PHYSICS
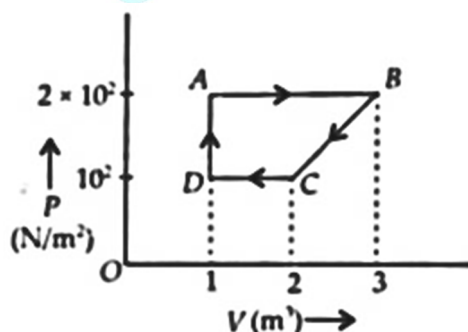
1. A cyclic process is shown in the figure. Work done the cyclic process ABCDA is

1) 160 J   2) 150 J   3) 600 J   4) 900 J

2. In the figure, a charged sphere of mass m and charge q starts sliding from rest on a vertical fixed circular track of radius R from the position shown. There exists a uniform and constant horizontal magnetic field of induction B. The maximum force exerted by the track on the sphere is -
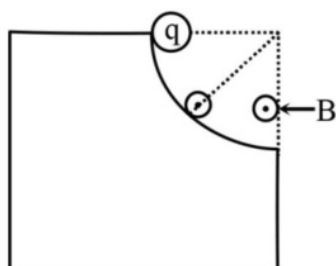

1) mg   2) $3mg - qB\sqrt{2gr}$ 3) $3mg + qB\sqrt{2gr}$ 4) $mg - qB\sqrt{2gr}$

3. Two identical spheres move in opposite directions with speeds v_1 and v_2 and pass behind an opaque screen where they may either cross without touching (event 1) or make an elastic head-on collision (event 2) -

   1) We can never make out which event has occurred

   2) We can not make out which event has occurred only if $v_1 = v_2$

   3) We can always make out which event has occurred

   4) We can make out which event has occurred only if $v_1 = v_2$

4. A pulley fixed with celling carries a string with blocks of mass 'm' and '3m' attached to its ends. The masses of string and pulley are negligible. When the system is released, its centre of mass moves with acceleration -

   1) g   2) g/2   3) g/4   4) Zero

5. The graph given below, shows the variation of $\sqrt{f}$ vs z for characteristics X-rays. Lines 1,2,3 and 4 shown in the graph corresponds to any one of $K_\alpha, K_\beta, L_\alpha$ or L_β emission, then L_β is represented by (f=frequency, z=atomic number)
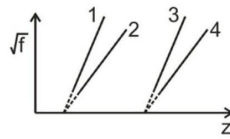
   1) Line 1   2) Line 2   3) Line 3   4) Line 4

6. A biconvex lens of focal length f forms a circular image of sun of radius r in focal plane. Then?

   1) $\pi r^2 \alpha f$

   2) $\pi r^2 \alpha f^2$

   3) If lower half part is covered by black sheet, then area of the image is equal to $\dfrac{\pi r^2}{2}$

   4) If f is doubled, intensity will increase

7. S_1, S_2 are two coherent sources (having initial phase difference zero) of sound located along x-axis separated by 4λ where λ is wavelength of sound emitted by them. Number of maxima located on the elliptical boundary around it will be: [S_1 and S_2 are assumed to be at focus of ellipse]
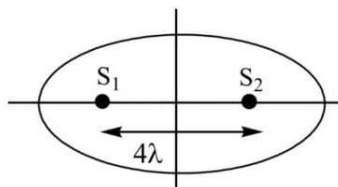
   1) 16   2) 12   3) 8   4) 4

8. Two blocks A and B of mass m and 2m respectively are connected together by a light spring of stiffness K and natural length l. The system is lying on a smooth horizontal surface with the block A in contact wit a fixed vertical wall as shown in the figure. The block B is pressed towards the wall by a distance x_0 form the natural position of spring and then released. There is no friction anywhere.
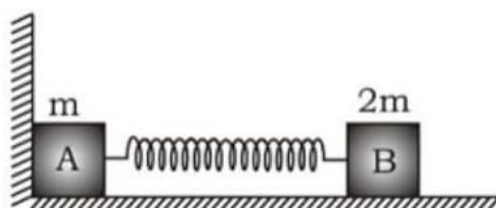
If block B is released at time t=0 and A just loses contact with the wall at time $T = \Delta t$ then the average acceleration of the centre of mass of the system during the time t = 0 to t = Δt is:

1) $\sqrt{\dfrac{2K}{9m}\dfrac{x_0}{\Delta t}}$
2) $\sqrt{\dfrac{K}{2m}\dfrac{x_0}{\Delta t}}$
3) $\sqrt{\dfrac{2K}{m}\dfrac{x_0}{\Delta t}}$
4) $\sqrt{\dfrac{K}{m}\dfrac{x_0}{\Delta t}}$

9. A solid ball of radius 0.2 m and mass 1 kg lying at rest on a smooth horizontal surface is given an instantaneous impulse of 50 N s at point P as shown. The number of rotations made by the ball about its diameter before hitting the ground is
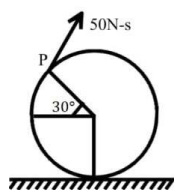

1) $\dfrac{625\sqrt{3}}{2\pi}$
2) $\dfrac{2500\sqrt{3}}{2\pi}$
3) $\dfrac{3125\sqrt{3}}{2\pi}$
4) $\dfrac{1250\sqrt{3}}{2\pi}$

10. A cylindrical vessel of radius R and height H and open at the top is completely filled with water. A small circular hole of radius r is made near the bottom of vessel. The time taken for 25% of water to flow out is

1) $\dfrac{\sqrt{2H}}{g}\left(\sqrt{3}-1\right)$
2) $\dfrac{R^2}{r^2}\sqrt{\dfrac{2H}{g}}\left(1+\dfrac{2}{\sqrt{3}}\right)$

3) $\dfrac{R^2}{r^2}\sqrt{\dfrac{2H}{g}}\left(1-\dfrac{2}{\sqrt{3}}\right)$
4) $\dfrac{r^2}{R^2}\sqrt{\dfrac{2H}{g}}\left(\sqrt{3}-1\right)$

11. The system of two rods shown in figure is vibrating at the same frequency having standing wave with junctions node a standing wave. The ratio of the number of antinodes in the two rods, if the radii of the rods are in the ratio, $\dfrac{r_B}{r_A}=2$ is (r_A and r_B are radii of the two the rods respectively)
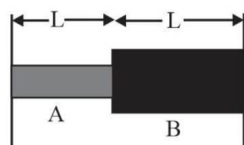

1) 1
2) 2
3) 3
4) 4

12. The shortest wavelength of X-rays emitted from an X-ray tube depends on

1) The current in the tube
2) The voltage applied to the tube

3) The nature of the gas in tube
4) The atomic number of the target material

13. A metal ball falls from a height of 1 m on to a steel plate and jumps upto a height of 81 cm. The coefficient of restitution of the ball and steel plate is

1) 0.2   2) 9   3) 0.9   4) 90

14. Two circular coils X and Y having equal number of turns and carry equal currents in the same sense and subtend same solid angle at point O. If the smaller coil X is midway between O and Y, then if we represent the magnetic induction due to bigger coil Y at O as B_Y and due to smaller coil X at O as B_X then
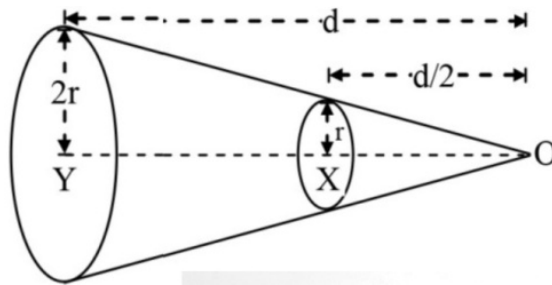

1) $\dfrac{B_Y}{B_X} = 1$ 2) $\dfrac{B_Y}{B_X} = 2$ 3) $\dfrac{B_Y}{B_X} = 1/2$ 4) $\dfrac{B_Y}{B_X} = 1/4$

15. A candidate connects a moving coil ammeter A and a moving coil voltmeter V and a resistance R as shown in figure
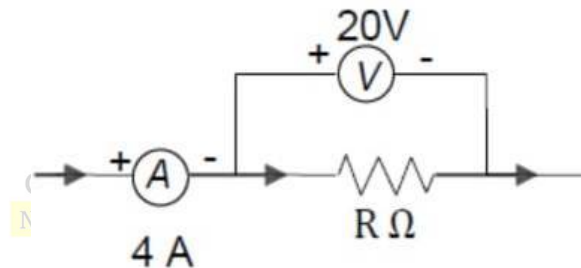
If the voltmeter reads 20 V and the ammeter reads 4A, then R is

1) Equal to $5\,\Omega$ 2) Greater than $5\,\Omega$

3) Less than $5\,\Omega$ 4) Greater or less than $5\,\Omega$ depending

16. A current $I = 10\sin(100\pi t)\,A.$ is passed in first coil, which induces a maximum e.m.f of 5π volt in second coil. The mutual inductance between the coils is -

1) 10 mH   2) 15 mH   3) 25 mH   4) 5 mH

17. Two infinitely long charged wires with linear densities λ and 3λ are placed along x and y-axis respectively. Determine the slope of the electric field at any point on the line $y = \sqrt{3}x$

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

18. A simple pendulum of length 1 m is oscillating with an angular frequency 10 rad s^{-1} the support of the pendulum starts oscillating up and down with a small angular frequency of 1 rad s^{-1} and an amplitude of 10^{-2}m. The relative change in the angular frequency of the pendulum is best given by:

1) 10^{-1} rad s^{-1}
2) 1 rad s^{-1}
3) 10^{-5} rad s^{-1}
4) 10^{-3} rad s^{-1}

19. Acceleration due to gravity at earth's surface is 10 ms^{-2}. The value of acceleration due to gravity at the surface of a planet of mass $\frac{1}{5}th$ and radius $\frac{1}{2}$ of the earth is -

1) $4\,ms^{-2}$
2) $6\,ms^{-2}$
3) $8\,ms^{-2}$
4) $12\,ms^{-2}$

20. A composite spherical shell is made up of two materials having thermal conductivities K and 2 k respectively as shown in the diagram. The temperature at the innermost surface is maintained at T whereas the temperature at the outermost surface is maintained at 10 T. A, B, C and D are four points in the outer material such that AB=BC=CD.
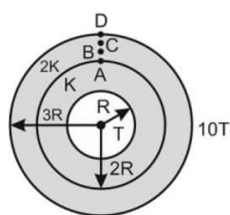
The effective thermal resistance between the inner surface of the shell and the outer surface of the shell for the radial heat flow is

1) $\dfrac{1}{8\pi KR}$
2) $\dfrac{1}{7\pi KR}$
3) $\dfrac{7}{48\pi KR}$
4) $\dfrac{6}{49\pi KR}$

21. In the certain process, 400 Cal of heat are supplied to a system and at the same time 105 J of mechanical work was done on the system. The increase in its internal energy is

1) 20 cal
2) 303 cal
3) 404 cal
4) 425 cal

22. The magnetic field at the origin due to the current flowing in the wire is
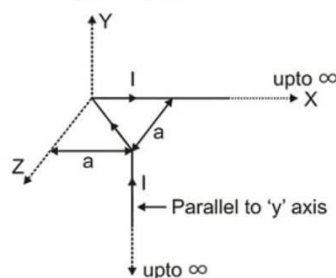
1) $-\dfrac{\mu_0 I}{8\pi a}\left(\hat{i}+\hat{k}\right)$
2) $\dfrac{\mu_0 I}{2\pi a}\left(\hat{i}+\hat{k}\right)$
3) $\dfrac{\mu_0 I}{8\pi a}\left(-\hat{i}+\hat{k}\right)$
4) $\dfrac{\mu_0 I}{4\pi a\sqrt{2}}\left(\hat{i}-\hat{k}\right)$

23. A very broad elevator is going up vertically with a constant acceleration of 2ms⁻². At the instant when its velocity is 4 ms⁻¹ a ball is projected from the floor of the elevator with a speed of 4 ms⁻¹ with respect to the elevator at an angle of 30⁰. The time taken by the ball to return the floor is (g = 10 ms⁻²)

1) 1/2 s   2) 1/3 s   3) 1/4 s   4) 1 s

24. A shell of mass 10kg is moving with a velocity of $10\ ms^{-1}$ when it blasts and forms two parts of mass 9 kg and 1 kg respectively. If the 1st mass is stationary, the velocity of the 2nd is

1) $1\ ms^{-1}$ 2) $10\ ms^{-1}$ 3) $100\ ms^{-1}$ 4) $1000\ ms^{-1}$

25. Two lithium nuclei in a lithium vapour at room temperature do not combine to form a carbon nucleus because

1) Carbon nucleus is an unstable particle

2) It is not energetically favourable

3) Nuclei do not come very close due to coulombic repulsion

4) Lithium nucleus is more tightly bound than a carbon nucleus

26. A point mass m = 20 kg, is suspended by a massless spring of constant 2000 N/M. The point mass is released when elongation in the spring is 15 cm. The equation of displacement of particle as a function of time is (Take g = 10 m/s²)
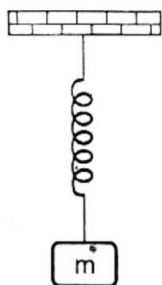
1) y = 10 sin 10t   2) y = 10 cos 10t

3) y = 10 $\sin\left(10t + \dfrac{\pi}{6}\right)$ 4) None of these

27. The radiation corresponding to $3 \rightarrow 2$ transition of hydrogen atom falls on a metal surface to produce photoelectrons. These electrons are made to enter a magnetic field of 3×10^{-4} T. If the radius of the largest circular path followed by these electrons is 10 mm, the work function of the metal is close to:

1) 1.8 eV   2) 1.1 eV   3) 0.8 eV   4) 1.6 eV

28. A ball of radius r and density ρ falls freely under gravity through a distance h before entering water. Velocity of ball does not change even on entering water. If viscosity of water is η, the value of h is given by
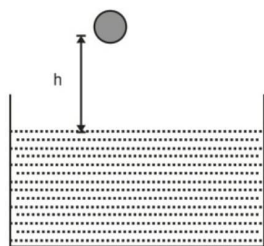
1) $\dfrac{2}{9}r^2\left(\dfrac{1-\rho}{\eta}\right)g$ 2) $\dfrac{2}{81}r^2\left(\dfrac{\rho-1}{\eta}\right)g$ 3) $\dfrac{2}{81}r^4\left(\dfrac{\rho-1}{\eta}\right)^2 g$ 4) $\dfrac{2}{9}r^4\left(\dfrac{\rho-1}{\eta}\right)^2 g$

29. An object O is placed at a distance of 20cm from a thin Plano-convex lens of focal length 15cm. The plane surface of the lens is silvered as shown in Fig. The image is formed at a distance of
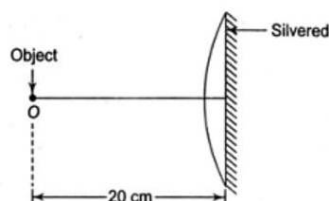
1) 60 cm to the right of the lens   2) 30 cm to the left of the lens
3) 24 cm to the right of the lens   4) 12 cm to the left of the lens

30. For sphere each of mass M and radius R are placed with their centers on the four corners A,B,C and D of a square of side b, The sphares A and B are hollow and C and D are solids. The moment of inertia of the system about side AD of square is

1) $\dfrac{8}{3}MR^2+2Mb^2$ 2) $\dfrac{8}{5}MR^2+2Mb^2$ 3) $\dfrac{32}{15}MR^2+2Mb^2$ 4) $32MR^2+4Mb^2$

31. The forbidden energy gap in Ge is 0.72 eV, given, hc=12400 eV-A⁰. The maximum wavelength of radiation that will generated electron hole pair is
1) 17220 A⁰   2) 172.2 A⁰   3) 17222 A⁰ 4) 1722 A⁰

32. In the shown indicator diagram over pressure-volume scales 'n' moles of an ideal gas in cycled. If the temperature of the gas in the state X and Y are respectively T_X and T_Y. Temperature of the gas in the state Z is the (All temperature are in absolute scale)
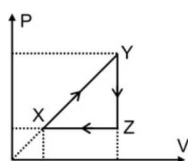
1) Arithmetic mean T_X and T_Y 　　　 2) Geometric mean T_X and T_Y

3) Harmonic mean of T_X and T_Y 　　 4) None of the above is correct

33. Dimensional formula of the physical quantity, resistance is

　　1) $\left[ML^2T^{-3}A^{-2}\right]$ 　　 2) $\left[ML^{-1}T^3A^{-1}\right]$ 　　 3) $\left[ML^2T^{-2}K^{-1}\right]$ 　　 4) $\left[ML^{-2}T^{-3}A^2\right]$

34. In a Young's double slit experiment with light of wavelength λ, the separation of slits is d and distance of screen is D such that $D \gg d \gg \lambda$. If the fringe width is β, the distance from point of maximum intensity to the point where intensity falls to half of the maximum intensity on either side is:

　　1) $\dfrac{\beta}{4}$ 　　　　 2) $\dfrac{\beta}{3}$ 　　　　 3) $\dfrac{\beta}{6}$ 　　　　 4) $\dfrac{\beta}{2}$

35. A stretched string of length L, fixed at both ends can sustain stationary waves of wavelength λ. Which of the following value of wavelength is not possible?

　　1) 2 L 　　　　 2) 4 L 　　　　 3) L 　　　　 4) $\dfrac{L}{2}$

36. A car weighing 1000 kg is going up an incline with a slope of 2 in 25 at a steady speed of 18 kmph. If g=10 ms⁻², the power of its engine is

　　1) 4 k W 　　　　 2) 50 k W 　　　　 3) 625 k W 　　　　 4) 25 k W

37. The amount of work done in moving a charge of 5 C across two points having a potential difference of 15 volts is equal to

　　1) 0.333 J 　　　　 2) 3 J 　　　　 3) 6 J 　　　　 4) 75 J

38. Masses 8,2,4,2 kg are placed at the corners A,B,C,D respectively of a square ABCD of diagonal 80 cm. The distance of centre of mass A will be

　　1) 20 cm 　　　　 2) 30 cm 　　　　 3) 40 cm 　　　　 4) 60 cm

39. What is the current drawn from the battery of 6V?
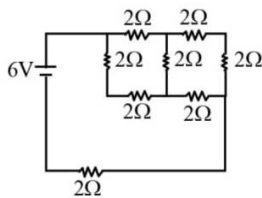
　　1) 125 A 　　　　 2) 12.5 A 　　　　 3) 1.25 A 　　　　 4) 2.5 A

40. Under the influence of a uniform magnetic field a charged particles is moving in a circle of radius R with constant speed v. The time period of the motion

　　1) Depends on v and not on R 　　　　 2) Depends on both R and v

　　3) Is independent of both R and v 　　 4) Depends on R and not on v

41. A particle execute simple harmonic motion (amplitude = A) between x = -A and x = +A. The time taken for it to go from 0 to $\frac{A}{2}$ is T_1 and to go from $\frac{A}{2}$ to A is T_2. Then

1) $T_1 < T_2$ 2) $T_1 > T_2$ 3) $T_1 = T_2$ 4) $T_1 = 2T_2$

42. A proton when accelerated through a potential difference of V volt has a wavelength λ associated with it. An $\alpha-$particle in order to have the same λ must be accelerated through potential difference of

1) V volt   2) 4V volt   3) 2V volt   4) (V/8) volt

43. The length of an elastic string is 'a' meter when the tension is 4 N, and 'b' meter when the tension is 5 N. The length in metre when the tension is 9 N, is

1) 4a – 5b   2) 5b – 4a   3) 9b – 9a   4) a + b

44. A particle starts from rest at t = 0 and moves in a straight line with acceleration as shown in figure. The velocity of the particle at t = 3 is
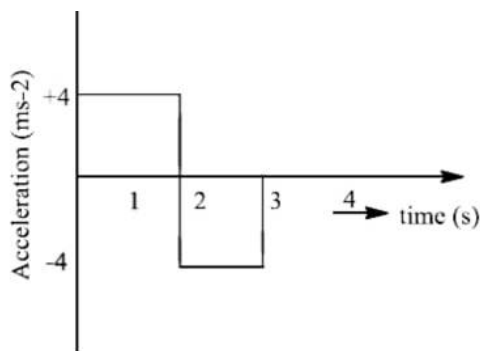
1) 2 ms^{-1} 2) 4 ms^{-1} 3) 6 ms^{-1} 4) 8 ms^{-1}

45. Which among the following is incorrect?

1) In meld's experiment p^2T remain constant. (p = loop, T = Tension)

2) In Kundt's experiment distance between two heaps of powder is $\lambda/2$

3) Quink's tube experiment is related with beats.

4) Echo phenomena are related with reflection of sound.

CHEMISTRY

46. Which one of the following elements is unable to form MF_6^{3-} ion?

    1) B   2) Al   3) Ga   4) In

47. Considering Ellingham diagram, which of the following metals can be used to reduce alumina?

    1) Mg   2) Zn   3) Fe   4) Cu

48. Mixture of chloroxylenol and terpineol acts as

    1) Antiseptic   2) Antipyretic   3) Antibiotic   4) Analgesic

49. The IUPAC name of $CH_3 - CH = CH - C \equiv CH$ is

    1) Pent-3-en-1-yne   2) Pent-2-en-3-yne

    3) Pent-3-en-4-yne   4) Pent-2-en-4-yne

50. In the structure of ClF_3, the number of lone pair of electrons on central atom 'Cl' is

    1) 4   2) 2   3) 1   4) 3

51. Identify the major products P, Q and R in the following sequence of reactions

52. Which of the following compounds can form a zwitter ion?

    1) Benzoic acid   2) Acetanilide   3) Aniline   4) Glycine

53. The type of isomerism shown by the complex [CoCl$_2$(en)$_2$] is

    1) Ionization isomerism   2) Coordination isomerism

    3) Geometrical isomerism   4) Linkage isomerism

54. The difference between amylase and amylopectin is

    1) Amylopectin have $1 \rightarrow 4$ α–linkage and $1 \rightarrow 6$ β–linkage

    2) Amylose have $1 \rightarrow 4$ α–linkage and $1 \rightarrow 6$ β–linkage

    3) Amylopectin have $1 \rightarrow 4$ α–linkage and $1 \rightarrow 6\alpha$–linkage

    4) Amylose is made up of glucose and galactose

55. Which oxide of nitrogen is not a common pollutant introduced into the atmosphere both due to natural and human activity?

    1) N_2O 2) NO_2 3) N_2O_5 4) NO

56. The compound A on treatment with Na gives B and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C respectively are

1) $C_2H_5Cl, C_2H_6, C_6H_5OH$
2) $C_2H_5Cl, C_2H_5Cl, C_6H_5ONa$
3) $C_2H_5Cl, C_2H_6, C_6H_5cL$
4) $C_2H_5Cl, C_6H_5ONa, C_2H_5Cl$

57. Which of the following carbocations is expected to be most stable?

1)   2)   3)   4)

58. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their

1) More extensive association of carboxylic acid via van der walls force of attraction

2) Formation of carboxylate ion

3) Formation of intramolecular H-bonding

4) Formation of intermolecular H-bonding

59. Iron pentacarbonyl, $Fe(CO)_5$ is

1) Trinuclear   2) Mononuclear   3) Tetranuclear   4) Dinuclear

60. Following solutions were prepared by mixing different volumes of NaOH and HCl of different concentrations

1) $60\,mL\,of\,\dfrac{M}{10}\,HCl + 40\,mL\,of\,\dfrac{M}{10}\,NaOH$ 2) $55\,mL\,of\,\dfrac{M}{10}\,HCl + 45\,mL\,of\,\dfrac{M}{10}\,NaOH$

3) $75\,mL\,of\,\dfrac{M}{5}\,HCl + 25\,mL\,of\,\dfrac{M}{5}\,NaOH$ 4) $100\,mL\,of\,\dfrac{M}{10}\,HCl + 100\,mL\,of\,\dfrac{M}{10}\,NaOH$

pH of which one of them will be equal to 1?

1) 4   2) 1   3) 2   4) 3

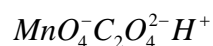61. On which of the following properties affect the coagulating power of an ion?

1) Both magnitude and sign of the charge on the ion

2) Size of the ion alone

3) The magnitude of the charge on the ion alone

4) The sign of charge on the ion alone

62. Among CaH_2, BeH_2, BaH_2, the order of ionic character is

1) BeH_2, BaH_2, CaH_2 2) CaH_2, BeH_2, BaH_2 3) BeH_2, CaH_2, BaH_2 4) BaH_2, BeH_2, CaH_2

63. For the redox reaction $MnO_4^{2-} + C_2O_4^{2-} + H^+ \rightarrow Mn^{2+} + CO_2 + H_2O$

    The correct coefficients of the reactants for the balanced equation are

    $MnO_4^- \quad C_2O_4^{2-} \quad H^+$

    1)

MnO_4^-	$C_2O_4^{2-}$	H^+
2	16	5

    2)

MnO_4^-	$C_2O_4^{2-}$	H^+
2	5	16

    3)

MnO_4^-	$C_2O_4^{2-}$	H^+
16	5	2

    4)

MnO_4^-	$C_2O_4^{2-}$	H^+
5	16	2

64. Which one of the following conditions will favour maximum formation of the product in the reaction, $A_2(q) + b_2(q) \rightleftharpoons x_2(g) \; put; \Delta_r H = -X \; kJ$?

    1) High temperature and high pressure

    2) Low temperature and low pressure

    3) Low temperature and high pressure

    4) High temperature and low pressure

65. Magnesium reacts with an element (X) to form an ionic compound. If the ground state electronic configuration of (X) is $1s^2 2s^2 2p^3$, the simplest formula for this compound is

    1) Mg_2X　　　　2) MgX_2　　　　3) Mg_2X_3　　　　4) Mg_3X_2

66. Iron exhibits bcc structure at room temperature. Above 900^0C, it transforms to fcc structure. The ratio of density of iron at room temperature to that at 900^0C (assuming molar mass and atomic radii of iron remains constant with temperature) is

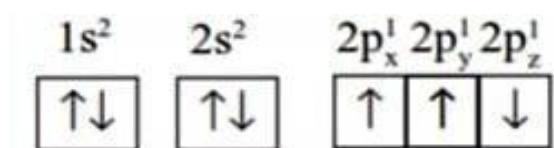   1) $\dfrac{3\sqrt{3}}{4\sqrt{2}}$　　　　2) $\dfrac{4\sqrt{3}}{3\sqrt{2}}$　　　　3) $\dfrac{\sqrt{3}}{\sqrt{2}}$　　　　4) $\dfrac{1}{2}$

67. Which ones a wrong statement?

    1) The electronic configuration of N atom is

    2) An orbital is designated by three quantum number while an electron in an atom is designated by four quantum numbers

    3) Total orbital angular momentum of electron in 's' orbital is equal to zero

    4) The value of m for d_z2 is zero

68. Nylon is an example of

    1) Polysaccharide 2) Polyamide 3) Polythene 4) Polyester

69. Which of the following lanthanoid ions is diamagnetic?

    (At nos. Ce=58, Sm=62, Eu=63, Yb=70)

    1) Sm^{2+} 2) Eu^{2+} 3) Yb^{2+} 4) Ce^{2+}

70. 6.02×10^{20} molecules urea are present in 100 ml of its solution. The molarity of solution is

    1) 0.01 M   2) 0.001 M   3) 0.1 M   4) 0.02 M

71. An excess of $AgNO_3$ is added to 100 mL of a 0.01 M solution of dichlorotetraaquachromium (III) chloride. The number of moles of AgCl precipitated would be

    1) 0.002   2) 0.003   3) 0.01   4) 0.001

72. $KMnO_4$ can be prepared from K_2MnO_4 as per the reaction

    $$3MnO_4^{2-} + 2H_2O \rightleftharpoons 2MnO_4^{-} + MnO_2 + 4OH^{-}$$
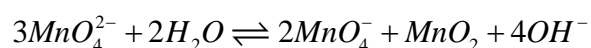
    The reaction can go to completion by removing OH^- ions by adding

    1) KOH   2) CO_2 3) SO_2 4) HCl

73. Which of the following compounds will not undergo Friedel-Craft's reaction easily?

    1) Xylene   2) Nitrobenzene   3) Toluene   4) Cumene

74. The basic structural unit of silicates is

    1) SiO_4^{4-} 2) SiO_3^{2-} 3) SiO_4^{2-} 4) SiO^{-}

75. Which is the strongest acid in the following?

   1) $HClO_3$ 2) $HClO_4$ 3) H_2SO_3 4) H_2SO_4

76. Roasting of sulphides gives the gas X as a by product. This is colourless gas with choking smell of burnt sulphur and cause great damage to respiratory organs as a result of acid rain. Its aqueous solution is acidic, acts as a reducing agent and its acid has never been isolated. The gas X is

    1) SO_2 2) CO_2 3) SO_3 4) H_2S

77. At 25^0 C molar aqueous solution of ammonium hydroxide is 9.54 ohm^{-1} cm^2 mol^{-1} and at infinite dilution molar conductance is 238 ohm^{-1} cm^2 mol^{-1}. The degree of ionisation of ammonium hydroxide at the same concentration and temperature is

    1) 20.800%   2) 1.008%   3) 40.800%   4) 2.080%

78. In the reaction
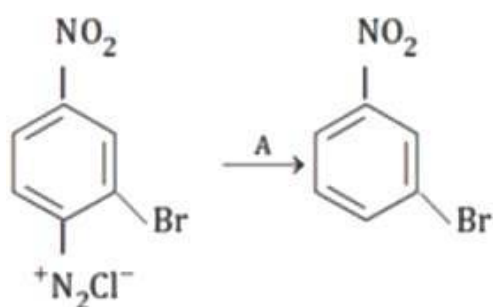
    A is

    1) Cu_2Cl_2 2) H_3PO_2 and H_2O 3) $H+/H_2O$ 4) $HgSO_4/H_2SO_4$

79. Which of the following does not give oxygen on heating?

    1) $Zn(ClO_3)_2$ 2) $K_2Cr_2O_7$ 3) $(NH_4)_2Cr_2O_7$ 4) $KClO_3$
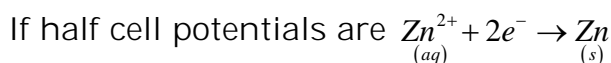
80. XeF_2 is isostructural with

    1) ICl_2^- 2) $SbCl_3$ 3) CCl_4 4) TeF_4

81. A reaction having equal energies of activation for forward and reverse reaction has

    1) $\Delta S = O$ 2) $\Delta G = O$ 3) $\Delta H = O$ 4) All of these

82. A button cell used in watches functions as follows

    $$Zn_{(s)} + Ag_2O_{(s)} + H_2O \rightleftharpoons 2Ag_{(s)} + Zn^{2+}_{(aq)} + 2OH^-$$

    If half cell potentials are $Zn^{2+}_{(aq)} + 2e^- \rightarrow Zn_{(s)}$

    $E^0 = -0.76V$

    $$Ag_2O_{(s)} + H_2O_{(l)} + 2e^- \rightarrow 2Ag_{(s)} + 2OH^-$$
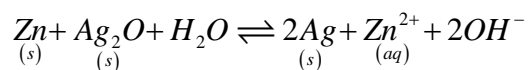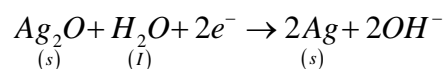
    $E^0 = 0.34V$

    The cell potential will be

    1) 1.1 V   2) 0.42 V   3) 0.84 V   4) 1.34 V

83. Hydrocarbon (A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms. (A) is

1) CH_3-CH_3 2) $CH_2=CH_2$ 3) $CH \equiv CH$ 4) CH_4
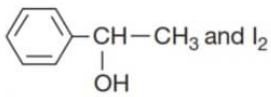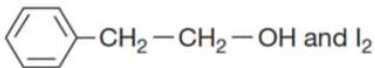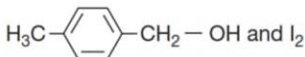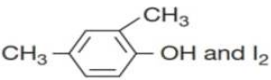
84. Which of the following is correct with respect to –I effect of the substituents? (R=alkyl)

1) $-NH_2 > -OR > -F$

2) $-NR_2 < -OR > -F$

3) $-NR_2 < -OR < -F$

4) $-NR_2 > -OR > -F$

85. Compound A, $C_8H_{10}O$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell. A and Y are respectively

1) $-CH-CH_3$ and I_2 (OH)

2) $-CH_2-CH_2-OH$ and I_2

3) H_3C- $-CH_2-OH$ and I_2

4) CH_3- $-CH_3$, OH and I_2

86. Given van der Waals constant for NH_3, H_2, O_2 and CO_2 are respectively 4.17, 0.244, 1.36 and 3.59, which one of the following gases is most easily liquefied?

1) O_2 2) H_2 3) NH_3 4) CO_2

87. A cylinder containing an ideal gas (0.1 mol of 1.0 dm³) is in thermal equilibrium with a large volume of 0.5 molal aqueous solution of ethylene glycol at its freezing point. If the stoppers S_1 and S_2 (as shown in the figure) are suddenly withdrawn, the volume of the gas in litres after equilibrium is achieved will be (Given, K_f (water) = 2.0 K kg mol-1, R=0.08 dm³ atmK⁻¹ mol⁻¹)
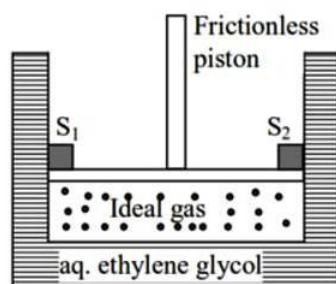
1) 1.14   2) 0.57   3) 2.18   4) 4.36

88. Consider the following reaction $A \xrightarrow{(i)CH_3MgBr} B \xrightarrow{Cu} 2-methyl-2-butene$ The mass percentage of carbon in A is

1) 33.33   2) 6.67   3) 16.66   4) 66.67

89. The most suitable method of separation of 1:1 mixture of ortho and para-nitrophenols is

   1) Chromatography

   2) Crystallisation

   3) Steam distillation

   4) Sublimation

90. Which of the following statements is not incorrect?

   1) Ovalbumin is a simple food reserve in egg-white

   2) Blood proteins thrombin and fibrinogen are involved in blood clotting

   3) Denaturation makes the proteins more active

   4) Insulin maintains sugar level in the blood of a human body

BIOLOGY

91. Which light is absorbed more by carotenoids?

   1) Yellow and green region

   2) Blue-green and violet region

   3) Yellow and orange-red region

   4) Yellow and blue-green region

92. Read the following statements carefully

   1) Gap junction facilitates the cells to communicate with each other by connecting the cytoplasm of two adjoining cells

   2) Adhering junctions help to stop substances from leaking across a tissue

   3) Compound epithelium covers the dry surface to the skin only and provides protection against chemical and mechanical stresses

   4) Most of the bones in vertebrates embryos are replaced by cartilages in adults

   How many of the above statements is/are correct?

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

93. Where is the water-splitting complex associated with PS-II situated?

   1) Inner side of chloroplast outer membrane

   2) Inner side of thylakoid membrane

   3) Outer side of thylakoid membrane

   4) Inner side of chloroplast outer membrane

94. Which of the following structural order of ganglions are correctly represented in cockroaches?

   1) Supra-pharyngeal ganglion, supra-oesophageal ganglion, sub-oesophageal, pro-thoracic ganglion, meta-thoracic ganglion, meso-thoracic ganglion, 1-6 abdominal ganglion

2) Supra-pharyngeal ganglion, supra-oesophageal ganglion, meta-thoracic ganglion, meso-thoracic ganglion, pro-thoracic ganglion, 1-6 abdominal ganglion

3) Sub-oesophageal ganglion, Supra-pharyngeal ganglion, sub-oesophageal, meso-thoracic ganglion, pro-thoracic ganglion, meta-thoracic ganglion, 1-6 abdominal ganglion

4) Supra-oesophageal ganglion, sub-oesophageal, pro-thoracic ganglion, meso-thoracic ganglion, meta-thoracic ganglion, 1-6 abdominal ganglion

95. At how many places in krebs cycle FADH2 is/are formed?

    1) 1   2) 2   3) 3   4) 4

96. Which of the following event occurs during the depolarization phase of an action potential in the neuronal membrane?

    1) K^+ ions rapidly move outside the cell

    2) Na^+ ions rapidly move inside the cell

    3) $Na+$ ions rapidly move outside the cell

    4) $K+$ ions rapidly move inside the cell

97. Which of the following is the correct sequence of glycolysis?

    1) $G6.P \rightarrow PEP \rightarrow 3.PGAL \rightarrow 3.PGA$ 2) $G6.P \rightarrow 3.PGAL \rightarrow 3.PGA \rightarrow PEP$

    3) $G6.P \rightarrow PEP \rightarrow 3.PGA \rightarrow 3.PGAL$ 4) $G6.P \rightarrow 3.PGA \rightarrow 3.PGAL \rightarrow PEP$

98. Reflex actions are by neuronal path ways called reflex arcs which components what should be the correct sequence of its components in withdrawal reflex after touching the hot things suddenly to withdraw the finger

    1) Afferent neuron$\rightarrow$ Efferent neuron$\rightarrow$ Interneuron$\rightarrow$ Receptor$\rightarrow$Effector

    2) Effector$\rightarrow$ Afferent neuron$\rightarrow$ Efferent neuron$\rightarrow$ Interneuron$\rightarrow$ Receptor

    3) Receptor$\rightarrow$ Afferent neuron$\rightarrow$ Efferent neuron$\rightarrow$ Effector

    4) Receptor$\rightarrow$ Afferent neuron$\rightarrow$ Interneuron$\rightarrow$ Efferent neuron$\rightarrow$ Effector

99. The growth of the given system per unit time which is expressed on a common basis or per unit initial parameter is known as

    1) Absolute growth rate   2) Relative growth rate

    3) Both 1 and 2   4) Exponential growth rate

100. The process that removes apical dominance is?

    1) Removal of shoot tips   2) Provide plants with a lot of auxin

    3) Both 1 and 2   4) None of these

101. Glycogen is homopolymer made up of
   1) Glucose units   2) Galactose unit   3) Ribose units   4) Amino units

102. Match the items in the column I with those in the column II.

   Column-I   Column-II
   A. Ca   1. Chlorosis
   B. Mo   2. Delayed flowering
   C. Fe   3. Necrosis
   D. Cl   4. Photolysis of water

	A	B	C	D		A	B	C	D
1)	3	2	1	4	2)	2	3	4	1
3)	3	2	4	1	4)	1	4	3	2

103. All of the following features are associated with myosin head of heavy meromyosin (HMM) of muscle protein, except
   1) Myosin binding site   2) ATP biding site
   3) Actin biding site   4) ATPase enzyme activity

104. The biological levels of organization of living things arranged from the simplest to most complex are,
   1) Biosphere, ecosystems, communities, populations, organisms, organ systems, organs, tissues, cells and organelles
   2) Biosphere, communities, ecosystems, organisms, populations, organ systems, organs, tissues, cells and organelles
   3) organelle, cells, tissues, organs, organ systems, organisms, populations, communities, ecosystems, biosphere
   4) Cells, organelles, tissues, organs, organ systems, organisms, populations, communities, ecosystems, biosphere

105. Match the following and mark the correct option

   Column-I   Column-II
   A. Myasthenia gravis   1. Radius and ulna
   B. Gliding joint   2. Genetic disorder of muscles
   C. Muscular dystrophy   3. Knee joint
   D. Hinge joint   4. Between the carpals
   E. Pivot joint   5. Auto-immune disorder of muscles

	A	B	C	D	E		A	B	C	D	E
1)	5	4	2	3	1	2)	2	4	5	3	1
3)	2	1	5	4	3	4)	5	3	2	4	1

106. Mineral are absorbed by the roots from the soil in the form of

   1) Very dilute solution   2) Very concentrated solution

   3) Ions   4) Molecules

107. Biejernick concluded that the cause of tobacco mosaic disease was not a filtrate toxin because

   1) The infectious agent could not be cultivated on nutrient media

   2) The infectious agent could be crystallized

   3) The infectious agent reproduced and could be passed on from a plant infected with filtered sap

   4) The sap was infectious even though it was filtered to remove bacterias

108. Which of the following hormone control 24-hour diurnal cycle or rhythmic activity of human body?

   1) Thymosin   2) Melanin   3) Melatonin   4) Thryoxine

109. Rust and smut disease of fungi are caused by fungi belonging to

   1)

Rust	Smut	Ascomycetes
Puccinia	Ustilago	

   2)

Smut	Rust	Basidiomycetes
Puccinia	Ustilago	

   3)

Rust	Smut	Basidiomycetes
Puccinia	Ustilago	

   4)

Smut	Rust	Ascomycetes
Puccinia	Ustilago	

110. Consider the following match of hormones and select the incorrect one

   1) Cortisol: Anti-inflammatory, immunosuppressive and stimulate RBC production

   2) Thyroxine: Regulate BMR, maintain water-electrolyte balance and support RBC formation

   3) Adrenaline: Prepare body for emergency or '3 F' conditions

   4) Calcitonin: Decreases bone calcium level in human body

111. The main difference in Gram +ve and Gram-ve bacteria resides in their

　　1) Differential staining of cell wall　　2) Special staining of cell wall

　　3) Simple staining of cell wall　　4) Positive staining of cell wall

112. The diagram given below is related to which of the following set of hormones?
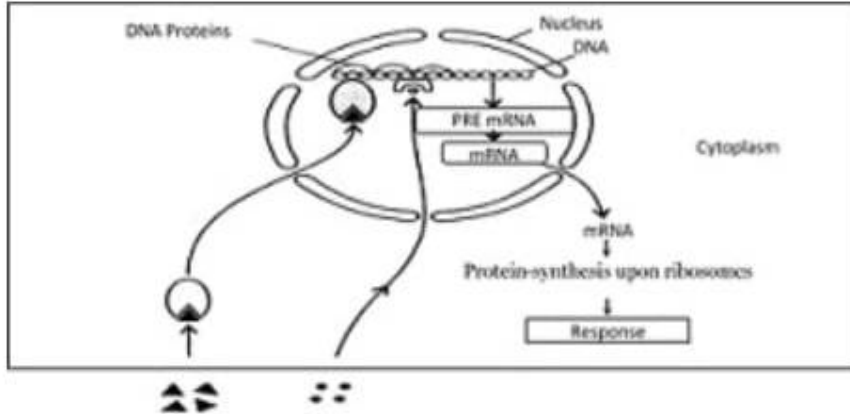
　　1) Cortisol, Estradiol, Gonadotrophins　　2) Testosterone, Oxytocin, Estradiol

　　3) Corticoids, Iodothyronines, Steroids　　4) Catecholamines, Steroids, Cortisol

113. Cryptogams do not have

　　1) Xylem vessels and sieve tubes

　　2) Tracheids and sieve tubes

　　3) Vessels, sieve tubes and companion cells

　　4) Tracheids and companion cells

114. Which of the following is the least and most abundant leucocytes in human blood, respectively?

　　1) Basophils; Neutrophils　　2) Neutrophils; Basophils

　　3) Eosinophils; Neutrophils　　4) Basophils; Lymphocytes

115. Juvenile state of moss is

　　1) Protonema　　2) Capsule　　3) Prothallus　　4) All

116. All given factors promotes absorption of water by roots except

　　1) Well-aerated soil　　2) Highly concentrated soil solution

　　3) Optimum soil temperature　　4) Available soil water

117. A person has cardiac output 5600 ml/minute and stroke volume 70 ml. What would be the number of heartbeats in 2 minutes in this person?

　　1) 80 heart beats　　2) 70 heart beats

　　3) 140 heart beats　　4) 160 heart beats

118. The female gametophyte of a typical dicot at the time of fertilization is

1) 8-celled   2) 7-celled   3) 6-celled   4) 4-celled

119. Read the following four statements (1-4.)

1) The second heart sound is DUB, which is associated with the closure of bicuspid and tricuspid valves

2) The duration between consecutive second and first heart sound is 0.5 seconds in a cardiac cycle

3) The heartbeat of a human increase when the adrenaline hormone is injected into it

4) The atrial systole in a cardiac cycle increases the flow of blood into the respective ventricle by about 70%

How many of the above statements are incorrect?

1) 3   2) 4   3) 2   4) 1

120. Significance of double fertilization is to

1) Gives rise to an endosperm that provides nourishment to the developing embryo

2) Increases the viability of the seeds

3) Use both the male gametes   4) All of these

121. Which of the following ions are actively secreted into the filtrate by tubular cells of nephron during urine formation?

1) NH_3, H^+, Na^+ 2) Na^+, K^+, NH_3 3) K^+, H^+, HCO_3^- 4) K^+, NH_3, H^+

122. Even in absence of pollinating agents, seed-setting is assured in:

1) Zostera   2) Salvia   3) Fig   4) Commelina

123. Crossing over occurs between ____ chromatid of _____ chromosome.

1) Sister, homologous   2) Non-sister, homologous

3) Non-sister, non homologous   4) Sister, homologous

124. How many statements are not incorrect?

1) Schleiden gave the cell hypothesis

2) Golgi bodies are extensive and continuous with the outer membrane of the nucleus

3) Endomembranous system contains vacuoles

4) Peroxisomes coordinate with Golgi bodies

1) 3   2) 1   3) 2   4) 4

125. Which of the following statement is not true for chylomicrons?

1) Chylomicrons are formed inside the lumen of small intestine

2) Chlomicrons are protein coated fat droplets

3) Chylomicrons contains triglycerides, cholesterol and phospholipids

4) Chylomicron released from epithelial cells of small intestine into lacteals

126. The biosynthetic phase of photosynthesis is

1) Directly dependent on the presence of light

2) Directly dependent on the products of the light reaction

3) Only dependent on CO_2 and water

4) Not dependent on ATP and NADPH

127. How many of the following cell organelles are bound by a single membrane?

Mitochondria, Lysosome, Peroxisome, Golgi body, Nucleus, Nucleolus, ER, Sphaerosome, Ribosomes

1) 4   2) 5   3) 6   4) 7

128. Match the following respiratory volumes with their value and select the correct option

Column-I   Column-II

A. Tidal volume   I. 2500 ml to 3000 ml

B. Residual volume   II. 1100 ml to 1200 ml

C. Expiratory Reserve volume III. 100 ml to 1100 ml

D. Inspiratory Reserve volume IV. 500 ml

	A	B	C	D			A	B	C	D
1)	IV	II	III	I		2)	IV	III	II	I
3)	I	II	III	IV		4)	IV	I	II	III

129. Which of the following two features are present in meiosis but absent in mitosis?

1) Pairing of non-homologous chromosome

2) Pairing of homologous chromosome and recombination between them

3) Replication of chromosome   4) All of these

130. All of the following factors are favourable for the formation of oxyhaemoglobin, except

1) High pO_2 2) Less H^+ ions concentration

3) Low pH   4) Low Temperature

131. Which of the following arrangements of xylem is found in the stem of plants?

1) Endarch   2) Exarch   3) Mesarch   4) Polyarch

132. Which one of the following statements pertaining to plant structure is correct?

1) The sclerenchyma comprises of isodiametric cells and forms the major component with organs

2) Xylem parenchyma acells are dead and thin-walled with a cell wall made of pectin

3) Tracheids are elongated or tube-like cells with thick and lignified walls and no protoplasm

4) Parenchymatous cells provide mechanical support to the internal organs

133. Select the incorrect match about evolution.

1) Origin of earth: 4500 million years

2) Origin of Universe: 20 million years

3) Origin of first cellular form of life: 2000 million years ago

4) Origin of first non-cellular form of life: 3 billion years ago

134. What is a species?

1) A basic unit in the phylogenic history of living organisms

2) A group of related populations from evolutionary point of view

3) A basic category containing most of the taxonomic information

4) A population of similar characteristics which forms evolutionary basis of variation

135. In the diagram, the x-axis denotes the number of individuals with a certain phenotype. The dotted lines denote the phenotypes favoured by natural selection. Which of the following inferences can be drawn from the given diagram?
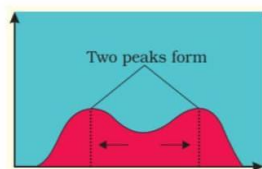
1) This natural selection will lead to stabilization

2) In this pattern of natural selection, more individuals will acquire the mean character value

3) This natural selection will lead to a directional change

4) This natural selection will lead to disruption

136. The packaging of chromatin at a higher level requires an additional set of proteins that are collectively referred to as

1) Non-histone chromosomal proteins

2) Small nuclear ribonucleoprotein (SnRNP)

3) Nucleoplasmin protein

4) Ribophorin protein

137. Which of the following is a family of monocots?

1) Leguminoseae 2) Solanaceae 3) Liliaceae 4) Brassicaceae

138. Read the following statements about the evolution of man and choose the option which correctly states true (T) or false (F):

A) The first human-like being the hominid was called Homo erectus with cranial capacities between 650-800 cc.

B) The cranial capacity of modern man is closer and similar to Neanderthal man

C) During ice age 75,000-10,000 years ago, modern Homo sapiens arose

D) The skull of an adult chimpanzee is more like a baby human skull

	A	B	C	D			A	B	C	D
1)	T	T	T	F		2)	T	F	T	F
3)	F	T	F	F		4)	F	T	T	F

139. Select the correct statement from the following:

A) Fleshy cylindrical stem in Euphorbia carries out photosynthesis.

B) Pistia and Eichhornia are examples of offset

C) Underground stem of grass and strawberry spread to new niche and when older part die new plants are formed

D) Thorns are woody, straight and pointed

1) A and B only   2) B and D only   3) B and C only   4) All of these

140. Select the correct option with respect to characteristic features of given animals:

A) Annelida: Metamerically segmented and schizocoelomate animals

B) Arthropoda: Jointed appendages with a closed circulatory system

C) Ctenophora: Shows bioluminescence and also known as sea walnuts.

D) Porifera: Archaeocytes are called collar cells, lines the spongocoel.

1) A,B,C are correct   2) A,C,D are correct

3) B and D are incorrect   4) Only D is incorrect

141. Which of these organisms show budding?

1) Yeast   2) Hydra   3) Spongilla   4) All of these

142. Which of the following is not a fundamental character of a chordate?

1) Rod like solid structure Notochord present dorsally

2) Solid, ventral and double nerve cord

3) Paired pharyngeal gill slits

4) Heart is ventral in all

143. In china rose, the flowers are

1) Actinomorphic, hypogynous with twisted aestivation

2) Actinomorphic, epigynous with valvate aestivation

3) Zygomorphic, hypogynous with imbricate aestivation

4) Zygomorphic, epigynous with twisted aestivation

144. Match the following and choose the correct option.

Group A   Group B
A) Aluerone layer   I) Without fertilization
B) Parthenocarpic fruit   II) Nutrition
C) Ovule   III) Double fertilization
D) Endosperm   IV) Seed

	A	B	C	D			A	B	C	D
1)	II	IV	III	I		2)	II	I	IV	III
3)	I	II	IV	III		4)	II	IV	I	III

145. Which one of the following statement is not correct about once-a-week pill for females?

1) It is Saheli oral contraceptive pills for females developed by scientists of CDRI, Lucknow

2) It is newly discovered contraceptive pills to be taken orally having progesterone – estrogen hormone combination

3) It is with very few side effects and having high contraceptive value

4) It prevents implantation by changing the nature of endometrium of uterus.

146. Choose the correct pair form the following regarding responses to abiotic factors

1) Aestivaiton: phytoplankton   2) Hibernation : seals

3) Dormancy : snails   4) Diapause: zooplankton

147. Which of the following assisted reproductive techniques is used in the test-tube-baby programme?

1) Zygote intra fallopian transfer (ZIFT)

2) Gamate intra fallopian transfer (GIFT)

3) Artificail Insemination (AI)

4) Intra uterine insemination (IUI)

148. AGGTATCGCAT is a sequence form the coding strand of a gene. What will be the corresponding sequence of the transcribed mRNA?

1) AGGUAUCGCAU   2) ACCUAUGCGAU

3) UGGTUTCGCAT   4) UCCAUAGCGUA

149. Which of the following statement is not correct about Hisardale?

1) It is newly developed breed of sheep

2) It is a type of outbreeding

3) It is an example of cross breeding

4) It is developed by corssing Bikaneri rams and Marino ewes

150. What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis?

1) The smaller the fragment size, the farther it moves

2) Positively charged fragments move to farther end

3) Negatively charged fragments do not move

4) The larger the fragment size, the farther it moves

151. Which of the following cells produce factors that help in maturation of spermatids to sprermatozoa?

1) Leydig cells   2) Sertoli cells   3) Spermatogonia   4) Both 1 and 2

152. Some of the steps involved in the production of humulin are given below. Choose the correct sequence.

1) Introduction of the recombinant plasmid into E. coli

2) Extraction of a recombinant gene product from E. coli.

3) Culturing recombinant E. coli in bioreactors

4) Insertion of the human insulin gene into a plasmid

1) 2,1,4,3   2) 1,3,2,4   3) 4,1,3,2   4) 3,2,1,4

153. Read the following statements carefully.

1) Female external genitalia include labia majora, labia minora, clitoris, vagina, and hymen

2) In females, at puberty, both ovaries contain about 60,000-80,000 primary follicles

3) The progesterone hormone concentration remains high prior to ovulation in the follicular phase of the menstrual cycle

4) The second meiotic division of secondary oocyte is completed inside ovary only after the entry of sperm.

How many from the above are incorrect statements?

1) 4   2) 3   3) 2   4) 1

154. Match the columns.

Column I	Column II
A) Emphysema	1) Test to detect antigen or antibody
B) Rosie	2) α-1 antitrypsin
C) ELISA	3) Protein enriched milk
D) ROP	4) Codes for proteins involved in plasmid replication

	A	B	C	D		A	B	C	D
1)	1	2	3	4	2)	1	3	4	2
3)	2	3	1	4	4)	4	3	2	1

155. Which of the following is/are used to induce parturition?

1) Oxytocin   2) Pitocin   3) Estrogen   4) Both 1 and 2

156. Stirred-tank bioreactors have been designed for

1) Addition of preservatyives to the product

2) Availability of oxygen throughout the process

3) Ensuring anaerobic conditions in the culture vessel

4) Purification of product

157. Which of the following is a plasmid?

1) pBR322   2) BamHII   3) SalI   4) EcoRII

158. In which of the folliwng disease, the number of T_H cells in body considerably decreases over the period of time?

1) AIDS   2) Cancer   3) Malaria   4) Typhoid

159. Select the incorrect statement.

1) Insertional inactivation technique helps in identification of the recombinant transformants with non-transformants by forming colourless colonies.

2) Insertional inactivation of β-galactosidase leads to the formation of colour less colonies

3) Insertional inactivation of β-galactosidase leads to the formation of blue colour colonies

4) In insertional inactivation, the rDNA is inserted within the coding sequence of an enzyme β-galactosidase

160. Read the following matching carefully

i) Artificial active immunity: Vaccination

ii) Natural passive immunity: Anti-tetanus serum (ATS)

iii) First line of defense: Physical barriers

iv) Anamnestic responses: Quick and highly intensified response

v) Graft rejection: Due to cell-mediated immunity (CMI)

How many from the above matching are correct?

1) Five   2) Four   3) Three   4) Two

161. Find out the correct statement

1) Totally unrelated species could also compete for the same resources

2) Resources need not to be limiting for competition to occur

3) In interference competition, feed efficiency of one species might be reduced due to the interfering and inhibitory presence of the other species, even if resources are abundant.

4) All are true

162. In the formula $\frac{dn/}{dt} = rN\left(\frac{K-N/}{K)}\right), \left(\frac{K-N/}{K}\right)$ stands for

   1) Environmental resistance   2) Reproductive potential
   3) Growth rate   4) Carrying capacity

163. Which of the following statement is not true for cocaine?

   1) It is commonly called coke or crack and is usually snorted

   2) It is obtained from coca plant Erythroxylum coca

   3) It has potent suppressing action on central nervous system

   4) It interferes with the transport of dopamine neurotransmitter

164. Find out the correct statement:

   1) Trophic level represents a functional level, not a species as such

   2) A given species never occupies more than one trophic level in the same ecosystem at the same time

   3) In most of the ecosystems, producers are less in number and biomass than the herbivores

   4) Pyramid of energy can never be upright

165. In a terrestrial ecosystems such as forests, maximum energy is found in

   1) T_1 2) T_2 3) T_3 4) T_4

166. Find the incorrect statement.

   1) 'Sixth extinction' is different from previous extinction in terms of rate of extinction

   2) Ecologists warn that if the present trend of extinction continues, nearly 50 percent of all species on earth might be wiped out within the next 100 years.

   3) Amphibians appear to be more vulnerable to extinction

   4) Recent extinction is completely natural

167. Hotspots are characterized by

   1) Very high species richness   2) High degree of endemism
   3) Region of accelerated habitat loss   4) All of these

168. Which one of the following pairs of organisms are exotic species introduced in India?

   1) Ficus religiosa, Lantana camara   2) Lantana camara, water hyacinth

3) Water hyacinth, Prosopis cineraria 4) Nile perch, Ficus religiosa

169. Select the incorrect match.

1) El Nino effect – odd climatic changes

2) Radioactive leakage- Three Mile island

3) Biomagnificaiton – Hg and DDT

4) Haryana Kisan Welfare Club – Ahmed Khan

170. Diagrammatic view of female reproductive system is given below. Select the incorrect option on the basis of labels given.
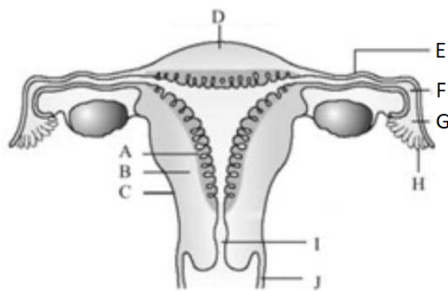
1) i + j=Birth canal   2) Fallopian tube=E+F+G+H

3) D represents infundibulum   4) A+B+C=Uterine wall layers

171. Which of the following statement is correct for colour blindness?

1) It is due to mutation in certain genes present on Y chromosome

2) It occurs more in females as compared to male

3) The son of the carrier woman has 50% chances of being colour blind

4) It is autosomal linked genetic disorder

172. Find the correct statement regarding DNA.

1) Form a double helical structure made up of two polypeptide chain

2) It is an acidic substance present in nucleus was first identified by F. Meischer in 1869

3) Phosphate group is linked to $5'$ OH of the nucleoside by glycosidic linkage

4) All four deoxyribonucleotides are always equally present in both the strands

173. If a completely radioactive double stranded DNA molecule undergoes two rounds of replication in a non-radioactive medium, what will be the radioactive status of the four resulting molecules?

1) All four still contain radioactivity 2) Three out four contain radioactivity

3) Radioactivity is lost from all four   4) Half the number contain no radioactivity

174. The recent record of ___ years old viable seed is of the date palm, Phoenix dactylifera, discovered during archaeological excavation at king Herod's palace near the dead sea

1) 1000   2) 2000   3) 3000   4) 500

175. Which one of the following is an incorrect matching of a microbe and its industrial product?

1) Monascus purpureus - statins
2) Acetobacter aceti – Acetic acid
3) Clostridium butylicum – Lactic acid
4) Aspergilus niger – Citric acid

176. Once BOD form the sewage is reduced significantly, the 'flocs' are allowed to sediment and it is known as___

1) Primary sludge
2) Secondary sludge
3) Activated sludge
4) Inactivated sludge

177. An explants is

1) Dead plant
2) Part of the plant that is not totipotent
3) part of the plant used in tissue culture
4) Part of the plant that expresses a specific gene

178. 1:1:1:1 ratio of progenies can be obtained if the plants employed for crossing are

A) TTRR × ttRR   B) TtRr × ttrr   C) TtRR × ttrr   D) Ttrr × ttRr

1) A, C amd D   2) A,B,C and D   3) B and D   4) A and B

179. In the given diagram, Biome distribution is shown with respect to annual temperature and precipitation. Select the correct option.
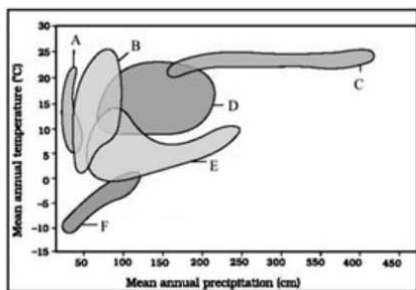
	Temperature forests	Grasslands	Arctic and Alpine tundra
A	C	E	A
B	D	B	F
C	E	B	F
D	F	A	C

1) A   2) B   3) C   4) D

180. Which one of the following is a wrong statement?

1) Most of the forests have been lost in tropical areas
2) Ozone in upper part of atmosphere is harmful to animals
3) Greenhouse effect is a natural phenomenon
4) Eutrophication is a natural phenomenon in freshwater bodies

NTA ABHYAS NEET MOCK TEST – 43

Answers and Explanations

PHYSICS

1) **2**	2) **3**	3) **1**	4) **3**	5) **3**	6) **2**	7) **1**	8) **1**	9) **3**	10) **3**
11) **2**	12) **2**	13) **3**	14) **3**	15) **2**	16) **4**	17) **3**	18) **4**	19) **3**	20) **3**
21) **4**	22) **3**	23) **2**	24) **3**	25) **3**	26) **3**	27) **2**	28) **3**	29) **4**	30) **3**
31) **3**	32) **2**	33) **1**	34) **1**	35) **2**	36) **1**	37) **4**	38) **2**	39) **3**	40) **3**
41) **1**	42) **4**	43) **2**	44) **2**	45) **3**					

CHEMISTRY

46) **1**	47) **1**	48) **1**	49) **1**	50) **2**	51) **4**	52) **4**	53) **3**	54) **3**	55) **3**
56) **4**	57) **1**	58) **4**	59) **2**	60) **4**	61) **1**	62) **3**	63) **2**	64) **3**	65) **4**
66) **1**	67) **1**	68) **2**	69) **3**	70) **1**	71) **4**	72) **2**	73) **2**	74) **1**	75) **2**
76) **1**	77) **2**	78) **2**	79) **3**	80) **1**	81) **3**	82) **1**	83) **4**	84) **3**	85) **1**
86) **3**	87) **3**	88) **4**	89) **3**	90) **3**					

BIOLOGY

91) **2**	92) **4**	93) **2**	94) **4**	95) **1**	96) **2**	97) **2**	98) **4**	99) **2**	100) **1**
101) **1**	102) **1**	103) **1**	104) **3**	105) **1**	106) **3**	107) **4**	108) **3**	109) **3**	110) **4**
111) **1**	112) **3**	113) **3**	114) **1**	115) **1**	116) **3**	117) **4**	118) **2**	119) **3**	120) **4**
121) **4**	122) **4**	123) **2**	124) **2**	125) **1**	126) **2**	127) **2**	128) **1**	129) **2**	130) **3**
131) **1**	132) **3**	133) **2**	134) **4**	135) **4**	136) **1**	137) **3**	138) **3**	139) **4**	140) **3**
141) **4**	142) **2**	143) **1**	144) **2**	145) **2**	146) **4**	147) **1**	148) **1**	149) **4**	150) **1**
151) **2**	152) **3**	153) **1**	154) **3**	155) **4**	156) **2**	157) **1**	158) **1**	159) **3**	160) **2**
161) **4**	162) **1**	163) **3**	164) **1**	165) **1**	166) **4**	167) **4**	168) **2**	169) **4**	170) **3**
171) **3**	172) **2**	173) **4**	174) **2**	175) **3**	176) **3**	177) **3**	178) **3**	179) **2**	180) **2**

PHYSICS

1. Work done during cyclic process ABCDA = area enclosed by ABCDA
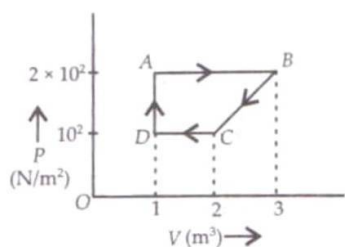
$$= \left(\frac{AB+CD}{2} \right) \times AD$$

$$= \left(\frac{2+1}{2} \right) \times 10^2$$

$$= 1.5 \times 10^2 \, J$$

$$= 150 \, J$$

2. $F_m = qvB \, (directed \, radially \, outward)$

$$\because N - mg\sin\theta - qvB = \frac{mv^2}{R}$$

$$or \; N = \frac{mv^2}{R} + mg\sin\theta + qvB$$

$\theta = \pi/2$

Hence at $\theta = \pi/2$

$$N_{max} = \frac{2mgR}{R} + mg + qB\sqrt{2gR}$$

$$= 3mg + qB\sqrt{2gR}$$

$$N_{max} = 3mg + qB\sqrt{2gR}$$

3. Balls are identical and velocity exchanges if elastic head on collision occurs.

4. Acceleration of each mass w.r.t.

$$pulley = \frac{3mg - mg}{(3m+m)} = g/2$$

Acceleration of centre of mass=

$$\frac{(3m)g/2 - mg/2}{(3m+m)} = g/4$$

5. For a given value of z, energy of K-series is more than L- series, also β –line has more energy as compared to α –line.

6. r = radius of sun's image

$$\tan\theta = \frac{r}{f} = const$$

$$\therefore \pi r^2 \alpha f^2$$

Intensity only depends on the number pf rays forming the image. Also only two rays are sufficient to form an image.

7.
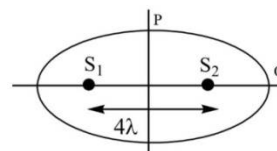
$$S_1 P - S_2 P = 0$$

$$S_1 Q - S_2 Q = 4\lambda$$

$\therefore$ 3 maximum lie on are between P and Q. Counting all quadrants; the total number is 12. P and Q symmetrical points are also maxima.

$\therefore$ Total number is 16

8.

$$u_{cm} = 0; \; v_{cm} = \frac{2v_0}{3}; < a_{cm} >= \frac{u_{cm} - u_{cm}}{\Delta t} = \frac{x_0}{\Delta t} \sqrt{\frac{2K}{9m}}$$

9. Impulse = change in momentum
Along vertical

$$V_V = \frac{50\cos 30^0}{1} = \frac{m}{s} = 25\sqrt{3} ms^{-1}$$

Along horizontal

$$V_H = \frac{50\cos 60^0}{1} = \frac{m}{s} = 25 ms^{-1}$$

Time of flight $T = \frac{2V_V}{g} = 5\sqrt{3}s$

Also $\omega = \frac{50 \times 0.2}{\frac{2}{5} mr^2} \, rad \, s^{-1}$

$$= 625 \, rad \, s^{-1}$$

$$2\pi n = \omega T$$

$$\Rightarrow n = \frac{\omega T}{2\pi} = \frac{3125\sqrt{3}}{2\pi}$$

10. $$T = \frac{A}{a}\sqrt{\frac{2H}{g}} = \frac{R^2}{r^2}\sqrt{\frac{2H}{g}}$$

$$t_1 = \frac{R^2}{r^2}\sqrt{\frac{2}{g}\times\left(\frac{3H}{4}\right)}$$

$$\therefore \Delta t = T - t_1$$

$$= \frac{R^2}{r^2}\sqrt{\frac{2H}{g}}\left(1-\frac{\sqrt{3}}{2}\right)$$

11. For rod A, $f_1 = \frac{n_1}{2l}\sqrt{\frac{T}{\rho A_1}}$

For rod B, $f_2 = \frac{n_2}{2l}\sqrt{\frac{T}{\rho A_2}}$

Given $f_1 = f_2$

$$\frac{n_1}{2l}\sqrt{\frac{T}{\rho A_1}}$$

$$= \frac{n_2}{2l}\sqrt{\frac{T}{\rho A_2}}\left[\because r_B = 2r_A, A_2 = 4A_1\right]$$

$$\frac{n_1}{2l}\sqrt{\frac{T}{\rho A_1}} = \frac{n_2}{2l}\sqrt{\frac{T}{\rho(4A_1)}}$$

$$n_1 = \frac{n_2}{2}$$

$$\frac{n_2}{n_1} = 2$$

12. Shortest wavelength or cut-off wavelength depends only upon the voltage applied in the Coolidge tube.

13. $e = \frac{velocity\,of\,sepration}{velocity\,of\,sepration}$

$$e = \sqrt{\frac{h_2}{h_1}} = \sqrt{\frac{81}{100}} = 0.9$$

14. $B_y = \frac{\mu_0 NI(2r)^2}{2\left[(2r)^2 + d^2\right]^{3/2}}$

$$B_x = \frac{\mu_0 NI(r)^2}{2\left[r^2 + (d/2)^2\right]^{3/2}} \Rightarrow \frac{B_y}{B_x} = \frac{1}{2}$$

15. Here, i=4A, V=20 volt; so,
$R = \frac{V}{I} = \frac{20}{4} = 5\Omega$. Since voltmeter is connected in parallel with resistance R, the effective resistance of this

combination is 5Ω only if the resistance R is greater than 5Ω, since total resistance in parallel combination becomes less than individual resistance.

16. Let $I = I_0 \sin\omega t$

Where $I_0 = 10, \omega = 100$

Then $\varepsilon = M\frac{dl}{dt}$

$$= M\frac{d}{dt}I_0 \sin\omega t$$

$$= M I_0 \omega \cos\omega t$$

$$\therefore \varepsilon_{max} = M I_0 \omega$$

$$5\pi = M \times 10 \times 100\pi$$

$$M = 5mH$$

17. $\vec{E} = \frac{3\lambda}{2\pi\epsilon_0\,x}\hat{i} + \frac{\lambda}{2\pi\epsilon_0\,\sqrt{3}}\hat{j}$
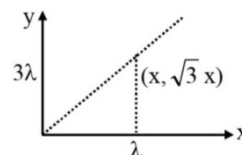
Slope $= \frac{Ely}{E_x} = \frac{1}{\sqrt{3}}\div 3 = \frac{1}{3\sqrt{3}}$

18. Angular frequency of simple

pendulum, $\omega = \sqrt{\frac{g}{l}}$

As the support oscillates up and down, effective g changes
$$\Delta g = 2.\omega_0^2 A = 2\times 1^2 \times 10^{-2}\,ms^{-2}$$
$$= 0.02\ ms^{-2}$$
Change in angular frequency $d\omega$ of the pendulum is given by
$$\frac{d\omega}{\omega} = \frac{-1}{2}.\frac{dg}{g}$$
$$\frac{|\Delta\omega|}{\omega} = \frac{1}{2}\frac{|\Delta g|}{g}$$
$$= \frac{1}{2}\times\frac{0.02}{10}$$
$$= 0.001\,rad\,s^{-1}$$

19. $g_p = \frac{GM_p}{R_P^2}$

M_p = mass of planet

R_P = radius of planet

g_p = acceleration due to gravity on planet

$$g_p = \frac{G\left(\dfrac{M_e}{5}\right)}{\left(\dfrac{R_e}{2}\right)^2}$$

$$= G \times \frac{1}{5} \times M_e \times \frac{4}{R_e^2}$$

$$= \frac{4}{5} g = 8\, m\, s^{-2}$$

20. $$R_{eff} = \int_R^{2R} \frac{dx}{K\left(4\pi x^2\right)} + \int_{2R}^{3R} \frac{dx}{2K\left(4\pi x^2\right)}$$

$$= \frac{1}{4\pi K}\left[-\frac{1}{x}\right]_R^{2R} + \frac{1}{8\pi K}\left[-\frac{1}{x}\right]_{2R}^{3R}$$

$$R_{eff} = \frac{7}{48\pi KR}$$

21. $$dQ = 400\, cal, dW = -105\, J$$

$$dU = dQ - dW$$

$$dU = 400 - (-25) = 425\, cal$$

Note dW is negativity because work is done on the system

22. $$\vec{B} = \frac{\mu_0}{4\pi} \frac{\left(-\hat{i} + \hat{k}\right)}{\sqrt{2}} = \frac{\mu_0 I}{8\pi a}\left(-\hat{i} + \hat{k}\right)$$

23. Components of velocity of ball relative to lift are
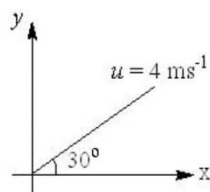
$$u_x = 4\cos 30^0 = 2\sqrt{3}ms^{-1} \quad and \quad u_y = 4\sin 30^0 = 2ms^{-1}$$

And acceleration of ball relative to lift is 12 ms⁻² in negative y-direction or vertically downwards. Hence, time of flight

$$T = \frac{2u_y}{12} = \frac{u_y}{6} = \frac{2}{6} = \frac{1}{3}s$$

24. Given that,

$$v_1 = 10ms^{-1}; \quad m_1 = 10kg$$

$$v_2 = 0; \quad m_2 = 9kg$$

$$v_3 = v; \quad m_3 = 1kg$$

According to conservation of momentum

$$m_1 v_1 = m_2 v_2 + m_3 v_3$$

$$10 \times 10 = 9 \times 0 + 1 \times v \Rightarrow v = 100\ ms^{-1}$$

25. Lithium nucleus and carbon nucleus are positively charge. According to coulomb law, same charge repel each other. So, nuclei do not come very close.

26. The motion of black is S.H.M.

$$\therefore y = A\sin(\omega t + \phi)$$

Here amplitude is

$$A = \frac{mg}{k} = \frac{20 \times 10}{2000}m = 10\ cm$$

At t = 0, displacement of body with respect to mean position is

$$y = 15 - 10 = 5cm$$

$$\therefore 5 = 10\sin(\omega \times 0 + \phi)\ or\ \frac{1}{2} = \sin\phi \Rightarrow \phi = \frac{\pi}{6}$$

$$\therefore y = 10\sin\left(10t + \frac{\pi}{6}\right)$$

27. We know that $$r = \frac{mv}{Bq}$$

$$\therefore v = \frac{Bqr}{m}$$

$$\therefore KE = \frac{1}{2}mv^2 = \frac{B^2 q^2 R^2}{2m} = 0.79\ eV$$

Now from photoelectric equation $E = \phi + KE$

$$\therefore \phi = E - KE = 1.89 - 0.79 = 1.1\ eV.$$

28. Velocity of ball when the water surface

$$v = \sqrt{2gh} \quad ....(i)$$

Terminal velocity of ball inside the water $$v = \frac{2}{9}r^2 g\frac{(\rho-1)}{\eta} \quad ....(ii)$$

Equating (i) and (ii) we get

$$\sqrt{2gh} = \frac{2}{9}\frac{r^2 g}{\eta}(\rho-1) \Rightarrow h = \frac{2}{81}r^4\left(\frac{\rho-1}{\eta}\right)^2 g$$

29. The effective focal length of the silvered lens is given by

$$\frac{1}{F} = -\frac{2}{f} + \frac{1}{f_m} = -\frac{2}{15} + \frac{1}{\infty} = -\frac{2}{15},$$
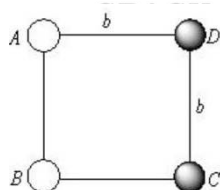
Which gives $F = -\dfrac{2}{15}\,cm$.

The silvered lens behaves like a concave mirror. Using the spherical mirror formula $\dfrac{1}{v} + \dfrac{1}{u} = \dfrac{1}{F}$, We have

$\left(\because u = -20\,cm \text{ and } F = -\dfrac{15}{2}\,cm \right)$

$\dfrac{1}{v} + \dfrac{1}{-20} = \dfrac{2}{-15}$

Which gives $v = -12\,cm$. The negative sing indicates that the image is formed to the left of the lens.

30. Moment of inertia of a hollow sphere of radius R about the diameter passing through D is

$I_A = I_B = \dfrac{2}{3} MR^2$ ....(i)

$I_C = I_D = \dfrac{2}{5} MR^2$ ....(ii)

Moment of inertia of whole system about side

$AD = I_S + I_D + I_B + I_C$

$= \dfrac{2}{3} MR^2 + \dfrac{2}{5} MR^2 + \left(Mb^2 + \dfrac{2}{3} MR^2 \right)$

$+ \left(Mb^2 + \dfrac{2}{5} MR^2 \right) = \dfrac{32}{15} MR^2 + 2Mb^2$

31. The forbidden energy gap, $E_g = \dfrac{hc}{\lambda}$

λ = maximum wave length of radiation

$\lambda = \dfrac{hc}{E_g} = \dfrac{12400}{0.72} = 17222 A^0$

32. $P_X V_X = nRT_X$

$P_Y V_Y = nRT_Y$

$P_Z V_Z = nRT_Z$

As $P_X = P_Z$ and $V_Z = V_Y$ and $\dfrac{P_X}{V_X} = \dfrac{P_X}{V_Y}$

$\therefore T_Z^2 = T_X T_Y$

33. According to Ohm's law, V = IR

$\therefore R = \dfrac{V}{I}$ But $V = \dfrac{W}{q} = \dfrac{W}{It} [\because q = It]$

$\therefore R = \dfrac{W/It}{I} = \dfrac{W}{I^2 t}$

Hence, $[R] = \dfrac{[W]}{[I^2][t]} = \dfrac{[ML^2 T^{-2}]}{[A^2 T]}$

$[ML^2 T^{-3} A^{-2}]$

34. AS $I_{max} = 4I$

Then $T_{net} = \dfrac{1}{2} I_{max} = 2I$

$\Rightarrow 2I = 2I(1 + \cos\phi)$

$\Rightarrow 1 + \cos\phi = 1 \Rightarrow \cos\phi = 0$

$\Rightarrow \phi = \dfrac{\pi}{2}, \dfrac{3\pi}{2}, \dfrac{5\pi}{2}, ...$

$\phi = \dfrac{2\pi}{\lambda} \Delta x \Rightarrow \dfrac{\pi}{2} = \dfrac{2\pi}{\lambda} \Delta x$

$\Rightarrow \Delta x = \dfrac{\lambda}{4}, \dfrac{3\lambda}{4}, \dfrac{5\lambda}{4}, ...$
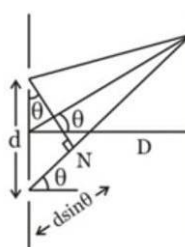
Also path difference $\Delta x = d \sin\theta = \dfrac{\lambda}{4}$

At desired location

$\Rightarrow \dfrac{d\, y_n}{D} = \dfrac{\lambda}{4} \Rightarrow y_n = \dfrac{\lambda D}{4d} = \dfrac{\beta}{4} \left\{ \because \beta = \dfrac{\lambda D}{d} \right\}$

$\Rightarrow$ *Separation between central* $\max ima$

and sesired $y = \dfrac{\beta}{4}$

35. For a string of length L the maximum possible wavelength can be 2L.

36. $P = mg \sin\theta \times V = 4000W$

37. Work done= (charge) × (potential difference)

$W = q(\Delta V) = 5 \times 15 = 75 J$

38. According to figure let A is the origin and co-ordinates of centre of mass be (x,y), then.
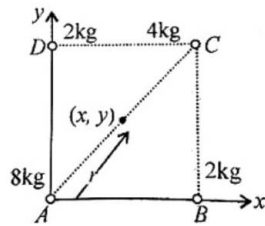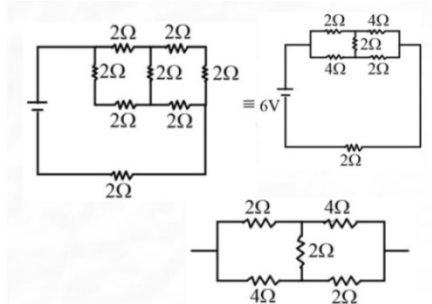

$$x = \frac{m_1 x_1 + m_2 x_2 + m_3 x_3 + m_4 x_4}{m_1 + m_2 + m_3 + m_4}$$

$$= \frac{0 + 2 \times \frac{80}{\sqrt{2}} + 4 \times \frac{80}{\sqrt{2}} + 0}{16} = \frac{30}{\sqrt{2}}$$

Similarly ,

$$y = \frac{30}{\sqrt{2}} \ so, r = \sqrt{x^2 + y^2} = 30 cm$$

39.

$$R_{eq} = \frac{2R_1 R_2 + R_1 R_3 + R_2 R_3}{R_1 + R_2 + 2R_3}$$

$$= \frac{2 \times 2 \times 4 + 2 \times 2 + 4 \times 2}{2 + 4 + 2 \times 2}$$

$$= \frac{16 + 4 + 8}{2 + 4 + 4} = \frac{28}{10}$$

$$i = \frac{6}{2 + 2.8} = \frac{6}{4.8} = 1.25 \ Amp$$

40. When magnetic field is perpendicular to motion of charged particle, then
Centripetal force = magnetic force

$$ie, \frac{mv^2}{R} = Bqv \quad or \ R = \frac{mv}{Bq}$$

Further, time period of the motion

$$T = \frac{2\pi R}{v} = \frac{2\pi \left(\frac{mv}{Bq} \right)}{v} \quad or \ T = \frac{2\pi m}{Bq}$$

It is independent of both R and v.

41. $x = A \sin \omega t$

$$For \ x = \frac{A}{2}, \sin \omega T_1 = \frac{1}{2} \Rightarrow T_1 = \frac{\pi}{6\omega}$$

$$For \ x = A, \sin \omega (T_1 + T_2) = 1$$

$$\Rightarrow T_2 = \frac{\pi}{2\omega} - T_1 = \frac{\pi}{2\omega} - \frac{\pi}{6\omega} = \frac{\pi}{3\omega}$$

i.e. $T_1 < T_2$

42.

$$\lambda_P = \lambda_\alpha \quad or \ \frac{h}{\sqrt{2m_P Q_P V_P}} = \frac{h}{\sqrt{2m_\alpha Q_\alpha V_\alpha}}$$

$$\therefore m_P Q_P V_P = m_\alpha Q_\alpha V_\alpha$$

$$\therefore V_\alpha = \left(\frac{m_P}{m_\alpha} \right) \left(\frac{Q_P}{Q_\alpha} \right) V = \left(\frac{1}{4} \right) \left(\frac{1}{2} \right) V = \frac{V}{8}$$

43. $T_1 = K(l - l_1) \quad T_2 = K(l - l_2) \quad so, \frac{T_1}{T_2} = \frac{l_1 - l}{l_2 - l}$

$$\therefore T_1 l - T_1 l_2 = T_2 l - T_2 l_1$$

$$(T_1 - T_2)l = T_1 l_2 - T_2 l_1$$

$$l = \frac{T_1 l_2 - T_2 l_1}{(T_1 - T_2)} \quad l = (5a - 4b)\dots\dots\dots(i)$$

$$k = \frac{1}{b - a}\dots\dots\dots(ii)$$

So, length of wire when tension is 9 N
9 = kl′   (l′ = change in length)

$$9 = \frac{1}{(b - a)} \times l' \Rightarrow l' = 9b - 9a$$

$Hence, \ final \ length = l + l'$

$$= 5a - 4a + 9a - 9a$$

$$l_0 = 5b - 4a$$

44. Velocity at 3s = total algebraic sum of area under the curve
$v = 4 \times 2 - 4 \times 1 = 4 \ m/s$

45. The explanation of the statements are given below
(i) In meled's experiment $p\sqrt{T}$ =
Constant $\Rightarrow p^2 T$ = Constant
Hence, this statement is correct
(ii) In kundt's experiment distance between teo heaps of powder is $\lambda / 2$
Hence, this statement is correct
(iii) Quink's tube experiment is related to interference
Hence the option is incorrect
(iv) Echo phenomena are related to the reflection of sound.
So, this statement is correct

CHEMISTRY

46. As 'B' has no d-orbitals, so it can't extend its covalency beyond 4. Hence, 'B' cannot form the ion like MF_6^{3-}, i.e., BF_6^{3-}.

As all other metals have vacant d-orbitals in their valence shells, so they can extend their covalency beyond 4.

47. The metal which is more reactive than 'Al' can reduce alumina. 'Mg' is more reactive than Al, so it can be used. As Zn, Fe and Cu are less reactive than 'Al' so they cannot reduce alumina.

48. Mixture of chloroxylenol and terpineol acts as antiseptic. These are components of Dettol.
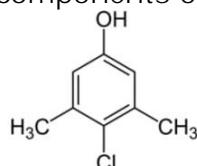
49. Using IUPAC rules this compound can be named as

$$\overset{5}{CH_3} - \overset{4}{CH} = \overset{3}{CH} - \overset{2}{C} \equiv \overset{1}{CH}$$
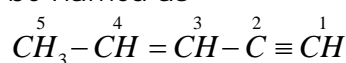
   Pent – 3 – en – 1 – yne

As here triple bond is at corner, so it is preferred over doubled bond for numbering.

50. The structure of ClF_3 is T-shape due to lone pair-lone pair electronic repulsion as follows
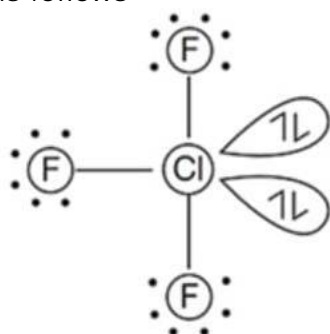
Hence, the number of lone pair of electrons on central Cl-atom is 2.

51. The sequence of reaction is as follows
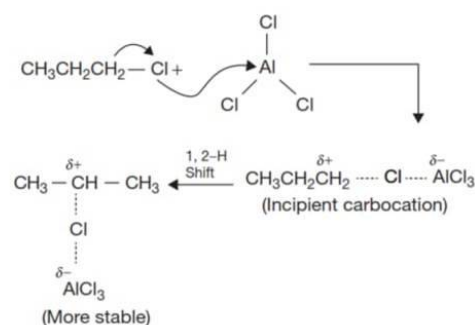
Now,
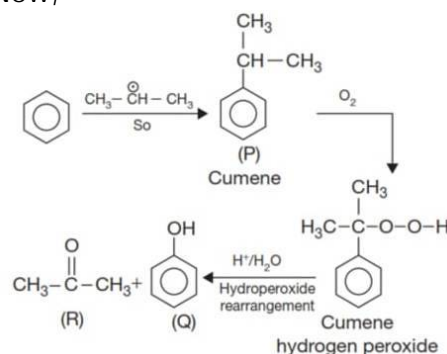
52. Glycine contains acidic group –COOH and basic group – NH_2 so
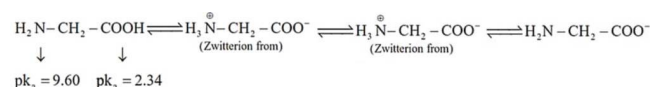
Benzoic acid, acetanilide and aniline do not form zwitter ion

53. In $[CoCl_2(en)_2]$, Coordination number of Co is 6 and this compound has octahedral geometry.

Trans-form
(optically inactive)

cis-form
(optically active)
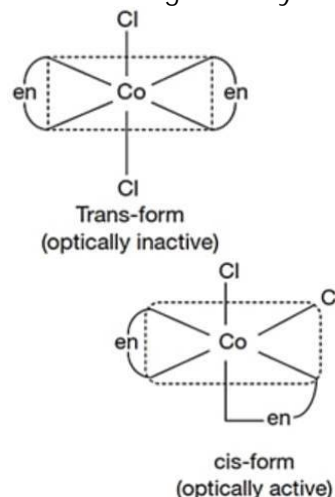
As per given option, here the type of isomerism is geometrical isomerism. It can not show ionization, coordination and linkage isomerisms as it does not fulfil required conditions for these isomerism.
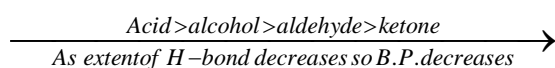
54. Amylose and amylopectin are polymers of α-D-glucose, so β-link is not possible. Amylose is linear with $1 \rightarrow 4$ α-llinkage whereas amylopectin is branched and has both $1 \rightarrow 4$ (for linear chain) and $1 \rightarrow 6$ α-linkages (for branching)

Amylose

Amylopectin
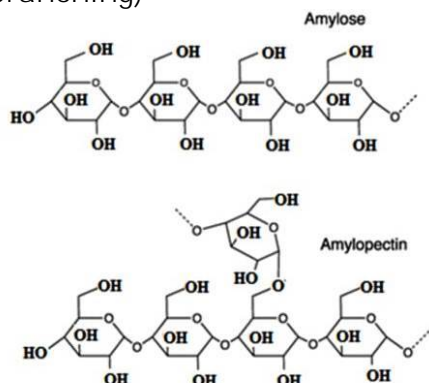
55. Nitrogen Pentaoxide (N_2O_5) is an oxide of nitrogen which is not a common pollutant. Dinitrogen pentoxide is an unstable and dangerous oxidiser, which contains only nitrogen and oxygen. It is formed when oxygen and nitrogen react. In the atmosphere attracts NOX gases that cause depletion of the ozone layer. Rest other nitrogen oxides are common pollutants.

56. The reaction occurs to give ethoxy ethane as the final product as follows
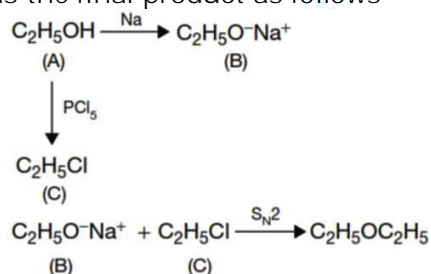
57. In B, C and D positive charge is/will be directly on carbon adjacent to –NO₂ group which is a strong electron withdrawing group.

58. Due to formation of stronger intermolecular H-bonding in carboxylic acid, association occurs. Hence, boiling point increases and become more than the boiling point of aldehydes, ketones and alcohols of comparable molecular masses.

$$\xrightarrow{\substack{Acid > alcohol > aldehyde > ketone \\ As\ extent\ of\ H-bond\ decreases\ so\ B.P.\ decreases}}$$

59. Based on the number of metal atoms present in a complex, they are classified as mononuclear, dinuclear, trinuclear and so on.
Eg: $Fe(CO)_5$: mononuclear
$CO_2(CO)_8$: dinuclear
$Fe_3(CO)_{12}$: trinuclear

60. Meq of HCl $= 75 \times \dfrac{1}{5} \times 1 = 15$

Meq of NaOH $= 25 \times \dfrac{1}{5} \times 1 = 5$

Meq of HCl in resulting solution = 10
Normality of [H⁺] in resulting

mixture $= \dfrac{10}{100} = \dfrac{1}{10}$

$$pH = -\log[H+] = -\log\left[\dfrac{1}{10}\right] = 1.0$$

61. Coagulation of colloidal solution by using an electrolyte depends on the chare present (positive or negative) on colloidal particles as well as on its size. Coagulating power of an electrolyte depends on the magnitude of charge present on effective ion of electrolyte. Coagulation power α magnitude of charge

62. Ionic nature α size of metal ion (metallic nature). For II group hydrides, on moving down the group metallic character of metals increases, so ionic character of metal hydride also increases.
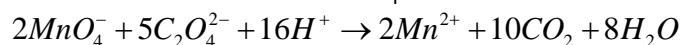
63.
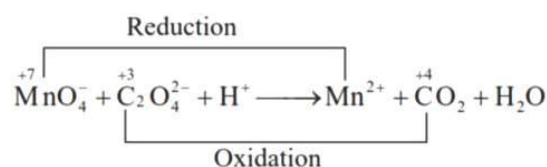
n-factor of $MnO_4^- \Rightarrow 5$

n-factor of $C_2O_4^{2-} \Rightarrow 2$

Ratio of n-factors of MnO_4^- and $C_2O_4^{2-}$ is 5:2
So, molar ratio in balanced reaction is 2:5
Hence the balanced equation is

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

64. Using Le-chatlier principle
$$A_2(q) + b_2(q) \rightleftharpoons x_2(g)\ put; \Delta_r H = -X\ kJ\ ?$$
On increasing pressure, equilibrium shifts in a direction where volume or number of gaseous moles decreases, i.e., in forward direction here.
On decreasing temperature, equilibrium shifts in exothermic direction, i.e., forward direction as heat

is coming out of system so decrease of temperature is needed.
Hence, high pressure and low temperature favours maximum formation of product in it.

65. Element (X) electronic configuration $1s^2 2s^2 2p^3$ so, valency of X is 3. Valency of Mg is 2. Formula of compound formed by Mg and X will be Mg_2X_2.
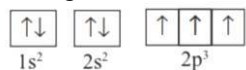
66. For BCC lattice: $Z = 2$, $a = \dfrac{4r}{\sqrt{3}}$
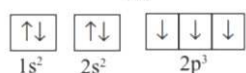
For BCC lattice: $Z = 4$, $a = 2\sqrt{2}r$

Hence

$$\frac{d_{25^0 C}}{d_{900^0 C}} = \frac{\left(\dfrac{ZM}{N_{A^{a^3}}}\right)_{BCC}}{\left(\dfrac{ZM}{N_{A^{a^3}}}\right)_{FCC}} = \frac{2}{4}\left(\frac{2\sqrt{2}r}{\dfrac{4r}{\sqrt{3}}}\right)^3 = \left(\frac{3\sqrt{3}}{4\sqrt{2}}\right)$$

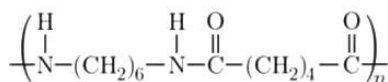67. According to Hund's Rule of maximum multiplicity, the correct electronic configuration of N-atom is

↑↓	↑↓	↑	↑	↑
$1s^2$	$2s^2$		$2p^3$	

OR

↑↓	↑↓	↓	↓	↓
$1s^2$	$2s^2$		$2p^3$	

Hence, option (a) violates Hund's rule. Rest other options are correct.

68. Nylon is a polyamide. For example Nylon 6,6 is comprised of two monomers, Hexamethylenediamine, and adipic acid, each providing six carbon atoms.

$$\left(\underset{\substack{| \\ H}}{N}-(CH_2)_6-\underset{\substack{| \\ H}}{N}-\overset{\substack{O \\ ||}}{C}-(CH_2)_4-\overset{\substack{O \\ ||}}{C}\right)_n$$

Nylon 6, 6

69. $Yb = [Xe]^{54} 4f^{14} 5d^0 6s^2$

$Yb^{2+} = [Xe] 4f^{14}$

As n=0 so diamagnetic. As in rest other there are unpaired electron/s so they are paramagnetic.

70. $n = \dfrac{6.02 \times 10^{20}}{6.02 \times 10^{23}} = 0.001$

$M = \dfrac{n}{V} \times 1000 = \dfrac{0.001}{100} \times 1000 = 0.01$

71. $AgNO_3 + \left[Cr(H_2O)_4 Cl_2\right]Cl \rightarrow AgCl$

$n = MV = 0.01 \times \dfrac{100}{1000} = 0.001$

72. As MnO_4^- can oxidise SO_2, HCl but not CO_2 as in CO_2 C-atom has its highest oxidation state (+4) it means CO_2 can be used here.

73. As any aromatic compound with meta directing group don't show Freidal Craft's reaction easily.
So, nitrobenzene does not show it as in it-NO_2 group is ring deactivating and meta directing. In rest other compounds given here alkyl group is ring activating and ortho, para directing so this reaction is possible.
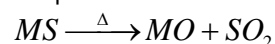
74. The basic structural unit of silicates is SiO_4^{4-}
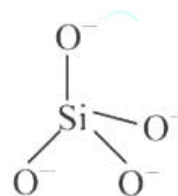
75. Acidic nature α electro negativity and oxidation number of central atom. Here $HClO_4$ is the strongest acid and decreasing order of acidic strength is as follows

$HClO_4 > HClO_3 > H_2SO_4 > H_2SO_3$
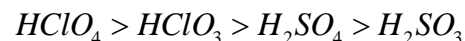
76. Roasting is used to convert metal sulphide ores into MSO_4 and MO.

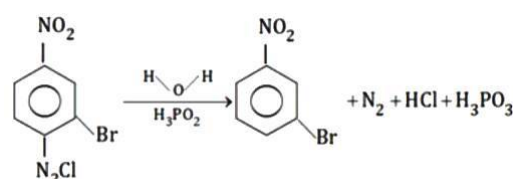$MS \xrightarrow{\Delta} MO + SO_2$

SO_2 is a colourless gas with choking smell of burnt sulphur and cause great damage to respiratory organs and result in acid rain. Its aqueous solution is acidic, acts as a reducing agent. Sulphur dioxide dissolves in water forming sulphurous acid hence, it is known as sulphurous anhydride.
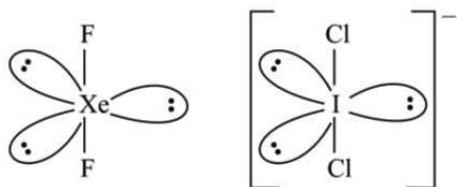
$H_2O + SO_2 \rightleftharpoons H_2SO_3$ It reduces chlorine to HCl.

$SO_2 + Cl_2 + 2H_2O \rightarrow H_2SO_4 + 2HCl$
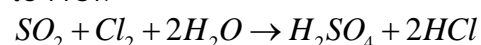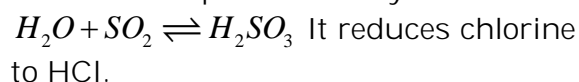
77. $\alpha = \dfrac{\wedge_m}{\wedge_m^\infty} = \dfrac{9.54}{238} = 0.04008 = 4.008\%$

78.

79. $Zn(ClO_3)_2 \xrightarrow{\Delta} ZnCl_2 + 3O_2$

$K_2Cr_2O_6 \xrightarrow{\Delta} 2K_2CrO_4 + CrO_3 + \frac{3}{2}O_2$

$2KClO_3 \rightarrow 2KCl + 3O_2$

$(NH_4)_2 Cr_2O_2 \xrightarrow{\Delta} N_2 + Cr_2O_3 + 2H_2O$

Hence only ammonium dichromate does not give oxygen on heating but gives N_2

80. XeF_2 and ICl_2^- both are linear molecules.

The shapes of $SbCl_3, CCl_4, TeF_4$ are pyramidal, tetrahedral and sea saw respectively.

81. $\Delta H = E_{a(F)} \rightarrow E_{a(b)}$

As $E_{a(F)} \rightarrow E_{a(b)}$

Hence $\Delta H = 0$

82. As cell is $Zn/Zn^2 \| Ag^+/Ag$

$E^o_{cell} = E^o_{cathode} - E^o_{anode}$
=0.34-(-0.76)=1.1V

83. The sequence of reaction is as follows

84. -I effect increases on increasing electronegativity of atom. So, correct order of –I effect is $-NR_2 < -OR < -F$

85. Option (1) is secondary alcohol which on oxidation gives phenylmethyl ketone (Acetophenone). This on reaction with I_2 and NaOH form iodoform and sodium benzoate. (iodoform test).
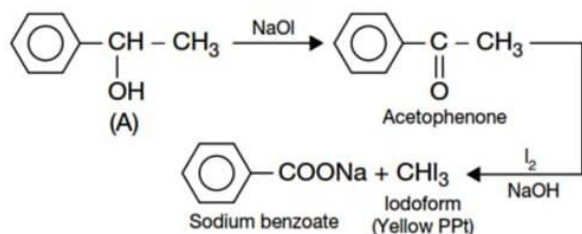
86. Here NH_3 is most easily liquefied as for it the value of 'a' is maximum. Van der waal constant 'a', signifies intermolecular forces of attraction.
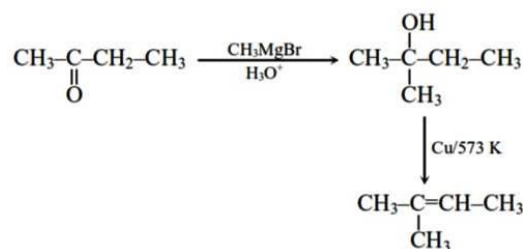
Higher is the value of 'a', easier will be the liquefaction of gas.
Liquefaction α 'a'-value
$$NH_3 > CO_2 > O_2 > H_2$$
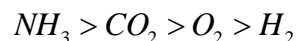
87. $\Delta T_f = K_f \times i \times m$

$\Delta T_f = 2.0 \times 1 \times 0.5$

$\Delta T_f = 1$

$273 - T_i = 1$

$T_i = 272K$

$P = \frac{nRT}{V}$

$P = \frac{0.1 \times 0.08 \times 272}{1}$

$P = 2.176\, atm$

Apply Boyle's law
$P_1V_1 = P_2V_2$
$2.176 \times 1 = 1 \times V_2$
$V_2 = 2.17$

88.

89. Steam distillation is used to separate a mixture of ortho and para nitrophenols. Due to the difference in their boiling points.

90. As during Denaturation of protein, the reactivity of protein decreases. Rest other options are correct facts.
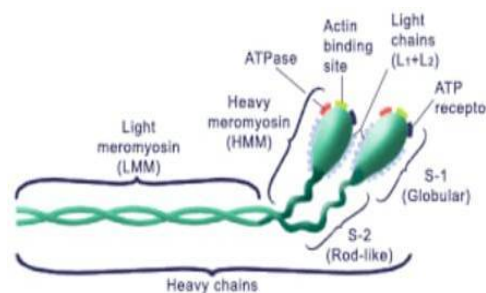
BIOLOGY

91. Pigments are substances having the ability to absorb light of different wavelengths. Chlorophyll 'a' absorbs light of visible spectrum having wavelengths between 400 nm to 700 nm. Maximum absorption by chlorophyll ' a '-occurs in the blue and red regions, and it also shows a higher rate of Photosynthesis. Carotenoids absorb light in the blue-green and violet region and reflect the longer yellow, red, and orange wavelengths.

92. Gap junctions facilitate the cells to communicate with each other by connecting the cytoplasm of adjoining cells for the rapid transfer of molecules and ions. Tight junctions help to stop substances from leaking across a tissue, whereas adhering junctions perform cementing to keep neighboring cells together. Compound epithelium covers the dry surface of the buccal cavity, pharynx, and inner lining of ducts of glands. In vertebrates, most of the cartilages present in the embryonic stage are replaced by bones in adults

93. The splitting of water is associated with the PSII and takes place on the inner side of the membrane. The protons or hydrogen ions that are produced by the splitting of water accumulate within the lumen of the thylakoids. This also creates oxygen, one of the net products of photosynthesis.

94. Cockroach's brain or the central nervous system consists of the supra-oesopghaeal or cerebral ganglia, sub-oesophageal ganglia and circum oesophageal connectives in the head and a double ganglionated ventral nerve cord in the thorax and abdomen. The brain or supra-oesophageal ganglia are a pair of large, closely apposed ganglia in the head.

95. In Krebs cycle, dehydrogenation reaction occurs four times; among which there are three points in the cycle where NAD^+ is reduced to $NADH+H^+$ and one point where FAD^+ is reduced to $FADH2$ when succinate is converted to fumarate.

96. During depolarization, the voltage-gated Na^+ channel opens due to the arrival of signal or action potential. This leads to the rapid movement of Na^+ ions from an outside extracellular fluid (ECF) to inside axoplasm as the concentration of Na^+ ions is more on outside or ECF. This leads to developing a net positive charge inside and net positive charge outside the axonal membrane.

97. In glycolysis, glucose and fructorse are phosphorylated to form glucose-6-phosphate by the activity of enzyme hexokinase and then converted to fructose 1-6 biphosphate which splits into 3C PGAL and DHAP. In subsequent steps, these products get oxidized to form PGA and then PEP, which at the end produces pyruvic acid, the end product of glycolysis

98. Reflex arc comprises five components that are arranged in a sequence so that it receives sensory information such as extreme heat from a sense organ to CNS and gives a motor command to muscles or glands
Receptor→ Afferent neuron→ Interneuron→ Efferent neuron→ Effector

99. Quantitative comparison between the growth of living system can also be made in two ways. Measurement and the comparison of total growth per unit time is called the absolute growth rate and the growth of the given system per unit time expressed on a common basis, per unit initial parameters is called the relative growth rate

100. In most higher plants, the growing apical bud inhibits growth of the lateral buds; the phenomenon is called apical dominance. Removal of shoot tips (decapitation) usually results in the growth of lateral buds. It is widely applied in tea plantation and hedge making

101. Glycogen is an homopolymer made up of glucose. It is multi-branched polysaccharide in which glucose molecules are linked by alpha-1-4 glycosidic linkage and branches are linked by alpha-1-6 glycosidic linkage

102. Calcium is required by the meristematic and differentiating tissues for cell wall formation as it an important component of middle lamella as calcium pectate. It is also needed during for synthesis of the mitotic spindle. Necrosis refers to the death of tissues resulting in the deficiency of elements like calcium, magnesium, copper, potassium. Delayed flowering results in the deficiency of elements like nitrogen, sulfur and molybdenum. Molybdenum is a component of various enzymes like nitrogenase and nitrate reductase (both involved in nitrogen metabolism) Chlorine is absorbed along with Na^+ and K^+. It also determines the solute concentration and the photolysis of water leading to oxygen evolution. Iron is an important constituent of ferredoxin and cytochromes (proteins involved in the transfer of electrons). It is required in larger amounts in comparison to the other micronutrients. Chlorosis is the loss of chlorophyll leadng to yellowing of leaves. Deficiency of elements nitrogen, potassium, magnesium, sulfur, iron, manganese, zinc and molybdenum causes chlorosis.

103. Mysin proteinhas two components: heavy meromyosin (HMM) and light meromyosin (LMM). HMM has high molecular weight and consists of globular myosin head and short arm, together called cross arm which helps in the formation of cross-bridges with acting proteins after hydrolysis of ATP.

104. The biological levels of organization of living things arranged from the simplest to most complex are organelle, cells, tissues, organs, organ systems organisms, population, communities, ecosystem, and biosphere

105. Myasthenia gravis is an autoimmune disorder affecting neuromuscular junction, whereas muscular dystrophy is a progressive degeneration of skeletal muscle due to genetic disorder.
The pivot joint is present between the atlas and axis cervical vertebrae as well as between radius and ulna of the forearm. Gliding joint is present between the carpals, whereas the hinge joint is present in the knee.

106. The plant roots absorb mineral from the soil solution. In the soil, the minerals are present in two forms: bound and solution form. Those minerals existing as positively charged ions are adsorbed on clay particles because clay particles are negatively charged. Ions are absorbed form the soil by both passive and active transport. Minerals are present in the soil as charged particles [nitrate ($NO3^-$), phosphate ($HPO4^-$) and potassium ions (K^+) that cannot move across the cell membrane, and the concentration of minerals in the soil is usually lower than the concentration of minerals in the root.

107. M.W. Beijerinek demonstrated that the extract of the infected plants of tobacco could cause infection in healthy plants and called the fluid as contagium vivum fluidum (infectious living fluid). The virus was found to be smaller than bacteria because they passed through a bacteria proof filter.

108. The pineal gland, which is a small neuroendocrine structure of human forebrain, secretes melatonin hormones which can control our 24-hours biological rhythmic activities/diurnal cycle or sleep-awake cycle. The pineal gland is often called a biological clock of the human body.

109. Rust of wheat is caused by Puccinia and smut is caused by Ustilago. Both are basidiomycetes fungi, and they are parasites on living plant body.

110. Glucocorticoids, mainly cortisol hormone, produce anti-inflammatory reactions and suppress the immune response. They also stimulate RBC production. Adrenaline or epinephrine is secreted form the adrenal medulla in response to stress or emergency or fight, flight and fright condition. Thyroxine regulated BMR, maintains water-electrolyte balance and supports RBC formation.
Thyrocalcitonin (TCT) is a long peptide hormone secreted by parafollicular cells of the thyroid gland (C-cells). Its secretion is regulated by an increased plasma level of calcium by a feedback mechanism. TCT lowers calcium level in the blood to normal by increasing calcium deposition in the bones, so it checks osteoporosis and stimulates excretion of calcium in the urine.

111. Bacteria can be classified into two groups on the basis of the differences in the cell envelopes and the manner in which they respond to the staining procedure developed by Christian gram. Gram staining is a differential staining method that separates bacteria into two categories based on the cell wall composition. Those that take up the gram stain are called gram-positive and the other that does not takes up gram stain are called gram-negative bacteria

112. All lipid-soluble hormones such as adrenocorticoids, steroidal, and iodothyronines hormones can easily cross the target cell membrane and enter inside the target cell. These hormones bind to their specific intracellular receptor to form the homone-receptor complex, which ultimately binds to DNA and regulates gene expression to give the physiological response

113. Pteriodophytes are the first successful land plants that had vascular tissues. Xylem consists of tracheids only for conduction, and vessels are absent. Phloem consists of sieve cells only; sieve tubes and companion cells are absent

114. The correct ascending order of different leucocytes of blood is Basophils > Eosinophils > Monocytes > Lymphocytes > Neutrophils
Neutrophils are about 60%-65% of total WBCs, and are major phagocytic cells of blood

115. The predominant stage of the life cycle of a moss is the gametophyte which consists of two stages, the first stage is the protonema stage, which develops directly from a spore. The second stage is the leafy stage, which develops from the protonema as a lateral bud.

116. Water is absorbed along with mineral solutes by the root hairs, purely by diffusion; thus, if soil solution is highly concentrated, the diffusion of water inside the root cell cannot occur. Highly concentrated soil solution inhibits the absorption of water from the soil solution.

117. Cardiac output=Stroke volume x heart beats/min
Heart beats/min = Cardiac output/stroke volume
=5600 ml/70ml
=80

118. The embryo sac is a female gametophyte in dicots. The most common type of dicot embryo consists of 7-celled and 8-nucleated structure. It consists of 1 egg cell, 2 synergids, 3 antipodals and a large central cell with 2 polar nuclei.

119. The second heart sound DUB is caused by the closure of the aortic valve and pulmonary valve at the end of ventricular systole or at the beginning of the atrial systole, about 70%-80% of the ventricles are normally filled; hence, during atrial contraction (atrial kick), the remaing 20%-30% gets filled

120. Double fertilization is characteristic of angiosperms, and it involves syngamy and triple fusion. The fusion of one male gamete with an egg cell is called syngamy, and it results in the formation of diploid zygote. The fusion of second male gamete with a secondary nucleus is called triple fusion, and it results in the formation of triploid primary endosperm nucleus. Double fertilization also increases the viability of the seeds and allows the utilization of both the male gametes produced by the pollen grains.

121. Tubular secretion is one fo the step of urine formation which mainly occurs by cells of PCT and DCT of nephrons. The selective secretion of harmful and nitrogenous wastes such as K^+, H^+, NH_3 etc., from blood to filterate takes place by tubular cells of nephron.

122. Commelina has cleistogamous flower and is invariably autogamous, and hence, assured seed-setting occurs even in the absence of the pollinator.

123. Crossing over is the exchange of chromosomal segment between non-sister chromatids of homologous chromosomes. It occurs during pachytene of prophase-I of meiosis, and it results in recombination of genes, producing genetic variation. It is carried out by enzyme recombinase.

124. Schwann proposed the hypothesis that the bodies of animals and plants are composed of cells and cell products. Endoplasmic reticulum are extensive and continuous with the outer membrane of nucleus. Peroxisomes are not part of endomembrane system; thus, they cannot coordinate with Golgi body.

125. Due to the action pancreatic lipase or steapsin and intestianal lipase, the emulsified fats are broken into fatty acids,glycerol and monoglycerides in lumen of the small intestine,. These compounds, along with water and bile salts, incorporate to form small vesicles called micelles in the lumen of small intestine. These micelles are relased into intestinal epithelial cells, where they again join to form small fat droplets or triglycerides covered bya protein layer and called as chylomicrons. These are ultimately released from epithelial cells to lacteals/lymphatic vessels.

126. The products of the light reaction are ATP, NADPH and O_2. Of these O_2 diffuses out of the chloroplast while ATP and NADPH are used to drive the processes leading to the synthesis of food, more accurately, sugars. This is the biosynthetic phase of photosynthesis. This process does not directly dependent on the products of the light reaction, i.e., ATP and NADPH, besides CO_2 and H_2O. You may wonder how this could be verified; it is simple: immediately after light becomes unavailable, the biosynthetic process continues for some time, and then stops. If then, light is made available, the synthesis starts again.

127. Lysosome, peroxisome, golgi body, ER, and sphaerosomes are bound by a single membrane. Mitochondria and nucleus are bound by a double membrane

128. Tidal volume is the amount of air inspired or expired during normal respiration. It is about 500 ml. Inspiratory reserve volume is the additional volume of air that a person can inspire by a forcible inspiration. It is about 2500 ml to 3000 ml. Expiratory reserve volume is the additional volume of air that a person can expire by a forcible expiration. It is about 1000 ml to 1100 ml.
Residual volume is the amount of air which is left in the lungs after fully exhaling. It is about 1100 to 1200 ml.

129. Pairing of homologous chromosomes and recombination or crossing over between genes occurs only in meiosis and is absent in mitosis.

130. In the lung alveoli, where there is high partial pressure of oxygen (pO_2), low pCO_2, lesser H^+ ion concentration (high pH) and lower temperature are all favourable factors to promote binding of oxygen with haemoglobin to form oxyhaemoglobin at the time of external respiration.

131. The stem shows endarch arrangement of xylem. In endarch condition, the protoxylem is present towards the centre and metaxylem is present towards the periphery. Roots show exarch arrangement, in which protoxylem is towards periphery and metaxylem is towards centre.

132. Tracheids are elongated or tube-like cells with thick and lignified walls and tapering ends. These are dead and are without protoplasm. Parenchyma forms the major component within organs. The cells of the parenchyma are generally isodiametric. They may be spherical, oval, round, polygonal or elongated in shape. The parenchyma performs various functions like photosynthesis, storage, secretion. Sclerenchyma provides mechanical support to organs.
Xylem parenchyma cells are living and thin-walled, and their cell walls are made up of cellulose. They store food materials in the form of starch or fat, and other substances like tannins

133. Big Bang theory explain the origin of universe, which occurred about 20 billion or 20000 million years ago. The origin of Earth occurred about 4.5 billion or 4500 million years ago. The first non cellular form of life was originated about 3 billion or 3000 million years ago.

134. Species is the smallest unit of taxonomic hierarchy, which consists of group of similar organism capable of interbreeding freely in nature to form fertile offsprings. It brings about variation necessary for evolution.

135. Natural selection can lead to stabilisaiton (in which more individuals acquire mean character value), directional change (more individuals aquire value other than the mean character value) or disruption (more individuals acquire peripheral character value at both ends of the distribution curve). The characteristic two peaks of the graph clearly indicate a disruptive selection.

136. The nucleosomes in chromatin are seen as 'beads on string' structure when viewed under electron microscope. It is further packaged to form chromatin fibres that are further coiled and condensed at metaphase stage of cell division to form chromosome. This packaging at higher level requires an additional set of proteins, collectively referred as NHC protein.

137. Family Liliaceae is commonly called Lily family. It is distributed worldwide. It is a Monocot family.

138. The first human-like being the hominid was called Homo habilis with cranial capacities between 650-800 cc. Cranial capacity of modern man is about 1350 cc and is similar to Neanderthal man with cranial capacity of about 1400 cc. During ice age between 75,000-10,000 years ago, modern Homo sapiens arose.

139. In Euphorbia, the stem becomes fleshy green and cylindrical and carries out photosynthesis. Such stem is called phylloclade, Pistia and Eichhornia are aquatic plants, in which stem is one and two-internode long and bears tuff of roots and bunches of leaves at nodes

140. Arthropoda has jointed appendages, chitinous exoskeleton and open circulatory system called haemocoel. Porifera has totipotent cells called archaeocytes, which can give rise to any cells, wheras choanocytes are collar cells lineing the spongocoel.

141. In yeast, the division is unequal. Small buds are produced that remain attached initially to the parent cell which eventually get separated and mature into a new yeast organism

142. There are few fundamental features of a chordate:
    Rod like solid structure called notochord on the dorsal side of embryo
    Presence of dorsal, hollow and single nerve cord
    Paired pharyngeal gill slits

143. China rose (Hibiscus), the flower is actinomorphic; thus it can be divided into two equal halves from any vertical plane passing through the centre. Ovary is superior (hypogynous) and petals shows twisted aestivation.

144. Aluerone layer is the outermost layer of endosperm in monocots which causes breakdown of stored food during germination of seed. Fruits formed without fertilization are called parthenocarpic fruits. Ovule after ferilization develops into seed

145. Saheli is a newly discovered oral contraceptive pill for females. It is developed by scientists of CDRI, Lucknow. It is a non-steroidal pill which contain centchroman. It changes the nature of endometrium, so it prevents implantation. It is so called once-a- week pill, as there is no need to take this pill daily.

146. In higher plants, seeds and some other vegetative reproductive structures serve as means to tide over periods of stress besides helping in dispersal – they germinate to form new plants under favourable moisture and temperature conditions. They do so by reducing their metabolic activity and going into a state of 'dormancy'. In animals, the organism, if unable to migrate, might avoid the stress by escaping in time. The familiar case of bears going into hibernation during winter is an example of escape in time. Some snails and fish go into aestivation to avoid summer – related problems – heat and dessication. Under unfavourable conditions many zooplankton species in lakes and ponds are known to enter diapauses, a stage of suspended development.

147. In test –tube-baby programme, ova from the wife/donor (female) and sperms from the husband/donor (male) are collected and are induced to form zygote following in-vitro fertilization and embryo transfer technique called IVF-ET. The resultant zygote or early embryo, in upto 8-celled stage, is transferred to fallopian tube (ZIFT) of mother to complete its further development

148. Coding strand is that strand of structural gene that is not transcribed and the sequence of mRNA is same as coding strand, except uracil is present in place of thymine.

149. Hisardale is a new breed of sheep developed in Punjab by crossing Bikaneri ewes and Marino rams. It is an example of cross breeding, which comes under outbreeding. In this method, superior males of one breed are mated with superior females of another breed.

150. Get electrophoresis was developed by Tiselius and is based on the principal that charged molecules move to electrode of opposite charge when placed in electric field and the movement depends on the charge and size of the molecule.
   Due to the sieve-like texture of the gel, smaller DNA fragments travel faster toward the electrode than the larger fragments.

151. Sertoli cell sof a seminiferous tubule of testis secrete inhibin, a proteinaceous hormone, when sperm count is too high, This hormone causes negative feedback to suppress the overactivity of the FSH hormone to suppress spermatogenesis.
   Also, FSH acts on the sertili cells and stimulates the secretion of some factors which help in the process of spermiogenesis

152. Humulin was first produced by an American company Eli Lily. The human insulin synthesizing gene was isolated and introduced into a plasmid. The recombinant plasmid was then introduced into E. coli which was then cultured in a bioreactor. Finally, the product was isolated and purified.

153. Female external genitalia include the mons pubis, labia majora, labia minora, clitoris and hymen.
   At puberty, each ovary contains 60,000-80,000 primary follicles. The estrogen hormone concentration remains high in the follicular phase prior to ovulation.
   The second meiotic division of secondary oocyte completes inside fallopian tube only after the entry of sperm.
   The estrogen hormone concentration remains high prior to ovulation in the follicular phase of the menstrual cycle.

154. α-1 antitrypsin is a genetically engineered protein obtained from a transgenic animal and is used for treatment of emphysema.
In Rosie cow, the gene encoding human protein alpha-lactalbumin was added. Thus, the milk of cow became nutritionally more balanced for human babies
ELISA is a diagnostic technique based on the antigen-antibody reaction and is used for early detection of pathogens.
ROP is a region of pBR322 that codes for proteins involved in plasmid replication.

155. At the end of pregnancy and completion of full term, to induce labour and parturition, the doctor may inject oxytocin to woman. The synthetic oxytocin is called pitocin, which causes vigorous contraction of myometrium of uterus for expulsion of baby outside the mother body through vagina.

156. A stirred-tank reactor is usually cylindrical or with a curved base to facilitate the mixing of the reactor contents. The stirrer facilitates even mixing and oxygen availability throughout the bioreactor.

157. pBR322 is the first plasmid vector developed by Bolivar and Rodrigues to transfer gene of interest to desire host cell. BamHI, SalI and EcoRII are restriction endonucleases, which are used to cut specific DNA segments.

158. Among all infectious diseases, HIV infection or AIDS is the most dangerous and fatal disease. There is no treatment or cure for this disease, and prevention is the best option. HIV enters into helper T-lymphocytes (T_H), replicates and produces progeny viruses. The progeny viruses released in the blood attach other helper T-lymphocytes. This is repeated, leading to a progressive decrease in the number of helper T-lymphocytes in the body of the infected person.

159. Select of recombinants due to inactivation of antibiotics is a cumbersome procedure. Therefore, alternative selectable markers have been developed, which differentiate recombinants from non-recombinants on the basis of their ability to produce colour. A recombinant DNA is inserted within the coding sequence of enzyme β-galactosidase. This results in insertational inactivation, and the colonies do not produces any colour.

160. Anti-tetanus serum is an example of artificial passive immunity, which contains preformed antibodies. First line of defense includes skin, which comes in physical barrier of innate immunity. Secondary immune responses are also called anamnestic responses, which are very quick and highly intensified due to presence of memory cells.

161. In some shallow south American lakes, visiting flamingoes and resident fishes compete for the same resource: the food zooplanktons present in the lakes. Resources need not be limiting for competition to occur. In interference competition, the feeding efficiency of one species might be reduced due to the interfering and inhibitory presence of the other species.

162. In the formula
$$\frac{dn/}{dt} = rN\left(\frac{K-N/}{K)}\right), \left(\frac{K-N/}{K}\right)$$ stands
for environmental resistance. Environmental resistance is the sum of the environmental factors (such as drought, mineral

deficiencies and competition) that tend to restrict the biotic potential of an organism or kind of organism and impose a limit on numerical increase.

163. Cocaine belong to CNS stimulant drugs; it has potent stimulating action on central nervous system which produces a sense of euphoria and increased energy. It interferes with the transport of dopamine neurotransmitter.

164. A given species can occupy more than one tropic level in the same ecosystem at the same time, but a given species cannot occupy more than one tropic level in the same food chain. In most ecosystems, producers are maximum in number and biomass than herbivores, Pyramid of energy is always upright.

165. T_1 or first tropic level in a terrestrial ecosystem is occupied by producers, which trap solar energy and transfer it to successive tropic level. Maximum energy is always present in T_1.

166. During the long period since the origin and diversification of life on earth, there were five episodes of mass extinction of species. The current species extinction rates are estimated to b e 100 to 1000 times faster than those in the pre-historic times.

167. The concept of hotspots was given by Norman Myer. They were identified for maximum protection of certain regions with very high levels of species richness and high degree of endemism. Initially 25 biodiversity hotspots were identified, but subsequently, 9 more were added. These hotspots are also the regions of accelerated habitat loss, as many species are endemic.

168. A species of organism that is not native to a locality and is moved there from its natural range by humans or other agents is called exotic species, e.g., in India, water hyacinth, Lantana camara, etc.

169. Haryana Kisan welfare club was established by Ramesh Chandra dagar to spread information and help on the practice of integrated organic farming. Integrated organic farming is a cyclical zero waste procedure where waste product from one process are cycled in as nutrients for other processes.

170.

171.

172. DNA forms a double helical structure made up of two polynucleotide chains. Phosphate group is linked to 5′ C of the nucleoside by phosphodiester bond.

173. DNA replication is semiconservative, i.e., during each replication cycle,

one of the parental strands is retained and a new daughter strand is obtained. Thus, only half of the parental DNA molecule is carried to the next generation.
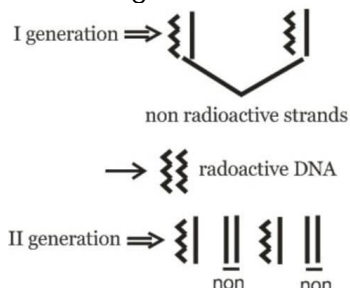
174. In a few species, seeds lose viability within a few months. Seeds of a large number of species remain alive for several years. Some seeds remain alive for hundreds of years. A recent record of 2000-year-old viable seed is of the date palm, Phoenix dactylifera, discovered during the archeological excavation at king Herod's palace near the dead sea.

175.

S.No	Microbes	Product	Use of product
1.	Aspergilus niger (a fungus)	Citric acid	Industrial use
2.	Acetobacter aceti (a bacterium)	Acetic acid	Industrial use
3.	Clostridium butylicum (a bacterium)	Butyric acid	Industrial use
4.	Monascus purpureus (yeast, a fungus)	Statins	Used as a 'blood cholesterol reducing agent'

176. Once BOD of sewage water is reduced significantly, the effluent is then passed into the settling tank where the bacterial 'flocs' are allowed to sediment. This sediment is called as activated sludge.

177. Any part of the plant taken out and grown out in a test tube, under sterile conditions in special nutrient media, is called an explants.

178. 1:1:1:1 is a dihybrid test cross ratio. It is obtained when crossing is done between a hybrid and a recessive genotype, when two gene loci are considered simultaneously.

179.
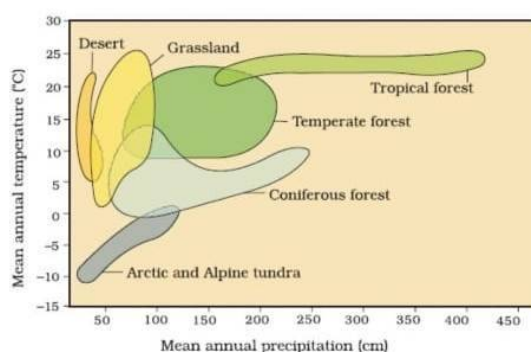
180. There is a good ozone which is found in the upper part of the atmosphere called the stratosphere, and it acts as a shield absorbing harmful UV rays from sun.
Ozone in the lower part of atmosphere, i.e., troposphere, is called bad ozone as it harms the life forms.