01. The dimensional formula for thermal resistance is :
   (1) $[M^{-1}L^{-3}T^2K]$ (2) $[ML^2T^{-3}K]$
    (3) $[M^{-1}LT^3K^{-1}]$ (4) $[M^{-1}L^{-2}T^3K]$

02. A point moves with uniform acceleration and v_1, v_2 and v_3 denote the average velocities in the three successive intervals of time t_1, t_2 and t_3. Which of the following realtion is correct ?
    (1) $(v_1 - v_2) : (v_2 - v_3) = (t_1 + t_2) : (t_2 + t_3)$
    (2) $(v_1 - v_2) : (v_2 - v_3) = (t_1 - t_2) : (t_2 - t_3)$
    (3) $(v_1 - v_2) : (v_2 - v_3) = (t_1 + t_2) : (t_2 - t_3)$
    (4) $(v_1 - v_2) : (v_2 - v_3) = (t_1 - t_2) : (t_2 + t_3)$

03. A projectile is launched with a speed of 20 m/s at an angle 30° with the horizontal from a sloping surface of inclination 60°. The range R is (Take g = 10 m/s^2).
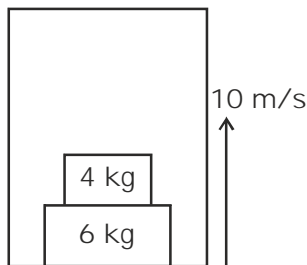   (1) 139 m
    (2) 69 m
    (3) 277 m
    (4) 203 m
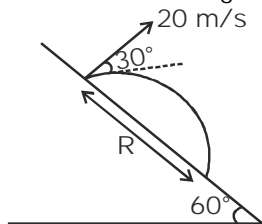
04. A ball is placed on a smooth inclined plane of inclination θ = 60° to the horizontal, which is rotating at frequency 2 Hz about a vertical axis passing through its lower end. At what distance from the lower end does the ball remain at rest?
    (1) 0.89 m   (2) 0.57 m   (3) 0.48 m   (4) 0.22 m

05. Find the force exerted by 6 kg block on floor of lift, as shown in figure. (Take g = 10 m/s^2)

    (1) 280 N   (2) 160 N
    (3) 200 N   (4) 180 N

06. Force acting on a particle is $6\hat{i} + 8\hat{j}$ N. Work done by this force is zero, when a particle is moved on the line 4y + kx = 6. Here value of k is:
    (1) –4   (2) 3   (3) $\dfrac{8}{3}$ (4) $\dfrac{3}{2}$

07. Two balls of equal masses have a head on collision with speed 8 m/s each. If the coefficient of restitution is $\dfrac{1}{8}$, the speed of each ball after impact will be :
   (1) 0.5 m/s   (2) 1 m/s   (3) 2 m/s   (4) 64 m/s

08. In a two block system an initial velocity v_0 with respect to ground is given to block A. Choose wrong statement :
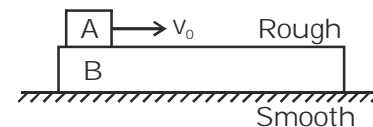
    (1) the momentum of block A is not conserved
    (2) the momentum of system of blocks A and B is conserved
    (3) the increase in momentum of B is equal to the decrease in momentum of block A
    (4) None of these

09. A ring of mass 2m and radius R has three particles attached to the ring as shown in the figure. The centre of the ring has a speed v_0. The kinetic energy of the system in case of no slipping is :
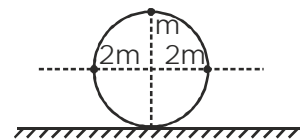
    (1) $8 \, mv_0^2$ (2) $10 \, mv_0^2$
    (3) $12 \, mv_0^2$ (4) $9 \, mv_0^2$

10. A solid sphere of mass 4 kg rolls up a 60° incline with an initial speed of 20 m/s. The maximum height reached by the sphere is ($g = 10$ m/s^2)

    (1) 28 m   (2) 14 m   (3) 21 m   (4) 10.5 m

11. Two particles of mass m and M are initially at rest at infinite distance. Find their relative velocity of approach due to gravitational attraction when d is their separation at any instant :

    (1) $\sqrt{\dfrac{2G(M+m)}{d}}$ (2) $\sqrt{\dfrac{G(M+m)}{2d}}$

    (3) $\sqrt{\dfrac{G(M+m)}{4d}}$ (4) $\sqrt{\dfrac{G(M+m)}{d}}$

12. The rotation of the earth about its axis speeds up such that a man on the equator becomes weightless. In such a situation, what would be the duration of one day ?

    (1) $2\pi\sqrt{\dfrac{R}{6g}}$ (2) $2\pi\sqrt{\dfrac{R}{12g}}$ (3) $2\pi\sqrt{\dfrac{R}{g}}$ (4) $2\pi\sqrt{\dfrac{R}{3g}}$

13. Water rises in a capillary tube to a certain height such that the upward force due to surface tension is balanced by 96×10^{-4} N force due to the weight of the liquid. If the surface tension of water is 12×10^{-2} N/m, the inner diameter of the capillary must be :

    (1) 1.35 mm   (2) 4.2 mm

    (3) 2.54 cm   (4) 5.82 cm

14. The level of water in a tank is 20 m high. A hole of diameter, 0.5 cm is made at the bottom of the tank. The rate of leakage of water from the hole is ($g = 10$ m/s^2)

    (1) $\pi \times 10^{-3}$ m^3/sec.   (2) 4×10^{-4} m^3/sec.

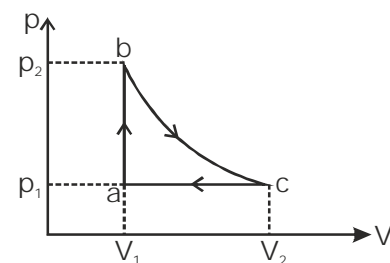   (3) 2×10^{-4} m^3/sec.   (4) $2\pi \times 10^{-3}$ m^3/sec

15. Carbon monoxide is carried around a closed abca in which bc is an isothermal process as shown in the figure. The gas absorbs 8000 J of heat as its temperature increases from 400 K to 1200 K in going from a to b. The quantity of heat rejected by the gas during the process ca is approximately:

    (1) 9200 J

    (2) 10400 J

    (3) 11800 J

    (4) 11200 J

16. In an adiabatic expansion, a gas does 60 J of work while in an adiabatic compression 80 J of work is done on a gas. The change of internal energy in the two processes respectively are :

    (1) –60 J, –80 J   (2) –60 J, +80 J

    (3) +60 J, –80 J   (4) +60 J, +80 J

17. The thickness of a metallic plate is 0.2 cm. The temperature between its two surface is 10°C. The quantity of heat flowing per second is 80 cal from 2 cm^2 area. In SI system, the coefficient of thermal conductivity will be :

    (1) 80   (2) 160   (3) 336   (4) 168

18. Each molecule of gas has f degrees of freedom. The ratio $\dfrac{C_P}{C_V} = \gamma$ for the gas is :

    (1) $1+\dfrac{f}{2}$ (2) $1+\dfrac{1}{f}$ (3) $1+\dfrac{2}{f}$ (4) $\dfrac{f}{2}$

19. Two rods of length l_1 and l_2 are made of materials whose coefficient of linear expansions are α_1 and α_2 respectively. If the difference between two lengths is independent of temperature, then :

    (1) $\dfrac{l_1}{l_2} = \dfrac{\alpha_1}{\alpha_2}$ (2) $\dfrac{l_1}{l_2} = \dfrac{\alpha_2}{\alpha_1}$

    (3) $l_2^2\,\alpha_1 = l_1^2\,\alpha$ (4) $\dfrac{\alpha_1^2}{l_1} = \dfrac{\alpha_2^2}{l_2}$

20. Frequency of oscillation is proportional to :
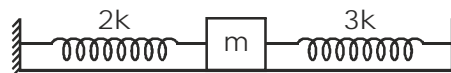
    (1) $\sqrt{\dfrac{5k}{m}}$ (2) $\sqrt{\dfrac{5k}{6m}}$ (3) $\sqrt{\dfrac{6k}{m}}$ (4) $\sqrt{\dfrac{m}{5k}}$

21. Fundamental frequency of a sonometer wire is n, if the tension is made 2 times and length and diameter are also increased 2 times, what is the new frequency ?

    (1) $\dfrac{n}{4}$ (2) $\dfrac{n}{2}$ (3) $\dfrac{n}{4\sqrt{2}}$ (4) $\dfrac{n}{2\sqrt{2}}$

22. Two waves are passing through a region in the same direction at the same time. If the equation of these waves are
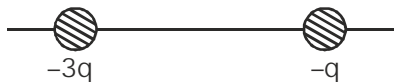
    $$y_1 = a \sin \frac{\pi}{\lambda}(vt - x)$$

    $$y_2 = b \sin \frac{\pi}{\lambda}[(vt - x) + x_0]$$

    then the amplitude of the resultant wave for

    $x_0 = \dfrac{\lambda}{2}$, is :

    (1) $|a - b|$ (2) $\sqrt{a^2 + b^2}$

    (3) $(a + b)$ (4) zero

23. The figure shows two charged particle on x-axis. The particles are free to move. However, at one point, a third charged particle can be placed such that all three particles would be in equilibrium.


    -3q   -q

    1. Is the third particle positively charged ?
    2. Is the point where the third particle is placed to the left, right or between the two charges?

    (1) negative, to their right
    (2) positive, between them
    (3) negative, to their left
    (4) positive, to their right

24. If a linear isotropic dielectric is placed in an electric field of strength E, then the polarization P is :

    (1) inversely proportional to E
    (2) directly proportional to $\sqrt{E}$
    (3) inversely proportional to $\sqrt{E}$
    (4) directly proportional to E

25. When 136 V is applied across a wire that is 20 m long and has a 0.2 mm radius, the current density is 8×10^4 A/m^2. The resistivity of the wire is :

    (1) 8.5×10^{-5} Ωm   (2) 2.2×10^{-4} Ωm
   (3) 3.2×10^{-5} Ωm   (4) 4.5×10^{-4} Ωm

26. A bulb of 100W, 220V is operated on a line of 98 V, then what will be the power consumed ?

    (1) 19.8 W   (2) 22.4 W
    (3) 16.4 Ω   (4) 12.8 W

27. A neutron, a proton, an electron and an α-particle enter a region of uniform magnetic field with the same velocities. The magnetic field is perpendicular and directed into the plane of the paper. The tracks of the particles are labelled in the figure. The α-particle follows the track
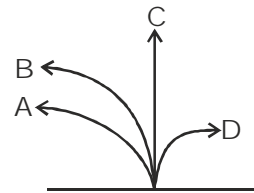
    (1) A   (2) B   (3) C   (4) D

28. An equilateral triangle is made by uniform wires AB, BC, CA. A current I enters at A and leaves from the mid point of BC. If the lengths of each side of the triangle is L, the magnetic field B at the centroid O of the triangle is :
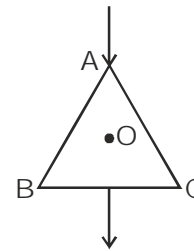

    (1) $\dfrac{\mu_0}{4\pi} \dfrac{2\sqrt{3}\, I}{L}$ (2) $\dfrac{\mu_0}{4\pi} \dfrac{4\sqrt{3}\, I}{L}$

    (3) $\dfrac{\mu_0}{4\pi} \dfrac{\sqrt{3}\, I}{L}$ (4) None of these

29. A magnet of magnetic moment M is rotated through 360° in a magnetic field B, the work done will be :

    (1) 2 MB   (2) MB

    (3) Zero   (4) 4 MB

30. A circular coil with a cross-sectional area of 8 cm^2 has 20 turns. It is placed at the centre of a long solenoid that has 30 turns/cm and a cross-sectional area of 12 cm^2, as shown in the figure. The axis of the coil coincides with the axis of the solenoid. What is their mutual inductance ?
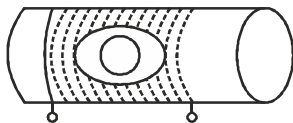
    (1) 0.2 mH   (2) 20.8 µH

    (3) 0.04 mH   (4) 60.3 µH

31. Which of the following is the best method to reduce eddy currents ?

    (1) Laminating core

    (2) Using thick wires

    (3) Reducing hysteresis loss

    (4) None of these

32. An arc lamp requires a direct current of 20 A at 120 V to function. If it is connected to a 220 V (rms), 100 Hz AC supply, the series inductor needed for it to work is close to :

    (1) 3.5 mH   (2) 5.6 mH   (3) 8.8 mH   (4) 14.7 mH

33. For plane electromagnetic waves propagating in the +z direction, which one of the following combination gives the correct possible direction for $\vec{E}$ and $\vec{B}$ field respectively ?

    (1) $(2\hat{i} + \hat{j}), (\hat{i} + 2\hat{j})$ (2) $(6\hat{i} + 4\hat{j}), (4\hat{i} - 6\hat{j})$

    (3) $(-4\hat{i} - 3\hat{j}), (3\hat{i} - 4\hat{j})$ (4) $(3\hat{i} + 2\hat{j}), (2\hat{i} - 3\hat{j})$

34. A ray of light is incident at the glass-liquid interface at an angle i. It emerges finally parallel to the surface of liquid. Then the value of μ_g would be :
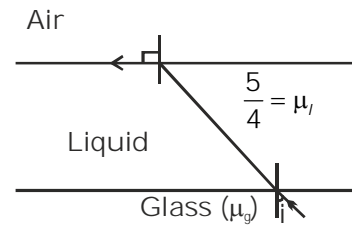
    (1) $\frac{5}{4}\sin i$ (2) $\frac{5}{4\sin i}$ (3) $\frac{\sqrt{5}}{2\sin i}$ (4) $\frac{1}{\sin i}$

35. A convex lens is in contact with concave lens. The magnitude of the ratio of their focal lengths is $\frac{3}{4}$. Their equivalent focal length is 60 cm. What are their individual focal lengths (in cm) :

    (1) –15, 20   (2) –20, 15

    (3) –105, 140   (4) –140, 105

36. In the ideal double-slit experiment, when a glass-plate (refractive index 1.5) of thickness t is introduced in the path of one of the interfering beams (wavelength $\frac{\lambda}{2}$), the intensity at the position where the central maximum occurred previously remains unchanged. The minimum thickness of the glass-plate is :
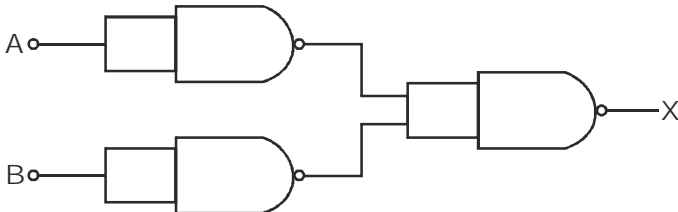
    (1) λ (2) $\frac{4\lambda}{3}$ (3) $\frac{\lambda}{4}$ (4) $\frac{2\lambda}{3}$

37. A ray of light passes through four transparent media with refractive indices μ_1, μ_2, μ_3 and μ_4 as show in the figure. The surfaces of all media are parallel. If the emergent ray CD is parallel to the incident ray AB, we must have :
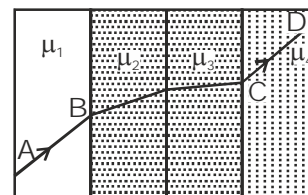
    (1) $\mu_1 = \mu_2$ (2) $\mu_2 = \mu_3$

    (3) $\mu_3 = \mu_4$ (4) $\mu_4 = \mu_1$

38. In Young's double slit experiment, one of the slit is wider than other, so that the amplitude of the light from one slit is triple of that from other slit. If I_m be the maximum intensity, the resultant intensity I when they interfere at phase difference ϕ is given by :

(1) $\dfrac{I_m}{4}\left(1 + 3\cos^2 \dfrac{\phi}{2}\right)$

(2) $\dfrac{I_m}{16}\left(1 + 12\cos^2 \dfrac{\phi}{2}\right)$

(3) $\dfrac{I_m}{8}\left(1 + 6\cos^2 \dfrac{\phi}{2}\right)$

(4) $\dfrac{I_m}{2}\left(1 + 18\cos^2 \dfrac{\phi}{2}\right)$

39. The work function of a substance is 6 eV. The longest wavelength of light that can cause photoelectron emission from this substance is approximately :

(1) 3316 Å (2) 3802 Å (3) 2062 Å (4) 2477 Å

40. If a star can convert all the He nuclei completely into oxygen nuclei, the energy released per oxygen nuclei is [Mass of He nucleus is 4.0026 amu and mass of oxygen nucleus is 15.9994 amu]

(1) 11169.02 MeV   (2) 10.24 MeV

(3) 56.12 MeV   (4) 7.6 MeV

41. The radius of the orbit of an electron in a Hydrogen-like atom is $4.5a_0$, where a_0 is the Bohr radius. Its orbital angular momentum is $\dfrac{3h}{2\pi}$. It is given that h is Planck constant and R is Rydberg constant. The possible wavelength(s), when the atom de-excites, is (are)

(1) $\dfrac{1}{3R}$ (2) $\dfrac{9}{16R}$ (3) $\dfrac{4}{3R}$ (4) $\dfrac{9}{10R}$

42. A radioactive sample at any instant has its disintegration rate 6000 disintegrations per minute. After 10 minutes, the rate is 750 disintegrations per minute. Then, the decay constant (per minute) is :

(1) 0.5 ln 2   (2) 0.3 ln 2

(3) 0.25 ln 2   (4) 0.15 ln 2

43. When p-n junction diode is forward biased, then:

(1) the depletion region is reduced and barrier height is increased

(2) the depletion region is widened and barrier height is reduced.

(3) both the depletion region and barrier height are reduced

(4) both the depletion region and barrier height are incereased

44. The energy band gap is maximum in :

(1) metals   (2) superconductors

(3) insulators   (4) semiconductors.

45. The combination of gates shown below yields :

(1) AND gate   (2) OR gate

(3) NOT gate   (4) NOR gate

46. In compound A, 1.00 g of nitrogen unites with 0.57 g of oxygen. In compound B, 2.00 g of nitrogen combines with 2.24g of oxygen. In compound C, 3.00g of nitrogen combines with 5.11g of oxygen. These results obey the following law
(1) law of constant proportion
(2) low of multiple proportion
(3) low of reciprocal proportion
(4) Dalton's law of partial pressure

47. The electrons, identified by quantum numbers n and l (i) n = 4, l = 1(ii) n = 4, 1 = 0 (iii) n = 3, 1 =2 (iv) n = 3, l = 1 can be placed in order of increasing energy, from the lowest to highest, as
(1) (iv) < (ii) < (iii) < (i)   (2) (ii) < (iv) < (i) < (iii)
(3) (i) < (iii) < (ii) < (iv)   (4) (iii) < (i) < (iv) < (ii)

48. Energy of an electron is given by

$E = -2.178 \times 10^{-18} J\left(\dfrac{Z^2}{n^2}\right)$ .Wavelength of light required to excite an electron in an hydrogen atom from level n = 1 to n = 2 will be :(h = 6.62 × 10^{-34} Js and c = 3.0 × 10^8 ms^{-1})

(1) 1.214×10^{-7} m   (2) 2.816×10^{-7} m
(3) 6.500×10^{-7} m   (4) 8.500×10^{-7} m

49. Arrange the following in increasing order of ionic radii ?$C^{4-}, N^{3-}, F^-, O^{2-}$
(1) $C^{4-} < N^{3-} < O^{2-} < F^-$
(2) $N^{3-} < C^{4-} < O^{2-} < F^-$

(3) $F^- < O^{2-} < N^{3-} < C^{4-}$
(4) $O^{2-} < F^- < N^{3-} < C^{4-}$

50. The values of E.N of atoms A and B are 1.20 and 4.0 respectively. The percentage of ionic character of A – B bond is
(1) 50%   (2) 72.24 %
(3) 55.3%   (4) 43%

51. Among the following ions, the $p\pi - d\pi$ overlap could be present in
(1) NO_3^- (2) PO_4^{3-}
(3) CO_3^{2-} (4) NO_2^-

52. Equal masses of H_2, O_2 and methane have been taken in a container of volume V at temperature 27°C in identical conditions. The ratio of the volumes of gases $H_2 : O_2$: methane would be :
(1) 8 : 16 : 1   (2) 16 : 8 : 1
(3) 16 : 1 : 2   (4) 8 : 1 : 2

53. Assuming that water vapour is an ideal gas, the internal energy change (ΔU) when 1 mol of water is vapourised at 1 bar pressure and 100°C,(given : molar enthalpy of vapourisation of water at 1 bar and 373 K = 41 kJ mol^{-1} and R = 8.3 J mol^{-1} K^{-1}) will be
(1) 41.00 kJ mol^{-1} (2) 4.100 kJ mol^{-1}
(3) 3.7904 kJ mol^{-1} (4) 37.904 kJ mol^{-1}.

54. Consider the following spontaneous reaction
$$2C_8H_{18}(g) + 25\ O_2(g) \rightarrow 16CO_2(g) + 18H_2O(g)$$
The sign of $\Delta H, \Delta S, \Delta G$ would be respectively
(1) +, – +   (2) –, +, –
(3) +, +, –   (4) –, –, –

55. For the following reaction in gaseous phase
$$CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g), K_p / K_c \text{ is}$$
(1) $(RT)^{1/2}$ (2) $(RT)^{-1/2}$
(3) (RT) (4) $(RT)^{-1}$

56. 2.5 ml of (2/5)M weak monoacidic base ($K_b = 1 \times 10^{-12}$ at 25°) is titrated with (2/15)M HCl in water at 25°C. The concentration of H^+ at equivalence point is ($K_W = 1 \times 10^{-14}$ at 25°C)
(1) 3.7×10^{-14} M   (2) 3.2×10^{-7}M
(3) 3.2×10^{-2}M   (4) 2.7×10^{-2} M

57. Which of the following is a redox reaction ?
(1) $NaCl + KNO_3 \rightarrow NaNO_3 + KCl$
(2) $CaC_2O_4 + 2HCl \rightarrow CaCl_2 + H_2C_2O_4$
(3) $Mg(OH)_2 + 2NH_4Cl \rightarrow MgCl_2 + 2NH_4OH$
(4) $Zn + 2AgCN \rightarrow 2Ag + Zn(CN)_2$

58. Which statement is correct for hydrogen ?
(1) It has a very high ionisation potential
(2) It is always collected at cathode
(3) It can exists both in +1 as well as – 1 oxidation state
(4) It has same electronegativity as halogens

59. A metal salt solution forms a yellow precipitate with potassium chromate in acetic acid, a white precipitate with dil H_2SO_4, but gives no precipitate with NaCl. The metal salt solution will consist of
(1) $PbCO_3$ (2) $BaCO_3$
(3) $MgCO_3$ (4) $CaCO_3$

60. Anhydrous $AlCl_3$ cannot be obtained from which of the following reactions ?
(1) Heating $AlCl_3.6H_2O$
(2) By passing dry HCl over hot aluminium powder
(3) By passing dry Cl_2 over hot aluminium powder
(4) By passing dry Cl_2 over a hot mixture of alumina and coke

61. The r_+/r_- ratio of ZnS is 0.402. Pick out the false statements of the following
(1) ZnS is 4 : 4 coordination compound
(2) ZnS does not crystallize in rock salt type lattice because r_+/r_- is too smal to avoid overlapping of S^{2-} ions
(3) Zn^{2+} ion in too small to fit precisely into the octahedral voids of S^{2-} ions
(4) Zn^{2+} ion is too large to fit into the octahedral voids of S^{2-} ions.

62. The vapour pressure of a solution of the liquids A (p° = 80 mm Hg and x_A = 0.4) and B(p° =120 mm Hg and x_B = 0.6) is found to be 100 mm Hg. It shows that the solution exhibits
(1) positive deviation from ideal behaviour
(2) negative deviation from ideal behaviour
(3) ideal behaviour
(4) positive deviation for lower conc. and negative for higher conc.

63. A solution of urea (mol. mass 56 g mol^{-1}) boils at 100.18°C at the atmospheric pressure.If K_f and K_b for water are 1.86 and 0.512 K kg mol^{-1} respectively, the above solution will freeze at
(1) 0.654°C   (2) – 0.654°C
(3) 6.54°C   (4) –6.54°C

64. An electrolytic cell contains a solution of Ag_2SO_4 and has platinum electrodes. A current is passed until 1.6 gm of O_2 has been liberated at anode. The amount of silver deposited at cathode would be

(1) 107.88 gm (2) 1.6 gm
(3) 0.8 gm (4) 21.60 gm

65. A gas X at 1 atm is bubbled through a solution containing a mixture of 1 M Y^- and M Z^- at 25°C. If the reduction potential of Z > Y > X, then,
(1) Y will oxidize X and not Z
(2) Y will oxidize Z and not X
(3) Y will oxidize both X and Z
(4) Y will reduce both X and Z

66. For the first order reaction
$C_2H_4O(g) \rightarrow CH_4(g) + CO(g)$, the initial pressure of $C_2H_4O(g)$ is 80 torr and total pressure at the end of 20 minutes is 120 torr. The time needed for 75% decomposition of C_2H_4O would be :
(1) 20 minutes (2) 40 minutes
(3) 80 minutes (4) 120 minutes

67. Which of the following gas molecules have maximum value of enthalpy of physisorption ?
(1) C_2H_6 (2) Ne
(3) H_2O (4) H_2

68. The metal oxide which cannot be reduced to metal by carbon is :
(1) Fe_2O_3 (2) Al_2O_3
(3) PbO (4) ZnO

69. The oxyacid of phosphorous in which phosphorous has the lowest oxidation state is
(1) hypophosphorous acid
(2) orthophosphoric acid
(3) pyrophosphoric acid
(4) metaphosphoric acid

70. Consider the following complex $[Co(NH_3)_5CO_3]ClO_4$. The coordination number, oxidation number, number of d – electrons and number of unpaired d – electrons on the metal are respectively
(1) 6, 3, 6, 0 (2) 7, 2, 7, 1
(3) 7, 1, 6, 4 (4) 6, 2, 7, 3

71. Which one of the following coordination compounds is used to inhibit the growth of tumours ?
(1) Trans – platin (2) EDTA complex of calcium
(3) $[(Ph_3P)_3RhCl]$ (4) Cis – platin

72. The crystals of ferrous sulphate on heating give :
(1) $FeO + SO_2 + H_2O$
(2) $FeO + SO_3 + H_2SO_4 + H_2O$
(3) $Fe_2O_3 + SO_2 + H_2SO_4 + H_2O$
(4) $Fe_2O_3 + H_2SO_4 + H_2O$

73. When a mixture of calcium benzoate and calcium acetate is dry distilled, the resulting compound is :-
(1) Acetophenone (2) Benzaldehyde
(3) Benzophenone (4) Acetaldehyde

74. Methyl $-\alpha$ – D–glucoside and methyl $-\beta$ – D –glucoside are called
(1) Geometrical isomers (2) Anomers
(3) Enantiomers (4) Epimers

75. In the reaction sequence :
cyclohexane $\xrightarrow{Cl_2/hv}$ (A) $\xrightarrow{alc. KOH/\Delta}$ (B) $\xrightarrow[\text{(ii) } H_2O/Zn]{\text{(i) } O_3}$ (C) , 'C' will be
(1) Hexanal (2) 2-Hexanone
(3) 3-Hexanone (4) Hexanedial

76. Buna -S is a polymer of :-
(1) Butadiene only (2) Styrene only
(3) Butadiene and styrene
(4) Butadiene and Acrylonitrile

77. $CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(\ell)}; \Delta H = -890kJ$
What is the calorific value of CH_4
(1) 55625 J / g (2) 50625 J / g
(3) 45590 J / g (4) 33099 J / g

78. Phenol and benzoic acid can be distinguished by :
(1) $NaHCO_3$ (2) NaOH
(3) Na (4) PCl_5

79. In the reaction
$C_2H_5OH \xrightarrow{Pl_3} (A) \xrightarrow{KCN} (B) \xrightarrow{Hydrolysis} (C)$
The product (C) is :-
(1) Acetic acid (2) Formic acid
(3) Oxalic acid (4) Propionic acid

80. In the given reaction :
$CH_3-CH-CH_2$ (epoxide) $\xrightarrow[\text{(ii) HOH/H}^+]{\text{(i) CH}_3\text{MgBr}}$ [X], [X] will be :-

(1) $CH_3-CH-CH_2-OH$ with CH_3
(2) $CH_3-CH-CH_2-CH_3$ with OH
(3) $CH_3-C(OH)(CH_3)-CH_3$
(4) $CH_3-CH=CH_2$

81. In the reaction sequence :

    $$CHCl_3 \xrightarrow{Air/hv} [X] \xrightarrow[\text{(Excess)}]{C_6H_6/Anhy.AlCl_3} [Y]$$

    [Y] will be :-

    (1) $Cl-\overset{\overset{\displaystyle O}{\|}}{C}-Cl$

    (2) $C_6H_5-\overset{\overset{\displaystyle O}{\|}}{C}-Cl$

    (3) $C_6H_5-\overset{\overset{\displaystyle O}{\|}}{C}-C_6H_5$

    (4) $C_6H_5 - CHO$

82. The inner orbital complex which exhibits both geometrical as well as optical isomerism ?

    (1) $[Cr(en)_3]^{3+}$
    (2) $[IrF_3(H_2O)_3]$

    (3) $[NiCl_2(en)_2]$
    (4) $[CO(CN)_2(OX)_2]^{3-}$

83. Cloud burst due to :
    (1) Attraction towards the electrical charges on the earth
    (2) Large amount of water present in the cloud
    (3) Dense clouds are present in the upper atmosphere
    (4) Mutual discharge oppositely charged clouds resulting in the coagulation

84. Which one of the following alkenes has minimum heat of hydrogenation :-
    (1) 2,3–dimethyl–2–butene
    (2) 2–methyl propene
    (3) propene
    (4) 2–butene

85. Nitrobenzene give N-phenylhydroxylamine by :–

    (1) Sn/HCl
    (2) $H_2/Pd - C$

    (3) Zn/NaOH
    (4) Zn/NH_4Cl

86. Which one of the following is most reactive for SN^2 reaction:–

    (1) $\underset{\displaystyle CH_3}{CH_3-CH-Br}$
    (2) $C_6H_5 - CH_2 - Br$

    (3) $CH_3 - CH_2 - I$
    (4) $CH_3 - CH_2 - O - CH_3$

87. In the given reaction

    $$C_6H_5CH_2 - COOH \xrightarrow[\text{(ii)}P_2O_5]{\text{(i)}NH_3/\Delta} [X], [X] \text{ will be :-}$$

    (1) $C_6H_5 - CH_2COONH_4$
    (2) $C_6H_5CH_2CONH_2$

    (3) $C_6H_5 - CH_2 - CN$
    (4) C_6H_5CN

88. When propanamide reacts with Br_2/KOH then which of the following compound is formed :-
    (1) Ethyl alcohol
    (2) Propyl alcohol
    (3) Propylamine
    (4) Ethylamine

89. The IUPAC name of the compound is ?

    $$\underset{\displaystyle OCH_3}{CH_3-CH_2-CH-CH_2-OH}$$

    (1) 2–Methoxy–1–butanol
    (2) 3–Methoxy–1–butanol
    (3) 3–Methoxy–4–butanol
    (4) 1,2–Methoxy butanol

90. Which is not colloidal
    (1) Chlorophyll
    (2) Egg
    (3) Ruby Glass
    (4) Milk

91. Axillary buds of stems get modified into woody, straight and pointed thorns in :
    (1) Opuntia
    (2) Bougainvillea
    (3) Euphorbia
    (4) Silk cotton

92. Trees occupy top vertical layer of a forest, shrubs the second and herbs and grasses occupy the bottom layers. This is an example of :
    (1) Pyramid
    (2) Divergence
    (3) Stratification
    (4) Zonation

93. As various ions from the soil are actively transported into the vascular tissues of the roots, water follows and increases the pressure inside the xylem. This is :
    (1) Positive pressure and can be responsible for pushing up water to small heights in the stem
    (2) Negative pressure and can be responsible for pulling water to small heights in the stem
    (3) Positive pressure and can be responsible for pulling water to small heights in the stem
    (4) Negative pressure and can be responsible for pushing water to small heights in the stem.

94. Gene regulation governing lactose operon of E.coli that involves the 'z' gene which.
    (1) Codes for the repressor of the lac operon
    (2) Codes for beta-galactosidase, which is responsible for the hydrolysis of the disaccharide

(3) Codes for permease, which increases permeability of the cell

(4) Encodes a transacetylase

95. The sewage water is treated till.

(1) The BOD is increased

(2) The BOD is maintained

(3) The BOD is reduced

(4) The BOD is sufficient for the survival of the organisms.

96. Which one of the following matches is correct.

(1) Rhizopus – Parasitic fungus – Phycomycetes

(2) Penicillium – Branched aseptate mycelium
– Ascomycetes

(3) Agaricus – Asexual spores are conidia
– Basidiomycetes

(4) Trichoderma – Sexual reproduction absent
– Deuteromycetes

97. Which of these is not an important event during fertilisation in human female.

(1) A sperm comes in contact with the zona pellucida layer of the ovum

(2) Contact of sperm with zona pellucida layer induces changes in the membrane

(3) Changes in the membrane allow the entry of sperms

(4) The secretion of the acrosome help the sperm enter into the cytoplasm of the ovum.

98. A chemical that involved in maintaining the cardio-vascular system as well as the kidney functions.

(1) Cortisol   (2) Melatonin

(3) Calcitonin   (4) Epinephrine

99. Match each disease with its correct type of symptoms

(a) Typhoid   (i) Cough and headache

(b) Pneumonia   (ii) Sustained high fever

(c) Common cold (iii) The chill and high fever recurring

(d) Malaria   (iv) Nasal congestion and discharge

(1) (a-ii); (b-i); (c-iii); (d-iv)

(2) (a-ii); (b-iv); (c-i); (d-iii)

(3) (a-ii); (b-i); (c-iv); (d-iii)

(4) (a-i); (b-ii); (c-iv); (d-iii)

100. Nuclear envelope is the derivative of :

(1) Phospholipids   (2) Protein and lipids

(3) Phosphoproteins   (4) Glucoproteins

101. Mung bean, produced through mutation breeding is resistant to :

(1) Bacteria (2) Virus (3) Fungi   (4) Insects

102. Vascular bundles in dicotyledons are considered open because :

(1) Xylem is surrounded all around by phloem

(2) There are vessels with perforations

(3) Parenchymatous cells become meristematic

(4) Combium is present.

103. Read the following four statements (a & d) and select the option with all correct statements.

(a) All pteridophytes have dipolid, independent, photosynthetic, vascular plant body

(b) Life cycle of an alga polysiphonia is gametophytic

(c) Selaginella is homosporous

(d) Species of sphagnum provide peat that have long been used as fuel

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

104. The true nucleus is absent in :

(1) Fucus   (2) Mucor

(3) Vaucheria   (4) Nostoc

105. Which one of the following statements is not true.

(1) Carrot grass has become abiquitous in a occurrence in India and causes pollen allergy

(2) The use of pollen tablets as food supplements become a fashion in recent years

(3) Pollen consumption increases the performance of athletes and race horses

(4) The viability of the pollen grains of leguminoseae is very short.

106. Removal of the ascending limb of Henle's loop from the nephron will result in :

(1) No urine formation

(2) More concentrated urine

(3) More diluted urine

(4) No change in quality and quantity of urine

107. Mountaineer balance their body while doing the their job because of :

(1) Cochlea

(2) Vestibular apparatus

(3) Tectorial membrane

(4) Organ of corti

108. The hilum is a scar on the :
    (1) Fruit, where style was present
    (2) Seed, where micropyle was present
    (3) Fruit, where pedicel was attached
    (4) Seed, where funicle was attached.

109. Which one of the following is correct.
    (1) Blood group -A – antigen-B – antibody-A
    (2) Blood group-B – antigen-B – antibody-B
    (3) Blood group-AB – antigen-A,B–antibody-absent
    (4) Blood group-O – antigen-O-antibodies-A,B.

110. The guts of cow and buffalo possess.
    (1) Archaebacteria   (2) Cyanobacteria
    (3) Chrysophytes   (4) Dinoflagellates

111. Which one of the following is functionally cross-pollination, but genetically it is similar to autogamy.
    (1) Xenogamy   (2) Cleistogamy
    (3) Geitonogamy   (4) Chasmogamy

112. An organism, which has double stranded DNA, 15% of the bases were shown to be cytosine. The percentages of the other three bases expected to be present in this DNA are :
    (1) A–15%, G–30%, T–30%
    (2) A–30%, G–30%, T–15%
    (3) A–30%, G–15%, T–30%
    (4) A–30%, G–15%, T–15%

113. Spermiation refers to :
    (1) Formation of primary spermatocytes
    (2) The process of releasing of sperms from the seminiferous tubules
    (3) Transformation of the spermatids into sperms
    (4) The formation of spermatids

114. Which of the following had the largest brain capacity.
    (1) Homo erectus
    (2) Homo neanderthalensis
    (3) Homo sapiens
    (4) Homo habilis

115. Which of the following viruses is not transferred through semen of an infected male.
    (1) Mumps virus   (2) Hepatitis B virus
    (3) HIV virus   (4) Herpes virus

116. A major characteristic of the monocot root is the presence of :
    (1) Vascular bundles are arranged in a ring
    (2) Presence of phloem parenchyma
    (3) Has a sclerenchymatous hypodermis
    (4) Vascular bundle is conjoint and open

117. When all the four chambers of heart are in a relaxed state then.
    (1) They are in joint systole
    (2) They are in joint diastole
    (3) They are in auricular distole
    (4) They are in ventricular systole

118. In Bt cotton, the inactive prototoxin protein is converted into active toxin in the gut of insect due to :
    (1) Action of enzyme in the gut
    (2) Acidic pH
    (3) Presence of conversation factors
    (4) Alkaline pH

119. The amount of biomass produced per unit area over a time period by plants during photosynthesis.
    (1) Primary production
    (2) Productivity
    (3) Gross primary productivity
    (4) Net primary productivity

120. In a ring barking experiment.
    (1) The shoot dies first
    (2) The root dies first
    (3) Neither root nor shoot will die
    (4) Both the root and the shoot die together

121. Immature lymphocytes differentiate into antigen-sensitive lymphocytes in :
    (1) Lymph nodes   (2) Tonsils
    (3) Peyer's patches   (4) Thymus

122. Vexillary aestivation of petals is the characteristic feature of flower of :
    (1) Tomato   (2) Tulip
    (3) Indigofera   (4) Aloe

123. In which of the following gametophyte is not independent and free-living.
    (1) Cycas   (2) Equisetum
    (3) Sphagnum   (4) Selaginella

124. A number of organised flattened membranous sacs present in the stroma of chloroplast are :
    (1) Grana   (2) Stroma lamellae
    (3) Thylakoids   (4) Cristae

125. Malfunctioning of kidneys can lead to :
    (1) Excretion of more urea through urine
    (2) Accumulation of urea in blood
    (3) Accumulation of NaCl in blood
    (4) Accumulation of ketone bodies in blood.

126. DNA is not present in :
    (1) Nucleus
    (2) Chloroplast
    (3) Mitochondria
    (4) ER.

127. To sustain animal visits, the flowers have to provide to the animals.
    (1) Foul odours
    (2) Nectar and pollen grains
    (3) Colour and fragrance
    (4) Fragrance and stigmatic exudates

128. Which of the following represents the correct combination without any exception.
    (1) Dioecious — Arthropoda
    (2) Marine — Protochordates
    (3) Fresh water — Osteichthyes
    (4) Three chambered — Reptilia
        heart

129. Alleles are :
    (a) Genes which code for a pair of similar traits
    (b) Slightly different forms of the same gene.
    Which of the following options is true.
    (1) Both (a) and (b) are true
    (2) Both (a) and (b) are false
    (3) (a) is true but (b) is false
    (4) (b) is true but (a) is false

130. Tubectomy is the :
    (1) Sterilisation procedure in the male
    (2) Sterilisation procedure in the female
    (3) Surgical removal of vas deference
    (4) Surgical removal of uterus

131. The Paris Agreement on climate change was achieved on :
    (1) 5 October 2016
    (2) 15 November 2016
    (3) 18 November 2016
    (4) 7 October 2016

132. HIV infected person starts suffering from infections due to :
    (1) Decrease in number of thromocytes
    (2) Decrease in number of leucocytes
    (3) Decrease in number of helper T-lymphocytes
    (4) Decrease in number of β-lymphocytes

133. Which one of the following statements is wrong.
    (1) Laminarin is the reserve food found in gracilaria and gelidium
    (2) Spirullina is a unicellular alga
    (3) Agar is obtained from gracilaria and gelidium
    (4) Porphyra, a marine alga used as food

134. Gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques, is an example of :
    (1) In-situ conservation
    (2) In-vitro conservation
    (3) Ex-situ conservation
    (4) In-situ cryo-conservation

135. Select the correct matching in the following pairs :
    (1) SER — Observed in the cells actively involved in protein synthesis
    (2) RER — Major sites for synthesis of lipids
    (3) SER — Synthesise steroidal hormones in animals
    (4) RER — Extension of inner membrane of nucleus

136. Primary succession takes place on/in.
    (1) Abandoned farm Land
    (2) Newly created pond
    (3) Burned forests
    (4) Lands that have been flooded.

137. Which one of the following diseases is different from the others.
    (1) Trichomoniasis
    (2) Gonorrhoea
    (3) Chlamydiasis
    (4) Encephalitis

138. The F_2 ratio in a dihybrid cross deviated very significantly from the 9 : 3 : 3 : 1 ratio, when :
    (1) The two genes are independent
    (2) The two genes did not segregate independently
    (3) The two genes are not physically associated
    (4) Two genes are present on the two different chromosomes

139. The following graph depicts changes in two populations (A and B) of herbivores in a grassy field. What would be the possible reason for these changes.
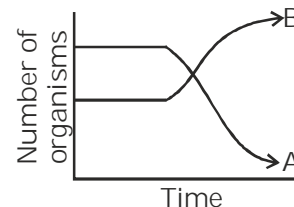
    (1) Population of A and B is increased
    (2) Population of A and B is decreased
    (3) Population A is inferior competitor
    (4) Population B is inferior competitor

140. What would be the growth curve when a root elongating at a constant rate.
    (1) Linear
    (2) Sigmoid
    (3) Parabolic
    (4) Hyperbolic

141. Plant factor that does not affect transpiration is:
    (1) Number of stomata
    (2) Distribution of stomata
    (3) Number of stomata open
    (4) Guard cells

142. NADH is/are produced in :
    (1) Mitochondrial matrix
    (2) Cytoplasm
    (3) Cytoplasm and mitochondrial matrix
    (4) The inner mitochondrial membrane.

143. Robert Constanza and his colleagues are related to :
    (1) Ecosystem services
    (2) Ecosystem management
    (3) Noise pollution
    (4) Population explosion

144. Which of the following regions of the brain is incorrectly paired with its function.
    (1) Medulla — Control respiration
    (2) Hypothalamus — Control urge for eating and drinking
    (3) Cerebellum — Control gastric secretion
    (4) Limbic lobe — Regulation of sexual behaviour

145. Which of the following characteristics is not true regarding insects.
    (1) They are bilaterally symmetrical
    (2) They are diploblastic and segmented
    (3) They have open type of circulatory system
    (4) They possess chitinous exoskeleton

146. Mechanism of muscle contraction is best explained by the sliding filament theory which states that contraction of a muscle fibre takes place by :
    (1) The sliding of the thin filaments over the thick filaments
    (2) The sliding of the thick filaments over the thin filaments
    (3) Sliding of thin and thick filaments towards each other

    (4) Sliding of thin and thick filaments away from each other.

147. Which one of the following is not an inclusion body found in prokaryotes.
    (1) Glycogen granule
    (2) Phosphate granule
    (3) Cyanophycean granule
    (4) Plasmid

148. The amount of nutrients present in the soil at any given time is referred to as :
    (1) Standing crop
    (2) Standing state
    (3) Gross primary productivity
    (4) Biogeochemical

149. Match Column I with Column II and select the true option.
    (a) Synthesis of protein — (i) Zygotene
    (b) Chromosomes start pairing — (ii) G_2
    (c) Tetrads — (iii) Diakinesis
    (d) Terminalisation — (iv) Pachytene
    (1) (a-ii); (b-i); (c-iv) (d-iii)
    (2) (a-ii); (b-iv); (c-i); (d-iii)
    (3) (a-i); (b-ii); (c-iv); (d-iii)
    (4) (a-ii); (b-i); (c-iii); (d-iv)

150. Multiple alleles can be found only when population studies are made because :
    (1) Multiple alleles are present on non-sister chromatids
    (2) Multiple alleles are present on different chromosomes
    (3) Multiple alleles are present at different loci on the same chromosome
    (4) In an individual only two alleles can be present.

151. Which of the following is not one of the prime health risks associated with greater UV radiation through the atmosphere due to depletion of stratospheric ozone.
    (1) Damage to eyes
    (2) Increased liver cancer
    (3) Reduced Immune system
    (4) Increase skin cancers

152. Single step large mutation is called :
    (1) Speciation
    (2) Saltation
    (3) Genetic drift
    (4) Stabilisation

153. Minerals known to be required in very small amounts for plant growth include.

    (1) Copper, Zinc, Boron, Chlorine

    (2) Copper, Zinc, Boron, Nitrogen

    (3) Boron, Zinc, Nitrogen, Sulphur

    (4) Iron, Manganese, Nickel, Calcium

154. Triple fusion is the characteristic feature of :

    (1) Cedrus   (2) Pinus

    (3) Caster   (4) Banana

155. ABO blood groups in humans are controlled by the gene I. It has three alleles-I^A, I^B and i, since there are three different alleles, six different genotypes are possible. How many phenotypes can occur.

    (1) One   (2) Two   (3) Three   (4) Four

156. Which of the following statements is not correct.

    (1) Oxyntic cells present in mucosa of stomach and secrete HCl

    (2) Goblet cells found in intestinal submucosa and secrete mucus

    (3) Renin is proteolytic enzyme found in gastric juice of infants

    (4) The hepatic lobules are the structural and functional units of liver.

157. Epigynous flowers are found in :

    (1) Cucumber   (2) Plum

    (3) Brinjal   (4) Rose

158. An abnormal human baby with 'XXX' sex chromosomes was born due to :

    (1) Fusion of two sperms and one ova

    (2) Fusion of two ova and one sperm

    (3) Fusion of sperm with ova in which cytokinesis does not take place

    (4) Formation of abnormal sperm in father

159. When a green plant exposed to the light on only one side, it bend toward the source of light as it grows, because.

    (1) The cells of lighted side grow faster

    (2) The cells of shaded side grow faster

    (3) Light enhances photosynthesis

    (4) Plants are phototropic

160. The chromosomes in which centromere is terminal is called :

    (1) Metacentric   (2) Submetacentric

    (3) Aerocentric   (4) Telocentric

161. The process of propagation of a plant in which two protoplasts are utilised is called :

    (1) Somatic hybrid   (2) Somatic hybridisation

    (3) Somaclone   (4) Explants

162. What would be the amount of DNA and number of chromosomes in your gametes as compared to somatic cell that has just completed the S phase.

    (1) Amount of DNA is one fourth and number of chromome is half

    (2) The amount of DNA and number of DNA would be half

    (3) The amount of DNA and number of chromosomes would be one fourth

    (4) The amount of DNA and number of chromosomes is one fourth

163. Trypsinogen is activated by :

    (1) Enterokinase, secreted by the intestinal submucosa

    (2) Chymotrypsinogen, secreted by intestinal mucosa

    (3) Enterokinase, secreted by intestinal mucosa

    (4) Procarboxypeptidases, secreted by in testinal mucosa.

164. Which of the following mammals is not viviparous.

    (1) Platypus   (2) Pteropus

    (3) Equus   (4) Balaenoptera

165. $\oplus \male K_{2+2} C_4 A_{2+4} \underline{G}_{(2)}$ is the floral formula of :

    (1) Lupin   (2) Chilli   (3) Gloriosa   (4) Mustard

166. In which of the following both pairs have correct combination.

    (1) In-situ conservation — Seed banks.
        Ex-situ conservation — Zoological parks.

    (2) In-situ conservation — National parks.
        Ex-situ conservation — Zoological parks.

    (3) In-situ conservation — Biosphere reserves.
        Ex-situ conservation — Wildlife sanctuaries

    (4) In-situ conservation — Botanical gardens
        Ex-situ conservation — Cryopreservation

167. Which of the following body of Indian government will make decisions regarding the validity of GM research and the safety of introducing GM organisms for public services.

    (1) ICAR   (2) GEAC   (3) RCGM   (4) ICBN

168. Which of the following parasites generally enter the small intestine through food and water contaminated with them and migrate to other organ through blood.

(1) Plasmodium vivax

(2) Haemophilus influenzae

(3) Salmonella typhi

(4) Entamoeba histolytica.

169. In each segment of cockroach exoskeleton has hardened plates called sclerites, which are situated.

(1) Tergites – Ventrally and sternites – dorsally

(2) Tergites – dorsally and sternites – ventrally

(3) Tergites – dorsally and sternites–laterally

(4) Tergites – laterally and sternites – ventrally

170. The range of mean annual precipitation is highest in :

(1) Tropical forest   (2) Temperate forest

(3) Coniferous forest   (4) Grassland

171. Spirulina can be grown easily on materials containing starch, straw, molases, animal manure and even sewage, to produce large quantities and can serve as food. Such utilisation

(1) Also increases environmental pollution

(2) Also reduces environmental pollution

(3) Has no effect on environmental pollution

(4) Has harmful effect on some microbial organisms.

172. The glenoid cavity articulates with :

(1) The head of the clavicle

(2) The head of the humerus

(3) The thigh bone

(4) The pubic symphysis

173. The total genes and their alleles in a population

(1) Are variable

(2) Differs from expected value

(3) Remains constant

(4) Depend on the environmental conditions

174. Male gametes are not flagellated in.

(1) Laminaria   (2) Fucus

(3) Chlamydomonas   (4) Porphyra

175. Every 500 ml of deoxygenated blood delivers approximately how many ml of CO_2 to the alveoli

(1) 4 ml   (2) 5 ml   (3) 20 ml   (4) 25 ml

176. During gametogenesis in female, which of the following cells is normally diploid.

(1) Primary Oocyte   (2) Secondary Oocyte

(3) Primary polar body (4) Secondary polar body

177. In agave vegetative propagation occurs through

(1) Runners   (2) Rhizome

(3) Bulbils   (4) Offset

178. Which one of the following statements is in correct.

(1) Each enzyme shows its highest activity at a particular temperature and pH

(2) Low temperature preserves the enzyme in a temporarily inactive state

(3) Malonate closely resembles succinate in structure

(4) At V_{max} all the substrate molecules are catalysed by the enzyme.

179. Drinking water and food contaminated by the faecal matter are the main source of infection of:

(1) Entamoeba histolytica

(2) Wuchereria bancrofti

(3) Wuchereria malayi

(4) Epidermophyton

180. The contrasting characters for flower colour selected by Mendel are :

(1) Yellow and Green   (2) Green and Yellow

(3) violet and White   (4) Red and White