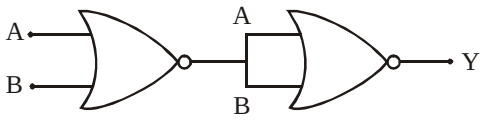
CBSE PMT – 2007 SCREENING

PHYSICS

1. The primary and secondary coil 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 webers, t is time in seconds and ϕ_0 is a constant, the output voltage across the secondary coil is
   (a) 120 volts (b) 220 volts
   (c) 30 volts (d) 90 volts
2. A beam of electron passes undeflected through mutually perpendicular electric and magnetic fields. If the electric field is switched off, and the same magnetic field is maintained, the electrons move
   (a) in a circular orbit
   (b) along a parabolic path
   (c) along a straight line
   (d) in an elliptical orbit.
3. The position x of a particle with respect to time t along x-axis is given by $x = 9t^2 - t^3$ where x is in metres and t in second. What will be the position of this particle when it achieves maximum speed along the +ve x direction?
   (a) 54 m (b) 81 m (c) 24 m (d) 32 m.
4. A particle starting from the origin (0, 0) moves in a straight line in the (x, y) plane. Its coordinates at a later time are $(\sqrt{3}, 3)$. The path of the particle makes with the x-axis an angle of
   (a) 45^o (b) 60^o (c) 0^o (d) 30^o
5. A car moves from X to Y with a uniform speed v_u and returns to Y with a uniform speed v_d. The average speed for this round trip is
   (a) $\sqrt{v_u v_d}$ (b) $\frac{v_d v_u}{v_d + v_u}$
   (c) $\frac{v_u + v_d}{2}$ (d) $\frac{2v_d v_u}{v_d + v_u}$.
6. Two radioactive substances A and B have decay constants 5λ and λ respectively. At t = 0 they have the same number of nuclei. The ratio of number of nuclei of A to those of B will be $(1/e)^2$ after a time interval
   (a) 4λ (b) 2λ (c) $1/2\lambda$ (d) $1/4\lambda$
7. In the following circuit, the output Y for all possible inputs A and B is expressed by the truth table



   (a)
A	B	Y
0	1	1
0	1	1
1	0	1
1	1	0

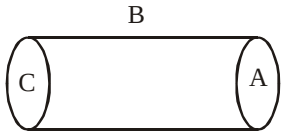
   (b)
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

   (c)
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

   (d)
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

8. In a radioactive decay process, the negatively charged emitted β-particles are
   (a) the electrons produced as a result of the decay of neutrons inside the nucleus
   (b) the electrons produced as a result of collisions between atoms
   (c) the electrons orbiting around the nucleus
   (d) the electrons present inside the nucleus.
9. The phase difference between the instantaneous velocity and acceleration of a particle executing simple harmonic motion is
   (a) π (b) $0.707\,\pi$
   (c) zero (d) $0.5\,\pi$
10. In a mass spectrometer used for measuring the masses of ions, the ions are initially accelerated by an electric potential V and then made to describe semicircular path of radius R using a magnetic field B. If V and B are kept constant, the ratio $\left(\frac{\text{charge on the ion}}{\text{mass of the ion}}\right)$ will be proportional to
    (a) $1/R^2$ (b) R^2 (c) R (d) 1/R
11. A wheel has angular acceleration of 3.0 rad/sec^2 and an initial angular speed of 2.00 rad/sec. In a time of 2 sec it has rotated through an angle (in radian) of
    (a) 10 (b) 12 (c) 4 (d) 6

12. A hollow cylinder has a charge q coulomb within i. If ϕ is the electric flux in units of voltmeter associated with the curved surface B, the flux linked with the plane surface A in units of voltmeter will be



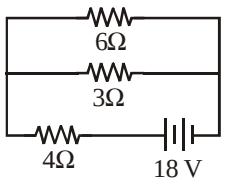
(a) $\frac{q}{2\varepsilon_0}$ (b) $\frac{\phi}{3}$

(c) $\frac{q}{\varepsilon_0}-\phi$ (d) $\frac{1}{2}\left(\frac{q}{\varepsilon_0}-\phi\right)$

13. The frequency of a light wave in a material is 2×10^{14} Hz and wavelength is 5000 Å. The refractive index of material will be
(a) 1.50 (b) 3.00 (c) 1.33 (d) 1.40

14. A nucleus $^{A}_{Z}X$ has mass represented by M(A, Z). If M_p and M_n denote the mass of proton and neutron respectively and B.E. the binding energy in MeV, then
(a) B.E. = $[ZM_p + (A - Z)M_p - M(A, Z)]c^2$
(b) B.E. = $[ZM_p + ZM_n - M(A, Z)]c^2$
(c) B.E. = $M(A, Z) - ZM_p - (A - Z)M_n$
(d) B.E. = $[M(A, Z) - ZM_p - (A - Z)M_n]c^2$

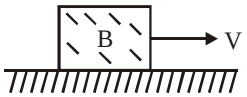
15. The total power dissipated in watts in the circuit shown here is



(a) 40 (b) 54 (c) 4 (d) 16

16. If the nucleus $^{27}_{13}Al$ has nuclear radius of about 3.6 fm, then $^{125}_{32}Te$ would have its radius approximately as
(a) 9.6 fm (b) 12.0 fm
(c) 4.8 fm (d) 6.0 fm.

17. A block B is pushed momentarily along a horizontal surface with an initial velocity V. If μ is the coefficient of sliding friction between B and the surface, block B will come to rest after a time



(a) $g\mu/V$ (b) g/V
(c) V/g (d) $V/(g\mu)$.

18. A particle moving along x-axis has acceleration f, at time t, given by $f = f_0\left(1-\frac{t}{T}\right)$, where f_0 and T are constants. The particle at t = 0 has zero velocity. In the time interval between t = 0 and the instant when f = 0, the particle's velocity (v_x) is

(a) $\frac{1}{2}f_0T^2$ (b) f_0T^2

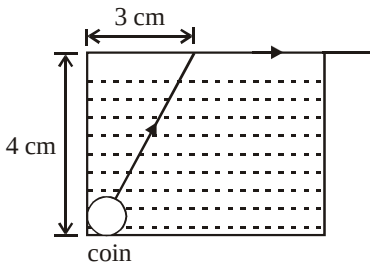
(c) $\frac{1}{2}f_0T$ (d) f_0T.

19. A common emitter amplifier has a voltage gain of 50, an input impedance of 100Ω and an output impedance of 200Ω. The power gain of the amplifier is
(a) 1000 (b) 1250 (c) 100 (d) 500.

20. Three resistances P, Q, R each of 2Ω and an unknown resistance S form the four arms of a Wheatstone bridge circuit. When a resistance of 6Ω is connected in parallel to S the bridge gets balanced. What is the value of S?
(a) 3Ω (b) 6Ω
(c) 1Ω (d) 2Ω

21. A steady current of 1.5 amp flows through a copper voltameter for 10 minutes. If the electrochemical equivalent of copper is 30×10^{-5} g coulomb^{-1}, the mass of copper deposited on the electrode will be
(a) 0.50 g (b) 0.67 g (c) 0.27 g (d) 0.40 g.

22. A small coin is resting on the bottom of a beaker filled with liquid. A ray of light from the coin travels upto the surface of the liquid and moves along its surface. How fast is the light travelling in the liquid?

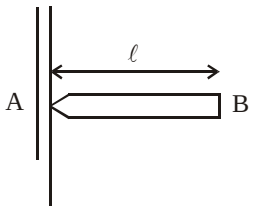


(a) 2.4×10^8 m/s (b) 3.0×10^8 m/s
(c) 1.2×10^8 m/s (d) 1.8×10^8 m/s

23. A transformer is used to light a 100 W and 110 V lamp from a 220 V mains. If the main current is 0.5 amp, the efficiency of the transformer is approximately
(a) 50% (b) 90% (c) 10% (d) 30%.

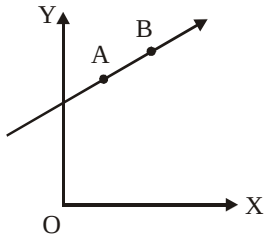
24. Dimensions of resistance in an electrical circuit, in terms of dimension of mass M, of length L, of time T and of current I, would be
(a) ML^2T^{-2} (b) $ML^2T^{-1}I^{-1}$
(c) $ML^2T^{-3}I^{-2}$ (d) $ML^2T^{-3}I-1$

25. A uniform rod AB of length ℓ, and mass m is free to rotate about point A. The rod is released from rest in the horizontal position. Given that the moment of inertia of the rod about A is $\frac{m\ell^2}{3}$, the initial angular acceleration of the rod will be



(a) $\frac{mg\ell}{2}$ (b) $\frac{3}{2}g\ell$
(c) $\frac{3g}{2\ell}$ (d) $\frac{2g}{3\ell}$.

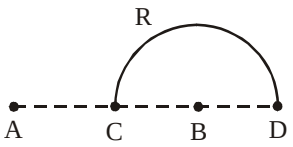
26. A particle of mass m moves in the XY plane with a velocity v along the straight line AB. If the angular momentum of the particle with respect to origin O is L_A when it is at A and L_B when it is at B, then



(a) $L_A = L_B$
(b) the relationship between L_A and L_B depends upon the slope of the line AB
(c) $L_A < L_B$
(d) $L_A > L_B$.

27. The particle executing simple harmonic motion has a kinetic energy $K_0 \cos^2 \omega t$. The maximum values of the potential energy and the total energy are respectively
(a) $K_0/2$ and K_0 (b) K_0 and $2K_0$
(c) K_0 and K_0 (d) 0 and $2K_0$.

28. Charges +q and –q are placed at points A and B respectively which are a distance 2L apart, C is the midpoint between A and B. The work done in moving a charge +Q along the semicircle CRD is



(a) $\frac{qQ}{2\pi\varepsilon_0 L}$ (b) $\frac{qQ}{6\pi\varepsilon_0 L}$
(c) $-\frac{qQ}{6\pi\varepsilon_0 L}$ (d) $\frac{qQ}{4\pi\varepsilon_0 L}$

29. Monochromatic light of frequency 6.0×10^{14} Hz is produced by a laser. The power emitted is 2×10^{-3} ω. The number of photons emitted, on the average, by the sources per second is
(a) 5×10^{16} (b) 5×10^{17}
(c) 5×10^{14} (d) 5×10^{15}

30. Three point charges +q, –q and +q are placed at points (x = 0, y = a, z = 0), (x = 0, y = 0, z = 0) and (x = a, y = 0, z = 0) respectively. The magnitude and direction of the electric dipole moment vector of this charge assembly are
(a) $\sqrt{2}$qa along the line joining points (x = 0, y = 0, z = 0) and (x = a, y = a, z = 0)
(b) qa along the line joining points (x = 0, y = 0, z = 0) and (x = a, y = a, z = 0)
(c) $\sqrt{2}$qa along +ve x direction
(d) $\sqrt{2}$qa along +ve y direction

31. Two satellites of earth, S_1 and S_2 are moving in the same orbit. The mass of S_1 is four times the mass of S_2. Which one of the following statements is true?
(a) The potential energies of earth satellites in the two cases are equal.
(b) S_1 and S_2 are moving with the same speed.
(c) The kinetic energies of the two satellites are equal.
(d) The time period of S_1 is four times that of S_2.

32. $\vec{A}$ and $\vec{B}$ are two vectors and θ is the angle between them, if $|\vec{A}\times\vec{B}| = \sqrt{3}(\vec{A}.\vec{B})$, the value of θ is
(a) 45° (b) 30° (c) 90° (d) 60°

33. A mass of 2.0 kg is put on a flat pan attached to a vertical spring fixed on the ground as shown in the figure. The mass of the spring and the pan is negligible. When pressed slightly and released the mass executes a simple harmonic motion. The spring constant is 200 N/m. What should be the minimum amplitude of the motion so that the mass gets detached from the pan (take g = 10 m/s^2)?
(a) 10.0 cm
(b) any value less than 12.0 cm
(c) 4.0 cm
(d) 8.0 cm

34. A charged paritcle (charge q) is moving in a circle of radius R with uniform speed v. The associated magnetic moment μ is given by
(a) qvR^2 (b) qvR^2/2
(c) qvR (d) qvR/2

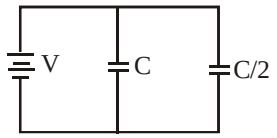
35. The total energy of electron in the ground state of hydrogen atom is – 13.6 eV. The kinetic energy of an electron in the first excited state is
(a) 6.8 eV (b) 13.6 eV
(c) 1.7 eV (d) 3.4 eV.

36. A 5 watt source emits monochromatic light of wavelength 5000 Å. When placed 0.5 m away, it liberates photoelectrons from a photosensitive metallic surface. When the source is moved to a distance of 1.0 m, the number of photoelectrons liberated will be reduced by a factor of
(a) 8 (b) 16 (c) 2 (d) 4

37. A particle executes simple harmonic oscillation with an amplitude a. The period of oscillation is T. The minimum time taken by the particle to travel half of the amplitude from the equilibrium position is
(a) T/8 (b) T/12 (c) T/2 (d) T/4

38. For a cubic crystal structure which one of the following relations indicating the cell characteristics is correct?
(a) $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90°$
(b) $a = b = c$ and $\alpha \neq \beta \neq \gamma = 90°$
(c) $a = b = c$ and $\alpha = \beta = \gamma = 90°$
(c) $a \neq b \neq c$ and $\alpha \neq \beta$ and $\gamma \neq 90°$

39. Two condensers, one of capacity C and other of capacity C/2 are connected to a V-volt battery, as shown.



The work done in charging fully both the condensers is
(a) $\frac{1}{4}CV^2$ (b) $\frac{3}{4}CV^2$
(c) $\frac{1}{2}CV^2$ (d) $2CV^2$.

40. A black body is at 727° C. It emits energy at a rate which is proportional to
(a) $(1000)^4$ (b) $(1000)^2$
(c) $727)^4$ (d) $(727)^2$

41. The resistance of an ammeter is 13 Ω and its scale is graduated for a current upto 100 amps. After an additional shunt has been connected to this ammeter it becomes possible to measure currents upto 750 amperes by this meter. The value of shunt-resistance is
(a) 2 Ω (b) 0.2 Ω (c) 2 kΩ (d) 20 Ω

42. An engine has an efficiency of 1/6. When the temperature os sink is reduced by 62°C, its efficiency is doubled. Temperature of the source is
(a) 37°C (b) 62°C (c) 99°C (d) 124°C

43. The electric and magnetic field of an electromagnetic wave are
(a) in opposite phase and perpendicular to each other
(b) in opposite phase and parallel to each other
(c) in phase and perpendicular to each other
(d) in phase and parallel to each other.

44. What is the value of inductance L for which the current is maximum in a series LCR circuit with $C = 10\ \mu F$ and $\omega = 1000 s^{-1}$
(a) 1 mH
(b) cannot be calculated unless R is known
(c) 10 mH
(d) 100 mH

45. Nickel shows ferromagnetic property at room temperature. If the temperature is increased beyond Curie temperature, then it will show
(a) anti ferromagnetism
(b) no magnetic property
(c) diamagnetism
(d) paramagnetism

46. A vertical spring with force constant k is fixed on a table. A ball of mass m at a height h above the free upper end of the spring falls vertically on the spring so that the spring is compressed by a distance d. The net work done in the process is

(a) $mg(h+d)-\frac{1}{2}kd^2$

(b) $mg(h-d)-\frac{1}{2}kd^2$

(c) $mg(h-d)+\frac{1}{2}kd^2$

(d) $mg(h+d)+\frac{1}{2}kd^2$

47. Under the influence of a uniform magnetic field a charged particle is moving in a circle of radius R with constant speed v. The time period of the motion
(a) depends on both R and v
(b) is independent of both R and v
(c) depends on R and not on v
(d) depends on v and not on R

48. If the cold junction of a thermo-couple is kept at 0°C and the hot junction is kept at T°C then the relation between neutral temperature (T_n) and temperature of inversion (T_i) is
(a) $T_n = 2T_i$ (b) $T_n = T_i - T$
(c) $T_n = T_i + T$ (d) $T_n = T_i/2$

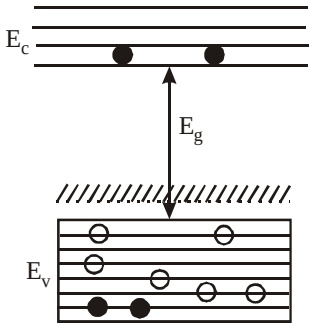
49. Assuming the sun to have a spherical outer surface of radius r, radiating like a black body at temperature t°C, the power received by a unit surface, (normal to the incident rays) at a distance R from the centre of the sun is

(a) $\frac{r^2\sigma(t+273)^4}{4\pi R^2}$ (b) $\frac{16\pi^2 r^2\sigma t^4}{R^2}$

(c) $\frac{r^2\sigma(t+273)^4}{R^2}$ (d) $\frac{4\pi r^2\sigma t^4}{R^2}$

where σ is the Stefan's constant.

50. In the energy band diagram of a material shown below, the open circles and filled circles denote holes and electrons respectively. The material is



(a) an insulator
(b) a metal
(c) an n-type semiconductor
(d) a p-type semiconductor

CHEMISTRY

51. Which one of the following on reduction with lithium aluminium hydride yields a secondary amine?
(a) Methyl isocyanide
(b) Acetamide
(c) Methyl cyanide
(d) Nitroethane.

52. RNA and DNA are chiral molecules, their chirality is due to
(a) chiral bases
(b) chiral phosphate ester units
(c) D-sugar component
(d) L-sugar component.

53. The Langmuir adsorption isotherm is deduced using the assumption
(a) the adsorption sites are equivalent in their ability to adsorb the particles
(b) the heat of adsorption varies with coverage
(c) the adsorbed molecules interact with each other
(d) the adsorption takes place in multilayers.

44. A weak acid, HA, has a K_a of 1.00×10^{-5}. If 0.100 mole of this acid disolved in one litre of water, the percentage of acid dissociated at equilbrium is closest to
(a) 1.00% (b) 99.9%
(c) 0.100% (d) 99.0%

55. The reaction of hydrogen and iodine monochloride is given as:

$$H_{2(g)} + 2ICl_{(g)} \longrightarrow 2HCl_{(g)} + I_{2(g)}$$

The reaction is of first order with respect to $H_{2(g)}$ and $ICI_{(g)}$, following mechanisms were proposed.
Mechanism A:

$$H_{2(g)} + 2ICl_{(g)} \longrightarrow 2HCl_{(g)} + I_{2(g)}$$

Mechanism B:

$$H_{2(g)} + ICl_{(g)} \longrightarrow HI_{(g)}; \text{slow}$$

$$HI_{(g)} + ICl_{(g)} \longrightarrow HCl_{(g)} + I_{2(g)}; \text{fast}$$

Which of the above mechanism(s) can be consistent with the given information about the reaction?
(a) A and B both (b) neither A nor B
(c) A only (d) B only

56. The efficiency of a fuel cell is given by

(a) $\frac{\Delta G}{\Delta S}$ (b) $\frac{\Delta G}{\Delta H}$ (c) $\frac{\Delta S}{\Delta G}$ (d) $\frac{\Delta H}{\Delta G}$

57. Consider the following reactions:
(i) $H^+_{(aq)} + OH^-_{(aq)} = H_2O_{(l)}$, $\Delta H = -X_1$ kJ mol^{-1}
(ii) $H_{2(g)} + \frac{1}{2}O_{2(g)} = H_2O(l)$, $\Delta H = -X_2$ kJ mol^{-1}
(iii) $CO_{2(g)} + H_{2(g)} = CO_{(g)} + H_2O$, $\Delta H = -X_3$ kJ mol^{-1}
(iv) $C_2H_{2(g)} + \frac{5}{2}O_{2(g)} = 2CO_2(g) + H_2O(l)$', $\Delta H = -X_3$ kJ mol^{-1}
Enthalpy of formation of $H_2O_{(l)}$ is
(a) $+X_3$ kJ mol^{-1} (b) $-X_4$ kJ mol^{-1}
(c) $+X_1$ kJ mol^{-1} (d) $-X_2$ kJ mol^{-1}

58. The correct order of increasing thermal stability of K_2CO_3, $MgCO_3$, $CaCO_3$ and $BeCO_3$ is
(a) $BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$
(b) $MgCO_3 < BeCO_3 < CaCO_3 < K_2CO_3$
(c) $K_2CO_3 < MgCO_3 < CaCO_3 < BeCO_3$
(d) $BeCO_3 < MgCO_3 < K_2CO_3 < CaCO_3$

59. In which of the following pairs, the two species are iso-structure?
(a) SO_3^{2-} and NO_3^- (b) BF_3 an NF_3
(c) BrO_3^- and XeO_3 (d) SF_4 and XeF_4

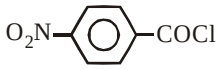
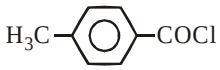
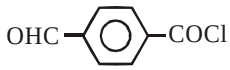
60. Which of the following oxidation states are the most characteristic for lead and tin respectively?
(a) +2, +4 (b) +4, +4
(c) +2, +2 (d) +4, +2

61. Which of the following statements, about the advantage of roasting of sulphide ore before reduction is not true?
(a) The ΔG_f^o of the sulphide is greater than those for CS_2 and H_2S.
(b) The ΔG_f^o is negative for roasting of sulphide ore to oxide.
(c) Roasting of the sulphide to the oxide is thermodynamically feasible.
(d) Carbon and hydrogen are suitable reducing agents for metal sulphides.

62. In a first-order reaction A $\rightarrow$ B, if k is rate constant and inital concentration of the reactant A is 0.5 M, then the half-life is

(a) $\frac{\log 2}{k}$ (b) $\frac{\log 2}{k\sqrt{0.5}}$

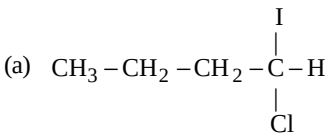
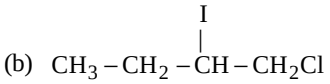
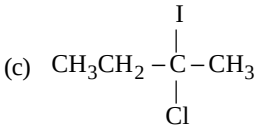
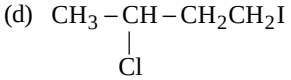
(c) $\frac{\ln 2}{k}$ (d) $\frac{0.693}{0.5k}$

63. Consider the following compounds.
(i) C_6H_5COCl
(ii) 
(iii) 
(iv) 

The correct decreasing order of their reactivity towards hydrolysis is
(a) (i) > (ii) > (iii) > (iv)
(b) (iv) > (ii) > (i) > (iii)
(c) (ii) > (iv) > (i) > (iii)
(d) (ii) > (iv) > (iii) > (i)

64. Predict the product C obtained in the following reaction of butyne-1.

$$CH_3CH_2 - C \equiv CH + HCl \longrightarrow B \xrightarrow{HI} C$$

(a) 
(b) 
(c) 
(d) 

65. Concentrated aqueous sulphuric acid is 98% H_2SO_4 by mass and has a density of 1.80 g mL^{-1}. Volume of acid required to make one litre of 0.1M H_2SO_4 solution is
(a) 16.65 mL (b) 22.20 mL
(c) 5.55 mL (d) 11.10 mL

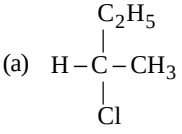
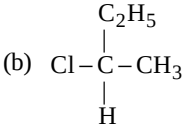
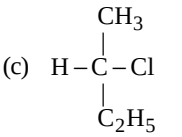
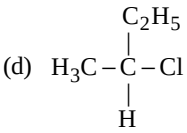
66. Reduction of aldehydes and ketones into hydrocarbons using zinc amalgam and conc. HCl is called
(a) Cope reduction
(b) Dow reduction
(c) Wolf-Kishner reduction
(d) Clemmensen redcution.

67. Given that bond energies of H – H and Cl – Cl are 430 kJ mol^{-1} and 240 kJ mol^{-1} respectively and ΔH_f for HCl is – 90 kJ mol^{-1}, bond enthalpy of HCl is
(a) 380 kJ mol^{-1} (b) 425 kJ mol^{-1}
(c) 245 kJ mol^{-1} (d) 290 kJ mol^{-1}

68. Which of the following represents the correct order of the acidity in the given compounds?
(a) $FCH_2COOH > CH_3COOH > BrCH_2COOH > ClCH_2COOH$
(b) $BrCH_2COOH > ClCH_2COOH > FCH_2COOH > CH_3COOH$
(c) $FCH_2COOH > ClCH_2COOH > BrCH_2COOH > CH_3COOH$
(d) $CH_3COOH > BrCH_2COOH > ClCH_2COOH > FCH_2COOH$

69. If threre is no rotation of plane polarised light by a compound in a specific solvent, though to be chiral, it may mean that
(a) the compound is certainly meso
(b) there is no compound in the solvent
(c) the compound may be a racemic mixture
(d) the compound is certainly a chiral.

70. $CH_3 - CHCl - CH_2 - CH_3$ has a chiral centre. which one of the following represents its R-configuration?

(a) 
(b) 
(c) 
(d) 

71. Which of the following is water-soluble?
(a) Vitamin E (b) Vitamin K
(c) Vitamin A (d) Vitamin B

72. Identify the correct order of the size of the following:
(a) $Ca^{2+} < K^+ < Ar < Cl^- < S^{2-}$
(b) $Ar < Ca^{2+} < K^+ < Cl^- < S^{2-}$
(c) $Ca^{2+} < Ar < K^+ < Cl^- < S^{2-}$
(d) $Ca^{2+} < K^+ < Ar < S^{2-} < Cl^-$

73. 0.5 molal aqueous solution of a weak acid (HX) is 20% ionised. If K_f for water is 1.86 K kg mol–1,the lowering in freezing point of the solution is
(a) 0.56 K (b) 1.12 K
(c) – 0.56 K (d) – 1.12 K

74. Sulphide ores of metals are usually concentrated by froth flotation process. Which one of the following sulphide ores offer an exception and its concentrated by chemical leaching?
(a) Galena (b) Copper pyrite
(c) Sphalerite (d) Argentite

75. If 60% of a first order reaction was completed in 60 minutes, 50% of the same reaction would be completed in aproximately
(a) 45 minutes (b) 60 minutes
(c) 40 minutes (d) 50 minutes
(log 4 = 0.60, log 5 = 0.69)

76. Which of the following will give a pair of enantiomorphs?
(a) $[Cr(NH_3)_6][Co(CN)_6]$
(b) $[Co(en)_2Cl_2]Cl$
(c) $[Pt(NH_3)_4][PtCl_6]$
(d) $[Co(NH_3)_4Cl_2]NO_2$. (en = $NH_2CH_2CH_2NH_2$)

77. If NaCl is doped with 10^{-4} mol % of $SrCl_2$, the concentration of cation vacancies will be
($N_A = 6.02 \times 10^{23}\ mol^{-1}$)
(a) $6.02 \times 10^{16}\ mol^{-1}$ (b) $6.02 \times 10^{17}\ mol^{-1}$
(c) $6.02 \times 10^{14}\ mol^{-1}$ (d) $6.02 \times 10^{15}\ mol^{-1}$

78. The d electron configurations of Cr^{2+}, Mn^{2+}, Fe^{2+} and Ni^{2+} are $3d^4$, $3d^5$, $3d^6$ and $3d^8$ respectively. Which one of the following aqua complexes will exhibit the minimum paramagnetic behaviour?
(a) $[Fe(H_2O)_6]^{2+}$ (b) $[Ni(H_2O)_6]^{2+}$
(c) $[Cr(H_2O)_6]^{2+}$ (d) $[Mn(H_2O)_6]^{2+}$
(At. No. Cr = 24, Mn = 25, Fe = 26, Ni = 28)

79. In which of the following the hydration energy is higher than the lattice energy?
(a) $MgSO_4$ (b) $RaSO_4$
(c) $SrSO_4$ (d) $BaSO_4$

80. Which of the compounds with molecular formula C_5H_{10} yields acetone on ozonolysis?
(a) 3-methyl-1-butene
(b) cyclopentane
(c) 2-methyl-1-butene
(d) 2-methyl-2-butene.

81. With which of the following electronic configuration an atom has the lowest ionisation enthalpy?
(a) $1s^2\ 2s^2\ sp^3$ (b) $1s^2\ 2s^2\ 2p^5\ 3s^1$
(c) $1s^2\ 2s^2\ 2p^6$ (d) $1s^2\ 2s^2\ 2p^5$

82. Which one of the following ionic species has the greatest proton affinity to form stable compound?
(a) NH_2^- (b) F^- (c) I^- (d) HS^-

83. The following equilibrium constants are given:

$N_2 + 3H_2 \rightleftharpoons 2NH_3; K_1$

$N_2 + O_2 \rightleftharpoons 2NO; K_2$

$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O; K_2$

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

(a) $\frac{K_2K_3^2}{K_1}$ (b) $\frac{K_2^2K_3}{K_1}$

(b) $\frac{K_1K_2}{K_3}$ (d) $\frac{K_2K_3^3}{K_1}$

84. Which one of the following ions is the most stable in aqueous solution?
(a) V^{3+} (b) Ti^{3+}
(c) Mn^{3+} (d) Cr^{3+}
(At.No. Ti = 22, V = 23, Cr = 24, Mn = 25)

85. The correct order of C –O bond length among CO, CO_3^{2-}, CO_2 is
(a) $CO < CO_3^{2-} < CO_2$
(b) $CO_3^{2-} < CO_2 < CO$
(c) $CO < CO_2 < CO_3^{2-}$
(d) $CO_2 < CO_3^{2-} < CO$

86. Which one of the following orders correctly represents the increasing acid strengths of the given acids?
(a) $HOClO < HOCl < HOClO_3 < HOClO_2$
(b) $HOClO_2 < HOClO_3 < HOClO < HOCl$
(c) $HOClO_3 < HOClO_2 < HOClO < HOCl$
(d) $HOCl < HOClO < HOClO_2 < HOClO_3$

87. Which one of the following on treatment with 50% aqueous sodium hydroxide yields the corresponding alcohol and acid?
(a) C_6H_5CHO (b) $CH_3CH_2CH_2CHO$

(c) $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ (d) $C_6H_5CH_2CHO$

88. For (i) I^-, (ii) Cl^-, (iii) Br^-, the increasing order of nucleophilicity would be
(a) $Cl^- < Br^- < I^-$ (b) $I^- < Cl^- < Br^-$
(c) $Br^- < Cl^- < I^-$ (d) $I^- < Br^- < Cl^-$

89. Calculate the pOH of a solution at 25°C that contains 1×10^{-10} M of hydronium ions, i.e. H_3O^+.
(a) 4.000 (b) 9.0000 (c) 1.000 (d) 7.000

90. Consider the following sets of quantum numbers:

	n	l	m	s
(i)	3	0	0	+ 1/2
(ii)	2	2	1	+ 1/2
(iii)	4	3	– 2	– 1/2
(iv)	1	0	– 1	– 1/2
(v)	3	2	3	+ 1/2

Which of the following sets of quantum number is not possible?
(a) (i), (ii), (iii) and (iv) (b) (ii), (iv) and (v)
(c) (i) and (iii) (d) (ii), (iii) and (iv)

91. The equilibrium constant of the reaction:

$$Cu_{(s)} + 2Ag^{+}_{(aq)} \longrightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)};$$

$E^\circ = 0.46$ V at 298 K is
(a) 2.0×10^{10} (b) 4.0×10^{10}
(c) 4.0×10^{15} (d) 2.4×10^{10}

92. Which one of the following polymers is prepared by condensation polymerisation?
(a) Teflon (b) Natural rubber
(c) Styrene (d) Nylon-66

93. The order of decreasing reactivity towards an electrophilic reagent, for the following would be
(i) benzene (ii) toluene
(iii) chlorobenzene (iv) phenol
(a) (ii) > (iv) > (i) > (iii)
(b) (iv) > (iii) > (ii) > (i)
(c) (iv) > (ii) > (i) > (iii)
(d) (i) > (ii) > (iii) > (iv)

94. Which of the folloiwng anions is present in the chain structure of silicates?
(a) $(Si_2O_5^{2-})_n$ (b) $(SiO_3^{2-})_n$
(c) SiO_4^{4-} (d) $Si_2O_7^{6-}$

95. An element, X has the following isotopic composition:
^{200}X : 90% ^{199}X : 8.0 % ^{202}X : 2.0 %
The weighted average atomic mass of the naturally occuring element X is closest to
(a) 201 amu (b) 202 amu
(c) 199 amu (d) 200 amu

96. The fraction of total volume occupied by the atoms present in a simple cube is
(a) $\frac{\pi}{3\sqrt{2}}$ (b) $\frac{\pi}{4\sqrt{2}}$
(c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

97. In the reaction:

$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-O-CH_2-CH_3 + HI \xrightarrow{\text{Heated}}$$

Which of the following compounds will be formed?
(a) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3 + CH_3CH_2OH$
(b) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2OH + CH_3CH_3$
(c) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2OH + CH_3-CH_2-I$
(d) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-I + CH_3CH_2OH$

98. The product formed in Aldol condensation is
(a) a beta-hydroxy aldehyde or a beta-hydroxy ketone
(b) an alpha-hydroxy aldehyde or ketone
(c) an alpha, beta unsaturated ester
(d) a beta-hydroxy acid

99. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphite ion in acidic solution is
(a) 4/5 (b) 2/5 (c) 1 (d) 3/5

100. Identify the incorrect statement among the following:
(a) Lanthanoid contraction is the accumulation of successive shrinkages.
(b) As a result of lanthanoid contraction, the properties of 4d series of the transition elements have no similarities with the 5d series of elements.
(c) Shielding power of 4f electrons is quite weak.
(d) There is a decrease in the radii of the atoms or ions as one proceeds from La to Lu.

BIOLOGY

101. ICBN stands for
(a) International Code of Botanical Nomenclature
(b) International congress of Biological Names
(c) Indian Code of Botanical Nomenclature
(d) Indian Congress of Biological Names.

102. Which pair of the following belongs to Basidiomycetes
(a) puffballs and Claviceps
(b) peziza and stink borns
(c) Morchella and mushrooms
(d) birds nest fungi and puffballs.

103. Biological organisation starts with
(a) cellular level (b) organismic level
(c) atomic level
(d) submicroscopic molecular level

104. Identify the odd combination of the habitat and the particular animal concerned.
(a) sunderbans - Bengal Tiger
(b) periyar - Elephant
(c) Rann of kutch - wild Ass
(d) Dachigam National park - Snow Leopard.

105. If you suspect major deficiency of antibodies in a person to which of the following would you look for confirmatory evidence?
(a) serum globulins
(b) fibrinogen in the plasma
(c) haemocytes (d) serum albumins

106. A common test to find the genotype of a hybrid is by
(a) crossing of one F_2 progeny with female parent
(b) studying the sexual behaviour of F_1 progenies
(c) crossing of one F_1 progeny with male parent
(d) crossing of one F_2 progeny with male parent.

107. The okazaki fragments in DNA chain growth
(a) polymerize in the 3' - to - 5' direction and forms replication fork
(b) prove semi-conservative natuire of DNA replication
(c) polymerize in teh 5' - to - 3' direction and explain 3' - to - 5' DNA replication
(d) result in transcription.

108. Which one of the following statement is correct?
(a) there is no evidence of the existence of gills during embryogensis of mammals
(b) all plant and animal cells are totipotent
(c) ontogeny repeats phylogeny
(d) stem cells are specialize cells.

109. In which one of the following the BOD (Biochemical Oxygen Demand) of sewage (s), distillery effluent (DE), paper mill effluent (PE) and sugar mill effluent (SE) have been arranged in ascending order ?
(a) SE < PE < S < DE (b) PE < S < SE < DE
(c) S < DE < PE < SE (d) SE < S < PE < DE.

110. The concept of chemical evolution is based on
(a) interaction of water, air and clay under intense heat
(b) effect of solar radiation on chemicals
(c) possible orgin of life by combination of chemicals under suitable environmental conditions
(d) crystallization of chemicals.

111. Which one of the following is surrounded by a callose wall?
(a) male gamete (b) egg
(c) pollen grain
(d) microspore mother cell

112. Probiotics are
(a) cancer inducing microbes
(b) new kind of food allergens
(c) live microbial food supplement
(d) safe antibiotics

113. One of endangered species of Indian medicinal plants is that of
(a) ocimum (b) garlic
(c) nepenthes (d) podophyllum

114. What is true about Nereis, scorpion, cockroach and silver fish ?
(a) they all posses dorsal heart
(b) none of them is aquatic
(c) they all belong to the same phylum
(d) they all have jointed paired appendages

115. The living organisms can be unexceptionally distinguished from the non-living things on the basis of their ability for
(a) interaction with the environment and progressive evolution
(b) reproduction
(c) growth and movement
(d) responsiveness to touch.

116. A person who is one along hunger strike and is surviving only on water, will have.
(a) less amino acids in his urine
(b) more glucose in his blood
(c) less urea in his urine
(d) more sodium in his urine .

117. The length of DNA molecule greatly exceeds the dimensions of the nucleus in eukaryotic cells. How is this DNA accommodated?
(a) super-coiling in nucleosomes
(b) DNase digestion
(c) through elemination of repititive DNA
(d) deletion of non-essential genes.

118. A sequential expression of a set of human genes
(a) messenger RNA (b) DNA sequence
(c) ribosome (d) transfer RNA.

119. In a coal fired power plant electrostatic precipitators are installed to control emission of
(a) NO_x (b) SPM (c) CO (d) SO_2

120. Select the wrong statement fom the following.
(a) Both chloroplasts and mitochondria have an internal compartment, the thylakoid space bounded by teh thylakoid membrane
(b) Both chloroplasts and mitochondria contain DNA
(c) The chloroplasts are generally much large than mitochondria
(d) Both chloroplasts and mitochondria contain an inner and an outer membrane.

121. Geometric representation of age structure is a characteristic of
(a) population (b) landscape
(c) ecosystem (d) biotic community.

122. During transcription, RNA polymerase holoenzyme binds to a gene promoter and assumes a saddle-like structure, what is it's DNA-binding sequence?
(a) AATT (b) CACC
(c) TATA (d) TTAA

123. A plant requires magnesium for
(a) protein synthesis
(b) chlorophyll synthesis
(c) cell wall development
(d) holding cells together.

124. In the prothallus of a vascular cryptogam, the antherozoids and eggs mature a different times. As a result
(a) there is high degree of sterility
(b) one can conclude that the plant is apomictic
(c) self-fertilization is prevented
(d) there is no change in success rate of fertilization

125. Ergot of rye is caused by a species of
(a) uncimula (b) ustilago
(c) claviceps (d) phytophthora.

126. The finches of Galapagos islands provide an evidence in favour of
(a) evolution due to mutation
(b) retrogressive evolution
(c) biogeographical evolution
(d) special creation .

127. Which one of the following is a slime mould?
(a) physarum (b) Thiobacillus
(c) Anabaena (d) Rhizopus.

128. The population of an insect species shows an explosive increase in numbers during rainy season followed by its disappearance at the end of the season. What does this show?
(a) the food plants mature and die at the end of the rainy season
(b) its population growth curve is of J-type
(c) the population of its predators increases enormously
(d) S-shaped or sigmoid growth of this insect.

129. Which of the following is a flowering plant with nodules containing filamentous nitrogen-fixing micro-organism
(a) crotalaria juncea (b) cycas revoluta
(c) cicer arietinum
(d) casuarina equisetifolia

130. Which one of the following is being utilized as a source of biodiesel in the Indian countryside?
(a) betroot (b) sugarcane
(c) pongamia (d) euphorbia

131. For a critical study of secondary growth in plants. which one of the folowing pairs is suitable?
(a) teak and pine (b) deodar and fern
(c) wheat and maiden hair fern
(d) sugarcane and sunflower.

132. Which one of the following is a fat-soluble vitamin and its related deficiency disease?
(a) Retinol - Xerophtahalmia
(b) Cobalamine - Beri-beri
(c) Calciferol - Pellagra
(d) A scorbic acid - Scurvy.

133. Two cells A and B are contiguous. Cell A has osmotic pressure 10 atm, turgor pressure 7 atm and diffusion pressure deficit 3 atm. Cell B has osmotic pressure 8 atm, turgor pressure 3 atm and diffusion pressure deficit 5 atm. The result will.
(a) no movement of water
(b) equilibrium between the two
(c) movement of water from cell A to B.
(d) movement of water from cell B to A.

134. In which one of the following preparations are your likely to come across cell junctions most frequently ?
(a) thrombocytes (b) tendon
(c) hyaline cartilage (d) ciliated epithelium.

135. If you are asked to classify the various algae into distnct groups, which of the following characters you should choose?
(a) nature of stored food materials in the cell
(b) structural organization of thallus
(c) chemical comppsition of the cell wall
(d) types of pigments present in the cell.

136. About 98 percent of the mass of every living organism is composed of just six element including carbon, hydrogen, nitrogen, oxygen and
(a) sulphur and magnesium
(b) magnesium and sodium
(c) calcium and phosphorus
(d) phosphorus and sulphur.

137. Which one of the following statements is correct?
(a) Both Azotobacter and Rhizobium fix atmospheric nitrogen in root nodules of plants.
(b) Cyanobacteria such as Anabaena and Nostoc are important mobilizers of phosphates and for plant nutrition in soil
(c) At present it is not possible to grow maize without chemical fertilizers
(d) Extensive use of chemical fertilizers may lead to eutrophication of nearby water bodies.

138. In the hexaploid wheat, the haploid (n) and basic (x) numbers of chromosomes are
(a) n = 21 and x = 21 (b) n = 21 and x = 14
(c) n = 21 and x = 7 (d) n = 7 and x = 21.

39. Passage cells are thin walled cells found in
(a) phloem elements that serve as entry points for substance for transport ot other plant parts
(b) testa of seeds to enable emergence of growing embryonic axis during seed germination
(c) central region of style through which the pollen tube grows towards the ovary
(d) endodermis of roots facilitating rapid transport of water from cortex to pericycle.

140. What is common between parrot, platypus and kangaroo?
(a) toothless jaws
(b) functional post-end tail
(c) ovoparity (d) homoiothermy

141. Bowman's glands are located in the
(a) anterior pituitary
(b) female reproductive system of cockroach
(c) olfactory epithelium of our nose
(d) proximal end of uriniferous tubles.

142. Which one of the following pairs is wrongly matched ?
(a) yeast - ethanol
(b) streptomycetes - antibiotic
(c) coliforms - vinegar
(d) methanogens - gobar gas.

143. Which part of ovary in mammals acts as an endocrine gland after ovulation ?
(a) stroma (b) germinal epithelium
(c) vetelline membrane
(d) Graafian follicle.

144. Opening of floral buds into flowers, is a type of
(a) autonomic movement of variation
(b) paratonic movement of growth
(c) autonomic movement of growth
(d) autonomic movement of locomotion.

145. Which one of the following is a matching pair of a body feature and the animal possessing it ?
(a) ventral central nervous system - Leech
(b) Pharyngeal gill slits absent in embryo - Chamaeleon
(c) ventral heart - Scorpion
(d) post-end tail - Octopus.

146. All enzymes of TCA cycle are located in the mitochondrial matrix except one which is located in inner mitochondrial membranes in eukaryotes and in cytosol in prokaryotes. This enzyme is
(a) isocitrate dehydrogenase
(b) malate dehydrogenase
(c) succinate dehydrogenase
(d) lactate dehydrogenase.

147. The first acceptor of electrons from an excited chlorophyll molecule of photosystem II is
(a) iron-sulphur protein
(b) ferredoxin
(c) quinone (d) cytochrome

148. Differentiation of organs and tissues in a developing organism, is associated with
(a) differential expession of genes
(b) lethal mutations (c) deletion of genes
(d) developmental mutations.

149. Which one of the following statements about mycoplasma is wrong ?
(a) They are pleomorphic
(b) They are sensitive to penicillin
(c) They cause diseases in plants
(d) They are also called PPLO.

150. Which one of the following pairs is mismatched?
(a) Apis indica - honey
(b) kenia lacca - lac
(c) Bombyx mori - silk
(d) Pila globosa - pearl

151. A person is having problems with calcium and phosphorus metabolism in his body. Which one of following glands may not be functioning properly ?
(a) parotid (b) pancreas
(c) thyroid (d) parathyroid

152. A genetically engineered micro-organism use successfully in bioremediation of oil spills is a species of
(a) Trichoderma (b) Xanthomonas
(c) Bacillus (d) Pseudomonas.

153. In the leaves of C_4 plants, malic acid formation during CO_2 fixation occurs in the cells of
(a) bundle sheath (b) phloem
(c) epidermis (d) mesophyll

154. Flagellated male gametes are present in all the three of which one of the following sets ?
(a) Zygnema, Saprolegnia and Hydrilla
(b) fucus, Marsilea and Calotropis
(c) Riccia, Dryopteris and Cycas
(d) Anthoceros, Funaria and Spirogyra

155. In the mean and the median pertaining to a certain character of a population are of the same value, which of the follwing is most likely to occur
(a) a bi-modal distribution
(b) a T-shaped curve
(c) a skewed curve
(d) a normal distribution.

156. One gene-one enzyme relationship was established for the first time in
(a) Salmonella typhimurium
(b) Escherichia coli
(c) Diplocococcus pneumoniae
(d) Neurospora crassa.

157. Two genes R and Y are located very close on the chromosomal linkage map of maize plant. When RRYY and rryy genotypes are hybridized, the F_2 segreagation will show
(a) segregation in the expected 9 : 3 : 3 : 1 ratio
(b) segregation in 3 : 1 ratio
(c) higher number of the parental types
(d) higher number of the recombinant types.

158. In cloning of cattle, a fertillized egg is taken out of the mother's womb and
(a) in the eight cell stage, cells are separated and cultured untill small embryos are formed which are implanted into the womb of other cow
(b) in the eight cell stage the individual cells are separated under electrical field for further development in culture media.
(c) from this upto eight identical twins can be produced
(d) the egg is divided into 4 pairs of cells which are implanted into the womb of other cows

159. Ultrasound of how much frequency is beamed into human body for sonography ?
(a) 15 - 30 MHZ (b) 1 - 15 MHZ
(b) 45 - 70 MHZ (d) 30 - 45 MHZ.

160. Two plants can be conclusively said to belong to the same species if they.
(a) have more than 90 per cent similar genes
(b) look similar and possess identical secondary metabolites
(c) have same number of chromosomes
(d) can reproduce freely with each other and form seeds.

161. Inheritances of skin colour in humans is an example of
(a) point mutation
(b) polygenic inheritance
(c) codominance
(d) chromosomal aberration.

162. When two species of different genealogy come to resemble each other as a result of adaptation, the phenomenon is termed
(a) microevolution (b) co-evolution
(c) convergent evolution
(d) divergent evolution

163. Increased asthmatics attacks in certain seasons are related to
(a) eating fruits preserved in tin containers
(b) inhalation of seasonal pollen
(c) low temperature
(d) hot and humid environment.

164. Among the human ancestors the brain size was more that 1000 CC in
(a) Homo erectus (b) Ramapithecus
(c) Homo habilis
(d) Homo neanderthalensis

165. Industrial melanism as observed in peppered moth proves that
(a) the melanic form of the moth has no selective advantage over lighter form in industrial area
(b) the lighter-form moth has no selective advantage either in polluted industrial area or non-polluted area
(c) melanism is a pollution-generated feature
(d) the true black melanic forms arise by a recurring random mutation.

166. A high density of elephant population in an area can result in
(a) intra specific competition
(b) inter specific competition
(c) predation on one another
(d) mutualism.

167. A drop of each of the following, is placed separately on four slides. Which of them will not coagulate?
(a) blood serum
(b) sample from the thoracic duct of lymphatic system
(c) Whole blood from pulmonary vein
(d) blood plasma.

168. Which one of the following ecosystem types has the highest annuial net primary productivity?
(a) tropical deciduous forest
(b) temperate evergreen forest
(c) temperate deciduous forest
(d) tropical rain forest.

169. In human body, which one of the following is anatomically correct?
(a) Collar bones - 3 pairs
(b) Salivary glands - 1 pairs
(c) Cranial nerves - 10 pairs
(d) Floating ribs - 2 pairs

170. Telomere repetitive DNA sequences control the function of eukaryotic chromosomes because they
(a) are RNA transcription initiator
(b) help chromosome pairing
(c) prevent chromosome loss
(d) act as replicons.

171. Spore diseminiation in some liverworts is aided by
(a) indusium (b) calyptra
(c) peristome teeth (d) elaters.

172. Which one of the following elements is not an essential micronutrient for plant growth?
(a) Zn (b) Cu (c) Ca (d) Mn

173. The overall goal of glycolysis, krebs cycle and the electron transport system is the formation of
(a) ATP in one large oxidation reaction
(b) sugars (c) nucleic acids
(d) ATP in small stepwise units.

174. Adaptive radiation refers to
(a) evolution of different species from a common ancestor
(b) migration of members of a species to different geographical areas
(c) power of adaptation in an individual to a variety of environments
(d) adaptations due to geographical isolation.

175. Which one of the follwoing pairs, is not correctly matched?
(a) Gibberellic acid - Leaf fall
(b) Cytokinin - Cell wall elongation
(c) IAA - Cell wall elongation
(d) Abscissic acid - Stomatal closure.

176. Select the correct statement from the following?
(a) Fitness is the end result of the ability to adapt and gets selected by nature
(b) All mammals except whales and camels have seven cervical vertebrae
(c) Mutations are random and directional
(d) Darwinian variations are small and directionless.

177. Male gametes in angiosperms are formed by the division of
(a) generative cell (b) vegetative cell
(c) microspore mother cell
(d) microspore.

178. In pea plants, yellow seeds are dominant to green. If a heterozygous yellow seeded plant is crossed with a green seeded plant, what ratio of yellow and green seeded plants would you expect in F_1 generation ?
(a) 9 : 1 (b) 1 : 3
(c) 3 : 1 (d) 50 :50

179. Which one of the follwing mammalian cells is not capable of metabolising glucose to carbon-dioxide aerobically?
(a) unstraited muscle cells
(b) liver cells (c) red blood cells
(d) white blood

180. A human male produces sperms with the genotypes AB, Ab, aB, and ab pertaining to two diallelic characters in equal proportions. What is the corresponding genotype of this person?
(a) AaBB (b) AABb
(c) AABB (d) AaBb.

181. What is common to whale, seal and shark?
(a) thick subcutaneous fat
(b) convergent evolution
(c) homoiothermy
(d) seasonal migration.

182. One of the important consequences of geographical isolation is
(a) preventing speciation
(b) speciation through reproductive isolation
(c) random creation of new species
(d) no change in the isolated fauna.

183. Lysozyme that is present in perspiration, saliva and tears, destroys
(a) certain types of bacteria
(b) all viruses
(c) most virus-infected cells
(d) certain fungi

184. In the human female, menstruation can be deferred by the administration of
(a) combination of FSH and LH
(b) combination of estrogen and progesterone
(c) FSH only (d) LH only

185. Which one of the following is not a constituent of cell membrane?
(a) glycolipids (b) proline
(c) phospholipids (d) cholesterol.

186. Compared to a bull a bullock is docile because of
(a) higher levels of cortisone
(b) lower levels of blood testosterone
(c) lower levels of adrenaline/ noradrenaline in its blood
(d) higher levels of thyroxine.

187. During the transmission of nerve impulse through a nerve fibre, the potential on the inner side of the plasma membrane has which type of electric change?
(a) first positive, then negative and continue to be positive
(b) first negative, then positive and continue to be positive.
(c) first positive, then negative and again back to positive
(d) first negative, then positive and again back to negative .

188. Which one of the follwoing pairs of organisms are exotic species introduced in India ?
(a) lantana camara, water hyacinth
(b) water hyacinth, prosopis cinereria
(c) nile perch, licus religiosa
(d) ficus religiosa , lantana camara.

189. In gymnosperms, the pollen chamber represents
(a) a cavity in the ovule in which pollen grains are stored after pollination
(b) an opening in the megagametophyte through which the pollen tube approaches the egg
(c) the microsporangium in which pollen grains develop
(d) a cell in the pollen grain in which the sperms are formed.

190. Molecular basis of organ differentiation dpends on the modulation in transcription by
(a) ribosome (b) transcription factor
(c) anticodon (d) RNA polymerase.

191. Which of the follwoing is an example of negative feedback loop in humans?
(a) secretion of tears after falling of sand particles into the eye.
(b) salivation of mouth at the sight of delicious food
(c) secretion of sweat glands and constriction of skin blood vessels when it is too hot
(d) constriction of skin blood vessels and contraction of skeletal mucles when it is too cold

192. The two polynucleotide chains in DNA are
(a) discontinuous (b) antiparallel
(c) semiconservative (d) parallel.

193. Which of the following pairs are correctly matched ?

	Animals	-	Morphological features
(i)	Crocodile	-	4-chambered heart
(ii)	Sea urchin	-	Parapodia
(iii)	Obelia	-	Thecodont
(iv)	Lemur	-	Thecodont

(a) (ii), (iii) and (iv) (b) only (i) and (iv)
(c) only (i) and (ii) (d) (i), (iii) and (iv)

194. Which one of the following pairs of structures distinguishes a nerve cell from other types of cells?
(a) vacuoles and fibres
(b) flagellum and modulloary sheath
(c) nucleus and mitochondria
(d) perikaryon and dendrites.

195. In maize, hybrid vigour is exploited by
(a) crossing of two inbred parental lines
(b) harvesting seeds from the most productive plants
(c) inducing mutations
(d) bombarding the seeds with DNA.

196. Which one of the following is a viral disease of poultry ?
(a) coryza (b) new castle disease
(c) pasteurellosis (d) salmonellosis.

197. The wavelength of light absorbed by Pr form of phytochrome is
(a) 680 nm (b) 720 nm
(c) 620 nm (d) 640 nm

198. Which one of the following is not a bioindicator of water pollution?
(a) blood-worms (b) stone flies
(c) sewage fungus (d) sludge-worms.

199. Feeling the tremors of an earthquake a scared resident of seventh floor of a multistoryed building starts climbing down the stairs rapidly. Which hormone initiated this action ?
(a) adrenaline (b) glucagon
(b) gastrin (d) thyroxine

200. "Foolish seedling'' disease of rice led to the discovery of
(a) ABA (b) 2, 4-D
(c) IAA (d) GA

HINTS & SOLUTIONS

1. (a) Since $\frac{V_s}{V_p} = \frac{N_s}{N_p}$

Where
N_s = No. of turns across primary coil = 50
N_p = No. of turns across secondary coil = 1500

and $V_p = \frac{d\phi}{dt} = \frac{d}{dt}(\phi_0 + 4t) = 4$

$\Rightarrow V_s = \frac{1500}{50} \times 4 = 120$ V

2. (a) If the electric field is switched off, and the same magnetic field is maintained, the electrons move in a circular orbit and electron will travel a magnetic field $\perp$ to its velocity.

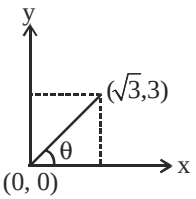
3. (a) Speed $v = \frac{dx}{dt} = \frac{d}{dt}(9t^2 - t^3) = 18t - 3t^2$

For maximum speed

$\frac{dv}{dt} = 0 \Rightarrow 18 - 6t = 0 \Rightarrow t = 3$

$\Rightarrow x_{max} = 81 - 27 = 54$

4. (b)



Let θ be the angle which the particle makes with x axis.

From figure, $\tan\theta = \frac{3}{\sqrt{3}} = \sqrt{3}$

$\Rightarrow \theta = \tan^{-1}(\sqrt{3}) = 60°$

5. (d) Since average speed

$$= \frac{\text{total distance travelled}}{\text{total time taken}}$$

Let s be the distance from x to y
Average speed

$$= \frac{s+s}{t_1+t_2} = \frac{2s}{\frac{s}{v_u}+\frac{s}{v_d}} = \frac{2v_u v_d}{v_d + v_u}$$

6. (c) $\lambda_A = 5\lambda$ and $\lambda_B = \lambda$

At t = 0, $(N_0)_A = (N_0)_B$

Given, $\frac{N_A}{N_B} = \left(\frac{1}{e}\right)^2$

According to radioactive decay,

$\frac{N}{N_0} = e^{-\lambda t}$

$\therefore \frac{N_A}{(N_0)_A} = e^{-\lambda_A t}$ ..... (1)

$\frac{N_B}{(N_0)_B} = e^{-\lambda_B t}$ ..... (2)

From (1) and (2)

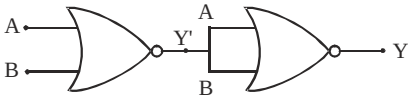
$\frac{N_A}{N_B} = e^{-(5\lambda - \lambda)t}$

$\Rightarrow \left(\frac{1}{e}\right)^2 = e^{-4\lambda t} = \left(\frac{1}{e}\right)^{4\lambda t}$

$\Rightarrow 4\lambda t = 2$

$\therefore t = \frac{1}{2\lambda}$.

7. (c)



$Y' = \overline{A + B}$

$Y = \overline{\overline{A + B}} = A + B$

Therefore truth table :

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

8. (a) In beta minus decay (β^-), a neutron is transformed into a proton, and an electron is emitted from the nucleus along with antineutrino.

$n = p + e^- + \bar{\nu}$

9. (d) Let $y = A \sin \omega t$

$$v_{inst} = \frac{dy}{dt} = A\omega \cos \omega t = A\omega \sin(\omega t + \pi/2)$$

$$\text{Acceleration} = -A\omega^2 \sin \omega t$$
$$= A\omega^2 \sin(\pi + \omega t)$$

$$\therefore \phi = \frac{\pi}{2} = 0.5\pi$$

10. (a) In mass spectrometer, when ions are accelerated through potential V

$$\frac{1}{2}mv^2 = qV \qquad \text{.....(i)}$$

As the magnetic field curves the path of the ions in a semicircular orbit

$$Bqv = \frac{mv^2}{R} \Rightarrow v = \frac{BqR}{m} \text{ ..... (ii)}$$

Substituting (ii) in (i)

$$\frac{1}{2}m\left[\frac{BqR}{m}\right]^2 = qV$$

$$\text{or } \frac{q}{m} = \frac{2V}{B^2R^2}$$

Since V and B are constants,

$$\therefore \frac{q}{m} \propto \frac{1}{R^2}$$

11. (a) Since, $\theta = \omega_0 t + \frac{1}{2}\alpha t^2$

Where α is angular aceleration, ω_0 is the initial angular speed.
t = 2s

$$\theta = 2 \times 2 + \frac{1}{2} \times 3(2)^2 = 4 + 6 = 10 \text{ rad}$$

12. (d) Since $\phi_{total} = \phi_A + \phi_B + \phi_C = \frac{q}{\varepsilon_0}$

Where q is the total charge.
As shown in the figure, flux associated with the curved surface B is $\phi = \phi_B$
Let us assume flux linked with the plane surfaces A and C be
$\phi_A = \phi_C = \phi'$
Therefore,

$$\frac{q}{\varepsilon_0} = 2\phi' + \phi_B = 2\phi' + \phi$$

$$\Rightarrow \phi' = \frac{1}{2}\left(\frac{q}{\varepsilon_0} - \phi\right)$$

13. (b) By using $v = n\lambda$

Here, $n = 2 \times 10^{14}$ Hz

$\lambda = 5000\text{Å} = 5000 \times 10^{-10}$ m

$v = 2 \times 10^{14} \times 5000 \times 10^{-10} = 10^8$ m/s
refractive index of the material,

$$\mu = c/v = \frac{3 \times 10^8}{10^8} = 3$$

14. (a) The difference in mass of a nucleus and its constituents, Δm, is called the mass defect and is given by

$$\Delta M = [ZM_p + (A - Z)M_n] - M$$

and binding energy = ΔMc^2

$$= [\{ZM_p + (A - Z)M_n\} - M]c^2$$

15. (b) Power dissipiated = P

$$= \frac{V^2}{R} = \frac{(18)^2}{6} = 54 \text{ W}$$

16. (d) It has been known that a nucleus of mass number A has radius
$R = R_0 A^{1/3}$
Where $R_0 = 1.2 \times 10^{-15}$m
and A = mass number

In case of $^{27}_{13}A\ell$, let nuclear radius be R_1

and for $^{125}_{32}Te$, nuclear radius be R_2

For $^{27}_{13}Al$, $R_1 = R_0(27)^{1/3} = 3R_0$

For $^{125}_{32}Te$, $R_2 = R_0(125)^{1/3} = 5R_0$

$$\frac{R_2}{R_1} = \frac{5R_0}{3R_0} = \frac{5}{3}R_1 = \frac{5}{3} \times 3.6 = 6 \text{ fm.}$$

17. (d) Friction is the retarding force for the block
$F = ma = \mu R = \mu mg$
Therefore, from the first equation of motion
$v = u - at$

$$0 = v - \mu g \times t \Rightarrow \frac{v}{\mu g} = t$$

18. (c) Here,

$$f = f_0\left(1-\frac{t}{T}\right) \text{ or, } \frac{dv}{dt} = f_0\left(1-\frac{t}{T}\right)$$

$$\text{or, } dv = f_0\left(1-\frac{t}{T}\right)dt$$

$$\therefore v = \int dv = \int\left[f_0\left(1-\frac{t}{T}\right)\right]dt$$

$$\text{or, } v = f_0\left(t-\frac{t^2}{2T}\right)+C$$

where C is the constant of integration.
At t = 0, v = 0.

$$\therefore 0 = f_0\left(0-\frac{0}{2T}\right)+C$$

$$\Rightarrow C = 0$$

$$\therefore v = f_0\left(t-\frac{t^2}{2T}\right)$$

If f = 0, then

$$0 = f_0\left(1-\frac{t}{T}\right)$$

$$\Rightarrow t = T$$

Hence, particle's velocity in the time interval t = 0 and t = T is given by

$$v_x = \int_{t=0}^{t=T} dv = \int_{t=0}^{T}\left[f_0\left(1-\frac{t}{T}\right)\right]dt$$

$$= f_0\left[\left(t-\frac{t^2}{2T}\right)\right]_0^T$$

$$= f_0\left(T-\frac{T^2}{2T}\right) = f_0\left(T-\frac{T}{2}\right)$$

$$= \frac{1}{2}f_0T.$$

19. (b) **Voltage gain =** $\beta \times$ Impedance gain

$$50 = \beta \times \frac{200}{100} = 2\beta \Rightarrow \beta = 25$$

and power gain $= \beta^2 \times \frac{200}{100} = 1250.$

20. (a) A balanced wheatstone bridge simply requires

$$\frac{P}{Q} = \frac{R}{S}$$

$$\frac{2}{2} = \frac{2}{S}$$

Therefore, S should be 2Ω.
A resistance of 6Ω is connected in parallel.
In parallel combination,

$$\frac{1}{R} = \frac{1}{R_1}+\frac{1}{R_2}$$

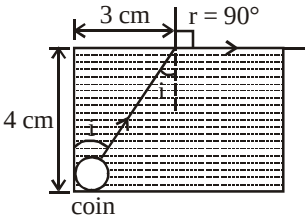
$$\frac{1}{2} = \frac{1}{6}+\frac{1}{S}$$

$$\Rightarrow S = 3\Omega$$

21. (c) By using m = ZIt
Where, Z is the electrochemical equivalent of copper.

$$\Rightarrow m = 30\times10^{-5}\times1.5\times10\times60$$
$$= 0.27 \text{ gm.}$$

22. (d)



Hypotenuse comes out to be 5 cm.

Since, $\frac{1}{\mu} = \frac{\sin i}{\sin 90°}$

$$\mu = \frac{1}{\sin i} = \frac{5}{3}$$

Speed, $v = \frac{c}{\mu} = \frac{3\times10^8}{5/3} = 1.8\times10^8 \text{ m/s}$

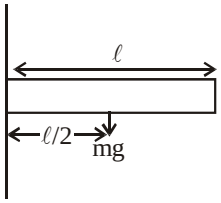
23. (b) Efficiency of the transformer

$$\eta = \frac{P_{output}}{P_{input}}\times100 = \frac{100}{220\times0.5}\times100 = 90.9\%$$

24. (c) Dimensions of Resistance,

$$R = \frac{[V]}{[I]} = \frac{[ML^2T^{-3}I^{-1}]}{[I]} = [ML^2T^{-3}I^{-2}]$$

25. (c)



Weight of the rod will produce torque,

$$\tau = mg \times \frac{\ell}{2}$$

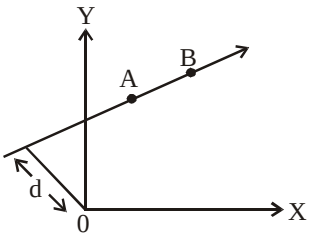
Also, $\tau = I\alpha$

Where, I is the moment of inertia = $\frac{m\ell^2}{3}$

and α is the angular acceleration

$$\therefore \frac{m\ell^2}{3}\alpha = mg \times \frac{\ell}{2} \Rightarrow \alpha = \frac{3g}{2\ell}$$

26. (a) Angular momentum = Linear momentum × distance of line of action of linear momentum about the origin.



$L_A = P_A \times d$, $L_B = P_B \times d$

As linear momenta are equal,

therefore, $L_A = L_B$.

27. (c) We have, U + K = E

where, U = potential energy, K = Kinetic energy, E = Total energy.

Also, we know that, in S.H.M., when potential energy is maximum, K.E. is zero and vice-versa.

$\therefore U_{max} + 0 = E \Rightarrow U_{max} = E$

Further,

$$K.E. = \frac{1}{2}m\omega^2 a^2 \cos^2 \omega t$$

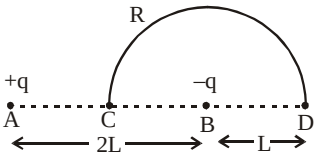
But by question, $K.E. = K_0 \cos^2 \omega t$

$$\therefore K_0 = \frac{1}{2}m\omega^2 a^2$$

Hence, total energy, $E = \frac{1}{2}m\omega^2 a^2 = K_0$

$\therefore U_{max} = K_0$ & $E = K_0$.

28. (c)



Potential at C = $V_C = 0$

Potential at D = V_D

$$= K\left(\frac{-q}{L}\right) + \frac{Kq}{3L} = -\frac{2}{3}\frac{Kq}{L}$$

Potential difference

$$V_D - V_C = \frac{-2}{3}\frac{Kq}{L} = \frac{1}{4\pi\epsilon_0}\left(-\frac{2}{3}.\frac{q}{L}\right)$$

$\Rightarrow$ Work done = $Q(V_D - V_C)$

$$= -\frac{2}{3} \times \frac{1}{4\pi\varepsilon_0}\frac{qQ}{L} = \frac{-qQ}{6\pi\varepsilon_0 L}$$

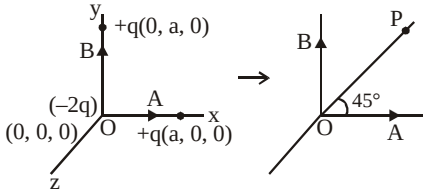
29. (d) Since $p = nh\nu$

$$\Rightarrow n = \frac{p}{h\nu} = \frac{2\times10^{-3}}{6.6\times10^{-34}\times6\times10^{14}}$$

$$= 5\times10^{15}$$

30. (a) Three point charges +q, –2q and +q are placed at points B (x = 0, y = a, z = 0), O (x = 0, y = 0, z = 0) and A(x = a, y = 0, z = 0) The system consists of two dipole moment vectors due to (+q and –q) and again due to (+q and –q) charges having equal magnitudes qa units – one along $\overrightarrow{OA}$ and other along $\overrightarrow{OB}$. Hence, net dipole moment,

$p_{net} = \sqrt{(qa)^2 + (qa)^2} = \sqrt{2}qa$ along $\overrightarrow{OP}$ at an angle 45° with positive X-axis.



31. (b) Since orbital velocity of satellite is

$v = \sqrt{\frac{GM}{r}}$, it does not depend upon the mass of the satellite.

Therefore, both satellites will move with same speed.

32. (d) $\left|\vec{A}\times\vec{B}\right| = \sqrt{3}(\vec{A}.\vec{B})$

$\Rightarrow AB\sin\theta = \sqrt{3}AB\cos\theta$

$\Rightarrow \tan\theta = \sqrt{3} \Rightarrow \theta = 60°$

33. (a) Mass gets detached at the upper extreme position when pan returns to its mean position.

At that point, $R = mg - m\omega^2 a = 0$

i.e. $g = \omega^2 a$

$\Rightarrow a = g/\omega^2 = mg/K$

$\Rightarrow a = \frac{2\times10}{200} \qquad \left[As = \omega^2 = \frac{K}{m}\right]$

$\Rightarrow a = 1/10\,m = 10cm$

34. (d) Magnetic moment, $m = IA$

$= \frac{qv}{2\pi R}(\pi R^2) = \frac{qvR}{2}$

$\left[\because I = \frac{q}{T} \text{ and } T = \frac{2\pi R}{v}\right]$

35. (d) Energy in the first excited state

$= \frac{-13.6}{n^2} = \frac{-13.6}{2^2} = -3.4\,ev$

But K.E. = –(Total energy) = +3.4 ev.

36. (d) Number of emitted electrons N_E

$\propto$ Intensity

$\propto \frac{1}{(Distance)^2}$

Therefore, as distance is doubled, N_E decreases by (1/4) times.

37. (b) Displacement from the mean position

$y = a\sin\left(\frac{2\pi}{T}\right)t$

According to problem y = a/2

$a/2 = a\sin\left(\frac{2\pi}{T}\right)t$

$\Rightarrow \frac{\pi}{6} = \left(\frac{2\pi}{T}\right)t \Rightarrow t = T/12$

This is the minimum time taken by the particle to travel half of the amplitude from the equilibrium position.

38. (c) For a cubic crystal,

$a = b = c$ and $\alpha = \beta = \gamma = 90°$

39. (b) Work done = Change in energy

$= \frac{1}{2}\left(C + \frac{C}{2}\right)V^2 = \frac{1}{2}\left(\frac{3C}{2}\right)V^2 = \frac{3CV^2}{4}$

40. (a) According to Stefan's law,

$E \propto T^4$

$\propto (t + 273)^4\,K \qquad [727°C = (727 + 273)K]$

$\propto (727 + 273)^4\,K$

$\propto (1000)^4\,K$

41. (a) We know

$\frac{I}{I_S} = 1 + \frac{G}{S}$

$\frac{750}{100} = 1 + \frac{13}{S}$

$S \Rightarrow 2\Omega$

42. (c) Since efficiency of engine is

$\eta = 1 - \frac{T_2}{T_1}$

According to problem,

$\frac{1}{6} = 1 - \frac{T_2}{T_1}$ ..... (1)

When the temperature of the sink is reduced by 62°C, its efficiency is doubled

$2\left(\frac{1}{6}\right) = 1 - \frac{T_2 - 62}{T_1}$ ..... (2)

Solving (1) and (2)

$T_2 = 372\,K$

$T_1 = 99°C$ = Temperature of source.

43. (c) Variation in magnetic field causes electric field and vice versa.

In electromagnetic waves, $\vec{E} \perp \vec{B}$. Both $\vec{E}$ and $\vec{B}$ are in the same phase.

In electromagnetic waves

$E = E_0 \sin(\omega t - kx)$

$B = B_0 \sin(\omega t - kx)$

The electromagnetic waves travel in the direction of $(\vec{E} \times \vec{B})$.

44. (d) Condition for which the current is maximum in a series LCR circuit is,

$$\omega = \frac{1}{\sqrt{LC}}$$

$$1000 = \frac{1}{\sqrt{L(10\times10^{-6})}}$$

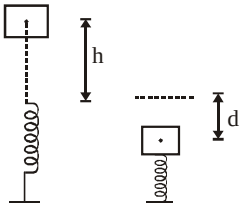
$\Rightarrow = L = 100\,mH$

45. (d) Beyond curie temperature, ferromagnetic substances behaves like a paramagnetic substance.

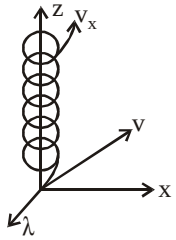
46. (a) Gravitational potential energy of ball gets converted into elastic potential energy of the spring.

$$mg(h + d) = \frac{1}{2}kd^2$$

$$\text{Net work done} = mg(h + d) - \frac{1}{2}kd^2 = 0$$



47. (b)



When a test charge q_0 enters a magnetic field $\vec{B}$ directed along z-axis, with a velocity $\vec{v}$ making angles d with the z-axis. The time period of the motion is independent of R and v.

48. (d) Since $T_n = \frac{T_i + T_c}{2}$ =Neutral temperature

$$T_n = \frac{T_i + 0}{2} = \frac{T_i}{2}$$

[T_c = 0°C = temperature of cold junction]

49. (c) Power radiated by the sun at t°C

$= \sigma(t + 273)^4 4\pi r^2$

Power received by a unit surface

$$= \frac{\sigma(t + 273)^4 4\pi r^2}{4\pi R^2} = \frac{r^2\sigma(t + 273)^4}{R^2}$$

50. (d) For a P-type semiconductor, the acceptor energy level, as shown in the diagram, is slightly above the top E_v of the volume band. With very small supply of energy an electron from the valence band can jump to the level E_A and ionise acceptor negatively.

Chemistry

51. (a) Reduction of alkyl isocyanides in presence of $LiAlH_4$ yields secondary amines containing methyl as one of the alkyl group.

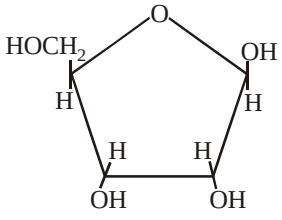
$$R - N \equiv C + 4[H] \xrightarrow{LiAlH_4} \underset{2°\text{amine}}{R - NH - CH_3}$$

e.g.,

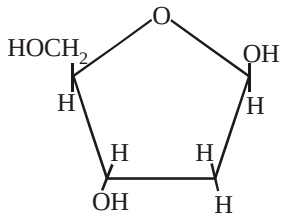
$$CH_3 - N \equiv C + 4[H] \xrightarrow{LiAlH_4} \underset{\text{dimethyl amine}}{CH_3 - NH - CH_3}$$

whereas, alkyl cyanides give 1° amine on reduction.

52. (c) Each nucleic acid consists of a pentose sugar a heterocyclic base, and phosphoric acid. The sugar present in DNA is 2-deoxy -D (–) ribose and the sugar present in RNA is D (–)- ribose. The chirality of DNA and RNA molecules are due to the presence of sugar components.



D(–)–ribose



2-deoxy–D(–)–ribose

53. (a) Langmuir adsorption isotherm is based on the assumption that every adsorption site is equivalent and the ability of a particle to bind there is independent of whether or not nearby sites are occupied.

54. (a) Given $K_a = 1.00\times10^{-5}$, C= 0.100 mol
for a weak electrolyte,
degree of dissociation

$$(\alpha) = \sqrt{\frac{KA}{C}} = \sqrt{\frac{1\times10^{-5}}{0.100}} = 10^{-2} = 1\%$$

55. (d) As the slowest step is the rate determining step thus the mechanism B will be more consistent with the given information also because it involve one molecule of H_2 and one molecule of ICl it can expressed as
$r = k[H_2][ICl]$
Which shows that the reaction is first order w.r.t. both H_2 & ICl.

56. (b) Efficiency of a fuel cell $(\eta) = \frac{\Delta G}{\Delta H}$

57. (d) This reaction shows the formation of H_2O, and the X_2 represents the enthalpy of formation of H_2O because as the definition suggests that the enthalpy of formation is the heat evolved or absorbed when one mole of substance is formed from its constituent atoms.

58. (a) As the basicity of metal hydroxides increases down the group from Be to Ba, the thermal stability of their carbonates also increases in the same order. Further group 1 compounds are more thermally stable than group 2 because their hydroxide are much basic than group 2 hydroxides therefore, the order of thermal stability is
$BeCO_3 < MgCO_3 < CaCO_3 < K_2CO_3$.

59. (c) Hybridisation of Br is BrO_3^-
Total valence elctrons = 7 + 3 × 6 = 25
Charge = –1 hence
Total = 25 + 1 = 26

$$= \frac{26}{8} = 3(Q) + 2(R) = 5$$

hybridization = dsp^3
hybridization of Xe in XeO_3
Total valence electrons

$$= 8 + 3\times6 = 26 = \frac{26}{8} = 3(Q) + 2(R) = 5$$

Hybridization = dsp^3
In both cases, the structure is trigonal pyramidal.

60. (a) All the group IV elements show tetravalency which can be explained on the basis of shifting of one e^- of ns to the vacant np orbital.These four orbitals give rise to four sp^3 hybrid orbitals.
When ns^2 electrons of the outermost shell do not participate in bonding it is called inert pair and the effect is called inert pair effect. The last three elements of group 4 i.e. Ge, Sn and Pb, have a tendency to form divalent as well as tetravalent ions. Since the inert pair effect increases from Ge to Pb, the stability of tetravalent ion decreases and that of divalent ion increases that is why Pb^{++} is more stable than Pb^{4+} and Sn^{4+} ions is more stable than Sn^{2+}.

61. (d) The sulphide ore is roasted to oxide before reduction because the ΔG_f^o of most of the sulphides are greater than those of CS_2 and H_2S, therefore neither C nor H can reduce metal sulphide to metal. Further, the standard free energies of formation of oxide are much less than those of SO_2. Hence oxidation of metal sulphides to metal oxide is thermodynamically favourable.

62. (c) For a first order reaction

$$k = \frac{2.303}{t}\log_{10}\frac{a}{a-x}$$

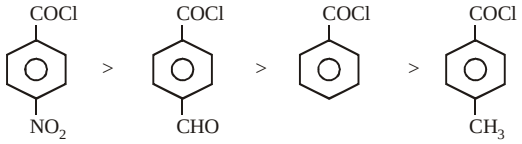
when $t = t_{½}$

$$k = \frac{2.303}{t_{½}}\log_{10}\frac{a}{a-a/2}$$

$$\text{or } t_{½} = \frac{2.303}{k}\log_{10}2 = \frac{\ln 2}{k}$$

63. (c) The degree of hydrolysis increases as the magnitude of positive charge on carbonyl group increases. Electron withdrawing

group increases the positive charge and electron releasing group decreases the negative change. Among these NO_2 & CHO are electron withdrawing group from which NO_2 has more –I effect than –CHO. On the other hand CH_3 is a electron releasing group therefore the order of reactivity towards hydrolysis is



64. (c) This reaction occurs according to Markownikoff's rule which states that when an unsymmetrical alkene undergo hydrohalogenation, the negative part goes to that C-atom which contain lesser no. of H-atom.

$$CH_3-CH_2-C\equiv CH + HCl \longrightarrow CH_3-CH_2-\underset{Cl}{\underset{|}{C}}=CH_2$$

$$\xrightarrow{HI} CH_3-CH_2-\underset{Cl}{\underset{|}{\overset{I}{\overset{|}{C}}}}-CH_2$$

65. (c) Molarity of H_2SO_4 solution

$$=\frac{98\times1000}{98\times100}\times1.84=18.4$$

Suppose V ml of this H_2SO_4 is used to prepare 1 lit. of 0.1M H_2SO_4

$\therefore\ V\times18.02=1000\times0.1$

or $V=\dfrac{1000\times0.1}{18.02}=5.55$ ml.

66. (d) $\underset{\diagdown\ \diagup}{C=O} \xrightarrow{Zn\text{-}Hg\ /\ conc.\ HCl} \underset{\diagdown\ \diagup}{CH_2} + H_2O$

Clemmensen reduction

e.g.

$$\begin{matrix}CH_3\\ \diagdown\\ CH_3\end{matrix}\!\!>\!C=O \xrightarrow[conc.\ HCl]{Zn\text{-}Hg\ /} \begin{matrix}CH_3\\ \diagdown\\ CH_3\end{matrix}\!\!>\!CH_2 + H_2O$$

67. (b) $\dfrac{1}{2}H_2+\dfrac{1}{2}Cl_2 \longrightarrow HCl$

$$\Delta H_{HCl}=\sum \text{B.E. of reactant}-\sum \text{B.E. of products}$$

$$-90=\frac{1}{2}\times430+\frac{1}{2}+\frac{1}{2}\times240-\text{B.E. of HCl}$$

$\therefore$ B.E. of HCl = 215 + 120 + 90

= 425 kJ mol^{-1}

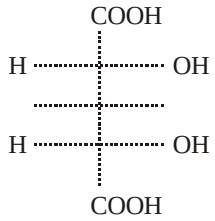
68. (c) Electron withdrawing substituent increases the acidity by increasing the ionic character of –O–H by inductive effect. Electronegativity decreases in the order.

F > Cl > Br

and hence –I effect also decreases in the same order, therefore the correct option is

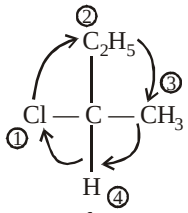
$FCH_2COOH > ClCH_2COOH > BrCH_2COOH > CH_3COOH$

69. (a) Compounds which do not show optical activity inspite of the presence of chiral carbon atoms are called *meso*-compounds. The absence of optical activity in these compound is due to the presence of a plane of symmetry in their molecules. e.g. meso-tartaric acid is optically inactive.



(Plane of symmetry)

70. (b)



R-configuration

71. (d) Vitamin B is water soluble whereas all other are water insoluble.

72. (a) For isoelectronic species, size of anion increases as negative charge increases whereas size of cation decreases with increase in positive charge. Further ionic radii of anions is more than that of cations. Thus the correct order is

$Ca^{++} < K^+ < Ar < Cl^- < S^{--}$

73. (b) As $\Delta T_f = i\,Kg\,m$

For

	HX	$\rightleftharpoons$	H^+	+	X^-
t = 0	1		0		0
teq	(1 – 0.20)		0.20		0.20

Total no. of moles = 1 – 0.20 + 0.20 + 0.20 = 1 + 0.20 = 1.2

$\therefore \Delta T_f = 1.2 \times 1.86 \times 0.5 = 1.1160 \approx 1.12\,K$

74. (d) Leaching is the selective dissolution of the desired mineral leaving behind the impurities in a suitable dissolving agent eg Argentitie or Silver glance, Ag_2S is an ore of silver. Silver is extracted from argentite by the mac-Arthur and Forest process (leaching process).

$$Ag_2S + 4NaCN \rightarrow 2Na[Ag(CN)_2] + Na_2S$$

$$4Au + 8KCN + 2H_2O + O_2 \rightarrow 4K[Au(CN)_2] + 4KOH$$

75. (a) For a first order reaction

$$k = \frac{2.303}{t}\log\frac{a}{a-x}$$

when t = 60 and x = 60%

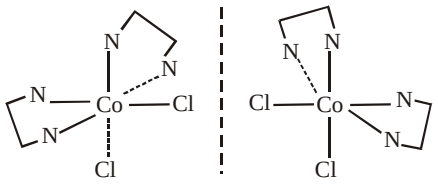
$$k = \frac{2.303}{60}\log\frac{100}{100-60} = \frac{2.303}{60}\log\frac{100}{40}$$

Now,

$$t_{½} = \frac{2.303}{0.0153}\log\frac{100}{100-50} = \frac{2.303}{0.0153}\times\log 2$$

$$= \frac{2.303}{0.0153}\times 0.3010 = 45.31\,\text{min}.$$

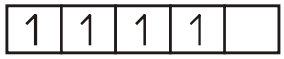
76. (b) Non superimposable mirror images are called optical isomers and may be described as "chiral'. They are also called enantiomers and rotate plane polarised light in opposite directions.

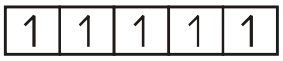


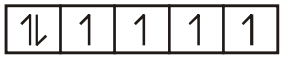
77. (b) Since each Sr^{++} ion provides one cation vacancy, hence
Concentration of cation vacancies = mole % of $SrCl_2$ added
$= 10^{-4}$ mole %

$$= \frac{10^{-4}}{100}\times 6.023\times 10^{23} = 6.023\times 10^{17}$$

78. (b) Lesser is the number of unpaired electrons smaller will be the paramagnetic behaviour. As Cr^{++}, Mn^{++}, Fe^{++} & Ni^{++} contains.

Cr^{++} ($3d^4$) = 
= 4 unpaired e^-.

Mn^{++} ($3d^5$) = 
= 5 unpaired e^-.

Fe^{++} ($3d^6$) = 
= 4 unpaired e^-.

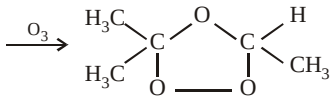
Ni^{++} ($3d^8$) = 
= 2 unpaired e^-.

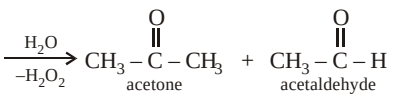
As Ni^{++} has minimum no. of unpaired e^- thus this is least paramagnetic.

79. (a) The solubility of sulphates of alkaline earth metals decreases as we move down the group from Be to Ba due to the reason that ionic size increases down the group. The lattice energy remains constant because sulphate ion is so large, so that small change in cationic sizes do not make any difference. Thus the order:

$$BeSO_4 > MgSO_4 > CaSO_4 > SrSO_4 > BaSO_4$$

80. (d) $H_3C-\underset{\underset{CH_3}{|}}{C}=CH-CH_3$





81. (b) The factors on which the ionisation energy depend are :

(i) Atomic size – I.E. decreases as the atomic size increases. So the attractive force decreases.

(ii) Number of electrons in the inner shell (screening effect). As the number of shells increases screening effect also increases and hence the I.E. tends to decrease.

82. (a) Proton affinity decreases in moving across the period from left to right due to increase in charge, within a group the proton affinities decreases from to p to bottom.
Nitrogen family > Oxygen family > Halogens

83. (d) Given,

$N_2 + 3H_2 \rightleftharpoons 2NH_3;\quad K_1 \qquad ....(i)$

$N_2 + O_2 \rightleftharpoons 2NO;\quad K_2 \qquad ....(ii)$

$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O;\quad K_3 \qquad ....(iii)$

We have to calculate

$4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O;\ K = ?$

or $2NH_3 + \frac{5}{2}O_2 \longrightarrow 2NO + 3H_2O$

For this equation, $K = \frac{[NO]^2\,[H_2O]^3}{[NH_3]^2\,[O_2]^{5/2}}$

but $K_1 = \frac{[NH_3]^2}{[N_2][H_2]^3},\ K_2 = \frac{[NO]^2}{[N_2][O_2]}$

& $K_3 = \frac{[H_2O]}{[H_2][O_2]^{1/2}}$

or $K_3 = \frac{[H_2O]^3}{[H_2]^3\,[O_2]^{3/2}}$

Now operate,

$\frac{K_2 \,.\, K_3^{\,3}}{K_1}$

$= \frac{[NO]^2}{[N_2][O_2]} \times \frac{[H_2O]^3}{[H_2]^3\,[O_2]^{3/2}} \cdot \frac{[N_2][H_2]^3}{[NH_3]^2}$

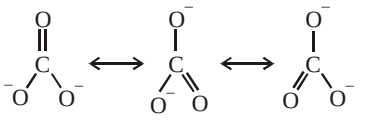
$= \frac{[NO]^2\,[H_2O]^3}{[NH_3]^2\,[O_2]^{5/2}} = K$

$\boxed{\therefore\ K = \frac{K_2 \,.\, K_3^{\,3}}{K_1}}$

84. (d) For chromium ion + 3oxidation state is most stable.

85. (c) All these structures exhibits resonance and can be represented by the following resonating structures.

(i) $:\overline{C} \equiv \overset{+}{O}: \longrightarrow :C = \ddot{O}:$

(ii) 

(iii) $:\underset{\cdot\cdot}{O} = C = \underset{\cdot\cdot}{O}: \longrightarrow :\overset{+}{\underset{\cdot\cdot}{O}} - C \equiv \overset{\cdot\cdot}{\underset{\cdot\cdot}{O}}\overset{-}{:}$

$\longrightarrow \overset{-}{:}\overset{\cdot\cdot}{\underset{\cdot\cdot}{O}} \equiv C - \overset{+}{\underset{\cdot\cdot}{O}}:$

More is the single bond character. More will be the bond length. Hence, the corret order is :

$CO < CO_2 < CO_3^{--}$

86. (d) $\underset{+1}{HOCl} < \underset{+3}{HOClO} < \underset{+5}{HOClO_2} < \underset{+7}{HOClO_3}$

As the oxidation number of the central atom increases, strength of acid also increases.

87. (a) Aldehydes containing no α-hydrogen atom on warming with 50% NaOH or KOH undergo disproportionation i.e. self oxidation - reduction known as cannizzaro's reaction.

$2C_6H_5CHO + NaOH \xrightarrow{50\%\ NaOH}$

$C_6H_5COONa + C_6H_5CH_2OH$

88. (a) Nucleophilicity increases down the periodic table.

$I^- > Br^- > Cl^- > F^-$

89. (a) Given $[H_3O^+] = 1 \times 10^{-10}$ M
at 25° $[H_3O^+][OH^-] = 10^{-14}$

$\therefore\ [OH^-] = \frac{10^{-14}}{10^{-10}} = 10^{-4}$

Now, $[OH^-] = 10^{-p^{OH}} = 10^{-4} = 10^{-p^{OH}}$
$\therefore\ p^{OH} = 4$

90. (b) (ii) is not possible for any value of n because l varies from 0 to (n – 1) thus for n = 2, l can be only 0, 1, 2.
(iv) is not possible because for l = 0, m = 0.
(v) is not possible because for l = 2, m varies from –2 to +2.

91. (c) As $E^o_{cell} = \frac{0.0591}{n}\log K_c$

$\therefore\ 0.46 = \frac{0.0591}{2}\log K_c$

$\therefore\ \log K_c = \frac{2 \times 0.46}{0.0591} = 15.57$

or K_c = Antilog 15.57 = $3.7 \times 10^{15} \approx 4 \times 10^{15}$

92. (d) Copolymer of adipic acid (6C) and hexamethylene diamine (6C).

$$n\ HOOC(CH_2)_4COOH + nH_2N(CH_2)_6NH_2 \rightarrow$$

Adipic acid — Hexamethylene diamine

$$\left(-\overset{O}{\overset{\|}{C}}-(CH_2)_4-\overset{O}{\overset{\|}{C}}-NH-(CH_2)_6-NH-\right)_n$$

Nylon 66

It has high tenacity and elasticity. It is resistant to abrasion and not affected by sea water. It is used for reinforcement of rubber tyres, manufacture of parachute, safety belts, carpets and fabrics.

93. (c) Electrophiles have high affinity for electrons. They attack at the site where electron-density is highest. Electron withdrawing substances increases the electron density. The electron withdrawing tendency decreases in the order :

$$-OH > -CH_3 > -H > -Cl$$

Therefore, the correct order of reactivity towards electrophile is

$$C_6H_5OH > C_6H_5CH_3 > C_6H_6 > C_6H_5Cl$$

94. (b) $(SiO_3^{2-})_n$ Two oxygen atoms per SiO_4 tetrahedron are shared giving polymeric anion chains.

Example : Spodumene $LiAl(SiO_3)_2$, Diposide $CaMg(SiO_3)_2$.

95. (d) Average isotopic mass of

$$X = \frac{200\times 90 + 199\times 8 + 202\times 2}{90+8+2}$$

$$= \frac{18000 + 1892 + 404}{100}$$

$$= \frac{19996}{100} = 199.96 \text{ amu}$$

96. (d) Number of atoms per unit cell = 1

Atoms touch each other along edges.

Hence $r = \frac{a}{2}$

(r = radius of atom and a = edge length)

Therefore % fraction $= \frac{\frac{4}{3}\pi r^3}{(2r)^3} = \frac{\pi}{6} = 0.52$

97. (c) In the cleavage of mixed ethers with two different alkyl groups, the alcohol and alkyl iodide that form depend on the nature of alkyl group. When primary or secondary alkyl groups are present, it is the lower alkyl group that forms alkyl iodide therefore

$$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-O-CH_2-CH_3 + HI \xrightarrow{\Delta}$$

$$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2OH + CH_3CH_2I$$

98. (a) Aldehydes and ketones having at least one α-hydrogen atom in presence of dilute alkali give β-hydroxy aldehyde or β-hydroxy ketone

$$CH_3-\overset{O}{\overset{\|}{C}}-\underset{H}{\underset{|}{}} + HCH_2CHO$$

Acetaldehyde

$$\xrightarrow{\text{dil.NaOH}} CH_3-\underset{H}{\overset{OH}{\overset{|}{\underset{|}{C}}}}-CH_2-CHO$$

Aldol

$$\xrightarrow[-H_2O]{\Delta} CH_3-CH=CH.CHO$$

Crotonaldehyde

99. (b) The balance chemical equation is :

$$2MnO_4^- + 6H^+ + 5SO_3^{--} \longrightarrow$$

$$2Mn^{++} + 5SO_4^{--} + 3H_2O$$

From the equation it is clear that

Moles of MnO_4^- require to oxidise 5 moles of SO_3^{--} are 2

Moles of MnO_4^- require to oxidise 1 mole of SO_3^{--} are 2/5.

100. (b) There is a steady decrease in the radii as the atomic number of the lanthanide elements increases. For every additional proton added in nucleus the corresponding electron goes to 4*f* subshell.

The shape of f -orbitals is very much diffused and they have poor shielding effect. The effective nuclear charge increases which causes the contraction in the size of electron charge cloud. This contraction in size is **quite regular** and known as **Lanthanoid contraction.**

Since the change in the ionic radii in the lanthanide series is very small, thus their chemical properties are similar.

Biology

101. (a) ICBN (International code of Botanical Nomenclature) - It is one of the code of nomen clature which is independent of zoological and bacteriological nomenclature. The code applies equally to names of taxonomic groups treated as plants whether or not these groups were originally so treated.

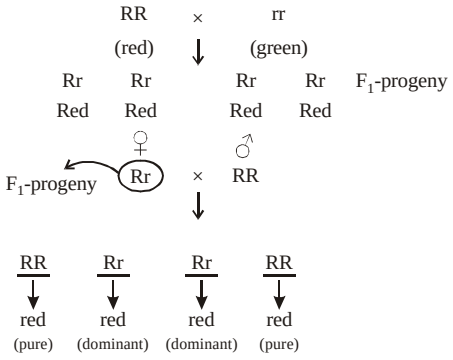
102. (d) The class Basidiomycetes includes those members that produce their basidia and basidiospores on or in a basidiocarp.

103. (d) Biological organisms starts with submicro scopic moleculer level like viruses, bacteria etc.
These organisms are unable to be seen by naked eyes without the help of microscope or even electron microscope.

104. (d) Dachigam national park is for conserration of Hangul which is one of India's most scenically beautiful wildlife reserves. It is located only 22 kilometers from Srinagar, the capital city of the northern state of Jammu and Kashmir. It covers an area of 141 square kilometers consisting of some of the most scenic natural beauty present on Earth. The variation in altitude is vast, ranging from 5500 ft to 14000 ft above mean sea level. Due to this vast variation, the park is very clearly demarcated into an upper and lower region. The best times to explore these two areas are summer and winter respectively.

105. (a) Serum globulins $\rightarrow$ It makes 2 to 3% of plasma proteins. The a and b - globulin sent with the hormones to transpert them the r–globulin from antibodies.

106. (c) crossing of one F_1 progeny with male parent. e.g



To find the genotype of hybrid test cross is done.

107. (c) okazaki fragments in DNA are linked up by the enzyme DNA ligase (DNA synthetase) after replacing the RNA primers with deoxyribonucleot ides after replacing the RNA primers with deoxyribonucleotides solution of the okazaki fragments in DNA chain growth :
Replication occurs always in 5' – 3' direction okazaki fragments, synthesized on 3' – 5' DNAtemplate, join to form lagging strand which grows in 3' – 5' direction.

108. (c) Ontogeny repeats phylogeny.

109. (b) Biochemical oxygen demand (B O D). If all the organic matter in one litre of water were oxidized by microorganisms. More value of BOD means the water sample is polluted by organic matter. BOD of distillary effluent is 40000 mg/L and that of paper mill effluent and sewage is 190 mg/L and 30 mg/L respectively

110. (c) The concept of chemical evolution is based on possible origin of life by combination of chemicals under suitable environmental conditions. The distribution of elements in the cosmos is the result of many processes in the history of the Universe. It provides us with a powerful tool to study the Big Bang, the density of baryonic matter, nucleosynthesis and the formation and evolution of stars and galaxies.

111. (d) MMC (megaspore mother cell is surrounded by a callose wall, ovules generally differentiate single MMC in the micropylar region of MMC. It is a large cell containing dense cytoplasm and a prominent nucleus.

112. (c) Probiotics are defined as live microorganisms, including Lactobacillus species, Bifidobacterium species and yeasts, that may beneficially affect the host upon ingestion by improving the balance of the intestinal microflora. The dietary use of live microorganisms has a long history.

113. (d) Podophyllum (pode-oh-FILL-um) is one of the endangered species of Indian medicinal plants. Which used to remove benign (not cancer) growths, such as certain kinds of warts. It works by destroying the tissue of the growth.

114. (a) Neries (belonging to class polychacta of phylum Annelida) scorpion and cockroach (belonging to phylum arthropoda) and silver fish all have dorsal heart.

115. (b) There are several factors and processes which differentiate living beings with non-living beings like reproducction, respiration, growth, etc. But among them reproduction is the only difference which differentiate without any exception living being with non-living beings.

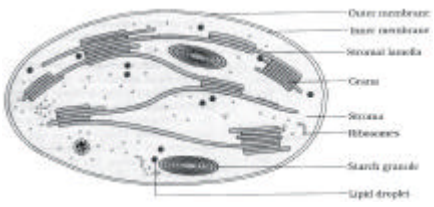
116. (c) Due to a long hunger strike and survival on water, a person will have less urea in his urine because urea comes to kidney as a waste product from liver which is formed after the breakdown of protein fat, carbohydrate during hunger. It is not synthesised but the synthesised ones are catabolised.

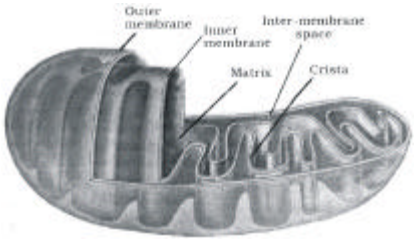
117. (a) The nucleosome model explains the packaging of histone proteins and DNA in the chromatin material which formsthe chromosome.

118. (b) A sequential expression of a set of human genes is the DNA sequence. Because gene is the functional part of DNA sequence.

119. (b) Recent years, the increases in toxic substances of NOx and/or SPM (Suspended Particulate Matter) from vehicles come to be serious problem. About the correlation between the traffic volume in our model and the real volume, we obtained the correlation coefficient of 0.74. Simultaneously, we got the result that the concentration of NOx was approximately 70 to 230 ppb. That of SPM was approximately 40 to 100 µg/m3.

120. (a) Both chloroplasts and mitochoridria have an internal compartment, the thylakoid space bounded by double membrane

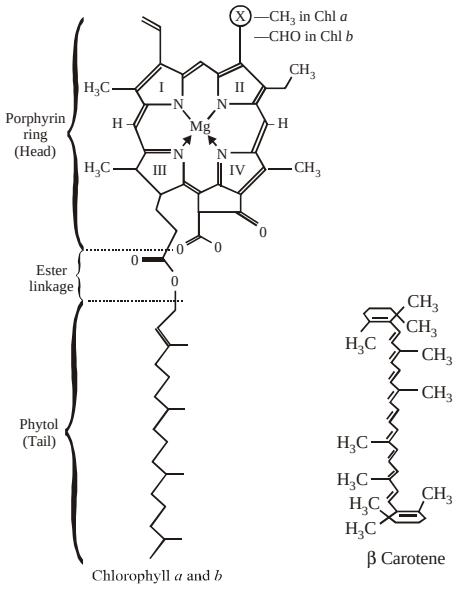




121. (a) Geometric representation of age structure a characteristic of population.

122. (a) The DNA binding sequence for RNA polymerase is called TATA box.

123. (b)

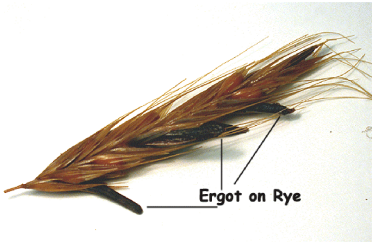


A plants require magnesium for chlorophyll synthesis All four sings bind with metal atom magnesium (Mg^{++}), Which remain present at the center ofchlorophyll molecule.

124. (c) In the prothallus of a vascular cryptogams the antherozoids and eggs mature at different times which result in failurity of self-fertilization,

125. (c) Ergot of Rye is a plant disease that is caused by the fungus Claviceps purpurea. The so-called ergot that replaces the grain

of the rye is a dark, purplish sclerotium, from which the sexual stage, of the life cycle will form after over wintering.



126. (c) The finches of galapagos is lands provides an evidence in favour of biogeographical evolution

127. (a) Physarum polycephalum belongs to phylum Amoebozoa, infraphylum Mycetozoa, and class Myxogastrea. P. polycephalum, often referred to as the "many-headed slime," is a slime mold that inhabits shady, cool, moist areas, such as decaying leaves and logs.

128. (b) If a population (e.g reindeer population) is allowed to grow in a predator free environment, the population grows beyond carrying capacity and there occurs population crash due to sudden shortage of food. such growth curves also occur in insect populations during rainy season, and in Algal blooms.

129. (d) It is also know as Australian pine, which is a deciduous tree with a soft, wispy, pine-like appearance that can grow to 100 feet or more in height. Also known as ironwood, beefwood, she oak and horsetail tree, it bears a superficial resemblance to the conifer genus Pinus because of its small, round, cone-like fruits and its branchlets of scale-like leaves that look like pine needles.

130. (c) Pongamia pinnata is one of the few nitrogen fixing trees (NFTS) to produce seeds containing 30-40% oil. It is often planted as an ornamental and shade tree but now-a-days it is considered as alternative source for Bio- Diesel. This species is commonly called pongam, karanja, or a derivation of these names. Pongami, jatropa, Euphorbia are petrocrops. However, in the Indian countryside, pongamia(kanjar) is being utilized as a source of biodiesel.

131. (a) Teak and pine is most suitable for the study of critical secondary growth because in secondary growth, secondary tissues are formed from lateral meristem which is well developed in these two cases and secondary growth occurs in gymnosperims and dicots.

132. (a) Fat soluble vitamins are - A, D, E and K and lack of vitamin A causes xerophthalmia.

133. (c) Movement of water will be from low DPD to high DPD i.e from A to B

134. (d) It is ciliated epithelium which bears numerous delicated hair like outgrowths the cilia, arising from basal granules. The cilia remains in rhythmic motion and creates current to transport the materials which comes in contact with them.

135. (d) It will be types of pigment present in the cell like Rhodophyceae presence of phycoerythrin chlorophyceae b high green algae presence of phycocyarin , green algne etc.

136. (c) It is calcium and phosphorus.

137. (d) Extensive use of chemical fertilizers may lead to eutrophiction of nearby water bodies.

138. (c) The basic number (x) of wheat is 7 so,
$6x = 2x = 42$ and $n = 21$

139. (d) The innermost leyer of the cortex is called endodermis. It comprises a single layer of barrel shaped cells without any intercellular spaces

140. (d) Only birds and mammals are homoiothermous.

141. (c) Bowman's glands are located in the olfactory epithelium of our nose

142. (c) Coliforms are a broad class of bacteria found in our environment, including the feces of man and other warm-blooded animals. The presence of coliform bacteria in drinking water may indicate a possible presence of harmful, disease-causing organisms.

143. (d) graafian follicle – the ovarian medulla contains many rouded or oval bodies, called ovarian, or grafian follicles, at varions

stages of development. Each follicle contains a large ovum surrounded by many layers of follicle cells.

144. (c) Opening of floral buds into flowers, is a type of autonomic movement of water which is due to epinasty.

145. (a) Leech has ventral central nervous system which consists of nerve ring, and a solid, double, mid ventral nerve cord with ganglia.

146. (c) Succinate:ubiquinone oxidoreductase, also known in mitochondria as Complex II, provides a link between the citric acid cycle and the membrane-bound electron-transport system. The membrane extrinsic, water-soluble domain, known as succinate dehydrogenase (SDH), contains the fumarate/succinate active site with a covalently bound FAD group and three iron-sulfur clusters: [2Fe-2S]2+/1+ , [4Fe-4S]2+/1+ , and [3Fe-4S]1+/0 . The enzyme catalyzes the interconversion of fumarate and succinate, and is closely related to fumarate reductase

147. (c) The first acceptor electrons from an excited chlorophyll is quinone

148. (a) The fate of a cell describes what it will become in the course of normal development. The fate of a particular cell can be discovered by labelling that cell and observing what structures it becomes a part of. The developmental potential, or potency, of a cell describes the range of different cell types it can become. The zygote and its very early descendents are totipotent - these cells have the potential to develop into a complete organism. The determination of different cell types (cell fates) involves progressive restrictions in their developmental potentials. Differentiation follows determination, as the cell elaborates a cell-specific developmental program. Differentiation results in the presence of cell types that have clear-cut identities, such as muscle cells, nerve cells, and skin cells.

149. (b) While working at the Rockefeller Institute, Brown reported isolation of a PPLO from human arthritic joint tissue in 1938. In 1949, Diennes reported to the 7th International Rheumatology Congress the isolation of PPLO from the genitourinary tracts of men afflicted with arthritis. In discussing the significance of this observation, Brown reported successful treatment of arthritic patients in 1949 with a new antibiotic called aureomycin (Clark, 1997).

150. (d) From pinetada vulgaris, pearl is obtained.

151. (d) Parathyroid disorders : It causes the lowering of blood calcium level. This increases the excitability of nerves and muscles causing cramps and convulsions.

152. (d) pseudomonas putida (super bus) developed by gentic engineering by Anand mohan chakravorty, is used to control oil spills.

153. (d) In C_4 plants, C_4 cycle occurs in mesophyll cells and C_3 - cycle occurs in abundle sheath.

154. (c) Riccia, dryopteris and cycas The male gametes of bryophytes are biflagellete, and those of pteriodophytes are multiflagellate, except selaginella having biflagellate gametes. The male gametes of gymnospems are non motile except those of cycas having multiciliate gametes.

155. (d) a normal distributon.

156. (d) It was given by Geneticists George W. Beadle and E. L. Tatum which states that each gene in an organism controls the production of a specific enzyme. It is these enzymes that catalyze the reactions that lead to the phenotype of the organism.

157. (c) When the linked genes are situated quite close, the chances of crossing over are highly reduced. Due to this, large number os parental gametes are formed and only few recombinant gametes are formed. This results in higher number of parental types in F_2 generation as compared to recombinants.

158. (a) In cloning of cattle, a fertilized egg is taken out of the mother's womb and in the eight cell - stage , cells are separated and cultured until small embryos are formed which are implanted into the womb of other cows.

159. (b) Ultrasound imaging has frequency range 1 - 15 MHz which has become part of our lives in the last decade. We are now all

familiar with the blurry black and white sonograms (ultrasound pictures) that show the unborn baby inside the mother's uterus. Although it may take a little imagination on our part to understand that a round circle is the baby's head, that does not prevent a proud mother-to-be from showing off her first baby picture.

160. (d) When the members of a species are inter - fertile and produce fertile offsprings.

161. (b) Inheritance of skin colour in human is controlled by three genes, A B and C which is polygenic in heritance.

162. (c) The analogous organs show comergent evolution due to similar adaptions which do not support organic evolution.

163. (b) pollen–grains of many species are responsible for some of the severe allergies and bronchial affliction in some people often lead to chronic respiratory disorders - asthma, bronchitis.

164. (d) Homo habilis had a cranial capacity in the range of 680 - 720 c.c & that of . homo erectus erectus 775 - 990 c.c., Homo erectus pekinesis 915-1200 c.c. Homo nenderthalensis 1300-1600 c.c.

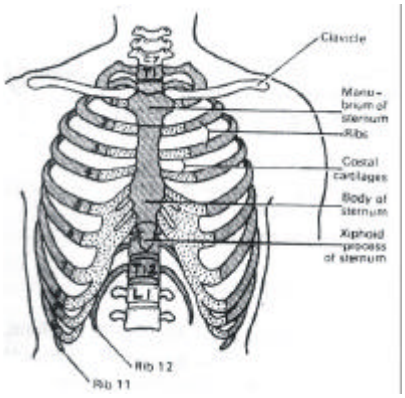
165. (d) During the period when the number of coal-burning factories in England was increasing (during the so-called Industrial Revolution) it was noticed that the number of melanic individuals of the species of Peppered Moth (Biston betularia) was becoming more common. Originally rare in the population of normally light-colored moths, the frequency of the melanic form increased in polluted areas until it was over 90%. This change in color has come to be known as "industrial melanism."

166. (a) It is competition between individuals of different species. The interspecific competition may be very severe because all the members of a species have similar requirements of food, habitat mate, etc and they also have similar adaptations to get their needs.

167. (a) Blood serum is liquid minus clotting elements of pale yellow colour. It does not have fibrinogen and other clotting materials. It does not take part in blood clotting.

168. (d) They are found in the equatorial regions rainfall exceeds 140 cm.) The warm humid **climate supports broad leaved evergreen plants.** Productivity is very high (12000 k. cal/m^2/ year The vegetation show stratification into two or more well defined layers.

169. (d) Floating ribs are 2- pairs (11th and 12th pair) which are not attached to sternum



170. (c) A highly conserved repetitive DNA sequence, (TTAGGG)n, has been isolated from a human recombinant repetitive DNA library. Telomerase seals the ends of the chromosomes

171. (d) Elater: Which is an elongated, spirally thickened, water-attracting cell in the capsule of a liverwort, derived from sporogenous tissue and assisting in spore dispersal.

172. (c) Essential micro elements are Fe, Mn, Zn, B, Cu, Mo and essential macronutrionts are C,H, N, P, S, Ca, K, Mg

173. (d) Glycolysis, krebs cycle and electron transport system, they all give ATP which is the main energy currency of our body. Glycosis takes place in cytoplarm kreb's cycle also in cytoplasm and ETS takes place in the mitochondria.

174. (a) Adaptive radiation refers to evolution of different species from a common ancestor. The mammals are adapted for different mode of life i.e. they show Adaptive radiation. They can be aerial (bat), aquatic

(whale and dolphins), burrowing or fossorial (rat), cursorial (horse), scantorial (squarrel) or arboreal (monkey). The adaptive radiation, the term by osborn, is also known as Divergent evolution.

175. (a) Gibberllic acid stimulates cell growth of leaves and stem causing their expansion, elongation respective and leaf fall is controlled by ABA.

176. (a) To survive in a particular environment, an organism need to adapt in that environment. If the organism becomes success in adapting them that organism is selected by nature .

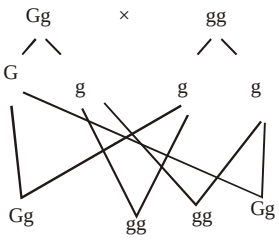
177. (a) Generative cell which is a cell of the male gametophyte or pollen grain in seed plants that divides to give rise directly or indirectly to sperm

178. (d) Let GG $\Rightarrow$ homozygons yellow seded plant.

gg $\Rightarrow$ homozygous green

Gg $\Rightarrow$ heterozygous green

According to the question :

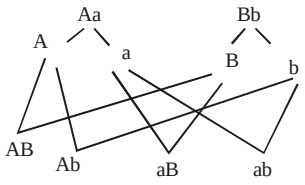


(yellow) (green) (green) (yellow)

So, the ratio cell be 50 : 50

179. (c) Since RBCS do not have mitochondria so they can respir only anaerobically

180. (d)



So, the corresponding genstype cell be AaBb.

181. (b) The analogous organs show convergent evolution due to samilar adaptation. They do not support organic evolution whole seadandshark shows convergent evolution due to similar habitate.

182. (b) Speciation takes place via reproductive isolation which is the most important consequence of geographical isolation.

183. (a) Lysozyme is an antibacterial agent which is secreted by the major salivary glands.

184. (b) The progesterone and estradiol continue the hypertrophy of endo metrial lining in the uterus and fallopian tubes and maintain it throughout pregnancy. progesterone is also necessary for the proper implantation of the foetus in the uterine wall. It stimulates the endometrial glands to secrete a nutrient fluid for the foetus, hence the term secetory phase. The progesterone inhibits the release of FSH so that it may not develop additional follicles and eggs.

185. (b) Proline is an amino acid which is a constituent part of a cell membrane.

186. (b) The bullock is castrated and therefore secretion of testosterone is not adequate

187. (d) Once the events of depolarization have occurred, a nerve impulse or spike is initiated. Action potential is another name of nerve impulse. It lasts about 1 msec (millisecond). The stimulalted, negatively charged point on the outside of the membrane sends out an electrical current to the positive point (still polarized adjacent to it. This local current causes the adjacent inner part of the membrane to reverse its potential from – 70m v to + 30m v. The reversal repeats itself over and over until the nerve impulse is conducted through the length of the neuron.

188. (a) Exotic Species - a species that has been introduced from another geographic region to an area outside its natural range. Examples are water hyacinth, Lantana camera

189. (c) The fertile region of microsporophyll bears a number of microsporangia or pollen sacs arranged in sori. The pollen chamber represents microsporangium in which pollen grains develop.

190. (d) The process of formation of protein sequence from DNA strand is called

transcription which requires RNA polymerase chain. RNA polymerase chains are of 3-types in eukaryotes
(i) RNA polymesase-I
(ii) RNA polymesase II
(iii) RNA polymesase-III

191. (d) When the set point of hypothalamus is disturbed by high temperature, it stimulates vasodialation and sweating while in low temperature there is vasoconstriction and shivering

192. (b) The two chains are antiparallel, one aligned in 5' $\rightarrow$ 3' direction the other in 3' $\rightarrow$ 5' direction.

193. (d) Crocodile belongs to reptilia class which has four chambered heart lemur teeth are combedded in the rockets of two which is known as there don't . In obelia polyps reproduce meduseas asexually and medusae form the polyps sexually. Such atteraction of asixual and sexual phases in the life cycle of obelia is called me tagenesis.

194. (d) The cytoplarm immediately surrounding the nucleus is loaded with profein synthetic machinery and is called perikaryon dendrites are usually shorter, tapering and much branched processes which may be one to several. These two are only present in nerve cells.

195. (a) Hybrid vigour is also called Helorosis which is measured in terms of size growth rate / field and number of other characters. Hybridisation increases vigour and fertility. It is exploited by crosing of two in bred parental lines. It is best maintained in vegetatively reproducing crops because of genetic recombinations .

196. (b) Newcastle disease (ND) is a highly contagious, generalised virus disease of domestic poultry and wild birds characterised by gastro-intestinal, respiratory and nervous signs.

197. (a) The Pr form: It absorbs light between 660 to 680nm and absorbs at a peak of 666 nm. It is the form synthesized in dark-grown seedlings. When Pr absorbs red light, it is convertedto the Pfr form

198. (b) Stone flies are not bio indicators. Bioindicators provide a range of techniques to assess the impcts of air pollution from reactive nitrogen (N) compounds on statutory nature conservation sites. They complement physical monitoring of atmospheric concentrations and deposition and risk assessment based on the critical loads approach by providing site-based information on atmospheric N concentrations, N deposition and/or ecological impacts.

199. (a) It is commonly called as **'emergency hormone'** or 3F – hormone (For fear, fight & flight). Its secretion is regulated by SNS, and not bypituitary as in case of adrenal cortex. It stimulates sweating, heart beat and breathing rate. It causes the dilation of coronary artery (supplying blood to the heart muscles), bronchioles (for increasing inspiratory volume) and pupil (for better vision)

200. (d) The effect of gibberellins had been known in japnan since early 1800 where certain rice plants were found to suffer from bakane or bakanae (foolish seedling) disease. Such rice plants were thin, pale green, spindle-shaped, longer by 50% than the healthy plants, and were sterile.