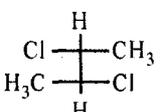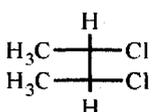# CHEMISTRY

1. Huckel's rule states that a monocyclic conjugated compound will be aromatic if it contains
   1. $(4n + 2\pi)$ electrons
   2. $(4\pi + 2n)$ electrons
   3. 4π electrons
   4. $(4n + 2)\pi$ electrons

2. Which of the following is optically inactive?
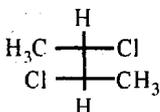
   4. None of these.

3. EAN of cobalt is 36 in $[Co(NH_3)_2O_2(en)Cl]$. Thus, O_2 is
   1. dioxide
   2. superoxide ion
   3. peroxide ion
   4. oxide

4. Chromyl chloride oxidises toluene to benzaldehyde, this reaction is known as
   1. Rosenmund reaction
   2. Wurtz reaction
   3. Etard reaction
   4. Fittig reaction

5. If 0.1 M of a weak acid is taken, and its percentage of degree of ionization is 1.34%, then its ionization constant will be :
   1. 0.8×10^{-5}
   2. 1.79×10^{-5}
   3. 0.182×10^{-5}
   4. None of the above

6. An organic compound X (molecular formula $C_6H_7O_2N$) has six carbon atoms in a ring system, two double bonds and a nitro group as substituent, X is
   1. Homocyclic but not aromatic
   2. Aromatic but not homocyclic
   3. Homocyclic and aromatic
   4. Heterocyclic and aromatic

7. In which of the following regions hydrogen and helium are found
   1. Stratosphere
   2. Mesosphere
   3. Exosphere
   4. Troposphere

8. Milk of magnesia is
   1. $Mg(OH)_2$
   2. $Ca(OH)_2$
   3. $CaCO_3$
   4. $MgCO_3$

9. Which of the following has highest knocking property?
   1. Aromatic hydrocarbons
   2. Olefins
   3. Branched chain paraffins
   4. Straight chain paraffins

10. Among the following compounds (I - III), the ease of their reaction with electrophiles is,
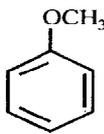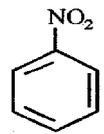
    1. $II > III > I$
    2. $III > II > I$
    3. $II > I > III$
    4. $I > II > III$

11. Haemoglobin contains 0.334% of iron by weight. The molecular weight of haemoglobin is approximately 67200. The number of iron atoms (at. wt. of Fe is 56) present in one molecule of haemoglobin are
    1. 1
    2. 6
    3. 4
    4. 2

12. Nessler's reagent is
    1. $KHgI_4$
    2. $K_2HgI_4 + NH_4OH$
    3. $K_2HgI_4 + KOH$
    4. $KHgI_4 + NH_4OH$

13. The solubility of hydroxides, fluorides or oxalates of the metals of Group II A
    1. increases down the group
    2. decreases down the group
    3. varies randomly
    4. is constant

14. AB; crystallizes in a body centred cubic lattice with edge length 'a' equal to 387 pm. The distance between two oppositely charged ions in the lattice is :
    1. 335 pm
    2. 250 pm
    3. 200 pm
    4. 300 pm

15. The reagent (s) which can be used to distinguish acetophenone from benzophenone is (are)
    1. 2, 4-Dinitrophenylhydrazine
    2. Aqueous solution of $NaHSO_3$
    3. Benedict reagent
    4. I_2 and NaOH.

16. For the cell

    $Zn \underset{\ominus}{|} Zn^2 + (1M) \| Cu^{2+}(1M) \underset{\oplus}{|} Cu$, E^0_{cell} is 1.10 V,

    $E^0_{cell^{2+}/Cu} = 0.34V$ and for the cell $Cu|Cu^{2+}(1M) \|$

    $Ag^+(1M) | Ag$, $E^0_{cell} = 0.46V$ hence, E^0_{cell} of the cell $Zn|Zn^{2+}(1M) \| Ag^+(1M) | Ag$ is
    1. -0.04 V
    2. $+0.04$V
    3. $+0.30$ V
    4. $+1.56$ V

17. Among the following complexes, optical activity is possible in
    1. $[Co(NH_3)_6]^{3+}$
    2. $[Co(H_2O)_2(NH_3)_2Cl_2]^+$
    3. $[Cr(H_2O)_2Cl_2]^+$
    4. $[Co(CN)_5NC]$

18. The r.m.s velocity of hydrogen is $\sqrt{7}$ times the r.m.s. velocity of nitrogen. If T is the temperature of the gas, then
    1. $T_{(H_2)} = T_{(N_2)}$
    2. $T_{(H_2)} > T_{(N_2)}$
    3. $T_{(H_2)} < T_{(N_2)}$
    4. $T_{(H_2)} = \sqrt{7}T_{(N_2)}$

19. The correct order of ionic radii of Y^{3+}, La^{3+}, Eu^{3+} and Lu^{3+} is
    1. $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$
    2. $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$
    3. $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$
    4. $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

20. The pK_a of an amino acid is 9.15. At what pH amino acid is 5% dissociated ?
    1. 9.15
    2. 4.85
    3. 9.44
    4. 7.87

21. In the froth floatation process for the purification of ores, the ore particles float because
    1. They are light
    2. Their surface is hydro dphobic i.e. not easily wetted by water
    3. They bear electrostatic charge
    4. They are insoluble

22. T_{50} of first -order reaction is 10 min. Starting with 10 mol L^{-1}, rate after 20 min is
    1. 0.0693 mol L^{-1} min^{-1}
    2. 0.0693×2.5 mol L^{-1} min^{-1}
    3. 0.0693×5 mol L^{-2} min^{-1}
    4. 0.0693×10 mol L^{-1} min^{-1}

23. Which of the following organometallic compound is σ and π bonded?
    1. $[Fe(\eta^5 - C_5H_5)_2]$
    2. $Fe(CH_3)_3$
    3. $K[PtCl_3(\eta^2 - C_2H_4)]$
    4. $[Co(CO)_5NH_3]^{2+}$

24. Which of the following statement is false?
    1. For 1 mole of an ideal gas, $C_p - C_v = R$
    2. $\left(\dfrac{\partial E}{\partial T}\right)_T = 0$ for an ideal gas
    3. $\Delta q = \Delta w + p\Delta v$

4. For reversible isothermal expansion of 1 mole of an ideal gas from volume V_1 to V_2, work done is equal to RT ln (V_2/V_1)

25. The correct order of the decreasing ionic radii among the following isoelectronic species are:
    1. $Ca^{2+} > K^+ > S^{2-} > Cl^{-1}$
    2. $Cl^- > S^{2-} > Ca^{2+} > K^+$
    3. $S^{2-} > Cl^- > K^+ > Ca^{2+}$
    4. $K^+ > Ca^{2+} > Cl^- > S^{2-}$

26. When two halogens are attached to same carbon atom, it is known as:
    1. *vic*-dihalide
    2. *gem*-dihalide
    3. α, ω -dihalide
    4. α, β-dihalide

27. SnO_2 is taken in basic medium and current is passed. Colloidal sol migrates towards
    1. anode (+plate)
    2. cathode (-plate)
    3. both (1) and (2)
    4. None of these

28. 0.45 g of acid of molecular weight 90 was neutralized by 20 ml. of a 0.5N caustic potash. The basicity of an acid is
    1. 1
    2. 2
    3. 3
    4. 4

29. Which of the following is a broad spectrum drug?
    1. Plasmoquine
    2. Chloroquine
    3. Chloramphenicol
    4. D.D.T.

30. A compound on treatment with NaOH followed by addition of $AgNO_3$ produces white precipitate at room temperature. The precipitate is soluble in NH_4OH. The compound is identified as
    1. vinyl chloride
    2. benzyl chloride
    3. chlorobenzene
    4. ethyl bromide

31. At what angles for the first order diffraction, spacing between two planes respectively are λ and $\dfrac{\lambda}{2}$?
    1. $0°, 90°$
    2. $90°, 0°$
    3. $30°, 90°$
    4. $90°, 30°$

32. Equivalent conductance of an electrolyte containing NaF at infinite dilution is 90.1 Ohm^{-1} cm^2. If NaF is replaced by KF what is the value of equivalent conductance?
    1. 90.1 Ohm^{-1} cm^2
    2. 111.2 Ohm^{-1} cm^2
    3. 0
    4. 222.4 Ohm^{-1} cm^2

33. The enthalpy of combustion of C_6H_6 is -3250 kJ, when 0.39 gm of C_6H_6 is burnt in excess of oxygen in an open vessel, the amount of heat evolved is
    1. 8.32 kJ
    2. 12.36 kJ
    3. 16.25 kJ
    4. 20.74 kJ

34. In which of the following is there a consistent decrease in atomic radius as the atomic number increases?
    1. halogens
    2. representative elements
    3. transition elements
    4. lanthanides

35. The basicity of aniline is less than that of cyclohexylamine. This is due to
    1. +R effect of $-NH_2$ group
    2. $-I$ effect of $-NH_2$ group
    3. $-R$ effect of $-NH_2$ group
    4. hyperconjugation effect

36. $E^o = \dfrac{RT}{nF} \ln K_{eq}$

    The above equation is called
    1. Gibb's equation
    2. Gibb's-Helmholtz equation
    3. Nernst equation
    4. Van der Waal's equation

37. Mac Arthur process is used for the extraction of :
    1. Au   2. Pt
    3. Cu   4. Zn

38. H_3BO_2 is
    1. monobasic and weak Lewis acid
    2. monobasic and weak Bronsted acid
    3. monobasic and strong Lewis acid
    4. tribasic and weak Bronsted acid

39. The following equilibrium constants are given:
    $N_2 + 3H_2 \rightleftharpoons 2NH_3$; K_1
    $N_2 + O_2 \rightleftharpoons 2NO$; K_2
    $H_2 + \dfrac{1}{2}O_2 \rightleftharpoons H_2O$; K_2

    The equilibrium constant for the oxidation of NH_3 by oxygen to give NO is

    1. $\dfrac{K_2K_3^2}{K_1}$ 2. $\dfrac{K_2^2K_3}{K_1}$

    3. $\dfrac{K_1K_2}{K_3}$ 4. $\dfrac{K_2K_3^3}{K_1}$

40. The ortho/para directing group among the following is :
    1. COOH   2. CN
    3. $COCH_3$ 4. $NHCONH_2$

41. Benzoic acid gives benzene on being heated with X and phenol gives benzene on being heated with Y. Therefore X and Y are respectively
    1. Soda-lime and copper
    2. Zn dust and NaOH
    3. Zn dust and soda-lime
    4. Soda-lime and zinc dust.

42. The enthalpies of the following reactions are shown below.

    $\dfrac{1}{2}H_2(g) + \dfrac{1}{2}O_2(g) \rightarrow OH(g)$; $\Delta H = 42.09 \text{ kJ mol}^{-1}$

    $H_2(g) \rightarrow 2H(g)$; $\Delta H = 435.89 \text{ kJ mol}^{-1}$

    $O_2(g) \rightarrow 2O(g)$; $\Delta H = 495.05 \text{ kJ mol}^{-1}$

    Calculate the O—H bond energy for the hydroxyl radical.
    1. $223.18 \text{ kJ mol}^{-1}$ 2. $423.38 \text{ kJ mol}^{-1}$
    3. $513.28 \text{ kJ mol}^{-1}$ 4. $113.38 \text{ kJ mol}^{-1}$

43. Elements X, Y and Z have atomic numbers 19, 37 and 55 respectively. Which of the following statements is true about them?
    1. Their ionization potential would increase with increasing atomic number
    2. 'Y' would have an ionisation potential between those of 'X' and 'Z'
    3. 'Z' would have the highest ionization potential
    4. 'Y' would have the highest ionization potential.

44. MnO_4^{2-} (1 mole) in neutral aqueous medium disproportionates to
    1. 2/3 mole of MnO_4^- and 1/3 mole of MnO_2
    2. 1/3 mole of MnO_4^- and 2/3 mole of MnO_2
    3. 1/3 mole of Mn_2O_7 and 1/3 mole of MnO_2
    4. 2/3 mole of Mn_2O_7 and 1/3 mole of MnO_2

45. Formation of a solution from two components can be considered as
    (i) pure solvent $\rightarrow$ separated solvent molecules, ΔH_1
    (ii) pure solute $\rightarrow$ separated solute molecules, ΔH_2
    (iii) separated solvent and solute molecules $\rightarrow$ solution, ΔH_3
    Solution so formed will be ideal if

    1. $\Delta H_{soln} = \Delta H_1 + \Delta H_2 - \Delta H_3$

    2. $\Delta H_{soln} = \Delta H_1 - \Delta H_2 - \Delta H_3$

    3. $\Delta H_{soln} = \Delta H_3 - \Delta H_1 - \Delta H_2$

   4. $\Delta H_{soln} = \Delta H_1 + \Delta H_2 + \Delta H_3$.

PHYSICS

46. The time of oscillation T of a small drop of liquid depends on radius r, density ρ and surface tension S. The relation between them is given by

1. $T \propto \sqrt{\dfrac{S}{\rho r^3}}$
2. $T \propto \sqrt{\dfrac{\rho r^3}{S}}$
3. $T \propto \sqrt{\dfrac{S^2 r^3}{\rho}}$
4. $T \propto \sqrt{\dfrac{\rho r^3}{S}}$

47. The number of significant figures in 3400 is
   1. 7   2. 6
   3. 12   4. 2

48. A sample of ideal monoatomic gas is taken round the cycle ABCA as shown in the figure. The work done during the cycle is
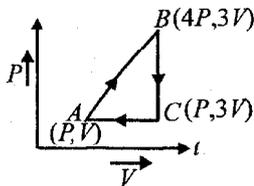
   1. 3 PV   2. zero
   3. 9 PV   4. 6 PV

49. The escape velocity for a body projected vertically upwards from the surface of earth is 11 km/s. If the body is projected at an angle of 45° with the vertical, the escape velocity will be
   1. 22 km/s   2. 11 km/s
   3. $\dfrac{11}{\sqrt{2}}\,km/s$ 4. $11\sqrt{2}\,km/s$

50. A projectile is projected at an angle of 45° with speed u. The radius of curvature of its trajectory at the maximum height is

1. $\dfrac{u^2}{g}$
2. $\dfrac{u^2}{4g}$
3. $\dfrac{2u^2}{g}$
4. $\dfrac{u^2}{2g}$

51. As intensity of incident light increases
   1. photoelectric current increase
   2. K.E. of emitted photoelectron increases
   3. photo electric current decreases
   4. K.E. of emitted photoelectrons decreases

52. Which is true of the following in a purely resistive ac circuit?

1. The current leads the driving voltage
2. The driving voltage leads the current.
3. The current and driving voltage are in the same phase.
4. Any of the above may be true depending on the value of resistance.

53. Two resistors A and B have resistances R_A and R_B respectively with $R_A < R_B$. The resistivities of their materials are ρ_A and ρ_B. Then

1. $\rho_A > \rho_B$ 2. $\rho_A = \rho_B$ 3. $\rho_A < \rho_B$
4. The information is not sufficient to find the relation between ρ_A and ρ_B

54. A block of mass 60 kg just slides over a horizontal distance of 0.9 m. If the coefficient of friction between their surface is 0.15 then work done against friction will be
   1. 79.4 J   2. 97.54 J
   3. 105.25 J   4. None of these

55. The efficiency of carnot engine when source temperature is T_1 and sink temperature is T_2 will be

1. $\dfrac{T_1 - T_2}{T_1}$
2. $\dfrac{T_2 - T_1}{T_2}$
3. $\dfrac{T_1 - T_2}{T_2}$
4. $\dfrac{T_1}{T_2}$

56. A capacitor of the capacitance 10 µF is charged by connecting through a resistance of 20Ω to a battery of 20 V, as shown. How much energy is supplied by the battery?
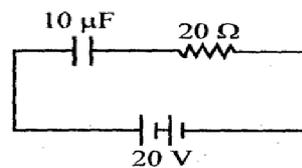
   1. <2 mJ   2. 2mJ
   3. >2 mJ   4. None of these

57. In which of the following Bohr's orbit n in a hydrogen atom emits the photons of lowest frequency?
   1. n = 4 to n = 3   2. n = 2 to n = 1
   3. n = 4 to n = 2   4. n = 3 to n = 1

58. A wheel having moment of inertia 2 kg-m² about its vertical axis, rotates at the rate of 60 rpm about this axis, The torque which can stop the wheel's rotation in one minute would be

1. $\dfrac{\pi}{18} N - m$ 2. $\dfrac{2\pi}{15} N - m$

3. $\dfrac{\pi}{12} N - m$ 4. $\dfrac{\pi}{15} N - m$

59. Photoelectric effect shows
    1. wave like behaviour of light
    2. paritcle like behaviour of 1ight
    3. both wave like and particle like behaviour
    4. Neither wave like nor particle like behaviour of light

60. The K.E. of one mole of an ideal gas is E = (3/2) RT. Then C_p will be
    1. 0.5 R   2. 0.1 R
    3. 1.5 R   4. 2.5 R

61. A triangular block of mass M with angles 30°, 60° and 90° rest with its 30° – 90° side on a horizontal table. A cubical block of mass m rests on 60° - 30° side. The acceleration which M must have relative to the table to keep m stationary relative to the triangular block is (assuming frictionless contact)

    1. g   2. $g/\sqrt{2}$

    3. $g/\sqrt{3}$ 4. $g/\sqrt{5}$

62. The condition for obtaining secondary maxima in the diffraction pattern due to single slit is

    1. $a \sin\theta = n\lambda$ 2. $a\sin\theta = (2n-1)\dfrac{\lambda}{2}$

    3. $a\sin\theta = (2n-1)\lambda$ 4. $a\sin\theta = \dfrac{n\lambda}{2}$

63. Seven resistances, each of value 20 Ω, are connected to a 2 V battery as shown in the figure. The ammeter reading will be
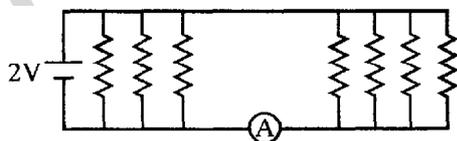
    1. 1/10A   2. 3/10A
    3. 4/10 A   4. 7/10 A.

64. The force between the two short electric dipoles, separated by a distance r, varies as
    1. r^2 2. r^{-3}
    3. r^4 4. r^{-4}

65. If R is universal gas constant, the amount of heat needed to raise the temperature of 2 moles of an ideal monoatomic gas from 273 K to 373 K, when no work is done, is
   1. 100 R   2. 150 R
    3. 300 R   4. 500 R

66. A block B of mass 4 kg is placed on a rough horizontal plane. A time dependent horizontal force f = kt acts on the block, k = 2 N/s². The frictional force between the block and the plane at t = 2 sec is (u = 0.2)
    1. 4N   2. 8N
    3. 12 N   4. zero

67. In a transformer, number of turns in the primary coil are 140 and that in the secondary coil are 280. If current in primary coil is 4 A, then that in the secondary coil is
    1. 4A   2. 2A
    3. 6A   4. 10A

68. A closed spherical surface of radius R encloses an electric dipole. The net electric flux through the surface is
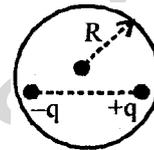
    1. zero   2. $2q.4\pi R^2$

    3. $\dfrac{q}{\varepsilon_0}$ 4. $\dfrac{2q}{\varepsilon_0}$

69. How much energy is required for a body of mass 1000 kg to escape from the earth? (g = 9.8 m/s², R = 6400 km)
    1. about 3.2×10^{10} J   2. about 6.4×10^{10} J
    3. about 6.4×10^6 J   4. None of these.

70. A phase difference between two points separated by 0.8 m in a wave of frequency 120 Hz is π/2. The wave velocity is
    1. 384 m/s   2. 768 m/s
    3. 250 m/s   4. 154 m/s

71. For a single side band transmission a balanced modulator is used to
    1. increase power of carrier wave
    2. increase amplitude of carrier wave
    3. suppress audio signal
    4. suppress carrier component

72. The amplitude of an alternate voltage is 120 V. Its rms value will be
    1. 107.3 V
    2. 84.8 V
    3. 70.7 V
    4. 68.8 V

73. A bag of mass M hangs by a long thread and a bullet (mass m) comes horizontally with velocity V and gets caught in the bag. Then for the combined (bag + bullet) system

    1. momentum $= \dfrac{mvM}{M+m}$

    2. kinetic energy $= \dfrac{mV^2}{2}$

    3. momentum $= \dfrac{mV(M+m)}{M}$

    4. kinetic energy $= \dfrac{m^2 v^2}{2(M+m)}$

74. A simple pendulum is exectuing simple harmonic motion with a time period T. If the length of the pendulum is increased by 21 % the increase in the time period of the pendulum of increased length is
    1. 50%
    2. 30%
    3. 21%
    4. 10%

75. A wheel with ten metallic spokes each 0.50m long is rotated with a speed of 120 rev/min in a plane normal to the earth' s magnetic field at the place. If the magnitude of the field is 0.40 G, the induced emf between the axle and the rim of the wheel is equal to
    1. 1.256×10^{-3} V
    2. 6.28×10^{-4} V
    3. 1.256×10^{-4} V
    4. 6.28×10^{-5} V

76. The average kinetic energy of a molecule of a perfect gas is
    1. (2/3)K T
    2. 1.5 KT
    3. 2.5 KT
    4. None of these

77. A ray of monochromatic light suffers minimum deviation of 38°, while passing through a prism of refracting angle 60°. Refractive index of the prism material is
    1. 2.4
    2. 0.8
    3. 1.3
    4. 1.5

78. In a circuit, containing a resistance R and a capacitance C, if the frequency f of impressed ac increases, the impedance Z of circuit will
    1. decrease
    2. increase
    3. remain constant
    4. first decrease and then increase

79. Two bodies of masses 10 kg and 100 kg are separated by a distance of 2m ($G = 6.67 \times 10^{-11}$ Nm^2 kg^{-2}). The gravitational potential at the mid point on the line joining the two is
    1. 7.3×10^{-7} J/kg
    2. 7.3×10^{-9} J/kg
    3. -7.3×10^{-9} J/kg
    4. 7.3×10^{-6} J/kg

80. For a given material, the Young's modulus is 2.4 times that of rigidity modulus, the Poission's ratio is
    1. 0.2
    2. 0.4
    3. 1.2
    4. 2.4

81. A particle executes S.H.M. having time period T, then the time period with which the potential energy changes is
    1. T
    2. 2T
    3. T/2
    4. ∞

82. A bar magnet of magnetic moment $\vec{M}$ is placed in the magnetic field $\vec{B}$. The torque acting on the magnet is
    1. $\vec{M} \times \vec{B}$
    2. $\vec{M} - \vec{B}$
    3. $\dfrac{1}{2}\vec{M} \times \vec{B}$
    4. $\vec{M} + \vec{B}$

83. Figure shows a capillary rise H. If the air is blown through the horizontal tube in the direction as shown, then rise in capillary tube will be
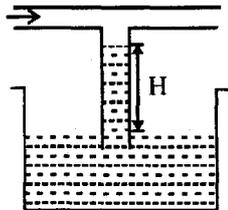
    1. =H
    2. >H
    3. <H
    4. zero

84. If red light and violet light rays are of focal lengths f_R and f_V respectively, then which one of the following is true?
    1. $\lambda_R \leq \lambda_V$
    2. $\mu_R > \mu_V$
    3. $\mu_R = \mu_V$
    4. $\mu_R < \mu_V$

85. A soap bubble has radius r and volume V. If the excess pressure inside the bubble is P Then PV is proportional to
    1. r
    2. r^2
    3. r^3
    4. r^4

86. The materials suitable for making electromagnets should have
    1. high retentivity and low coercivity
    2. low retentivity and low coercivity
    3. high retentivity and high coercivity
    4. low retentivity and high coercivity

87. The photo electric work function for a metal surface is 4.125 eV. The cut-off wavelength for this surface is
    1. 4125 A°
    2. 3000 A°
    3. 6000 A°
    4. 2062A°

88. In a n-p-n transistor
    1. holes move from emitter to base
    2. negative charge moves from emitter to base
    3. holes move from base to collector
    4. negative charge moves from collector to base

89. Ground waves are polarised
    1. Parallel to the earth's surface
    2. normal to the earth's surface
    3. at an angle 45° from earth's surface
    4. in any direction.

90. The logic behind 'NOR' gate is that it gives
    1. high output when both inputs are low
    2. high output when both inputs are high
    3. low output when both inputs are low
    4. None of these.

BIOLOGY

91. Which plays an important role in the dispersal of spores in *Funaria*?
    1. Operculum
    2. Capsule
    3. Peristome and annulus
    4. Sporogonium

92. Read the following five statements (i - v) and answer the question.
    (i) In Equisetum the female gametophyte is retained on the parent sporophyte.
    (ii) In Ginkgo male gametophyte is not independent,
    (iii) The sporophyte in Riccia is more developed than that in Polytrichum.
    (iv) Sexual reproduction in *Volvox* is isogamous.
    (v) The spores of slime molds lack cell walls.
    How many of the above statements are correct?
    1. Two
    2. Three
    3. Four
    4. One

93. The fluidity of membranes in a plant in cold weather may be maintained by
    1. increasing the number of phospholipids with unsaturated hydrocarbon tails
    2. increasing the proportion of integral proteins
    3. increasing concentration of cholesterol in membrane
    4. increasing the number of phospholipids with saturated hydrocarbon tail

94. Addition of a solute to pure water causes
    1. negative water potential.
    2. more negative water potential.
    3. positive water potential.
    4. more positive water potential.

95. Which one of the following process help the water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts?
    1. Fragmentation
    2. Leaching
    3. Catabolism
    4. Humification

96. Which one of the following species of plant is considered as the world's most problematic aquatic weed?
    1. Lantana
    2. Eichhornia
    3. Parthenium (carrot grass)
    4. Brown algae

97. The first dicarboxylic acid in Krebs' cycle is
    1. isocitric acid
    2. pyruvic acid
    3. oxalo acetic acid
    4. α-ketoglutaric acid

98. $N_2 + 8e^- + 8H^+ + 16\,ATP \rightarrow 2NH_4 + H_2 + 16ADP + 16Pi$
    The above equation refers to
    1. ammonification
    2. nitrification
    3. nitrogen fixation
    4. denitrification

99. If turgor pressure becomes equal to osmotic pressure
    1. water leaves the cell.
    2. water enters the cells.
    3. no exchange of water takes place.
    4. solute pass out of the cell.

100. The two chromatids of a metaphase chromosome represent
    1. replicated chromosomes to be separated at anaphase
    2. homologous chromosomes of a diploid set
    3. non-homologous chromosomes joined at the centromere
    4. maternal and paternal chromosomes joined at the centromere

101. A vascular bundle in which the protoxylem is pointing to the periphery is called
    1. endarch
    2. exarch
    3. radial
    4. closed

102. Which one of the following micro-organisms is used for production of citric acid in industries?
    1. Penicillium citrinum
    2. Aspergillus niger
    3. Rhizopus nigricans
    4. Lactobacillus bulgaris

103. Emasculation is not required when flowers are
    1. bisexual
    2. intersexual
    3. unisexual
    4. either (1) or (2)

104. Which one of the following is common to multicellular fungi, filamentous algae and protonema of mosses?
    1. Diplontic life cycle
    2. Members of kingdom plantae
    3. Mode of Nutrition
    4. Multiplication by fragmentation

105. Which part of the coconut produces coir?
    1. Seed coat
    2. Mesocarp
    3. Epicarp
    4. Pericarp

106. Root hair arises from
    1. pericycle
    2. endodermis
    3. cortex
    4. epiblema

107. The productivity of a crop declines when leaves begin to wilt mainly because
    1. the chlorophyll of wilting leaves decomposes.
    2. flaccid mesophyll cells are incapable of photosynthesis.
    3. stomata close, preventing CO_2 from entering the leaf.
    4. photolysis, the water-splitting step of photosynthesis, cannot occur when there is a water deficiency.

108. Which one of the following is not a function of an ecosystem?
    1. Energy flow
    2. Decomposition
    3. Productivity
    4. Stratification

109. The process in which mature differentiated cells reverse to meristematic activity to form callus is called
    1. dedifferentiation
    2. differentiation
    3. redifferentiation
    4. None ofthe above

110. Which one of the following statement is true?
    1. The greater the Biological Oxygen Demand (BOD) of waste water, more is its polluting potential.
    2. The greater the BOD of waste water, less is its polluting potential.
    3. The lesser the BOD of waste water, more is its polluting potential.
    4. The lesser the BOD of waste water, less is its polluting potential.

111. Ecosystem is
    1. always open
    2. always closed
    3. both open and closed depending upon community
    4. both open and closed depending upon biomass

112. Transition zone between two vegetations is
    1. ecotone
    2. ecotype
    3. ecocline
    4. ecosystem

113. The conditions necessary for vernalization are
    1. high temperature and water
    2. low temperature and oxygen
    3. water and carbon dioxide
    4. oxygen and water.

114. Final electron acceptor in oxidative phosphorylation is
    1. hydrogen
    2. dehydrogenase
    3. cytochrome
    4. oxygen

115. In a CAM plant, the concentration of organic acid
    1. increases during the day.
    2. decreases during the day.
    3. increases during night.
    4. decreases or increases during day.

116. The phenomenon of plasmolysis is evident when cells are kept in
    1. hypotonic solution
    2. hypertonic solution
    3. isotonic solution
    4. None of the above

117. Quantasomes are found in
    1. mitochondria
    2. chloroplast
    3. lysosome
    4. endoplasmic reticulum

118. Phellogen and phellem respectively denote
    1. cork and cork cambium
    2. cork cambium and cork
    3. secondary cortex and cork
    4. cork and secondary cortex

119. Which one of the following is a correct statement?
    1. Pteridophyte gametophyte has a protonemal and leafy stage
    2. In gymnosperms female gametophyte is free-living
    3. Antheridiophores and archegoniophores are present in pteridophytes
    4. Origin of seed habit can be traced in pteridophytes

120. Function of suspensor of embryo is
    1. absorption of nourishment.
    2. push the embryo into nutritive endosperm region.
    3. formation of secondary embryos.
    4. All of the above

121. Pineapple (ananas) fruit develops from
    1. a multipistillate syncarpous flower
    2. a cluster of compactly borne flowers on a common axis
    3. a multilocular monocarpellary flower
    4. a unilocular polycarpellary flower

122. Scutellum is a/an
    1. protective covering of radicle
    2. protective covering of plumule
    3. endosperm of gymnosperms
    4. shield-shaped cotyledon

123. The common bottle cork is a product of:
    1. Dermatogen   2. Phellogen
    3. Xylem   4. Vascular cambium

124. Telomere and eukaryotic chromosome possesses short segments of
    1. guanine rich repeats.
    2. thymine rich repeats.
    3. cytosine rich repeats.
    4. adenine rich repeats.

125. What mechanism explains the movement of sucrose from source to sink ?
    1. Evaporation of water and active transport of sucrose from sink.
    2. Osmotic movement of water into the sucrose loaded sieve tube cells creating a higher hydrostatic pressure into the source than in the sink.
    3. Tension created by differences in hydrostatic pressure in the source and sink.
    4. Active transport of sucrose through the sieve tube membranes driven by proton pump.

126. Which one of the following areas in India, is a hotspot of biodiversity?
    1. Eastern Ghats   2. Gangetic Plain
    3. Sunderbans   4. Western Ghats

127. A taxon facing an extremely high risk of extinction in wild in the immediate future is called:
    1. critical endangered
    2. endangered
    3. vulnerable
    4. extinct in wild

128. Compensation point is
    1. where there is neither photosynthesis nor respiration.
    2. when rate of photosynthesis is equal to the rate of respiration.
    3. when entire food synthesized into photosynthesis remain utilized.
    4. when there is enough water just to meet the requirements of plant.

129. Which of the following hormones does not naturally occur in plants?
    1. 2, 4-D (2,4-dichloropheoxy acetic acid)
    2. IAA
    3. ABA
    4. GA

130. Which of the following statements regarding photorespiration are true?
    1. Photorespiration is a metabolically expensive pathway
    2. Photorespiration is avoided when CO_2 is abundant.
    3. Photorespiration results in a loss of usable carbon dioxide.
    4. All of the above

131. A trace element essential for plant growth and radio-isotope, which is used in cancer therapy is
    1. cobalt   2. calcium
    3. sodium   4. iron

132. Which one of the following elements in plants is not remobilised?
    1. Phosphorus   2. Calcium
    3. Potassium   4. Sulphur

133. Water will be absorbed by root hairs when
    1. concentration of salt in the soil is high.
    2. concentration of solutes in the cell sap is high.
    3. plant is rapidly respiring.
   4. they are separated from soil by a permeable membrane.

134. Which of the following types of phytohormones resemble the nucleic acids in some structural aspects?
    1. Auxin
    2. Cytokinin
    3. Gibberellin
    4. ABA

135. Which of the following statement(s) is/are incorrect?
    (i) Proton channel of oxysome / complex V / ATP synthase is located in F_1.
    (ii) Metabolic water is produced in terminal oxidation /produced in respiration,
    (iii) CoQ accepts electron from NADH dehydrogenase (complex I) and also can accept electron from $FADH_2$/succinate Q-reductase/ complex II.
    (iv) Cytochrome c is a small protein attached to outer surface of the inner mitochondrial membrane and acts as mobile carrier for transfer of electrons between complex I (Cyt bc, complex) and III.
    (v) Complex IV refers to cytochrome c oxidase (cyt a, a_3 and 2 Cu per centre)
    (vi) If a cell is treated with a drug that inhibits ATP synthase, the pH of mitochondrial matrix will increase,
    1. (i), (ii) and (iii)
    2. (iii), (v) and (vi)
    3. (i) and (iv)
    4. Only (iii)

136. Which one of following feature is possessed by Crustaceans and not by insects?
    1. Paired limbs
    2. Two pairs of antenna
    3. Chitinous exoskeleton
    4. Bilateral symmetry

137. Which period is called the "Golden age of fishes"?
    1. Jurassic period
    2. Devonian period
    3. Permian period
    4. Ordovician period

138. During inspiration the diaphragm
    1. relaxes to become dome-shaped
    2. contracts and flattens
    3. expands
    4. shows no change

139. Cirrhosis of liver is caused by the chronic intake of
    1. Opium
    2. Alcohol
    3. Tobacco (Chewing)
    4. Cocaine

140. Which of the following sets contains polysaccharides?
    1. Glucose, fructose, lactose
    2. Starch, glycogen, cellulose
    3. Sucrose, maltose, cellulose
    4. Galactose, starch, sucrose

141. Streptokinase which is used as a 'clot buster' obtained from
    1. *Streptococcus*
    2. *Staphylococcus*
    3. *Lactobacillus*
    4. *Saccharomyces*

142. Baculoviruses are excellent candidates for
    1. species-specific narrow spectrum pesticidal applications.
    2. species-specific broad spectrum pesticidal applications.
    3. species-specific narrow spectrum insecticidal applications.
    4. species-specific broad spectrum insecticidal applications.

143. Select the correct statement.
    1. Genetic engineering works only on animals and has not yet been successfully used on plants.
    2. There are no risks associated with DNA technology.
    3. The first step in PCR is heat which is used to separate both the strands of target DNA.
    4. DNA from one organism will not bond to DNA from another animal.

144. Sigmoid growth curve is represented by
    1. $dN/dt = rN$
    2. $dN/dt = rN(1-N/K)$
    3. $N_t = N_0 + B + I - D - E$
    4. $dN/dt = 1 - N/K$

145. The lactic acid generated during muscle contraction is converted to glycogen in :
    1. Muscle
    2. Kidney
    3. Pancreas
    4. Liver

146. Thromboplastin is secreted by
    1. platelets
    2. lymphocytes
    3. helper T-cells
    4. mast cells

147. A coenzyme is
    1. Same enzyme that occurs in different tissues such as heart and muscle
    2. One that shares the function of other enzyme
    3. Organic or inorganic in nature and helps activate metabolic enzymes
    4. Organic non-protein in nature and helps to activate metabolic enzymes

148. The sphincter of Oddi is present between
    1. Oesophagus and cardiac stomach
    2. Pyloric stomach and duodenum
    3. Hepatic duct and cystic duct
    4. Hepatopancreatic duct and duodenum

149. Which phases of cell division is arrested in oogonia of vertebrate?
1. Anaphase II
2. Interphase
3. Diplotene
4. Both prophase I and II

150. Which one of the following combination is mismatched?
1. Glycocalyx - may be capsule or slime layer
2. Pili - Reproduction
3. Cell wall - Protective, determ ines shape, prevents from bursting
4. Flagella, Pili and Fimbriae - Surface structures of bacterial cell

151. The most basic amino acid is
1. Arginine
2. Histidine
3. Glycine
4. Glutamine

152. Poison glands of snake are modified
1. Linguals
2. Sublinguals
3. Maxillaries
4. Parotids

153. Which of the following statements are wrong?
(i) Leucocytes disintegrate in the spleen and liver.
(ii) RBC, WBC and blood platelets are produced by bone marrow,
(iii) Neutrophils bring about destruction and detoxification of toxins of protein origin,
(iv) The important function of lymphocytes is to produce antibodies,
1. (i) and (ii) only
2. (i) and (iv) only
3. (i) and (iii) only
4. (ii) and (iii) only

154. Which one single organism or the pair of organisms is correctly assigned to its taxonomic group?
1. Paramecium and Plasmodium belong to the same kingdom as that of Penicillium
2. Lichen is a composite organism formed from the symbiotic association of an algae and a protozoan
3. Yeast used in making bread and beer is a fungus
4. Nostoc and Anabaena are examples of protista

155. Bee dances are meant for
1. Courtship
2. Communication
3. Recreation
4. Instinct

156. The adults are radially symmetrical but larvae exhibit bilateral symmetry in
1. Mollusca
2. Hemichordata
3. Echinodermata
4. Cephalochordata

157. Which one of the following techniques is safest for the detection of cancers?

1. Magnetic resonance imaging (MRI)
2. Radiography (X-ray)
3. Computed tomography (CT)
4. Histopathological studies

158. Common cold differs from pneumonia in, that
1. Pneumonia is caused by a virus while the common cold is caused by the bacterium Haemophilus influenzae
2. Pneumonia pathogen infects alveoli whereas the common cold affects nose and respiratory passage but not the lungs
3. Pneumonia is a communicable disease whereas the common cold is a nutritional deficiency disease
4. Pneumonia can be prevented by a live attenuated bacterial vaccine whereas the common cold has no effective vaccine

159. Which of the following technique is used for the separation of DNA fragments ?
1. Gel electrophoresis
2. Chromatography
3. Transformation
4. Transduction

160. Plasmids are suitable vectors for gene cloning because
1. these are small circular DNA molecules which can integrate with host chromosomal DNA.
2. these are small circular DNA molecules with their own replication origin site.
3. these can shuttle between prokaryotic and eukaryotic cells.
4. these often carry antibiotic resistance genes.

161. Which one of the following statement is correct?
1. Warm and moist environment favour decomposition whereas low temperature and anaerobiosis inhibit decomposition
2. Warm and moist environment inhibit decomposition whereas low temperature and anaerobiosis favour decomposition
3. Warm and anaerobiosis favour decomposition whereas low temperature favours decomposition
4. Warm and low temperature inhibit decomposition whereas anaerobiosis favours decomposition

162. Which of the following statement(s) is/are true?
(i) Biowar is the use of biological weapons against humans and /or their crops and animals,
(ii) Bioethics is the unauthorized use of bioresources and traditional knowledge related to bioresources for commercial benefits,

(iii) Biopatent is exploitation of bioresources of other nations without proper authorisation,

1. (ii) only
2. (i) only
3. (i) and (ii) only
4. (i) and (iii) only

163. The species that invade a bare area are called
1. keystone species
2. extinct species
3. pioneer species
4. rare species

164. If receptor molecule is removed from target organ for hormone action, the target organ will
1. continue to respond but require higher concentration of hormone
2. continue to respond but in opposite away
3. continue to respond without any difference
4. not respond to hormone

165. Osteoporosis is caused by
1. Ca^{2+} deficiency
2. Hypersecretion of calcitonin
3. K^+ deficiency
4. Hypersecretion of Parathormone

166. Which hormone is related to mineral metabolism but is not a peptide / protein in nature?
1. Parathyroid hormone (PTH)
2. Atrial natriuretic (ANF)
3. Aldosterone
4. All of these

167. Mark the incorrect statement
1. The ear ossicle attached to tympanic membrane is malleus
2. Opsin (of Rhodopsin) develops from vitamin A
3. The pressure on ear drum is equalized by eustachian tube
4. Otolith organ consists of saccule and utricle

168. The contractile protein of skeletal muscle involving ATPase activity is
1. Myosin
2. Actin
3. Troponin
4. Tropomyosin

169. Malpighian tubules are the excretory organs in
1. Cockroach
2. Platyhelminthes
3. Ascaris
4. Pila

170. The functional unit of mammalian kidney is
1. ureter
2. urinary bladder
3. urethra
4. nephron

171. The condition of excess urea in blood is known as
1. Polyuria
2. Haematuria
3. Uraemia
4. Diuresis

172. Chordae tendinae are found in
1. joints of legs
2. atria of heart
3. ventricles of brain
4. ventricles of heart

173. The pattern of contraction and relaxation of the heart is referred to as
1. Blood pressure
2. arterial flow
3. blood flow
4. cardiac cycle

174. Rate of breathing in mammals largely depends upon
1. Oxygen concentration in blood
2. CO_2 concentration in blood
3. Volume of O_2 in trachea
4. Extent of depression of diaphragm

175. Which of the following statements are true?
(i) The blood transports CO_2 comparatively easily because of its higher solubility,
(ii) Approximately 8-9% of CO_2 is transported being dissolved in the plasma of blood,
(iii) The carbon dioxide produced by the tissues, diffuses passively into the blood stream and passes into red blood corpuscles and react with water to form H_2CO_3.
(iv) The oxyhaemoglobin (HbO_2) of the erythrocytes is basic,
(v) The chloride ions diffuse from plasma into the erythrocytes to maintain ionic balance.

1. (i), (iii) and (v) are true, (ii) and (iv) are false
2. (i), (iii) and (v) are false, (ii) and (iv) are true
3. (i), (ii) and (iv) are true, (iii) and (v) are false
4. (i), (ii) and (iv) are false, (iii) and (v) are true

176. Young one of the cockroach is called
1. Naid
2. Grub
3. Nymph
4. Maggot

177. What is the figure given below showing in particular?
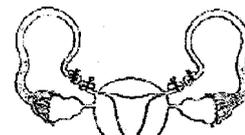
1. Ovarian cancer
2. Uterine cancer
3. Tubectomy
4. Vasectomy

178. Identify the human developmental stage shown below as well as the related right place of its occurrence in a.normal pregnant woman, and select the right option for the two together.
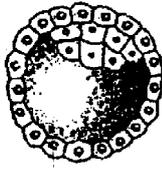
Developmental stage	Site of occurrence
1. Late morula	Middle part of fallopian tube
2. Blastula	End part of fallopian tube
3. Blastocyst	Uterine wall
4. 8 celled morula	Starting point of fallopian tube

179. Which one of the following statements is correct with respect to immunity?
    1. Preformed antibodies need to be injected to treat the bite by a viper snake.
    2. The antibodies against small pox pathogen are produced by T-lymphocytes.
    3. Antibodies are protein molecules, each of which has four light chains.
    4. Rejection of a kidney graft is the function of B-lymphocytes.

180. Given below is a pedigree chart showing the inheritance of a certain sex-linked trait in humans
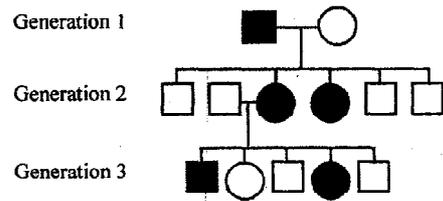
Key :

☐ Unaffected male ■ Affected male

◯ Unaffected female ● Affected female

The trait traced in the above pedigree chart is
    1. dominant X - linked
    2. recessive X-linked
    3. dominant Y- linked
    4. recessive Y-linked.