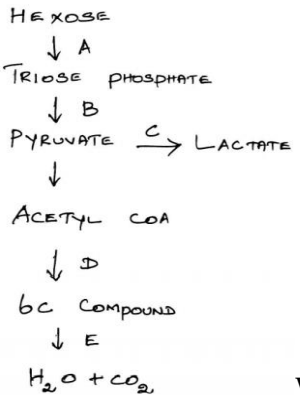
118. Turgor pressure becomes equal to the wall pressure then
a) water leaves the cell b) water enter the cell
c) NO exchange of water take place d) Solute goes from cell in to water

119. The diagram shows the reversible conversion of pyruvate to lactate by the enzyme lactate dehydrogenase.



What would be the effect of Inhibition of lactate dehydrogenase in a mammalian cell under anaerobic condition?
a) A decrease in cell pH, due to the accumulation of lactic acid
b) A decrease in glycolysis, due to the lack of NAD
c) An increase in ATP production, due to increased amounts of reduced NAD.
d) An increase in the activity of the Kub cycle, due to increased amounts of pyruvate

120. The diagram summarizes the pathway of glucose breakdown.



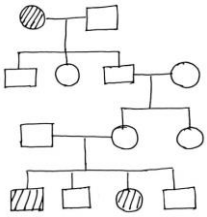
Which two steps result in net increase of ATP?
a) A and C b) A and D c) B and D d) B and E

121. The condition necessary for vernalization are
a) high temperature and water b) Low temperature and oxygen
c) water and carbon – dioxide d) Oxygen and water

122. Which of the following is the example of co – dominance
a) $Hb^A Hb^A$, $I^A I^B$ b) $Hb^S Hb^S$, $I^A I^B$ c) $Hb^A Hb^S$, $I^A I^B$ d) $Hb^S Hb^S$, $I^A I^A$

123. Who postulated the chromosome theory of Inheritance
a) De Vries b) Mendel c) Sutton & Boveri d) Morgan

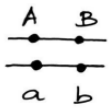
124. Study the pedigree given below and assign the type of inheritance of the trait

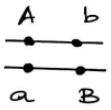


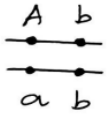
a) X –linked recessive b) Y – linked c) autosomal recessive d) autosomal dominant

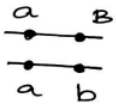
125. A normal Aa woman whose father was albino marries an albino man, what proportion of normal and albino are expected among their offspring
a) All normal b) 2 normal: 1 Albino c) All albino d) 1 normal: 1 Albino

126. Which of the following show linkage group in coupling phase:

a) 

b) 

c) 

d) 

127. A colourblind man marries a daughter of a colourblind father, then in the offspring
a) All sons are colourblind b) All daughters are colourblind
c) Half sons are colourblind d) No daughters is colourblind

128. In DNA replication, the primer is
a) A small deoxyribonucleotide polymer b) A small ribonucleotide polymer
c) Helix destabilizing protein d) Enzyme taking part in joining nucleotides of new strand

129. To code the 50 amino acids in a polypeptide chain, what will be the minimum number of nucleotides cistron?
a) 50 b) 153 c) 306 d) 309

130. Which of the following techniques are used in analyzing restriction fragments length polymerphesin (RFLP):
A) Electrophoresis B) Electroporation C) Methylation D) Restriction digestion
a) A and C b) C and D c) A and D d) B and D

131. In a polypeptide chain of 125 amino acid. If the 25th codon is mutated to UAA, then.
a) A polypeptide of 124 amino acid is formed b) A polypeptide of 125 amino acid is formed
c) A polypeptide of 24 amino acid is formed d) Any of the above can be possible

132. In a nucleotide H_3PO_4 binds to which carbon atom of pentose sugar.
a) Only 1st carbon b) Only 3rd carbon c) Only 5th carbon d) Both 3rd& 5th carbon

133. Sometimes the starting codon is GUG in place of AUG, GUG normally stands for:-
a) Valine b) Glycine c) Methionine d) Tyrosine

134. Which one of the following has found extensive use in genetic engineering work in plants
a) *Bacillus Wagulens* b) *Agrobacterium tumefaciens*
c) *Clostridium septicum* d) *Xanthanonas citri*

135. Which of the following restriction endonuclease enzyme produce blunt end in DNA:
a) Bam HI G$^{\downarrow}$GATC$^{\uparrow}$C
b) E CORI G$^{\downarrow}$AATTC
GTTAA$^{\uparrow}$G
c) Hae – III GG$^{\downarrow}$CC
CC$^{\uparrow}$GG
d) Both and A and B

SECTION B

136. The protein products of the following Bt toxin genes Cry IAC & cry II Ab are responsible for controlling
a) Bollworm b) Roundworm c) Moth d) Fruit fly

137. Gene therapy first used in the treatment of
a) Albinism b) Haemophilia c) ADA deficiency d) AIDS

138. If a breeder has to evolve a disease resistant strain what step will be taken first
a) Hybridisation b) Selection of parents c) Working out the yield d) Bagging

139. In Mung bean, resistance to yellow mosaic virus and powdery mildew were brought about by:
a) Mutation breeding b) Biofortification
c) Tissue culture d) Hybridization and selection

140. Development of fruit without fertilization is called
a) Cell division b) Cell culture c) Parthenocarpy d) parthenogenesis

141. Which of the following require water for gamete transfer
a) Algae, bryophytes and pteridophytes b) Pteridophytes only
c) Gymnosperms d) Angiosperms

142. Type of cell division takes place in Apomixis is
a) Reductional b) Meiosis c) Both a and b d) Mitosis

143. Ubisch bodies are (nutritive bodies) secreted by
a) Tapetum b) Exine c) Microspore mother cell d) Endothecium

144. Assertion (A): Flowers of yucca and moth show symbiosis
Reason (R): In yucca cross-pollination is assisted by a moth that lay eggs in it.
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 the correct explanation of A
c) Both A and R are true but R is not the correct explanation of A
d) A is true but R is false.

145. The ploidy of suspensor cell of embryo is
a) Haploid b) Diploid c) Triploid d) Polyploid

146. Specialised epidermal cells surrounding the guard cells are called
a) Complementary cells b) Subsidiary cells c) Bulliform cells d) Lenticels

147. Chemiosmotic theory of ATP synthesis in the chloroplasts and mitochondria is based on:
a) accumulation of ca^{+} ions b) accumulation of Na^{+} ions
c) accumulation of K^{+} ions d) proton gradient

148. In Eukaryotes a single mRNA is synthesised from
a) Two structural genes b) Many structural genes
c) A single structural gene d) Three structural genes

149. If one strand of DNA has the nitrogenous base sequence at ATCTG, what would be the complementary RNA strand sequence
a) TTAGU b) UAGAC c) AACTG d) ATCGU

150. The taq polymerase enzyme is obtained from
a) *Thermus aquaticus* b) *Thiobacillus ferroxidans*
c) *Bacillus subtilis* d) *Pseudomonas putida*

PART D – ZOOLOGY
SECTION A

151. Proboscis gland in Balanoglossus is associated with
a) Digestion b) Respiration c) Circulation d) Excretion

152. Pseudocoelomate animals belong to the phylum
a) Platyhelminthes b) Arthropoda c) Mollusca d) None of these

153. Highest degree of polymorphism is found in
a) Protozoa b) Cnidaria c) Platyhelminthes d) Arthropoda

154. The epithelial tissue present on the inner surface of bronchioles and fallopian tubes is
a) Cuboidal Epithelial b) Glandular Epithelial c) Ciliated Epithelial d) Squamous Epithelial

155. The number of spiracles present in cockroaches are
a) 9 pairs b) 10 pairs c) 12 pairs d) 14 pairs

156. Secretion of pancreatic juice is stimulated by
a) Gastrin b) Secretin c) Enterogasterone d) Enterokinase

157. The layer of cells that secretes enamel of tooth is
a) Dentoblast b) Ameloblast c) Osteoblast d) Odontoblast

158. Maximum absorption of water occurs in
a) Colon b) Rectum c) Large intestine d) Small intestine

159. Which of the following diseases are occupational respiratory disorders?
a) Silicosis, fibrosis and asbestosis b) Emphysema and mountain sickness
c) Asthma and emphysema d) Asthma and AIDS

160. About 1200 mL of air is always known to remain inside the human lungs. It is described as
a) Inspiratory reserve volume b) Expiratory reserve volume
c) Residual volume d) Tidal volume

161. The important function of lymph is to
a) Transport oxygen to the brain b) Transport carbon dioxide to the lungs
c) Return RBCs to the lymph nodes d) Return interstitial fluid to the blood

162. The first heart sound 'Lubb' occurs in which phase of the cardiac cycle?
a) Isometric relaxation b) Atrial diastole c) Ventricular systole d) Ventricular diastole

163. Pulmonary artery differs from pulmonary vein in having
a) No endothelium b) Strong valves c) Brunner's cells d) Thick muscular walls

164. The ascending and descending limb of Henle's loop is a respectively lined by
a) Squamous epithelium, cuboidal epithelium b) Cuboidal epithelium, squamous epithelium
c) Ciliated epithelium, squamous epithelium d) Cuboidal epithelium, ciliated epithelium

165. The principle nitrogenous excretory compound in humans is synthesized
a) In kidneys, but eliminated mostly through liver
b) In kidneys as well as eliminated by kidneys
c) In liver and also eliminated by the same through bile
d) In the liver, but eliminated mostly through kidneys

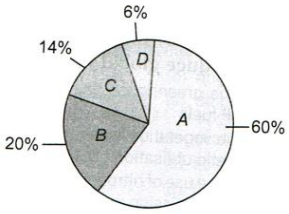
166. Podocytes are modified
a) Endothelial cells of the glomerulus b) Endothelial cells of the Bowman's capsule
c) Epithelium cells of the Bowman's capsule d) Epithelium cells of the glomerulus

167. Fascicles in human/animal are the
a) Blood capillaries b) Muscle bundles c) Intercalated discs d) Muscle cytoplasm

168. Hardness of the bones is due to
a) Hard matrix made up of calcium salts b) Soft matrix made up of sodium salts
c) Hard matrix made up of sodium salts d) Soft matrix made up of chondroitin salts

169. Formula of vertebral column of man is
a) $C_4T_4L_4S_8C_8$ b) $C_7T_{12}L_5S_1C_1$ c) $C_7T_{12}L_1S_5C_1$ d) $C_7T_8L_5S_6C_7$

170. Study carefully the following pie diagram representing the relative contribution of various greenhouse gases to total global warming. Identify the gases A, B, C and D



a) A-N_2O, B − CO_2, C − CH_4, D − CFCs b) A-CO_2, B − CH_4, C − CFCs, D − N_2O
c) A-CH_4, , B − CFCs, C − N_2O, D − CO_2 d) A-CFCs, , B − N_2O, C − CO_2, D − CH_4

171. Chipko movement was started in Garhwal, Himalayas in
a) 1970 by Local Women b) 1973 by a Bishnoi Woman Amrita Devi
c) 1974 by Local Women d) 1974 by a Bishnoi Woman Amrita Devi

172. The sequence of ear ossicles from outside to inside is
a) malleus → incus → stapes b) incus → stapes → malleus
c) stapes → incus → malleus d) malleus → stapes → incus

173. Insufficient quantities of antidiuretic hormone in blood lead to
a) Diabetes mellitus b) Glycosuria c) Diabetes insipidus d) Uremia

174. Which of the following hormones are produced in the hypothalamus and stored in the posterior pituitary?
a) FSH and LH b) ADH and oxytocin c) TSH and STH d) ACTH and MSH

175. Corpus luteum secretes
a) Progesterone and oestrogen b) LH
c) Only progesterone d) Progesterone and LH

176. Name the most important hormone which causes the uterine contraction strongly
a) Oxytocin b) Inhibin c) Protection d) Progesterone

177. Temperature of human testis is
a) 2-2.5 below body temperature b) 38℃ c) 33℃ d) 2.25 above body temperature

178. Androgen Binding Protein (ABP) and inhibin are secreted by
a) Interstitial cells b) Leydig cells c) Sertoli cells d) Germinal epithelium

179. Most mammals have their testis sac called scrotal sac which is for
a) Protection b) Ova formation c) Sperm formation d) Temperature regulation

180. Hormone releasing IUDS among the following are
a) Copper-T b) LNG-20 c) Saheli d) Diaphragm

181. Scientific study of human population is called
a) Dramography b) Dandrography c) Demography d) None of these

182. The similarity of bone structure in the fore limbs of many vertebrates is an example of
a) homology b) Analogy c) Convergent evolution d) adaptive radiation

183. Genetic drift operates in
a) small isolated population b) Large isolated population
c) Non-reproductive population d) Slow reproductive population

184. Urey and Miller in their experiment used a mixture of gases corresponding to primitive earth. These were
a) C_3, NH_3, H_2, CO_2 b) O_2, NH_3, CH_4, H_2 c) NH_3, CH_4, H_2O, CO_2 d) CH_4, NH_3, H_2, H_2O

185. Which of the following is not an autoimmune disease
a) Psoriasis b) Rheumatoid arthritis c) Alzheimer's disease d) Vitiligo

SECTION B

186. Which of the following immunoglobulin's does constitute the largest percentage in human milk
a) IgA b) IgG c) IgD d) IgM

187. Which one of the following is a hallucinogenic drug
a) Caffeine b) Morphine c) Lysergic acid diethylamide d) opium

188. The most common egg-type variety used for commercial production throughout the world is
a) Leghorn b) Plymoth rock c) Cornish d) New Hampshire

189. Which of the following belongs to free living nitrogen fixing bacteria?
I. *Rhizobium* II. *Azospirillum* III. *Azotobacter*
Choose the correct option
a) I and II b) I and III c) II and III d) I, II and III

190. Roquefort cheese is formed by ripening with the fungi for a particular
a) Colour b) Flavor c) Shape d) Texture

191. The type of population, where pre-reproductive animals occur in large numbers, is
a) Declining b) Fluctuating c) Stable d) Growing

192. Two species occupying same or overlapping area are called as
a) Sympatric b) Allopatric c) Parapatric d) Ring species

193. In primary succession in water, the pioneer species are
a) Free floating angiosperm b) Small phytoplanktons
c) Rooted hydrophytes d) Lichens

194. Large unit of land having different types of plants and animals, is called
a) Uniform vegetation b) Biome c) Ecosystem d) Niche

195. The rate of biomass production per unit area over a time period by plants during photosynthesis is called
a) Gross primary productivity b) Net primary productivity
c) Secondary productivity d) Decomposition

196. The total number of biodiversity hot spots in the world are
a) 24 b) 12 c) 34 d) 52

197. Some of the nutrient cycles are labelled as below
I. Sulphur cycle II. Phosphorus cycle III. Carbon cycle IV .Nitrogen cycle
Of these, the sedimentary cycle is represented by
a) I only b) II only c) III only d) I and II

198. Catalytic converters are fitted into automobiles to reduce the emission of harmful gases. Catalytic converters changes unburnt hydrocarbons into
a) Carbon dioxide and water b) Carbon monoxide
c) Methane d) Carbon dioxide and methane

199. Olfactory smell area is present in
a) Frontal lobe b) Parietal lobe c) Temporal lobe d) Occipital lobe

200. Which function will be lost due to damage of occipital lobe?
a) Hearing b) Speech c) Vision d) Memory