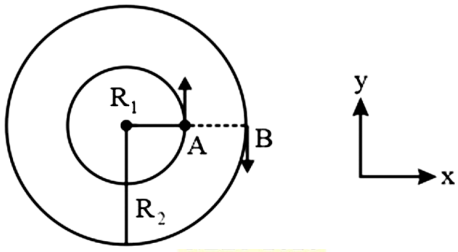
NTA ABHYAS NEET MOCK TEST – 40

PHYSICS

1. In hydrogen like atom, electron makes transition from an energy level with quantum number n to another with quantum number $(n-1)$. If $n>>1$, the frequency of radiation emitted is (almost) proportional to

1) $\frac{1}{n^3}$ 2) $\frac{1}{n}$ 3) $\frac{1}{n^2}$ 4) $\frac{1}{n^4}$

2. In the figure given, A and B are two particles having same magnitude of angular velocity in opposite sense, at $t=0$, the $\vec{V}_A-\vec{V}_B$ at $t=\frac{\pi}{2\omega}$ sec is



1) $-\omega R_1\hat{i}+\omega R_2\hat{i}$ 2) $\omega R_1\hat{i}-\omega R_2\hat{j}$ 3) $\omega R_1\hat{j}-\omega R_2\hat{i}$ 4) $\omega R_1\hat{j}+\omega R_2\hat{i}$

3. A particle of mass m_1 makes a head-on elastic collision with another particle of mass m_2 at rest. m_1 rebounds straight back with $\frac{4}{9}$ of its initial kinetic energy. Then $\frac{m_1}{m_2}$ is :

1) $\frac{2}{3}$ 2) $\frac{1}{5}$ 3) $\frac{3}{2}$ 4) $\frac{2}{5}$

4. An object, initially at rest, explodes into three fragments of equal mass. The momenta of two parts are $2p\hat{i}$ and $p\hat{j}$ where p is a positive number. The momentum of the third part is

1) Will be of the magnitude $3p$ inclined at $\tan^{-1}\left(\frac{1}{2}\right)$ with x-axis.

2) Will be of the magnitude $\sqrt{5}p$ inclined at $\tan^{-1}(2)$ with x-axis.

3) Will be magnitude $3p$ inclined at $\pi-\tan^{-1}\left(\frac{1}{2}\right)$ with x-axis.

4) Will be magnitude $\sqrt{5}p$ inclined at $\pi-\tan^{-1}\left(\frac{1}{2}\right)$ will x-axis.

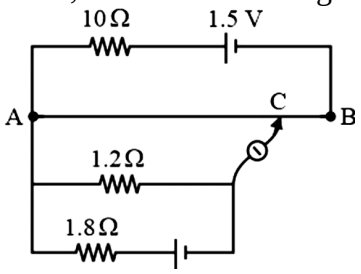
5. The coercivity of a small bar magnet is $4\times10^3\,Am^{-1}$. It is inserted inside a solenoid of 500 turns and length 1m to demagnetize it. The amount of current to be passed through the solenoid will be

1) 2.5 A 2) 5A 3) 8A 4) 10 A

6. To get maximum current through a resistance of 2.5Ω, one can use m rows of cells, each row having n cells. The internal resistance of each cell is 0.5Ω. The values of n and m, if the total number of cells is 45, are

1) $m=3,\ n=15$ 2) $m=5,\ n=9$ 3) $m=9,\ n=5$ 4) $m=15,\ n=3$

7. In the below circuit, AB is a wire of length 100 cm with $5\,\Omega$ resistance. If there is no deflection in the galvanometer, the current flowing in the wire AB is



1) 0.1 A 2) 0.5 A 3) 1.0 A 4) 1.4 A

8. A power transmission line feeds input power at 2300 V to a step down transformer with its primary windings having 4000 turns giving the output power at 230 V. If the current in the primary of the transformer is 5A and its efficiency is 90%, the output current would be :

1) 45 A 2) 50 A 3) 20 A 4) 25 A

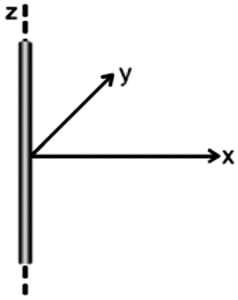
9. A 60 W, 120 V bulb is connected to a 240 V, 60 Hz supply with an inductance in series. Find the value of inductance so that bulb gets correct voltage.

1) $\frac{2.3}{\pi}H$ 2) $2\sqrt{3}H$ 3) πH 4) $\frac{2\sqrt{3}}{\pi}H$

10. The two plates of a parallel plate capacitor are 4mm apart. A slab of dielectric constant 3 and thickness 3 mm is introduced between the plates with its faces parallel to them. The distance between the plates is so adjusted that the capacitance of the capacitor becomes 2/3 rd of its original value. What is the new distance between the plates?

1) 9 mm 2) 21 mm 3) 5 mm 4) 8 mm

11. An infinitely long wire is kept along $z-$axis from $z=-\infty$ to $z=+\infty$, having uniform linear charge density $\frac{10}{9}\,nC\,m^{-1}$. The electric field $\vec{E}$ at point (6 cm, 8 cm, 10 cm) will be :



1) $\left(160\hat{i}+120\,\hat{j}+200\hat{k}\right)\,NC^{-1}$ 2) $\left(200\hat{k}\right)\,NC^{-1}$

3) $\left(160\hat{i}+120\,\hat{j}\right)\,NC^{-1}$ 4) $\left(120\hat{i}+160\,\hat{j}\right)\,NC^{-1}$

12. A mass of $6\times10^{24}\,kg$ is to be compressed in a sphere in such a way that the escape velocity from the sphere is 3×10^{8}. What should be the radius of the sphere?

1) 9 km 2) 9 m 3) 9 cm 4) 9 mm

13. A rocket is fired with a speed $u=3\sqrt{gR}$ from the earth surface. What will be its speed at interstellar space?

1) zero 2) $\sqrt{2gR}$ 3) $\sqrt{7gR}$ 4) $\sqrt{3gR}$

14. The ratio of energies of emitted radiation by a black body at 600 k and 900 k, when the surrounding temperature is 300 k, is

1) $\frac{5}{16}$ 2) $\frac{7}{16}$ 3) $\frac{3}{16}$ 4) $\frac{9}{16}$

15. A perfect gas goes from state A to state B by absorbing $8\times10^5\,J$ of heat and doing $6.5\times10^5\,J$ of external work. It is now transferred between the same two states in another process in which it absorbs $10^5\,J$ of heat. In the second process,

1) Work done on gas is $10^5\,J$ 2) Work done on gas is $0.5\times10^5\,J$

3) Work done by gas is $10^5\,J$ 4) Work done by gas $0.5\times10^5\,J$

16. When Q amount of heat is supplied to an ideal monoatomic gas, the gas performs $\frac{Q}{2}$ amount of work on its surrounding, then the value of specific heat C is

1) 2R 2) 1.5 R 3) 3R 4) 2.5 R

17. A very long metallic hollow pipe of length l and radius $r(<<l)$ is carrying charge Q, uniformly distributed upon it. The pipe is rotated about its axis with constant angular speed ω. The energy stored in the pipe of length $\frac{l}{100}$ is

1) $\frac{\mu_0Q^2\omega^2r^2}{100\pi l}$ 2) $\frac{\mu_0Q^2\omega^2r^2}{200\pi l}$ 3) $\frac{\mu_0Q^2\omega^2r^2}{800\pi l}$ 4) $\frac{\mu_0Q^2\omega^2r^2}{400\pi l}$

18. A current of 1A is flowing through a straight conductor of length 16 cm. The magnetic induction (in tesla) at a point 10 cm from the either end of the wire is :

1) $\frac{8}{3}\times10^{-6}$ 2) $\frac{1}{6\sqrt{2}}\times10^{-5}$ 3) $\frac{1}{6\sqrt{3}}\times10^{-6}$ 4) $\frac{\sqrt{3}}{6}\times10^{-6}$

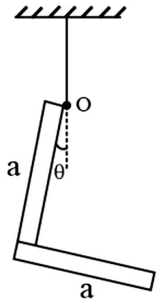
19. A and B participate in a race with acceleration a_1 and a_2 respectively. A reaches t times earlier than B at finish line and their velocities at finish line are v_1 and v_2, respectively. If difference between their velocities is v, then find the value of v

1) $\frac{a_1+a_2}{2}t$ 2) $\sqrt{a_1a_2}t$ 3) $\frac{a_1a_2}{a_1+a_2}t$ 4) $\frac{2a_1a_2}{a_1+a_2}t$

20. A particle is projected with velocity $20\ ms^{-1}$ at angle 60^0 with horizontal. The radius of curvature of trajectory, at the instant when velocity of projectile becomes perpendicular to velocity of projection, is $\left(g=10\ ms^{-1}\right)$

1) $60\sqrt{3}\,m$ 2) $\frac{80}{\sqrt{3}}m$ 3) $40\sqrt{3}\,m$ 4) $\frac{80}{3\sqrt{3}}m$

21. A uniform L shaped rod each of side a is held, as shown in the figure. The angle θ such that rod remains stable will be.



1) $\tan^{-1}\left(\frac{1}{2}\right)$ 2) $\tan^{-1}\left(\frac{1}{3}\right)$ 3) $\tan^{-1}2$ 4) $\tan^{-1}3$

22. A rope of length 10 m and linear density $0.5\ kg\ m^{-1}$ is lying length wise on a smooth horizontal floor. It is pulled by a force of 25 N. The tension in the rope at a point 6m away from the point of application is

1) 20 N 2) 15 N 3) 10 N 4) 5N

23. The half-life period of a radioactive element x is same as the mean life time of another radioactive element y. Initially both of them have the same number of atoms. Then,

1) x and y have the same decay rate initially
2) x and y decay at the same rate always
3) y will decay at a faster rate than x
4) x will decay at a faster rate than y

24. What is the binding energy per nucleon of ${}_6C^{12}$ nucleus?

Given : mass of $C^{12}\ (m_c = 12.000\,u)$

mass of photon $(m_p) = 1.0078\ u$

mass of neutron $(m_n) = 1.0087\ u$

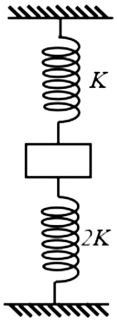
and 1 amu = 931.4 Mev

1) 5.26 MeV
2) 10.11 MeV
3) 15.65 MeV
4) 7.68 MeV

25. The bob of a simple pendulum executes a simple harmonic motion in water with a period t, while the period of oscillation of the bob is t_0 in air. Neglecting frictional force of water and given that the density of the bob is $(4/3) \times 1000\ kg\,m^{-3}$. The correct relationship between t and t_0 is

1) $t = t_0$
2) $t = t_0 / 2$
3) $t = 2t_0$
4) $t = 4t_0$

26. A block mass m is connected to two springs of spring constant 2k and k, respectively, as shown in the vertical plane. At equilibrium, both springs are compressed by same length. If suddenly lower spring is cut, then acceleration of block, just after spring cut, is



1) 2g downward
2) g downward
3) g upward
4) none of these

27. Which one of the following statement is wrong, in the context of X-rays generated from X-ray tube?

1) Wavelength of characteristic X-rays decreases when the atomic number of the target increases
2) Cut-off wavelength of the continuous X-rays depends on the atomic number of the target
3) Intensity of the characteristic X-rays depends on the electrical power given to the X-ray tube
4) Cutoff wavelength of the continuous X-rays depends on the energy of the electrons in X-ray tube

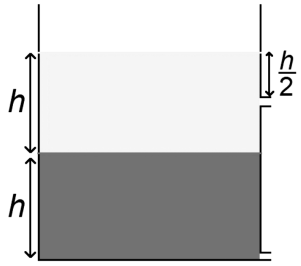
28. To decrease the cut-off wavelength of continuous X-ray by 25%, the potential difference across the X-ray tube

1) must be increased by $\frac{100}{3}\%$
2) must be decreased by 20%
3) must be increased by 25%
4) must be decreased by 25%

29. The excess pressure inside a spherical drop of water is four times that of another drop. Then, their respective mass ratio is

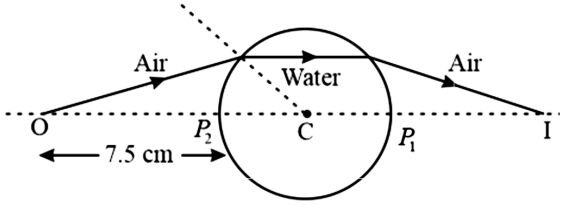
1) 1 : 16
2) 8 : 1
3) 1 : 4
4) 1 : 64

30. Equal volumes of two immiscible liquids of density 2ρ and 4ρ, respectively, are filled in the vessel as shown in the figure. Two small holes are punched at depth $\frac{h}{2}$ and $2h$, respectively, from the surface of the lighter liquid. If v_1 and v_2 are the velocities of efflux at these holes, then the ratio of $\frac{v_1}{v_2}$ is



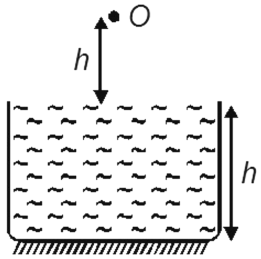
1) 1/3 2) $1/\sqrt{3}$ 3) $1/2$ 4) $1/\sqrt{2}$

31. A thin walled glasses sphere of radius 2.5 cm is filled with water. An object (O) is placed at 7.5 cm from the surface of the sphere. Neglecting the effect of glass wall, at what distance the image (I) of the object, measured from the centre of sphere is formed? (refractive index of water = 1.333)



1) 20 cm 2) 15 cm 3) 10 cm 4) 7.5 cm

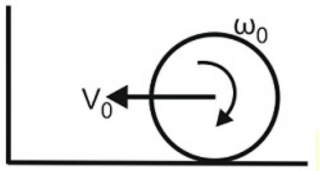
32. An object O is placed at a height $h = 12\,cm$ above water $\left(\mu = \frac{4}{3}\right)$ surface in a beaker. The lower surface of the beaker is polished, as shown in the figure. The location of final image will be



1) 10 cm below water surface 2) 10 cm above water surface
3) 30 cm below water surface 4) 30 cm above water surface

33. A uniform disc is rotating at a constant speed in a vertical plane about a fixed horizontal axis passing through the centre of the disc. A piece of the disc from its rim detaches itself from the disc at the instant when it is at a horizontal level with the centre of the disc and moving upward. Then about the fixed axis, the angular speed of the remaining disc is
1) remains unchanged 2) decreases
3) increase 4) initially increases and later decreases

34. A solid sphere has linear velocity $v_0 = 4\ m/s$ and angular velocity $\omega_0 = 9$ rad/s as shown. Ground on which it is moving is smooth. It collides elastically with a rough wall of coefficient of friction μ. Radius of the sphere is 1m and mass is 2kg.



1) $\frac{1}{2}$ 2) $\frac{2}{3}$ 3) $\frac{1}{3}$ 4) $\frac{1}{4}$

35. The diode used in the circuit, has a constant voltage drop of 0.5 V at all current and a maximum power rating of 100 milliwatts. The value of the resistor R, connected in series with the diode, for obtaining maximum current is

1) 1.5 Ω 2) 5 Ω 3) 6.675Ω 4) 200Ω

36. A solenoid of radius 4 cm and 1000 turns, carries a current of 8A. If it is equivalent to a magnet of same size and magnetization $\vec{M}$ (Magnetic moment/Volume) of 2000 Am^{-1}, then the length of the solenoid is

1) $10\pi\ cm$ 2) $20\pi\ cm$ 3) 30 cm 4) 40 cm

37. Steam of 100^0C is passed into 1.1 kg of water contained in a calorimeter of water equivalent 0.02 kg at 15^0C, till the temperature of the calorimeter and its contents rises to 80^0C. The mass of steam condensed (in kg) is (Take latent heat of steam $= 540\ cal\ g^{-1}$) :

1) 0.130 2) 0.065 3) 0.260 4) 0.135

38. A 2 kg copper block is heated to 500^0C and then it is placed on a large block of ice at 0^0C. If the specific heat capacity of copper is 400 $J\ kg^{-1}\ {}^0C^{-1}$ and latent heat of fusion of water is $3.5 \times 10^5\ J\ kg^{-1}$, the amount of ice that can melt is

1) $\frac{7}{8}\ kg$ 2) $\frac{7}{5}\ kg$ 3) $\frac{8}{7}\ kg$ 4) $\frac{5}{7}\ kg$

39. In the equation $\left(p + \frac{\alpha}{V^2}\right)(V - b) = \text{constant}$, the unit of α is

1) dyne × cm^5 2) dyne × cm^4 3) dyne × cm^{-3} 4) dyne × cm^{-2}

40. The pressure on a circular plate is measured by measuring the force on the plate and the radius of the plate. If the errors in measurement of force and radius are 5% and 3%, respectively, then the percentage of error in the measurement of pressure is

1) 8 2) 14 3) 11 4) 12

41. A beam of natural light falls on a system of 5 nicol prisms, whose transmission axis are turned, each through an angle $\alpha = 30^0$, with respect to the previous prism. The fraction of the intensity that passed through the system is

1) 0.24 2) 0.16 3) 0.12 4) 0.32

42. Visible light of wavelength 6000×10^{-8} cm falls normally on a single slit and produces a diffraction pattern. It is found that the second diffraction minimum is at 60^0 from the central maximum. If the first minimum is produced at θ_1, then θ_1 is close to

1) 20^0 2) 30^0 3) 25^0 4) 45^0

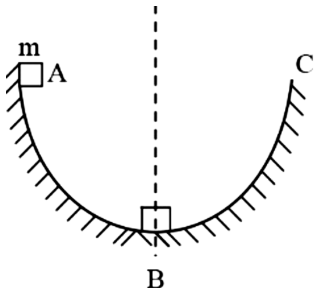
43. Two wires, made up of same material, are of equal lengths but their radii are in the ratio 1 : 2. On stretching each of these two string by the same tension, the ratio between their fundamental frequencies is

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

44. The phase difference between two points is $\pi/3$. If the frequency of waves is 50 Hz, then, the distance between two points is (Given $v = 330\ ms^{-1}$)

1) 2.2 m 2) 1.1 m 3) 0.6 m 4) 1.7 m

45. While slippling a on rough spherical surface of radius 'R', block A of mass 'm' comes with velocity $\sqrt{1.4gR}$ at bottom B. Work done in slipplig the block from 'B' to 'C' is



1) $\frac{mgR}{4}$ 2) mgR 3) $1.3\ mgR$ 4) $\frac{5}{4}\ mgR$

CHEMISTRY

46. The angular momentum of an electron is 'd' orbital is equal to $\left(\hbar = \frac{h}{2\pi}\right)$

1) $\sqrt{2}\hbar$ 2) $2\sqrt{3}\hbar$ 3) 0 4) $\sqrt{6}\hbar$

47. Which of the following species contains equal number of σ and π bonds?

1) XeO_4 2) $(CN)_2$ 3) $CH_2(CN)_2$ 4) HCO_3^-

48. The solubility product of $Cr(OH)_3$ at 298 K is 6.0×10^{-31}. The concentration of hydroxide ions in a saturated solution of $Cr(OH)_3$ will be

1) $\left(18 \times 10^{-31}\right)^{1/4}$ 2) $\left(4.86 \times 10^{-29}\right)^{1/4}$

3) $\left(18 \times 10^{-31}\right)^{1/2}$ 4) $\left(2.22 \times 10^{-31}\right)^{1/4}$

49. Which one of the following electrolytes has the same value of van't Hoff's factor (i) as that of the $Al_2(SO_4)_3$ (if all are 100% ionized)?

1) K_2SO_4 2) $K_3[Fe(CN)_6]$ 3) $K_4[Fe(CN)_6]$ 4) $Al(NO_3)_3$

50. "Metals are usually not found as nitrates in their ores". Out of the following two (1 and 2) reasons which is/are true for the above observation?

i) Metal nitrates are highly unstable

ii) Metal nitrates are highly soluble in water

1) (i) is true but (ii) is false 2) (i) is the false but (ii) is true

3) (i) and (ii) are false 4) (i) and (ii) are true

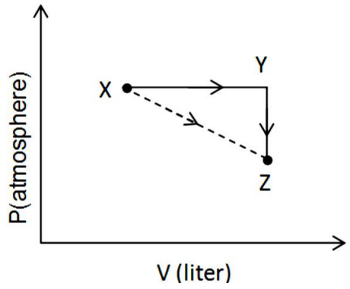
51. Which of the following statements is correct for a reversible process in a state of equilibrium?

1) $\Delta G = 2.303\,RT \log K$ 2) $\Delta G^0 = -2.303\,RT \log K$

3) $\Delta G^0 = 2.303\,RT \log K$ 4) $\Delta G = -2.303\,RT \log K$

52. When initial concentration of a reactant is doubled in a reaction, its half-life period is not affected. The order of the reaction is
1) First 2) Second
3) More than zero but less than first 4) Zero

53. For an ideal gas, consider only P – V work in going from an initial state X to the final state Z. The final state Z can be reached by either of the two paths shown in the figure. Which of the following set choice is correct? (take ΔS as change in entropy and W as work done)



A) $W_{x\to y\to z} = W_{x\to y}$ B) $\Delta S_{x\to y\to z} = \Delta S_{x\to y}$
C) $\Delta S_{x\to z} = \Delta S_{x\to y} + \Delta S_{y\to z}$ D) $W_{x\to z} = W_{x\to y} + W_{y\to z}$
1) A, B 2) A, C 3) B, C 4) A, B, C

54. Within each pair of element F and Cl, S and Se, and Li and Na, respectively, the elements that release more energy upon electron gain are
1) Cl, S and Li 2) F, S and Li 3) Cl, Se and Na 4) F, Se and Na

55. 5g of zinc is treated separately with an excess of
1) dilute hydrochloric acid and
2) aqueous sodium hydroxide.
The ratio of the volumes of H_2 evolved in these two reactions is
1) 1 : 4 2) 1 : 1 3) 1 : 2 4) 2 : 1

56. In a fuel cell methanol is used as fuel and oxygen gas is used as an oxidizer.
The reaction is $CH_3OH(1) + \frac{3}{2}O_2(g) \to CO_2(g) + 2H_2O(1)$
At 298 K standard Gibb's energies of formation for $CH_3OH(1)$, $H_2O(1)$ and $CO_2(g)$ are -166.2, -237.2 and -394.4 $kJ\,mol^{-1}$ respectively. If standard enthalpy of combustion of methanol is -726 $kJ\,mol^{-1}$, efficiency of the fuel cell will be
1) 87% 2) 90% 3) 97% 4) 80%

57. The boiling point of 0.2 $mol\ kg^{-1}$ solution X in water is greater than equimolal solution of Y in water. Which one of the following statements is true in this case?
1) Molecular mass of X is greater than the molecular mass of Y.
2) Molecular mass of X is less than the molecular mass of Y.
3) Y is undergoing dissociation in water while X undergoes no change
4) X is undergoing dissociation is water.

58. Biochemical Oxygen Demand (BOD) is the amount of oxygen required (in ppm)
1) For the photochemical breakdown of waste present in $1m^3$ volume of a water body.
2) for sustaining life in a water body.
3) by bacteria to break-down organic waste in a certain volume of a water sample.
4) by anaerobic bacteria to breakdown organic waste present in a water body.

59. Magnetic moment 2.83 BM is given by which of the following ions?
(At. Nos. Ti = 22, Cr = 24, Mn = 25, Ni = 28)
1) Mn^{2+} 2) Ni^{2+} 3) Ti^{3+} 4) Cr^{3+}

60. Solubility of the alkaline earth's metal sulphates in water decreases in the sequence
1) Sr>Ca>Mg>Ba 2) Ba>Mg>Sr>Ca 3) Ca>Sr>Ba>Mg 4)Mg>Ca>Sr>Ba

61. Maximum bond angle at nitrogen is present in which of the following?

1) NO_2 2) NO_2^+ 3) NO_2^- 4) NO_3^-

62. The number of d-electrons in Fe^{2+} (Z = 26) is not equal to the number of electrons in which one of the following?

1) p-electrons in Cl (Z = 17) 2) d-electrons in Fe (Z = 26)
3) p – electrons in Ne (Z = 10) 4) s-electrons in Mg (Z = 12)

63. Cobalt (III) chloride forms several octahedral complexes with ammonia. Which of the following will not give test of chloride ions with silver nitrate at 25^0C ?

1) $CoCl_3.4NH_3$ 2) $CoCl_3.5NH_3$ 3) $CoCl_3.6NH_3$ 4) $CoCl_3.3NH_3$

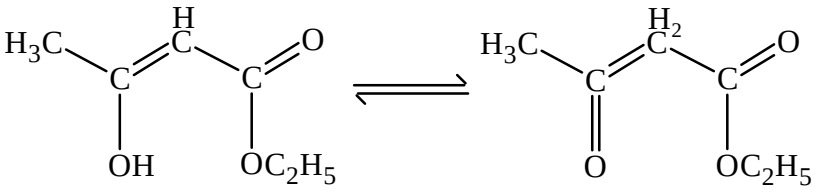
64. In comparison to the zeolite process for the removal of permanent hardness, the synthetic resins method is

1) More efficient as it can exchange only cations
2) Less efficient as the resins cannot be regenerated
3) More efficient as it can exchange both cations as well as anions
4) Less efficient as it exchanges only anions.

65. Which of the following processes does not involve oxidation of iron?

1) Decolourization of blue $CuSO_4$ solution by iron
2) Formation of $Fe(CO)_5$ from Fe
3) Liberation of H_2 from steam by iron at high temperature
4) Rusting of iron sheets

66. The enolic form of ethyl acetoacetate as below has



1) 16 sigma bonds and 1 pi-bond 2) 9 sigma bonds and 2 pi-bonds
3) 9 sigma bonds and 1 pi-bond 4) 18 sigma bonds and 2 pi-bonds

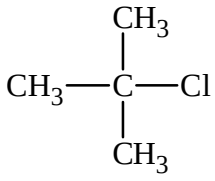
67. Which of these statements about $\left[Co(CN)_6\right]^{3-}$ is true

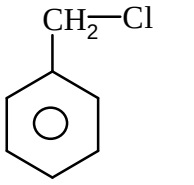
1) $\left[Co(CN)_6\right]^{3-}$ has four unpaired electrons will be in a low-spin configuration.
2) $\left[Co(CN)_6\right]^{3-}$ has four unpaired electrons and will be in a high-spin configuration.
3) $\left[Co(CN)_6\right]^{3-}$ has no unpaired electrons and will be in a high-spin configuration.
4) $\left[Co(CN)_6\right]^{3-}$ has no unpaired electrons and will be in a low-spin configuration.

68. The reaction of $H_3N_3B_3Cl_3$ (A) with $LiBH_4$ in tetrahydrofuran gives inorganic benzene (B). Further, the reaction of (A) with (C) leads to $H_3N_3B_3(Me)_3$. Compounds (B) and (C) respectively, are

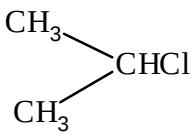
1) Borazine and MeBr 2) Boron nitride and MeBr
3) Diborane and MeMgBr 4) Borazine and MeMgBr

69. In which of the following compounds, the C-Cl bond ionisation shall give most stable carbonium ion?

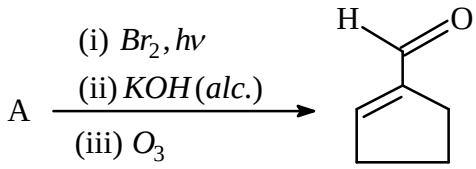
1) 

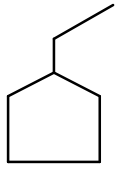
2) 

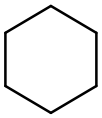
3) $O_2NCH_2CH_2Cl$

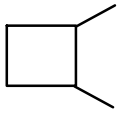
4) 

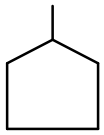
70. In the following reaction A is



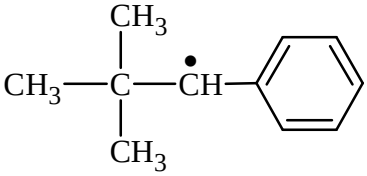


2) 

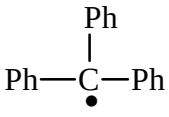
3) 

4) 

71. Consider the following compounds



(I)



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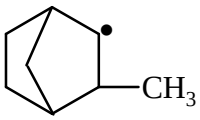
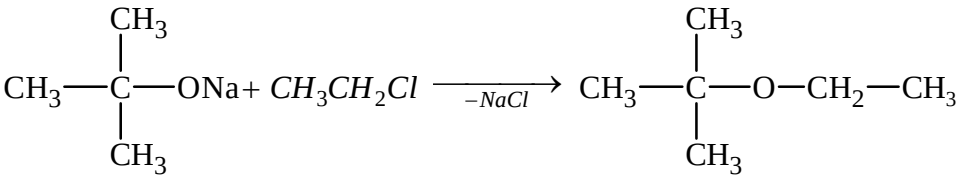


(III)

Hyper conjugation occurs in

1) II only 2) III only 3) I and III 4) I only

72. The reaction



is called

1) Williamson continuous etherification process 2) Gatterman – Koch reaction

3) Etard reaction 4) Williamson Synthesis

73. The anodic half-cell of lead-acid battery is recharged using electricity of 0.05 Faraday. The amount of $PbSO_4$ electrolyzed (in g) during the process is (Molar mass of $PbSO_4 = 303\,g\,mol^{-1}$)

1) 22.8 2) 15.2 3) 7.6 4) 11.4

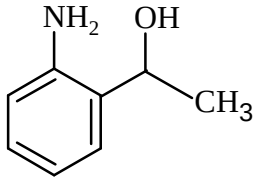
74. The tests performed on compound X and their inferences are

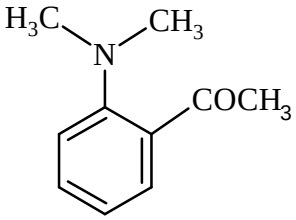
Test Inference

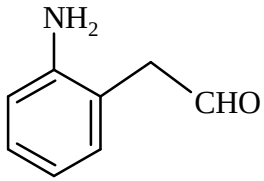
1) 2, 4- DNP test coloured precipitate

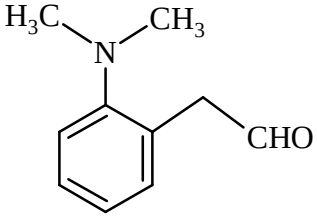
2) iodoform test yellow precipitate

3) Azo dye test no dye formation

1) 

2) 

3) 

4) 

75. When propyne is treated with aqueous H_2SO_4 in presence of $HgSO_4$, the major product is –

1) Propanal 2) Propyl Hydrogen Sulphate

3) Acetone 4) Propanaol

76. A compound 'X' on treatment with $Br_2 / NaOH$, provided $C_3H_9N(Y)$ which gives positive carbylamine test. Compound 'X' is

1) $CH_3COCH_2NHCH_3$ 2) $CH_3CH_2COCH_2NH_2$

3) $CH_3CH_2CH_2CONH_2$ 4) $CH_3CON(CH_3)_2$

77. Among the colloids cheese (C), milk (M) and smoke (S), the correct combination of the dispersed phase and dispersion medium respectively are

1) C: solid in liquid; M : solid in liquid; S solid in gas

2) C : solid in liquid; M : liquid in liquid; S : gas in solid

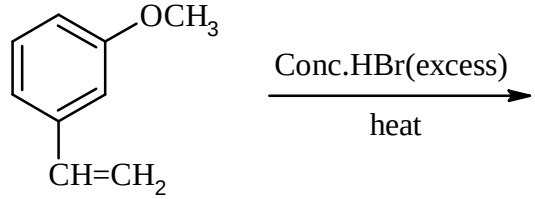
3) C : liquid on solid; M : liquid in lid; S : solid in gas

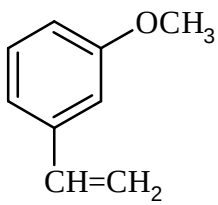
4) C : liquid in solid; M : liquid in liquid; S : solid in gas

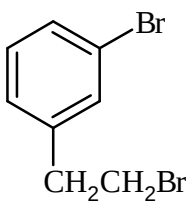
78. An organic compound contains C = 40%, H = 13.33% and N=46.67%. Its empirical formula is

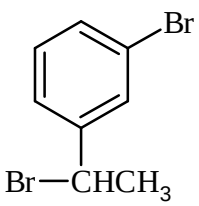
1) C_2H_2N 2) C_3H_7N 3) CH_4N 4) CHN

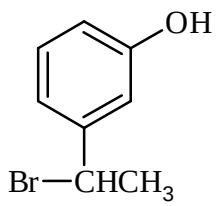
79. The major product of the following reactions



1) 

2) 

3) 

4) 

80. For the reaction, $H_2 + I_2 \rightarrow 2HI$, the differential rate law is

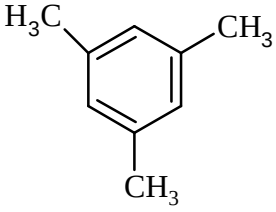
1) $-\frac{d[H_2]}{dt} = -\frac{d[I_2]}{dt} = \frac{1}{2}\frac{d[HI]}{dt}$

2) $-\frac{d[H_2]}{dt} = -2\frac{d[I_2]}{dt} = \frac{1}{2}\frac{d[HI]}{dt}$

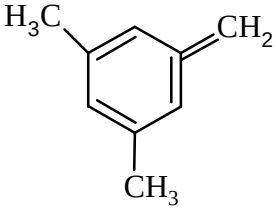
3) $-\frac{d[H_2]}{dt} = -\frac{d[I_2]}{dt} = \frac{d[HI]}{dt}$

4) $-\frac{d[H_2]}{dt} = -\frac{d[I_2]}{dt} = -\frac{d[HI]}{dt}$

81. Given



(I)



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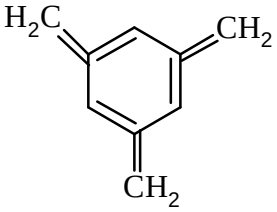
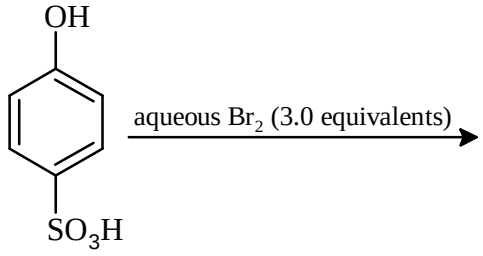


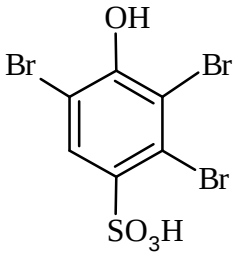
(III)

The enthalpy of the hydrogenation of these compounds will be in the order as

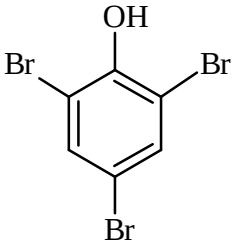
1) III > II > I 2) II > III > I 3) II > I > III 4) I > II > III

82. The major product of the following reaction is

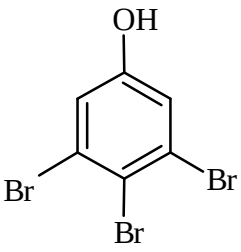




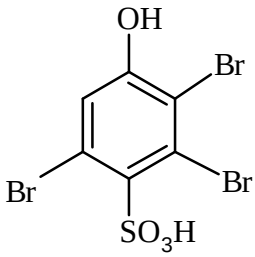
(P)



(Q)



(R)



(S)

1) P 2) Q 3) R 4) S

83. Dissolving 120g of urea (mol.wt.60) in 1000 g of water gave a solution of density 1.15 g/ml. The molarity of the solution is

1) 2.00 M 2) 2.22 M 3) 1.78 M 4) 2.05 M

84. Which polymer has a 'chiral' monomer (s) ?

1) Nylon 6, 6 2) Neoprene 3) PHBV 4) Buna-N

85. Bithional is generally added to the soaps as an additive to function as a/an :

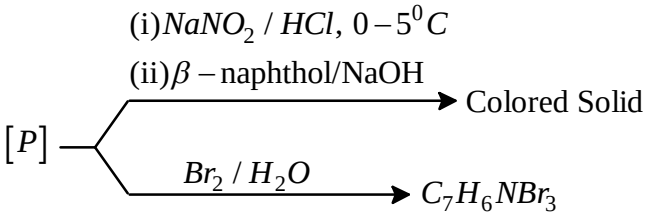
1) Buffering agent 2) Softner 3) Antiseptic 4) Dryer

86. Consider the following sequence of reaction

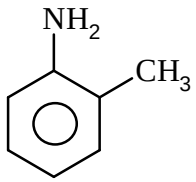
$Ph - NO_2 \xrightarrow{Sn/HCl} (X) \xrightarrow[0-5^0 C]{NaNO_2/HCl} P \xrightarrow{CuBr/HBr} (Q)$ .The final product (Q) is

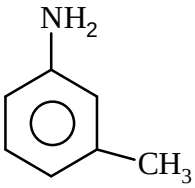
1) chlorobenzene 2) bromobenzene 3) benzyl bromde 4) benzyl chloride

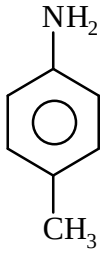
87. Consider the following reactions,

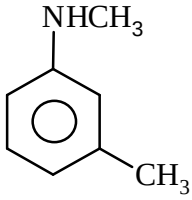


The compound (P) is

1) 

2) 

3) 

4) 

88. The function of "Sodium pump" is a biological process operating in each and every cell of all animals. Which of the following biologically important ions is also a constituent of this pump

1) Mg^{2+} 2) K^{+} 3) Fe^{2+} 4) Ca^{2+}

89. A weak acid HX has the dissociation constant $1\times10^{-5}M$. It forms a salt NaX on reaction with alkali. The degree of hydrolysis of 0.1 M solution of NaX is

1) 0.0001% 2) 0.15% 3) 0.01% 4) 0.1%

90. When the following aldohexose exists in its D – configuration, the total number of stereoisomers in its pyranose form is

1) 2 2) 4 3) 6 4) 8

BIOLOGY

91. The smallest disease causing agent is _____, and it is made up of _____

1) (i) mycoplasma, (ii) proteins and nuclei acids 2) (i) prions, (ii) proteins only
3) (i) viroids, (ii) nuclei acid only 4) (i) viroids, (ii) proteins only

92. Select the odd one with respect to the chemical nature of a hormone?

1) Peptide and polypeptide 2) Steroid and iodothyronine
3) Steroids and amino acid derivative 4) Nuclei and derivatives

93. In plant nutrition, elements are classified as major or minor depending on

1) Their availability in the soil
2) Their relative production in the ash obtained after burning the plants
3) The relative amounts required by the plants
4) The relative importance in plant growth.

94. Hormones which interact with the membrane-bound receptors normally do not enter the target cell but generate second messengers. These second messengers are referred as

1) Calcium ion and inositol 3-phosphate 2) Inositol 3-phosphate and cAMP
3) cAMP and calcium ion 4) All the above

95. Organisms called methanogens are most abundant in

1) Sulphur rock 2) Cattle yard 3) Polluted stream 4) Hot spring

96. The alpha and beta cells are found in

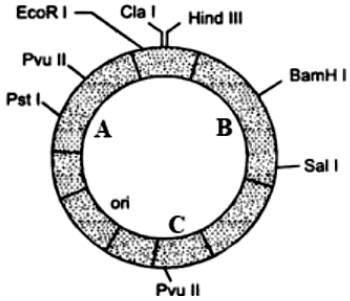
1) Islets of Langerhans 2) Pancreatic duct
3) Accessory pancreatic duct 4) Pancreatic acini

97. Select the option having the fungi which belong the same class

1) Agaricus and Aspergillus 2) Rhizopus and Yeast
3) Morchella and Saccharomyces 4) Mucor and Yeast

98. The structure that lies at base of thalamus in the human brain is
1) the structure responsible for the synthesis of oxytocin
2) the structure which forms the major part of brain
3) the association area
4) the amygdale

99. Identify the labeling A, B and C in this plasmid given below



1) A : Amp^R , B : Tet^R and C : ROP
2) A : Tet^R , B : Amp^R and C : ROP
3) A : Amp^R , B : Kan^R and C : POR
4) A : Tet^R , B : Amp^R and C : POR

100. The process of responding to peripheral nerve stimulation that occurs involuntarily is referred to as
1) Reflex action 2) Action potential 3) Nerve impulse 4) Co-ordination

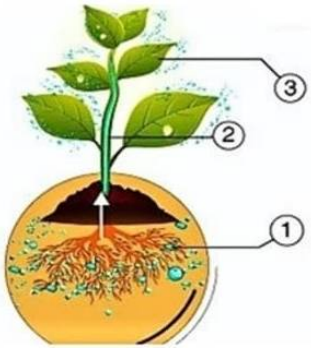
101. The main role of bacteria in the carbon cycle involves
1) assimulation of nitrogeneous compound
2) photosynthesis
3) chemosynthesis
4) digestion or breakdown of organic compounds

102. Joints which are fused end-to-end with the help of dense fibrous connective tissue are referred to as
1) sutures
2) synovial joints
3) cartilaginous joint
4) ball and socket joint

103. Pinus is a gymnosperm because it
1) bears pollen grains
2) is a large tree growing in colder areas
3) lacks ovary but possesses exposed ovules
4) possesses vascular tissues

104. The anatomical unit of muscle is
1) muscle fibre 2) sarcomere 3) filaments 4) sutures

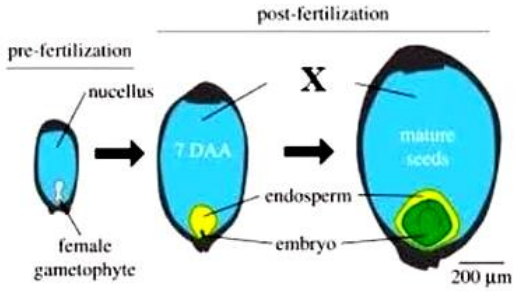
105. Identify the process involved, recognizing labels 1, 2 and 3



1) Photosynthesis 2) Respiration in plants 3) Transpiration process 4) none

106. Ammonia, urea, uric acid, carbon dioxide, water and ions like Na^+, K^+, Cl^-, phosphate, sulfate, ete., are
1) Excretory substances
2) Metabolic product
3) Respiratory substances
4) both (1) and (2)

107. Identify ‘X’ from the diagram below.



1) Degenerate (destroyed) secondary nucleus 2) Remnant of nucellus (persistent nucellus)
3) Peripheral (outer) part of endosperm 4) Degenerate (destroyed) synergids

108. Iron-free compound of haemoglobin is
1) Globin 2) Haematin 3) Biliubin 4) Haemotoxin

109. In gymnosperms, the pollination is
1) Micropylar and anemophilous 2) Micropylar-entomophilous
3) Stigmatic-anemophilous 4) Stigmatic-anemophilous

110. The oxygen dissociation curve of hemoglobin is
1) S shape 2) Sigmoid shape 3) Hyperbola 4) Both (a) and (b)

111. A process where the diploid cell of an ovule outside the embryo sac developing into another embryo sac without reduction is known as
1) Parthenogenesis 2) Apospory
3) Double fertilization 4) Endosperm formation

112. A specialized center called respiratory rhythm center is primarily responsible for the regulation of respiration. It is located in
1) cerebellum 2) the lowest part of the brain
3) the top portion of the brainstem 4) none of these

113. What is not the incorrect sequence of prophase I of meiosis?
1) Leptotene, pachytene, zygotene, diakinesis, diplotene
2) Diplotene, leptotene, pachytene, zygotene, diakinesis
3) Diakinesis, diplotene, leptotene, zygotene, pachytene
4) Leptotene, zygotene, pachytene, diplotene, diakinesis

114. The principal organ in humans involved in the absorption of nutrients like glucose, fructose, fatty acids, glycerol and amino acids is
1) stomach 2) small intestine 3) mouth 4) large intestine

115. Which character marks the beginning of the second phase of mitosis?
1) Appearance of chromosome 2) Initiation of spindle
3) Disintegration of nuclear envelope 4) Formation of equatorial plate

116. What are the steps of the endomembrane system?
1) The proteins and lipids get wrapped in a vesicle, drifted to Golgi, attach to cis-Golgi, move through Golgi, exit trans-Golgi in a new vesicle, drift to the cell membrane, and exocytosis.
2) The proteins and lipids get wrapped in a vesicle, drifted to the endoplasmic reticulum, attach to trans Golgi, move through Golgi, exit cis Golgi in a new vesicle, drift to the trans Golgi, move through Golgi, exit cis Golgi in a new vesicle, drift to the cell membrane, and exocytosis.
3) The carbohydrates and lipids get wrapped in a vesicle, drifted to Golgi, attach to cis Golgi, move through Golgi, exit trans Golgi in a new vesicle, drift to the cell membrane, and exocytosis.
4) The nuclei acids and lipids get wrapped in a vesicle, drifted to the endoplasmic reticulum, attach to trans Golgi in a new vesicle, drift to the cell membrane, and exocytosis.

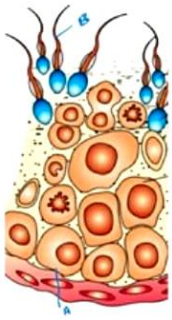
117. A fleshy folds of tissue, which extends down from mons pubis and surrounds vaginal orifice is
1) labia minora 2) labia majora 3) clitoris 4) hymen

118. Read the following four statements (i – iv)
i) Every chromosome essentially has a primary constriction or the centomere.
ii) During different stages of cell division, cells show structured chromosomes in place of the nucleus.
iii) Nuclear pores are the passages through which movement of RNA and protein takes place in one direction between the nucleus and cytoplasm.
iv) Chromatin contains DNA, some basic proteins called histone and RNA only
How many of the above statements are correct?
1) Four 2) one 3) Two 4) Three

119. An inverted pear-shaped organ attached to the pelvic wall involved in reproduction is
1) Womb 2) Uterus 3) Breast 4) Both (1) and (2)

120. Shape of the cell may vary depending on
1) Mode of nutrition 2) Type of nucleus
3) the volume of cytoplasm 4) Function they perform

121. Identify the structures labeled as A and B.



1)

A	B
Spermatogonia	Spermatid

2)

A	B
Oocyte	Spermatozoa

3)

A	B
Spematid	Spermatozoa

4)

A	B
Spermatogonia	Spermatozoa

122. Which one of the following statements pertaining to plant structure is correct?
1) The shoot apical meristem has a quiescent centre.
2) Cork lacks stomata but lenticels carry out transpiration
3) Passage cells help in transfer of food from cortex to phloem
4) Sieve tube elements possess cytoplasm but no nuclei.

123. The oral contraceptive developed by CDRI has lesser side effects because it
1) contains a non-steroidal preparation 2) contains both estrogen and progesterone.
3) inhibits ovulation and implanation 4) has to be taken for a period of 21 days.

124. When a meristematic tissue called cambium is present inside a vascular bundle, the bundle is said to be
1) Conjoint 2) Open 3) Closed 4) Collateral

125. Which of the following barrier methods are made of rubber?
1) Cervical cap 2) Multiload 375 3) Progestasert 4) Lippes loop

126. Which of the following is not correct with respect to binomial nomenclature?
1) The naming system of binomial nomenclature was given by Carolus Linnaeus is being practiced by biologists all over the world.
2) Both the words in a biological name, when handwritten, are separately underlined, or printed in italics to indicate their Latin origin.
3) The first word starts with a capital letter while the second one starts with a small letter
4) The first word in a biological name represents the specific epithet while the second component denotes the genus.

127. A person injured in a road accident requiring an urgent immune response was brought to the doctor. The doctor immediately gave an ATS injection. What type of immunity as provided to the patient?
1) Artificially acquired active immunity 2) Naturally acquired active immunity
3) Naturally acquired passive immunity 4) Artificially acquired passive immunity

128. What is the function of the rich protein layer found in Euglena instead of a cell wall ?
1) It contributes to photosynthesis.
2) It helps in locomotion.
3) It contributes to flexibility.
4) It allows the organism to be heterophic in the absence of sunlight.

129. Choose the incorrect match with respect to disorder and their associated clinical condition.
1)

Disorder	**Associated clinical condition**
Cardiac arrest	When heart stops beating

2)

Disorder	**Associated clinical condition**
Heart attack	When the heart muscle is suddenly damaged

3)

Disorder	**Associated clinical condition**
Heart failure	When the heart is not pumping blood effectively

4)

Disorder	**Associated clinical condition**
Ischemic heart	Causes due to deposition of calcium, fat, cholesterol and fibrous tissue, Which makes the lumen of arteries narrower

130. Statement I : The megaspore mother cell divides mitotically to produce four spores.
Statement II : Megaspore mother cells are diploid, and megaspore is haploid.
1) Both statements are true and statement II is a correct explanation of statement I.
2) Both statements are true but statement II is not a correct explanation of statement I.
3) Statement I is true but statement II is wrong
4) Statement I is wrong but statement II is true.

131. Cannabinoid receptors are principally present in
1) Brain 2) Bone marrow 3) Muscles 4) Gonads

132. If the diploid chromosome number in a flowering plant is 12, then which one of the following will have only 6 chromosomes?
1) Endosperm 2) Leaf cells 3) Cotyledons 4) Synergids

133. The change of frequency of alleles in a population would result in
1) Evolution 2) Inbreeding
3) Gene migration 4) Genetic equilibrium

134. How many of the following statement is/are incorrect?
A) Nuclear type of endosperm is the rarest type of endosperm, in which the nucleus remains intact.
B) Cellular type of endosperm involves both karyokinesis and cytokinesis, simultaneously.
C) Cellular type of endosperm is found in coconut.
1) One 2) Two 3) Three 4) None

135. A more ape-like form was observed in _____, while _____ was more man-like.
1) Dryopithecus and Ramapithecus 2) Ramapithecus and Java man
3) Java man and Peking man 4) Neanderthal man and Cromagnon man

136. Nucellar embryo is
1) Apomictic haploid 2) Apomitic diploid
3) Amphimictic haploid 4) Amphimictic diploid

137. The size of the brain of Neanderthal is about
1) 1400 cc 2) 900 cc 3) 600 cc 4) 1600 cc

138. The period of viability in seeds vary from species to species. Which of the following plants has seeds with the highest recorded period of viability?
1) Orobanche uniflora 2) Striga asiatica 3) Phoenix dactylifera 4) Lupinus articus

139. Which of the statement about breeding is wrong?
1) By inbreeding purelines cannot be evolved
2) Continued inbreeding, especially close inbreeding increases fertility and productivity
3) Cross-breeding allows desirable qualities of two different breeds to be combined
4) Inbreeding exposes harmful recessive genes that are eliminated by selection

140. Which of the following groups of plants are propogated through underground root ?
1) Ginger, Potato, onion and zamikand
2) Bryophyllum and Kalanchoe
3) Pistia, Chrysanthemum and pineapple
4) Sweet potato, Asparagus, Tapioca and Dahlia

141. Arrange the following structures according to their decreasing number.
A. Hepatic or gastric caeca
B. Malpighian tubules
C. Ommatidia
1) Malpighian tubule > Ommatidia > Hepatic caeca
2) Ommatidia > Malpighian tubule > Hepatic caeca
3) Hepatic caeca > Ommatidia > Malpighian bubule
4) Malpighian tubule > Ommatidia > Hepatic caeca

142. If a double – stranded DNA has 30% of guanine, what will be the percentage of adenine and thymine base pairs?
1) 20 % 2) 30 % 3) 40 % 4) 60%

143. How many of the following substances given in the list below are secreted by exocrine glands?
Saliva, oil, digestive enzymes, thyroxine, FSH, mucus, insulin, earwax.
1) Five 2) Four 3) Six 4) Three

144. When a phosphate group is linked to 5’ OH of deoxyadenosine by phosphodiester linkage, a corresponding nucleotide is formed, which is
1) Adenosine 2) Adenylic acid
3) Adenine 4) Dedoxyadenylic acid

145. Comb plates for locomotion are found in :
1) Porifera 2) Cnidaria 3) Ctenophora 4) Mollusca

146. Which of the following is incorrect about nuclesome?
1) Histones are organized to form a unit of eight molecules called a histone octamer
2) The negatively charged DNA is wrapped around the positively charged histone octamer.
3) Nucleosomes constitute the repeating unit of a structure in nucleus called chromatin
4) The nucleosomes in chromatin are seen as 'Beads on string' structure when viewed under light microscope.

147. Which of the following organism is not radially symmetrical?
1) Pila 2) Echinus 3) Cucumaria 4) Ctenoplana

148. To determine the type of organic compounds found in living organisms, the living tissue is ground in
1) Trichloroacetic acid 2) Trichloroamino aicd
3)Trichlorobenzoic acid 4) Trichlorobutyric acid

149. Which of the following is present in maximum percentage in living matter?
1) Carbon 2) Nitrogen 3) Oxygen 4) Potassium

150. Which of the following nitrogeneous waste is excreted in form of pellets or paste?
1) Reptiles and birds 2) Snails and insects 3) Insects and birds 4) All the above

151. How does an enzyme catalyze a reaction?
1) By increasing activation energy of the reaction
2) By decreasing activation energy of the reaction
3) By supplying heat energy
4) First increases and then decreases activation energy

152. By an angiogram, it was analyzed that there is a restriction to the flow of blood in the blood vessels. Which of the following disease can arise due to such a medical condition?
1) Angina pectoris and coronary artery disease 2) Heat failure and AMS
3) Diabetes and arteriosclerosis 4) Emphysema and atherosclerosis

153. Which of the following fruit develops from monocarpellary or multicarpellary, syncarpous ovary and forms a single fruit?
1) Simple fruit 2) Aggregate fruit 3) Multiple fruit 4) Composite fruit

154. Which of the following is not a medicinal plant?
1) Muliathi 2) Aloe vera 3) Belladona 4) Indigofera

155. Which of the following statement is incorrect?
1) In Australian acacia, the petioles expand, become green and synthesize food.
2) If more than two leaves arise at a node and form a whorl, it is called whorled, as in mustard.
3) In palmately compound leaves, the leaflets are attached at a common point, i.e., at the tipe of the petiole, as in silk cotton.
4) Leaves of dicotyledonous plants generally possess reticulate venation, while parallel venation is the characteristic of most monocotyledons.

156. In monocotyledon seed, the outermost layer of endosperm is called
1) Aleurone layer 2) Scutellum 3) Coleoptile 4) Coleorrhizae

157. According to Allen' rule, the mammals from cold climate have
1) Shorter ears and longer limbs 2) Shorter ears and shorter limbs
3) Longer ears and shorter limbs 4) Longer ears and longer limbs

158. If a superior competitor is removed from the area, there is always an increased population of the otherwise exploited species. This phenomenon is called
1) Competitive inclusion 2) Competitive release
3) Gause's principle 4) Resource portioning

159. Match the gases in column – I their source in column – II

	Column – I		Column – II
A)	Nitrous oxide (N_2O)	1)	Secondary pollutant from car exhausts
B)	Chlorofluorocarbons (CFCs)	2)	Combustion of fossil fuels, wood, etc.
C)	Methane (CH_4)	3)	Denitrification
D)	Ozone (O_3)	4)	Refrigerators, aerosol, sprays
E)	Carbon dioxide (CO_2)	5)	Cattle dung and toilets

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

160. Water (prevention and control of pollution) Act was passed in the year
1) 1974 2) 1987 3) 1995 4) 1986

161. Which of the following is incorrect about the experiment performed by T.W.Engelmann?
1) The experimental organism used was Cladophora (green algae).
2) For the experimental purpose, the suspension of aerobic bacteria was utilized.
3) The bacteria accumulated mainly in the region of the orange and green parts of the light spectrum.
4) For splitting of light into its spectral component prism was used.

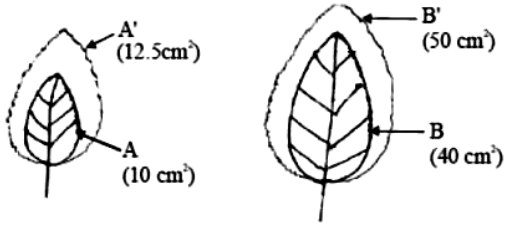
162. Find out the incorrect statement from the following.
1) Dark reaction depends on the product formed by light reaction
2) In stroma, enzymatic reactions incorporates CO_2 into the plant leading to the synthesis of sugar.
3) Purple and green sulphur bacteria use H_2S as hydrogen donor.
4) There is no division of labour in chloroplast.

163. Which of the following reaction involves substrate – level phophorylation?
1) 2-phosphoglycerate to 2-phospheoenolpyruvate
2) Fructose to Fructose -6-phosphate
3) Phosphoenolpyruvic acid to pyruvic acid.
4) Fructose 1, 6-bisphosphate to PGAL and DHAP

164. In an electron transport chain, the cytochrome which donates electrons to O_2 is
1) Cytochrome b 2) Cytochrome c 3) Cytochrome a_3 4) Cytochrome a

165. The following experiment was performed to test the effect of auxin on the plant growth. Five plant seedlings (all growing actively) were prepared as below; they were unilaterally illuminated, and growth was measured after 10 days.
Treatments :
Plant A : Tip not removed, nothing applied
Plant B : Tip removed, nothing applied
Plant C : Tip removed, gelatin block with cytokinin was placed on the cut edge.
Plant D : Tip removed gelatin block with auxin placed on the cut edge.
Which of the following plants would show curvature after the above treatment?
1) A and B 2) A and D 3) B and C 4) A, B, C and D

166. In the below diagrams, A and B are initials areas of leaves. A' and B' are areas of leaves after growth. Which of the following is correct?



1) Both relative and absolute growth of leaves are same
2) Absolute growth is same, but relative growth is different
3) Absolute growth is different, but relative growth is the same
4) Both absolute and relative growth of leaves are different

167. Conversion of milk to curd improves its nutritional value by increasing the amount of
1) Vitamin D 2) Vitamin B_{12} 3) Vitamin A 4) Vitamin E

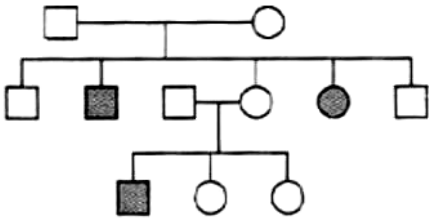
168. The process of recovery and purification of the expressed biological products is called
1) Downstream processing 2) Bio processing
3) Postproduction processing 4) Upstream processing

169. The following features belong to which syndrome?
i) Furrowed tongue
ii) Palm is broad with characteristic palm crease
iii) Physical, psychomotor and mental retardation
iv) Short statured with the small round head
1) Down's syndrome 2) AIDS
3) Turner's syndrome 4) Klinefelter's syndrome

170. Find out the total number of Mendelian disorders from the following :
Cystic fibrosis, Haemophilia, Sickle cell anemia, Colour blindness, Thalassemia, Phenylketonuria
1) 4 2) 5 3) 6 4) 3

171. A diseased man marries a normal woman. They have three daughters and five sons. All the daughters were diseased and sons were normal. The gene of this disease is
1) Sex-linked dominant 2) Sex-linked recessive
3) Autosomal recessive 4) Autosomal dominant

172. Analyze the pedigree chart that is given below and select the correct option.



1) Inheritance of a sex-linked inborn error of metabolism like phenylketonuria
2) Inheritance of a condition like phenyketonuria as an autosomal recessive trait
3) The pedigree chart is wrong as this is not possible
4) Inheritance of a recessive sex-linked disease like haemophilia

173. Name the blank spaces a, b, c and d from the table below :

Type of Microbe	Scientific Name	Commercial Product
Bacterium	a	Lactic acid
Fungus	b	Cyclosporin – A
c	Monascus purpureus	Statin
Fungus	Penicillium notatum	d

1) a = Lactobacillus, b = Cyclosporum Polysporum, c=Fungus, d = Penicillin
2) a = Lactobacillus, b = Trichoderma Polysporum, c = Yeast, d = Penicillin
3) a = Lactobacillus, b = Trichoderma Polysporum, c = Bacteria, d = Red mould
4) a = Lactococcuus, b = Trichoderma Polysporum, c = Fungus, d = Black mould

174. An individual homozygous for genes cd is crossed with wild type and F_1 crossed back with the double recessive. The appearance of the offspring is as follows

++ $\rightarrow$ 903
cd $\rightarrow$ 897
+d $\rightarrow$ 98
c+ $\rightarrow$ 102

The distance between the genes c and d is
1) 20 map units 2) 9.8 map units 3) 10.2 map units 4) 10 map units

175. Which of the following represents the steps involved in developing GMOs?
1) Identification of DNA with desirable gene.
2) Introduction of identified DNA into the host.
3) Maintenance of introduced DNA in the host and transfer of the DNA to its progeny.
4) All the above

176. The fragmented DNA can be visualized by staining DNA with
1) NaCl 2) Ethidium bromide 3) Ethylene bromide 4) NaBr

177. **Statement – I :** Recombinant DNA technology has been less effective in the therapeutic drug production.
Statement – II : Recombinant therapeutics induce unwanted immunological responses.
1) Only Statement-I is correct 2) Only statement-II is correct
3) Both statements are correct 4) Both statement are incorrect

178. Which group of vertebrates comprises the highest number of endangered species?
1) Birds 2) Mammals 3) Fishes 4) Reptiles

179. In the World Summit on sustainable development held in 2002 in Johannesburg, South Africa, how many countries pledged their commitment to achieve a significant reduction in the current rate of biodiversity loss at global, regions and local levels by 2010?
1) 100 2) 180 3) 190 4) 200

180. Read the following statements carefully :
i) Primary succession is a very slow process taking thousands of years for the climax to be reached.
ii) The energy at a higher trophic level is always more than at a lower level.
iii) Bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called fragmentation.
iv) All succession, whether taking place in water or on land, proceeds to a similar climax community : the mesic condition.
Which of the two above statements are correct?
1) (i) and (ii) 2) (ii) and (iii) 3) (i) and (iv) 4) (iii) and (iv)

NTA ABHYAS NEET MOCK TEST – 40

ANSWERS & SOLUTIONS

PHYSICS

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

CHEMISTRY

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

BIOLOGY

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

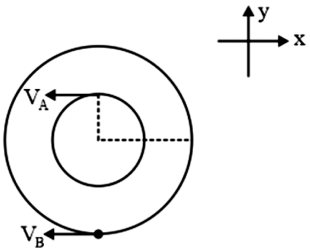
PHYSICS

1. $\Delta E = h\upsilon$

$$= k\left[\frac{1}{(n-1)^2} - \frac{1}{n^2}\right]$$

$$= \frac{(k)2n}{n^2(n-1)^2} \simeq \left(\frac{2k}{n^3}\right)$$

2. $t = \dfrac{\pi}{2\omega}$



$\vec{V}_A = \omega R_1(-\hat{i})$

$\vec{V}_B = \omega R_2(-\hat{i})$

3. Let the initial speed of m_1 is v_0, then from the question we know that

$\frac{4}{9}\frac{1}{2}m_1v_0^2 = \frac{1}{2}m_1v_1^2$

$v_1 = \frac{2}{3}v_0$

Since the collision in elastic, $e = 1$.

$\Rightarrow\ v_0 = v_2 + v_1$

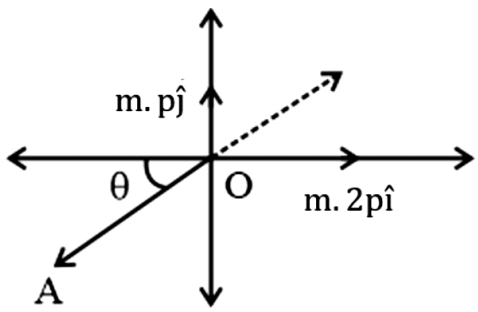
Where v_1 is the speed of m_1 after the collision and v_2 is the speed of m_2 after collision.

$\Rightarrow\ v_2 = \dfrac{v_0}{3}$

$m_1v_0 = -m_1\frac{2}{3}v_0 + m_2\frac{v_0}{3}$

$\frac{m_1}{m_2} = \frac{1}{5}$

4.



From the figure, the momentum of third part can be represented by vector OA. Using the law of conservation by vector OA. Using the law of conservation of linear momentum.

Magnitude of

$OA = \sqrt{(2p)^2 + p^2} = \sqrt{5}p$

$\tan\theta = \dfrac{1}{2}$

$\theta = \tan^{-1}\left(\dfrac{1}{2}\right)$

Therefore, option will be of magnitude $\sqrt{5}p$ inclined at $\pi - \tan^{-1}\left(\frac{1}{2}\right)$ with x-axis is correct.

5. n = number of turns per unit length of solenoid,

$n = \dfrac{500}{1}$

$H = ni \Rightarrow i = \dfrac{H}{n} = \dfrac{4\times10^3}{500} = 8A$

6. $R = 2.5\ \Omega,\ r = 0.5\ \Omega$

no. of rows = m,

no. of columns in each row = n

$i = \dfrac{nE}{R + nr/m}$ total cells $\Rightarrow mn = 45$

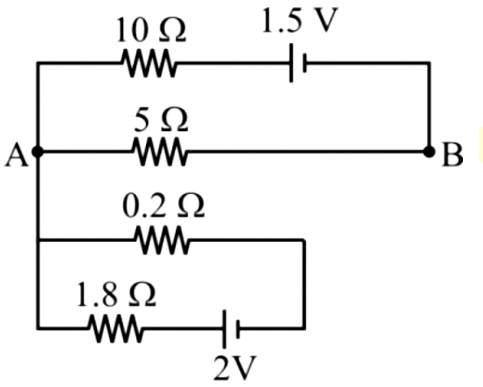
for max. current; $R = nr/m$, $mR = nr$

$m = 3,\ n = 15$

7. Since no current flows through galvanometer,

$\therefore$ Equivalent circuit will be

$\therefore\ i_{AB}\dfrac{1.5}{(10+5)\Omega}0.1\ A$



8. Efficiency $\eta = 0.9 = \dfrac{P_s}{P_p}$

$V_s I_s = 0.9 \times V_p I_p$

$I_s = \dfrac{0.9 \times 2300 \times 5}{230} = 45A$

9. $R = \dfrac{(120)^2}{60} = 240\Omega$ we require

$i = 0.5\ A$

Or $|Z| = 480\,\Omega$

$X_L = \sqrt{480^2 - 240^2} = 240\sqrt{3}\ \Omega$

$L = \dfrac{240\sqrt{3}}{60 \times 2\pi} = \dfrac{2.\sqrt{3}}{\pi} H$

10. Here distance between parallel plates $d = 4mm = 0.004m$, $K = 3$, thickness $t = 3mm = 0.003\,m$ and $d_1 = ?$

$\therefore\ C = \dfrac{\varepsilon_0 A}{d}$ and $C_1 = \dfrac{\varepsilon_0 A}{d_1 - t\left(1 - \dfrac{1}{K}\right)}$

Since $C_1 = \dfrac{2}{3}C$ (given)

$\therefore\ \dfrac{\varepsilon_0 A}{d_1 - t\left(1 - \dfrac{1}{K}\right)} = \dfrac{2}{3}\dfrac{\varepsilon_0 A}{d}$

$\dfrac{1}{d_1 - t\left(1 - \dfrac{1}{K}\right)} = \dfrac{2}{3d}$

$\dfrac{1}{d_1 - 0.003\left(1 - \dfrac{1}{3}\right)} = \dfrac{2}{3 \times 0.004}$

$\dfrac{1}{d_1 - 0.003 \times \dfrac{2}{3}} = \dfrac{1}{0.006}$

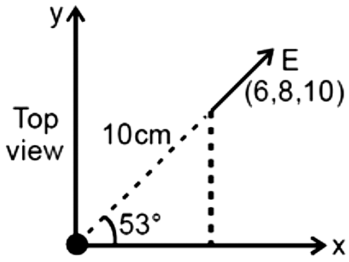
$\dfrac{1}{d_1 - 0.002} = \dfrac{1}{0.006}$

$d_1 - 0.002 = 0.006$

$d_1 = 0.006 + 0.002 = 0.008\ m$

$= 8\,mm$

11.



$E = \dfrac{2k\lambda}{d} = \dfrac{2 \times 9 \times 10^9 \times \left(\dfrac{10}{9}\right) \times 10^{-9}}{10 \times 10^{-2}} = 200\ V$

m^{-1}

As field is radial out, there is no component of it is Z direction.

$\vec{E} = 200\cos 53\,\hat{i} + 200\sin 53\,\hat{j}$

$= \left(120\,\hat{i} + 160\,\hat{j}\right) NC^{-1}$

12. let escape velocity be v_e, then kinetic energy is

$= \dfrac{1}{2}mv_e^2$ ---(i)

And escape energy $= +\dfrac{GM_e m}{R_e}$ ---(ii)

Equation Eqs. (i) and (ii), we get

$\dfrac{1}{2}m_e v_e^2 = \dfrac{GM_e m}{R_e}$

$\Rightarrow v_e = \sqrt{\dfrac{2GM_e}{R_e}}$

$\Rightarrow R = \dfrac{2GM_e}{v_e^2}$

Given,

$G = 6.67 \times 10^{-11} Nm^2 kg^{-2}$

$R = \dfrac{2 \times 6.67 \times 10^{-11} \times 6 \times 10^{24}}{\left(3 \times 10^8\right)^2}$

$R = 8.89 \times 10^{-3}$

$R \approx 9 \times 10^{-3} m = 9\ mm$

13. From conservation of mechanical energy
(K.E + P.E.) surface
=(K.E. + P.E.) infinity

$$\frac{1}{2}m\left(3\sqrt{gR}\right)^2+\left(-\frac{GMm}{R}\right)=\frac{1}{2}mv_\infty^2+0$$

Or $v_\infty=\sqrt{7gR}$.

14. $$\frac{E_1}{E_2}=\frac{T_1^2-T_s^4}{T_2^4-T_2^4}$$

$$=\frac{(600)^4-(300)^4}{(900)^4-(300)^4}=\frac{3}{16}$$

15.

$$dU=dQ-dW=8\times10^5-6.5\times10^5=1.5\times10^5\,J$$

In the second process, dU remains same

$$\therefore\ dW=dQ-dU=10^5-1.5\times10^5$$

$$=-0.5\times10^5\,J$$

16. $$Q=\Delta U+\frac{Q}{2}$$

$$\Rightarrow\Delta U=\frac{Q}{2}$$

$$\Rightarrow\Delta U=\frac{3}{2}nR\Delta T=\frac{Q}{2}$$

$$C=\frac{Q}{nR\Delta T}$$

$$\Rightarrow C=3R$$

17. $$I=\frac{Q}{T}=\frac{Q\omega}{2\pi}\Rightarrow I'=\frac{I}{l}=\frac{Q\omega}{2\pi l}$$

$$B=\mu_0 I'=\frac{\mu_0 Q\omega}{2\pi l}\Rightarrow U=\frac{B^2}{2\mu_0}\times\text{Volume}$$

$$U=\frac{1}{2\mu_0}\times\left[\frac{\mu_0^2Q^2\omega^2}{4\pi^2l^2}\right]\times\pi r^2\frac{l}{100}$$

$$=\frac{\mu_0Q^2\omega^2r^2}{800\pi l}$$

18. $$B=\frac{\mu_0 I}{4\pi r}\left(\sin\phi_1+\sin\phi_2\right)$$

19. $$\frac{1}{2}a_1t_0^2=\frac{1}{2}a_2\left(t_0+t\right)^2$$

$$v_1=a_1t_0 \qquad v_2=a_2\left(t_0+t\right)$$

$$v=v_1-v_2=\left(a_1-a_2\right)t_0-a_2t$$

$$\sqrt{\frac{a_1}{a_2}}t_0=t_0+t$$

$$t_0=\frac{t}{\sqrt{\frac{a_1}{a_2}-1}}$$

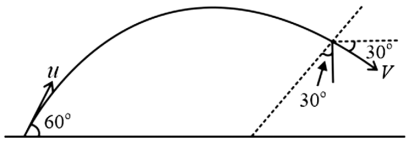
$$v=\left(a_1-a_2\right)\frac{t}{\sqrt{\frac{a_1}{a_2}-1}}-a_2t$$

$$=t\left(\frac{a_1\sqrt{a_2}}{\sqrt{a_1}-\sqrt{a_2}}-\frac{a_2\sqrt{a_2}}{\sqrt{a_1}-\sqrt{a_2}}-a_2\right)$$

$$=t\left(\frac{a_1\sqrt{a_2}-a_1\sqrt{a_1}}{\sqrt{a_1}-\sqrt{a_2}}\right)$$

$$=t\left(\sqrt{a_1}\sqrt{a_2}\right)$$

20.



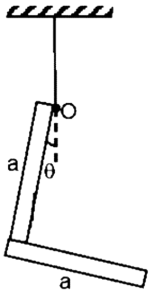
$V\cos30^\circ=u\cos60^\circ\Rightarrow\ V=\frac{20}{\sqrt{3}}$ m

$$V\cos30^0=\cos60^0\Rightarrow V=\frac{20}{\sqrt{3}}\ ms^{-1}$$

$$a_c=g\cos30^0=10\times\frac{\sqrt{3}}{2}$$

$$\therefore\quad r=\frac{V^2}{a_c}=\frac{80}{3\sqrt{3}}\ m$$

21.



At equilibrium, the centre of mass will be below the point of suspension.
Taking torque about point O,

$$mg\frac{l}{2}\sin\theta+mg\left(l\sin\theta-\frac{l}{2}\cos\theta\right)=0$$

$$\Rightarrow\frac{3l}{2}\sin\theta=\frac{l}{2}\cos\theta\ \Rightarrow\ \tan\theta=\frac{1}{3}$$

$$\Rightarrow\theta=\tan^{-1}\frac{1}{3}$$

22. Mass of rope $= 10 \times 0.5 = 5\ kg$

Given force = 25 N

Acceleration $= \frac{F}{m} = \frac{25}{5} = 5\, ms^{-2}$

Length of remaining rope = 4m

Hence mass of remaining rope $= 4 \times 0.5 = 2\ kg$

Hence tension on the rope at a point 6 m away $= m \times a = 2 \times 5 = 10\ N$.

23. $(t_{1/2})x = (t_{mean})y$

Or $\frac{0.693}{\lambda_z} = \frac{1}{\lambda_y}$

Therefore, $\lambda_x < \lambda_y = 0.693\ \lambda_y$

$\lambda_x < \lambda_y$

Or Rate of decay = λ N

Initially number of atoms (N) of both are equal but since $\lambda_y > \lambda_x$, therefore, y will decay at a rate faster than x.

24. A carbon nucleus has 6 protons and 6 neutrons. Total mass of carbon = $(6m_p = 6m_n) = 12.099$ amu and $m_c = 12.000$ amu

mass defect $= \Delta m = 0.099$ amu

$\frac{\text{Binding energy}}{\text{nucleons}} = \frac{BE}{A} = \frac{(\Delta m)931.4}{12}$

$= \frac{(0.099)(931.4)}{12} = 7.68\, MeV$

25. $t_0 = 2\pi\sqrt{I/g}$ ---(i)

Due to upthrust of water on the top, its apparent weight decreases

upthrust = weight of liquid displaced

$\therefore$ Effective weight $= mg - (V\sigma g) = V\sigma g - V\sigma g$

$V\sigma g' = Vg(\rho - \sigma)$, where σ is density of water

Or $g' = g\left(\frac{\rho - \sigma}{\rho}\right)$

$\therefore\ t = 2\pi\sqrt{I/g'} = 2\pi\sqrt{\frac{I\rho}{g(\rho - \sigma)}}$

$\therefore\ \frac{t}{t_0} = \sqrt{\frac{I\rho}{g(\rho - \sigma)} \times \frac{g}{I}} = \sqrt{\frac{\rho}{\rho - \sigma}}$

$= \sqrt{\frac{4 \times 1000/3}{\left(\frac{4000}{3} - 1000\right)}} = 2$

Or $t = t_0 \times 2 = 2t_0$

26. $2kx = mg + kx$

$\Rightarrow\ kx = mg$

When the lower spring is cut the net downward force on the block is

$F_{net} = kx + mg = 2mg$

$\Rightarrow a = 2g$ (downward).

27. Cut-off wavelength depends on the applied voltage not the atomic number of the target. Characteristic wavelength depends on the atomic number of target.

28. $\lambda = \frac{hc}{eV}$, $\frac{\lambda_1}{\lambda_2} = \frac{V_2}{V_1}$, $\lambda_2 = \frac{3}{4}\lambda_1$

$V_2 = \frac{4}{3}V_1$ (which is equal to $\frac{100}{3}$% increase)

29. Excess pressure inside a spherical drop of water

$p = \frac{2T}{R}$

Given, $p_1 = 4p_2$

$\frac{2T}{R_1} = 4 \times \frac{2T}{R_2}$ or $R_2 = 4R_1$

Now, $\frac{m_1}{m_2} = \frac{4\pi R_1^3 d_1}{4\pi R_2^3 d_2}$ or $\frac{m_1}{m_2} = \frac{R_1^3}{R_2^3}$

$\frac{m_1}{m_2} = \frac{1}{64}$

30. $2\rho g\frac{h}{2} = \frac{1}{2}2\rho v_1^2 \Rightarrow v_1 = \sqrt{gh}$

$4\rho gh + 2\rho gh = \frac{1}{2}.4\rho v_2^2$

$\Rightarrow 6\rho gh = 2\rho v_2^2 \Rightarrow v_2 = \sqrt{3gh}$

$\therefore\ \frac{v_1}{v_2} = \frac{1}{\sqrt{3}}$

31. For refraction at first surface,

$u = -7.5\ cm$, $R_1 = 2.5\ cm$

$\mu_1 = 1$, $\mu_2 = \frac{4}{3}$ ---(ii)

$\therefore \quad \frac{\mu_2}{v'} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R_1}$

$\therefore \quad \frac{4/3}{v'} - \frac{1}{(-7.5)} = \frac{4/3 - 1}{2.5}.$

$\Rightarrow \quad \frac{4}{3v'} = \frac{1}{7.5} - \frac{1}{7.5} = 0$

$\Rightarrow \quad v' = \infty$

It means the ray is parallel within the sphere.

For refraction at second surface,

$u = -\infty, \quad \mu_1 = \frac{4}{3}$

$\mu_2 = 1, \quad R_2 = -2.5 \ cm$

$\therefore \quad \frac{\mu_2}{v'} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R_2}$ gives

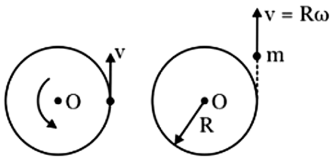
$\Rightarrow \quad \frac{1}{v'} - \frac{4/3}{(-\infty)} = \frac{1-(4/3)}{(-2.5)}$

$\Rightarrow \quad v = +7.5 \ cm$

i.e., image is formed at distance 7.5 cm to the right of P_2. Hence, distance of final image P from centre $C = 7.5 + 2.5 = 10 \ cm$.

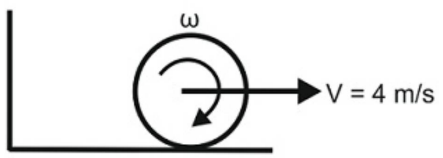
32. Consider refraction at water surface, reflection at mirror and then refraction at water surface again.

33.



Since the broken away piece of mass m (say) has the same linear speed as it had before detaching from the disc, the angular speed of the remaining disc will remain unchanged.

34. $\omega = \frac{v}{R} = \frac{4}{1} = 4 \ rad/s$



Let N be perpendicular force between wall and sphere at the time of collision and Δt the time of impact, then

$N\Delta t = \Delta P = 8m$ ---

Further

$R(\mu N \Delta t) = \Delta(I\omega) = \left(\frac{2}{5}mR^2\right)(5)$ ---

(As $\Delta\omega = 5 \ rad/s$)

Dividing Eq. (2) by Eq.(1), we get

$\mu = \frac{1}{4}$

35. $P_{max} = VI_{max} \Rightarrow I_{max} = \frac{P}{V} = \frac{100}{0.5} \times 10^{-3}$

$I_{max} = \frac{1}{5}A$

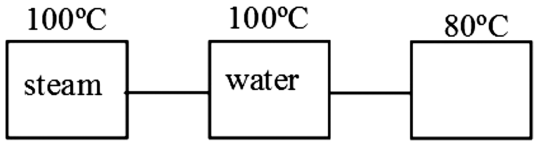
$I_{max} = \frac{V_{net}}{R_{net}} = \frac{1.5 - 0.5}{R} = \frac{1}{R}$

$\Rightarrow R = 5$

36. $M = \frac{\pi r^2 IN}{\pi r^2 L} = \frac{NI}{L} \Rightarrow L = \frac{NI}{M}$

$= \frac{1000 \times 8}{20000} \times 100 \ cm = 40 \ cm$

37. Heat release by steam = Heat gained by calorimeter and its contents



38. Heat emitted by copper = Heat gained by ice

$mc\Delta\theta = m'L$

$\Rightarrow m' = \frac{m\Delta\theta}{L}$

Given : $m = 2kg, \quad c = 400 \ J \ kg^{-1} \ {}^0C^{-1}$

$\Delta\theta = 500, \quad L = 3.5 \times 10^5 \ J \ kg^{-1}$

Heat emitted by copper = Heat gained by ice

$mc\Delta\theta = m'L$

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Given : $m = 2kg, \quad c = 400 \ J \ kg^{-1} \ {}^0C^{-1}$

$\Delta\theta = 500, \quad L = 3.5 \times 10^5 \ J \ kg^{-1}$

$\therefore \quad m' = \frac{2 \times 400 \times 500}{3.5 \times 10^5} = \frac{8}{7} \ kg$

39. According to the principle of dimensional homogeneity, $[p] = \left[\frac{\alpha}{V^2}\right]$

$\Rightarrow [\alpha] = [p]\left[V^2\right] = \left[ML^{-1}T^{-2}\right]\left[L^6\right]$

$= \left[ML^5T^{-2}\right]$.

Hence, the units of $\alpha = gm \times cm^5 \times s^{-2}$

= dyne $\times$ cm^4

40. $P = \frac{F}{A} = \frac{F}{\pi R^2}$

$\frac{\Delta P}{P} \times 100 = \frac{\Delta F}{F} \times 100 + 2\frac{\Delta R}{R} \times 100$

$= 5 + 2(3) = 5 + 6 = 11$

$\frac{\Delta P}{P} \times 100 = 11\%$

41. $I = \frac{I_0}{2} \times \left(\cos^2 30\right)^4 = \frac{I_0}{2} \times \left(\frac{3}{4}\right)^4$

$= \frac{I_0}{2} \times \frac{81}{256} = I_0 \times \frac{81}{512} \approx 0.16$

42. For 2nd minima,

$d \sin\theta = 2\lambda$

$\sin\theta = \frac{\sqrt{3}}{2}$ (given)

$\Rightarrow \frac{\lambda}{d} = \frac{\sqrt{3}}{4}$ …(1)

So, for 1st minima

$d \sin\theta = \lambda$

$\sin\theta = \frac{\lambda}{d} = \frac{\sqrt{3}}{4}$

$\theta = 25.65^0$

$\theta \approx 25^0$

43. Here, $\rho_1 = \rho_2$; $\frac{r_1}{r_2} = \frac{1}{2}$, $T_1 = T_2$

$n_1 = \frac{1}{2lr_1}\sqrt{\frac{T_1}{\pi\rho_1}}$; $n_2 = \frac{1}{2lr_2}\sqrt{\frac{T_2}{\pi\rho_2}}$

$\frac{n_1}{n_2} = \frac{r_2}{r_1} = 2$

44. From the relation,

$\Delta\phi = \frac{2\pi}{\lambda} \times \Delta x$

$\Rightarrow \Delta x = \frac{2\pi}{\lambda} \times \Delta\phi$ ---(i)

Also, $\lambda = \frac{v}{n}$

Now, from Eqs.(i) and (ii), we get

$\Delta x = \frac{v}{2\pi n} \times \Delta\phi$

$\Rightarrow \Delta x = \frac{330}{2\pi \times 50} \times \frac{\pi}{3}$

Or $\Delta x = 1.1\ m$

45. Loss in P.E. =

gain in K.E. + work done against friction $mgR = \frac{1}{2}m(1.4gR) + W_f$

$W_f = 0.3\ mgR$

Now,

$W_{B\to c} = mgR + 0.3mgR = 1.3\ mgR$

CHEMISTRY

46. Orbital angular momentum

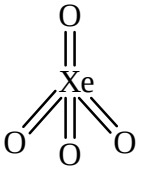
$= \sqrt{l(l+1)}\,\hbar$

for d-orbital $l = 2$

So orbital angular momentum

$= \sqrt{2(2+1)}\,\hbar = \sqrt{6}\hbar$

47. Here XeO_4 contains same number of σ and π bonds



number of σ bonds =4, number of π bonds = 4

In rest other compound given here number of σ and π bonds are different. For example in $(CN)_2$ there are 3σ and 4π bonds.

48. $Cr(OH)_3 \rightleftharpoons \underset{s}{Cr^{3+}} + \underset{3s}{3OH^-}$

$6 \times 10^{-31} = S \times (3S)^3$

$6 \times 10^{-31} = 27S^4$

$S = \left(\frac{6}{27} \times 10^{-31}\right)^{1/4}$

$\left[OH^-\right] = 3S = 3\left(\frac{6}{27} \times 10^{-31}\right)^{1/4}$ ---(ii)

$= \left(18 \times 10^{-31}\right)^{1/4} M$.

49. van't Hoff factor of

$Al_2(SO_4)_3 \rightarrow 2Al^{+3} + 3SO_4^{-2}$

So $n = 5$

$K_4\left[Fe(CN)_6\right] \rightarrow 4K^+ + \left[Fe(CN)_6\right]^{-4}$

So $n = 5$

As $\alpha = 100\% = 1$

$i = n = 5$

In K_2SO_4 $i = 2$, In

$K_3\left[Fe(CN)_6\right] i = 4$, In

$Al(NO_3)_3\, i = 4$.

50. Metal are usually not found as nitrates in their ores as metal nitrates are highly stable like $NaNO_3$ and KNO_3 and are highly soluble in water.

51. $\Delta G = \Delta G^0 + 2.303RT \log Q$

At equilibrium $\Delta G = 0$ and

$Q = K_{eq} = K$

$0 = \Delta G^0 + 2.303\, RT \log K$

So $\Delta G^0 = -2.30RT \log K$

52. It is first order reaction in which half-life is independent of initial concentration.

$t \quad \propto \left(\frac{1}{a}\right)^{n-}$

n = order of reaction

$t_{1/2} = \frac{0.693}{k}$ (for first order $t_{1/2}$ is independent of concentration)

53. Since entropy is a state function

$\Delta S_{X \rightarrow Z} = \Delta S_{X \rightarrow Y} + \Delta S_{Y \rightarrow Z}$

Now $W_{Y-Z} = 0$ (for isochoric)

$W_{X \rightarrow Y \rightarrow Z} = W_{X \rightarrow Y}$

54. $Cl > F$ (in case of fluorine addition of electron becomes little tough than chlorine so electron affinity is less than chlorine it is due to more electron density and smaller size of fluorine atom which causes more electron repulsion)

$S > Se$ and $Li > Na$ (as on moving down the group size increases, and effective nuclear charge decreases so electron affinity decreases.

55. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

$Zn + 2NaOH \rightarrow Na_2ZnO_2 + H_2$

Mole of

$Zn = \frac{\text{Mole of dil.HCl}}{2} = \frac{\text{Mole of NaOH}}{2}$

As volume of a gas $\propto$ moles of gas

$\frac{\text{Volume of } H_2 \text{ from HCl}}{\text{Volume of } H_2 \text{ from NaOH}} = \frac{1}{1}$

56. $CH_3OH(1) + \frac{3}{2}O_2(g) \rightarrow CO_2(g) + 2H_2O(1)$

$\Delta H = -726\, kJ\, mol^{-1}$

Also

$\Delta G_f^0 CH_3OH(I) = -166.2\, kJ\, mol^{-1}$

$\Delta G_f^0 H_2O(I) = -166.2\, kJ\, mol^{-1}$

$\Delta G_f^0 CO_2(I) = -394.4\, kJ\, mol^{-1}$

$\Delta G_f = \sum \Delta G_f^0$ products $- \sum \Delta G_f^0$ reactants

$= -394.4 - 2(237.2) + 166.2$

$= 702.6\, kJmol^{-1}$

Now efficiency of fuel cell

$= \frac{\Delta G}{\Delta H} \times 100 = \frac{702.6}{726} \times 100 = 97\%$

57. $(\Delta T_b)_x > (\Delta T_b)_y$

As same solvent is used so, K_b is same for both X and Y

As m is same (given)

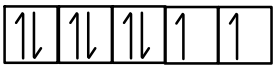
So $i_x.k_b.m > i_y.k_b.m$

$i_x > i_y$

Hence x is undergoing dissociation in water.

58. Biochemical oxygen demand (BOD) is the amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water.

59. $Ni^{2+} = (Ar)3d^8$



Ni^{2+} has two unpaired election $(n = 2)$

As

$\mu = \sqrt{n(n+2)} = \sqrt{2(2+2)} = 2.83\, B$

M In

Mn^{2+}; $n = 5$

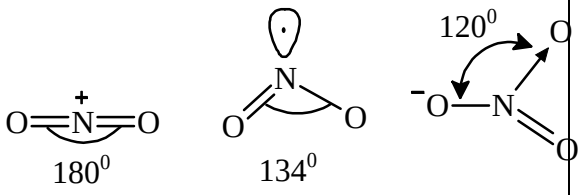
Cr^{3+}; $n = 3$; Ti^{3+}; $n = 1$

60. On moving down the group size of cation increases so hydration energy decreases and solubility decreases as lattice energy dominates over hydration energy.

Due to very small size of Mg^{+2}, Mg^{+2} shows maximum hydration energy and $MgSO_4$ is more soluble here.

$$\underset{\text{Hydration energy}\downarrow\ \text{Solubility}\downarrow}{MgSO_4 > CaSO_4 > SrSO_4 > BaSO_4}$$

61. Bond angle $\propto$ bond order, s% NO_2^+ : sp hybridization (bond angle = 180^0)



62. $Fe^{2+} = 3d^6$ (number of 'd' electrons = 6)

In $Cl = 1s^2 2s^2 2p^6 2s^2 3p^5$ (number of 'p' electrons = 12)

In Fe (number of 'd' electrons = 6) and in Mg (number of 's' electrons = 6)

63. As $CoCl_3.3NH_3$ is represented as $\left[Co\left(NH_3\right)_3 Cl_3\right]$ it means it does not have any ionisable Cl^- hence no white ppt of AgCl is possible. In other three complexes given here ionisable Cl^- is possible so white ppt of AgCl is possible.

$\left[Co\left(NH_3\right)_3 Cl_3\right] \xrightarrow{AgNO_3}$ no ppt.

64. 1) Zeolite method removes only cations $\left(Ca^{2+}\text{ and } Mg^{2+}\text{ ion}\right)$ present in hard water

$$2NaZ + M^{2+}(aq) \rightarrow MZ_2(s) + 2Na + (aq)\left(M \rightarrow Mg, Ca\right)$$

2) Synthetic resin method removes cations $\left(Ca^{2+}\text{ and } Mg^{2+}\text{ ion}\right)$ and anions (like Cl^-, HCO_3^-, SO_4^{2-} etc.)

65. $Fe^0 + 5CO \rightarrow \left[Fe^0\left(CO\right)_5\right]$

As no change in the oxidation state of iron occurs so it is not an oxidation reaction.

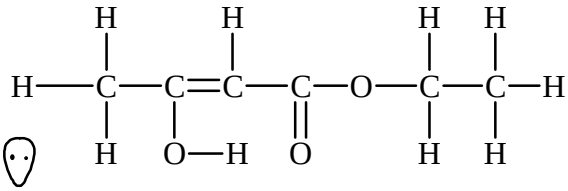
In rest other iron gets oxidized, for example.

$$\overset{0}{Fe} + CuSO_4 \rightarrow \overset{2+}{Fe}SO_4 + Cu$$

66. As 1 H atom $= 1\sigma$,

1 single bond $= 1\sigma$

1 double bond $= 1\sigma, 1\pi$

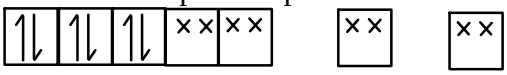


It has 18σ and 2π

67. In $\left[Co\left(CN\right)_6\right]^{3-}$ cobalt is in +3 oxidation state so

$Co^{+3} = \left(Ar\right)3d^6 4s^0 4p^0$

As in presence of strong field ligand, pairing of electrons occurs so in this complex no unpaired electron is present and is a low-spin complex.



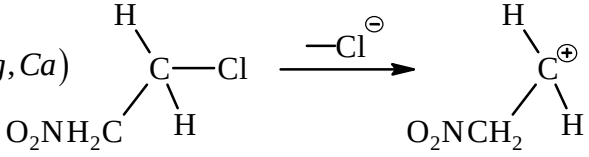
68. Here B is Borazine and C is MeMgBr. The reactions are as follows

$$\underset{(A)}{B_3N_3H_3Cl_3} + LiBH_4 \rightarrow \underset{(B)}{B_3N_3H_6}$$

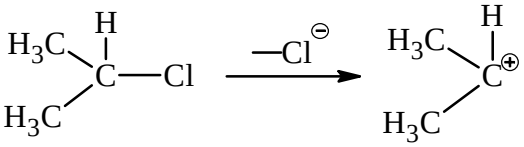
Inorganic Benzene or Borazine

$$B_3N_3H_3Cl + MeMgBr$$
$$(C)$$
$$\rightarrow B_3N_3H_3\left(CH_3\right)_3 + 3MgBrCl$$

69.

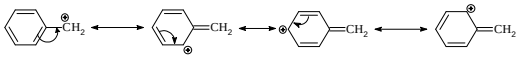


-I effect

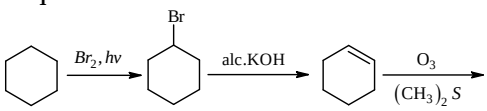


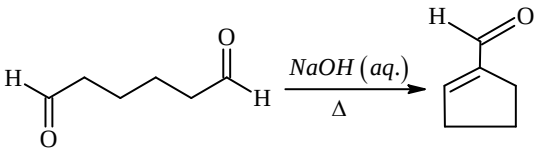
Secondary carbonium ion
[isopropyl carbonium ion]

Most stable carbonium ion is benzyl carbocation due to resonance.

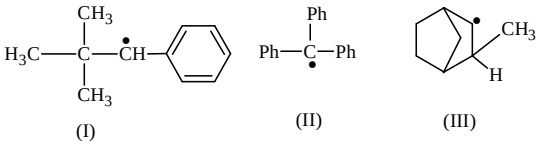


70. Here A is cyclohexane and the reaction sequence is as follows





71.



Only (III) has $\alpha-$H in conjugation with free radical so hyper conjugation with free radical so hyper conjugation is possible.

72. Given reaction is Williamson continuous etherification process. It an important laboratory method for the preparation of symmetrical and unsymmetrical ethers. In this method, an alkyl halide $\left(1^0 \text{ or } 2^0\right)$ is allowed to react with sodium alkoxide to get ether.

73.

$$\underset{0.05/2}{(A)\,PbSO_4(s)} + 2OH^- \rightarrow PbO_2 + H_2SO_4 + \underset{0.05F}{2e^-}$$

$$\underset{0.05/2}{(C)\,PbSO_4(s)} + \underset{0.05F}{2e^-} + 2H^+$$

$$\rightarrow Pb(s) + H_2SO_4$$

$$n_{PbSO_4} = \frac{0.05}{2} \text{ mole}$$

$$W_{PbSO_4} = \frac{0.05}{2} \times 303 = 7.6\ gm$$

74. Information (1) indicates that compound has a carbonyl $\left(\begin{array}{c} O \\ \| \\ -C- \end{array}\right)$ group.
Information (2) indicates that compound a methyl ketone $\left(\begin{array}{c} O \\ \| \\ CH_3-C- \end{array}\right)$ group.
Information (3) indicates that it is 3^0 amine and not 1^0 amine so answer is (2) which gives 2m 4-DNP test and iodoform test.

75. Alkynes undergo markownikoffs addition of water in presence of $H_2SO_4/HgSO_4$:

$$CH_3-C\equiv C-H + H_2SO_4$$

$$\xrightarrow{HgSO_4} \left[\underset{\text{unstable enol}}{CH_3-\overset{OH}{\overset{|}{C}}=CH_2}\right]$$

$$\rightleftharpoons \underset{\text{acetone}}{CH_3-\overset{O}{\overset{\|}{C}}-CH_3}$$

76. $X \xrightarrow{Br_2/NaOH} C_3H_9N(Y)$

As Y gives +ve carbylamines test so it is a primary amine and X is an amide which on Hoffmann's bromamide degradation gives amine Y.

$$CH_3CH_2CH_2CONH_2$$

$$= (X) \xrightarrow{Br_2+NaOH} (CH_3CH_2CH_2NH_2)$$

Option (2) is not possible as it is not an amide. (1, 4) are not possible as they will not give 1^0 amine on degradation.

77.

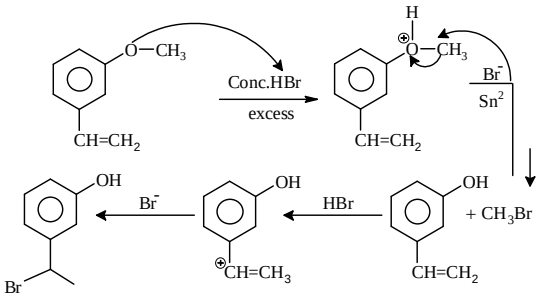
Colloid	**Dispersed Phase**
Cheese (C)	Liquid
Milk (M)	Liquid
Smoke (S)	Solid

78.

Elements	Percent by mass	Atomt extc mass	Relative number of moles Of elements	Simple molar ratio
C	40	12	$\frac{40}{12}=3.33$	$\frac{3.33}{3.33}=$
H	13.33	1	$\frac{13.33}{1}=1$	$\frac{13.33}{3.33}=$
N	46.67	14	$\frac{46.67}{14}=3$	$\frac{3.33}{3.33}=$

Hence, empirical ratio is CH_4N .

79. This conversion occurs as follows



80. $H_2 + I_2 \rightarrow 2HI$

Rate of reaction,

$$= \frac{-d[H_2]}{dt} = \frac{-d[I_2]}{dt} = \frac{1}{2}\frac{d[HI]}{dt}$$

Or

$$= \frac{-2d[H_2]}{dt} = \frac{-2d[I_2]}{dt} = \frac{d[HI]}{dt}$$

81. $R-CH=CH-R + \underset{(1mole)}{H_2} \rightarrow R$

$-CH_2-CH_2-R$

$+\Delta H$ (Heat of hydrogenation)

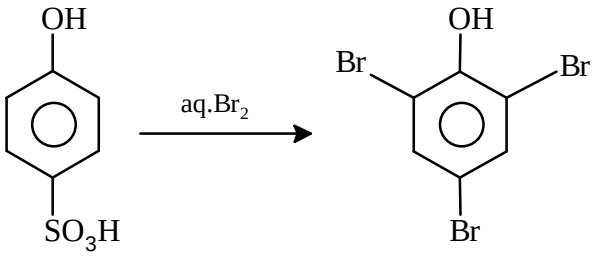
Enthalpy of hydrogenation

$$\propto \frac{1}{\text{stability of alkene}} \propto \frac{1}{\text{Number of } \alpha - \text{H atoms}}$$

Stability order I > II > III.

Heat of hydrogenation order III > II > I.

82. In phenol –OH-group is highly ring activating due to strong +R effect so if $-COOH-$ or $-SO_3H-$ groups are present at ortho and para positions they can subsitituted by electrophile like Br^+. It is important to use Br_2 in water so that Br^+ can be easily generated in good amount.



83. Total mass of solution

$= 1000 + 120 = 1120g$

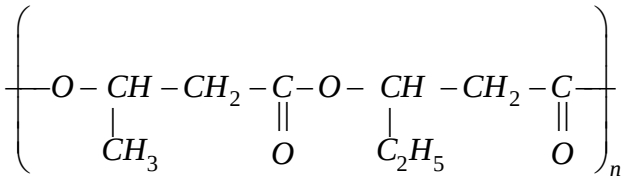
Total volume of solution is

$$(L) = \frac{1120}{1.15} \times 10^3$$

$$M = \frac{W}{M} \times \frac{1}{V(L)} = \frac{120}{60} \times \frac{1.15 \times 10^3}{1120}$$

$= 2.05\ M$

84. PHBV :



Monomer :

$CH_3 - \overset{*}{C}H - CH_2 - COOH$ and

OH

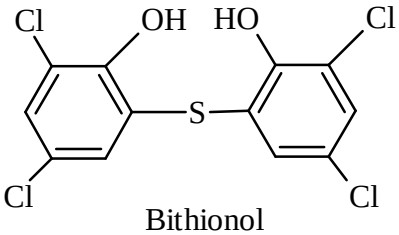
3-Hydroxybutanoic acid

$CH_3 - CH_2 - \overset{*}{C}H - CH_2 - COOH$

OH

3-Hydroxypentanoic acid

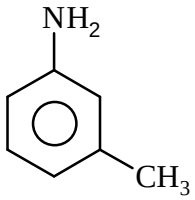
85. Bithionol (the compound is also called bithional) is added to soaps to impart antiseptic properties



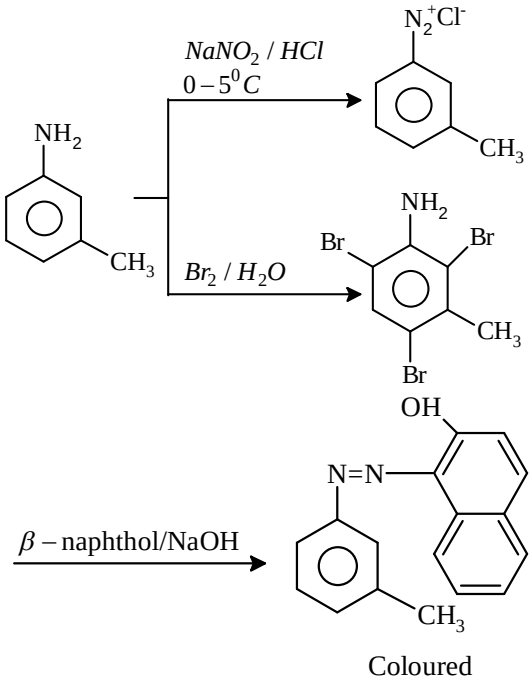
Bithionol

86 $Ph-NO_2 \xrightarrow{Sn/HCl} Ph-NH_2 \xrightarrow{NaNO_2/HCl}$

$Ph-N=N-Cl \xrightarrow{CuBr/HBr} Ph-Br$



87. Here compound (P) is and the reactions are as follows



88. K^+ ion is a constituent of sodium pump. Sodium-potassium pump, in cellular physiology, a protein that has been identified in many cells that maintains the internal concentration of potassium ions $\left[K^+\right]$ higher than that in the surrounding medium (blood, body fluid, water) and maintains the internal concentration of sodium ions $\left[Na^+\right]$ lower than that of the surrounding medium.

89. Hydrolysis reaction is

$X^- + H_2O \rightarrow HX + OH^-$

For a salt of weak acid with a strong base

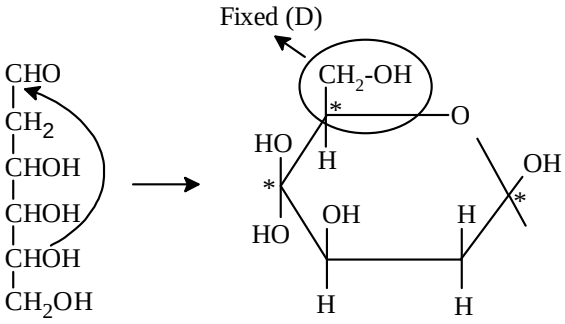
$$K_h = \frac{K_w}{K_a} = C\alpha^2 = \frac{10^{-14}}{10^{-5}} = 0.1 \times \alpha^2$$

$\alpha^2 = 10^{-8}$

$\alpha = 10^{-4}$

So, the degree of hydrolysis $= 10^{-4} \times 100 = 10^{-2} = 0.01\%$

90.



d-configuration

number of chiral centres that can be changed = 3

number of stereoisomers

$= 2^n = 2^3 = 8$

BIOLOGY

91. Prions are discovered by Prusiner in 1982. They are the smallest infectious protein particles which lack nuclei acid. Prions are modified hydrophobic glycoproteins that are resistant to protease action compared with normal proteins; they function as infectious agents. Prions change normal proteins to an infectious form, and they are found to cause disease in animals and not in plants.

92. Chemically, the hormone may be a peptide, polypeptide (insulin), steroid (cortisol), iodothyronine (thyroid hormones) or amino acid derivative (epinephrine).

93. Major elements are required by 1 milligram/gram of dry matter, and minor elements are required in the

quantity of less than 1 milligram/gram of dry matter.

94. Second messengers are intracellular signaling molecules released by the cell in response to exposure to extracellular signaling molecules : the first messengers.

Examples of second messenger molecules include cyclic AMP, cyclic GMP, inositol trisphosphate, diacylglycerol and calcium.

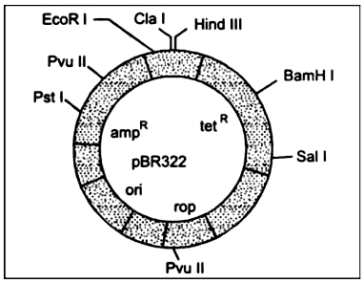
95. Methanogenic archaea reside primarily in the rumen and the lower segments of the intestines of ruminants, where they utilize the reducing equivalents derived from rumen fermentation to reduce carbon dioxide, formic acid or methylamines to methane (CH_4).

96. Islets of Langerphans is endocrine part of pancreas which contains alpha cells, beta cells and delta cells, Pancreatic acini cells secrete pancreatic enzymes. The ducts carry the secretions.

97. Rhizopus and Mucor are members of Phycomycetes. Aspergillus, Saccharomyces (yeast), Morchella (morels) are Ascomycetes fungi. Agaricus (Muschroom) contains edible Basidiomycetes fungi. Morchella, commonly called as morels, are edible Ascomycetes fungi.

98. The thalamus, hypothalamus and epithalamus form the diencephalon. Epithalamus forms the roof, while the hypothalamus forms the floor of diencephalon; this structure is responsible for the synthesis of oxytocin.

99. Plasmids are extra chromosomal self-replicating DNA present in the cytoplasm of bacteria. The given plasmid is pBR322, the most common vector used in genetic engineering.



100. A reflex is defined as an involuntary, unlearned, repeatable, automatic reaction to a specific stimulus which does not require input from the brain. A reflex arc is made up of 5 components :
A receptor : muscle spindle
An afferent fibre : muscle spindle afferent
An integration centre : spinal cord
An efferent fibre : a-motor neurons
An effector : muscle.

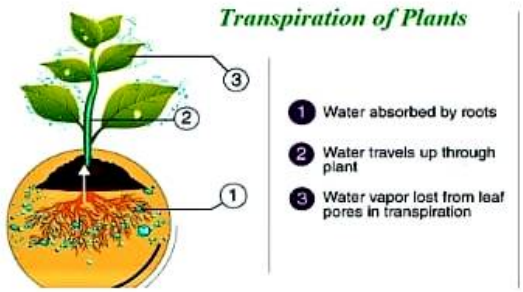
101. Bacteria are essential decomposers in nature. They play a vital role in the recycling of nutrients by causing the breakdown of dead organic matter; thus, they play a critical role in the carbon cycle. The most important bacterium involved in the carbon cycle is Pseudomonas denitrificans.

102. Sutures are fibrous joints present in the cranium. They are immovable joints. The four major sutures are the coronal, sagittal, lambdoid and squamous sutures. They connect the frontal, parietal, temporal and occipital bones. The coronal suture joins the frontal bone to the parietal bones. The sagittal suture joins the two parietal bones together.

103. The word Gvmnosperm is derived from Greek words ‘gymno’ meaning naked and ‘sperma’ meaning seed. Thus, gymnosperms are naked seed-bearing plants in which seeds are not present inside fruits, as gymnosperms are nonflowering plants in which ovules are borne directly on megasporophyll. Thus, ovules remain exposed before and after fertilization.

104. Myofibrils are assembled of repeated structures called sarcomeres (the smallest functional unit of muscle fibre). However, a single muscle cell has many myofibril (muscle fibre) units. Each sarcomere is composed of actin (called thin) and myosin (called thick) filaments, arranged in a precise order, and protein complexes that support the filament structures.

105. Transpiration is a physiological process that occurs in plants. It is a physical process and occurs through the movement of water through the epidermis or stomata that happens by getting absorbed from the soil.



106. Animals accumulate ammonia, ure, uric acid, carbon dioxide, water and ions like Na^+, K^+, Cl^-, phosphate, sulfate, etc., either by metabolic activities or by other means like excess ingestion. These substances have to be removed totally or partially.

107. The nucellus is diploid nutritive tissue present in ovule; it provides nutrition to developing embryo sac. In most ovules, nucellus is completely consumed during the development of embryo sac. In some ovules, where nucellus is abundant, it persists even after the development of embryo sac. These remains of nucellus are called perisperm. Perisperm is observed in seeds of beet, coffee, etc.

108. Haemoglobin is a conjugated protein, which is made up of a protein called globin and a non-protein group haeme. Haeme is an iron $\left(Fe^{2+}\right)$-prophyrin complex. A mammalian haemoglobin molecule is composed of four haeme molecules with four globin molecules.

109. In gymnosperms, pollination occurs by wind, i.e., anemophilous. During pollination, pollen grains land on the female cones near the micropylar region. The pollen grains are transferred directly to the ovule, as the ovules are exposed directly to the surface.

110. The relationship between the pO_2 and % saturation of haemoglobin when represented on a graph is termed as the oxygen – haemoglobin dissociation curve and is sigmoid (s-shaped) in shape.

111. A process where the diploid cell of an ovule outside the embryo sac developing into another embryo sac without reduction is known as apospory. When diploid cells of nucellus divide to form diploid embryo sac which contains diploid egg cell, from which embryo develops without fertilization or gametic fusion, then it is called apospory. This mechanism of seed formation without gametic fusion or fertilization is called apomixes. It is commonly present in members of Asteraceae and grasses.

112. Medulla oblongata, the lower half of the brain, or brainstem contains the cardiac, respiratory, vomiting and vasomotor centres and regulates autonomic, involuntary functions such as breathing, heart rate and blood pressure.

113. Prophase I of meiosis is of longest duration and is further subdivided into five sub phases : leptotene, zygotene, pachytene, diplotene, diakinesis. Leptotene shows bouquet formation.

The pairing of homologous chromosome or synapsis occurs in zygotene. Crossing over occurs in pachytene. Chiasmata formation occurs in diplotene, and terminalisation occurs in diakinesis.

114. The small intestine is the main organ for absorption of nutrients. It has a large number of villi and microvilli which increase the surface area of intestine for the absorption of food. Microbial eye forms as a result of holding of plasma membrane of cells, giving it a brush-bordered appearance.

115. The nuclear membrane disintegrates at the end of prophase, and the disintegration of the nuclear membrane marks the beginning of metaphase. In metaphase, chromosome starts moving towards the centre of the cell and gets organized in one straight line to form metaphase plate. Spindle fibre attaches to the kinetochore of each chromosome from each pole.

116. Cellular orangelles that depend on each other for formation and functioning are part of the endomembrane system. Orangelles like endoplasmic reticulum, Golgi body, lysosome and vacuole are part of the endomembrane system. Protein synthesis takes place on rough ER. The endomembrane system performs its function through the following steps :
The proteins and lipids formed in the endoplasmic reticulum are
1) Wrapped in a vesicle
2) drifted to Golgi
3) attach to cis-Golgi
4) move through Golgi
5) exit trans-Golgi in a new vesicle.
6) drift to the cell membrane
7) exocytosis.

117. The labia majora is a prominent pair of cutaneous skin folds that forms the lateral longitudinal borders of the vulval clefts. The labia majora forms the folds that cover the labia minora.

118. Statements (i) and (ii) are correct. Nuclear pores are the passages through which the movement of RNA and proteins takes place in both directions between the nucleus and cytoplasm. Chromatin contains DNA some basic proteins, histones, some acidic non-histone proteins and RNA.

119. The uterus is a female reproductive organ located between the bladder and rectum, in the pelvic area, and is an inverted pear-shaped structure. The uterus is connected to a fallopian tubes, the cervix, and the vagina. The main purpose of the uterus is to nourish a foetus prior to birth. In menstruating females, the ovaries release eggs that travel via the fallopian tubes to the uterus. If fertilized, the eggs bind themselves to the wall of the uterus(womb) and the foetus develops.

120. Different cells have different shapes. The shape of the cell is variable, and it depends on the functions performed by the cell.

121. The spermatogonia (sing. Spermatogonium) are present on the inside wall of seminiferous tubules, and they increase in numbers by mitotic division. Each spermatogonium is diploid and contains 46 chromosomes. Some spermatogonia are called primary spermatogonia are called primary spermatocytes, which undergo meitotic division. They form second meiotically and give rise to haploid spermatids. They transform into spermatozoa (sperms) by the process called spermiogenesis.

122. Sieve tube elements possess cytoplasm but lack nucleus at maturity. Its metabolic activities are regulated by the nucleus of closely associated cell called companion cell.

123. Oral administration of small doses of either progestogens or progestogenestrogen combinations is another contraceptive method used by the females. They inhibit ovulation and implantation as well as alter the quality of cervical mucus to prevent/retard entry of sperms. Pills are very effective with lesser side effects and are well accepted by the females. Saheli, a new oral contraceptive for the females, contains a non-steroidal preparation. It is a 'once a week' pill with very few side effects and high contraceptive value.

124. Vascular bundles having cambium in between xylem and phloem are called open bundles. Due to cambium, secondary growth is possible. Vascular bundles which lack cambium are called closed bundles. Open bundles occur in dicots, and closed bundles occur in monocots.

125. Diaphragms, cervical caps and vaults : These are made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus.

126. Biologists follow universally accepted principles to provides scientific names to known organisms. Each name has two components : the generic name and the specific epithet. This system of providing a name with two components is called binomial nomenclature. The first word in a biological name represents the genus, while the second component denotes the specific epithet.

127. Passive immunity is a kind of immunity in which readymade antibodies (gamma globulins), obtained from human r animal serum, are injected into the human body to provoke an immediate immune response.
Road accidents are accompanied with broken skin and dirt which urges doctors to prescribe anti-tetanus injections. ATS stands for anti-tetanus serum, which is a form of artificially acquired passive immunity.

128. Euglenoids are freshwater organisms. Instead of a cell wall, they have a protein-rich layer called pellicle which makes their body flexible. They have two flagella, a short and a long one. Though they are photosynthetic in the presence of sunlight, when deprived of sunlight, they behave like heterotrophs by predating on other smaller organisms.

129. Ischemic heart disease is characterized by discomfort and chest pain due to the lack of blood supply to the heart, especially in times of excitement or exertion when the heart requires a greater amount of blood.

130. Megaspore mother cell is a prominent cell in the nucellus. It divides by meiosis and forms a row of four haploid megaspores.

131. THC (tetrahydrocannabinol), acting through cannabinoid receptors, also activates the brain's reward system. THC stimulates neurons in the reward system to release the signaling chemical dopamine at levels higher than those typically observed in response to natural stimuli.

132. Synergids are formed by megaspore, which is a haploid structure. Thus, synergids are haploid and possess 6 chromosomes.

133. According to Hardy-Weinberg equilibrium, any change in the frequency of allele from one generation to another generation is known as evolution. In other words, deviation from Hardy-Weinberg equilibrium is evolution.

134. In the most common type of endosperm development, the PEN undergoes successive nuclear divisions to give rise to free nuclei.

135. About 15 million years ago, primates called Dryopithecus and Ramapithecus existed. They were hairy and walked like gorillas and chimpanzees.

136. Substitution of usual sexual reproduction by a form of reproduction which does not include meiosis and syngamy is called apomixes. In this phenomenon, embryo is developed by some other tissue without fertilization, e.g., nucelleus or integuments or unfertilized egg. Nucellus is a diploid tissue, so nucellar embryo is apomictic diploid.

137. The Neanderthal man with a brain size of 1400cc lived in the near east and central Asia between 1,00,000 – 40,000 year back. They used hides to protect their body and buried dead bodies.

138. There are several records of very old yet viable seeds. The oldest is that of a lupine, Lupinus arcticus, excavated from Arctic Tuundra. The seed germinated and flowered after an estimated record of 10,000 years of dormancy. 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.

139. Continued inbreeding, especially close inbreeding reduces fertility and productivity. This is called inbreeding depression.

140. Reproductive roots are adventitious roots which are generally fleshy and develop adventitious buds, e.g., sweet potato, Dahilia, Asporagus, Topioca, etc.

141. Hepatic caeca are 6 to 8 blind tubules present at the junction of foregut and midgut. At the junction of midgut and hindgut, 100 to 150 yellow-coloured thin filamentous malpighian tubules are present. Each compound eye of cockroach consists of about 2000 hexagonal ommatidia.

142. If a double stranded DNA consists of 30% guanine, then according to Chargaff's rule, cytosine is also 30%. Remaining 40% includes adenine and thymine base pairs.

143. On the basis of the mode of pouring of their secretions, glands are divided into two categories, namely, exocrine and endocrine glands. Exocrine glands secrete mucus, saliva, earwax, oil, milk, digestive enzymes and other cell products. These products are released through ducts or tubes. In contrast, endocrine glands do not have ducts. Their products called hormones are secreted directly into the fluid, bathing the gland. In the given list, insulin, FSH and thyroxine are hormones.

144. Nucleotide is a combination of nucleoside and phosphate group. When deoxyribose sugar attaches to adenine nucleoside, deoxyadenosine is formed. When phosphate attaches to 5'OH of deoxyadenosine, then a corresponding nucleotide called deoxyadenylic acid is formed.

145. Ctenophores are characterized by eight rows of cilia, which are used for locomotion. The cilia in each row are arranged to form a stack of combs, also called comb plates; thus, the name ctenophore comes from the Greek word meaning 'comb bearer'.

146. The nucleosome chain represents 'beads on string'-like structure (representing chromatin) when viewed under electron microscope. This chromatin undergoes further coiling to form chromatin fibres. These chromatin fibres undergo further coiling to form chromosomes, which are distinctly visible during metaphase of cell division.

147. Radial Symmetrry : A radial animal has a top and a bottom (or an oral and aboral side), but has no head end or rear end and no left to right. Examples of animals possessing radial symmetry are : Cnidaria, Ctenophora and Echinodermata.

148. To determine the type of organic matter present, living tissue is grinded in trichloroacetic acid. The slurry thus obtained is filtered to obtain acid-soluble pool, which passes through the filter, and acid-insoluble pool, which is retained. The acid-soluble pool contains the micromolecules and the acid-insoluble pool contains the macromolecules.

149. Oxygen is the most abundant element present in the living tissue. In human body, it forms 65.5%. It is the main component of all biomolecules such as carbohydrate, proteins fats and nuclei acid.

150. Excretion of uric acid as a nitrogeneous waste is a way to preserve water in body and minimize loss of water in urine. Therefore, animals which survive in water-stress conditions excrete their nitrogeneous waste as uric acid to prevent water loss.

151. The enzyme catalyzes a reaction by lowering down the activation energy of the reaction so that the reaction can occur at normal cellular conditions. Activation energy is lowered by using binding energy which is released when substrate binds to the active site of the enzyme to form ES complex. Thus, ES complex formation is very much necessary for enzyme –catalyzed reactions to occur.

152. Coronary artery disease (CAD) : It is often referred to as antherosclerosis. If affects the vessels that supply blood to the heart muscle. In this condition, the lumen of arteries gradually becomes narrower due to the deposits of calcium, fat, cholesterol and fibrous tissues.
Angina (orr Angina pectoris) : Because of insufficient blood supply to heart muscles, a symptom of acute chest pain appears indicating decreases availability of oxygen to the heart muscles. It can occur in both sexes of any age but its occurrence increase with age.

153. When a single fruit develops from a single flower having one or many syncarpous ovaries, it is called a simple fruit. It can be dry or fleshy depending on the nature of the fruit wall called the pericarp.

154. Muliathi (Glycirrhizae), a member of Fabaceae, Alo vera, a member of Liliaceae family, and Belladonna (Astropa bellandonna), a member of Solanaceae family, are all medical plants. Indigofera commonly called the Nile is used obtain dye.

155. In the alternate type of phyllotaxy, a single leaf arise at each node in an alternate manner, as in china rose, mustard and sunflower plants. If more than two leaves arise at a node and form a whorl, it is called whorled, as in Alstonia.

156. The outermost layer of the endosperm of monocots is called the Aleurone layer, it consists of enzymatic proteins which help in breakdown of stored food and supply it to the embryo during the germination of seed. Ploidy of cells of the aleurone layer is 3n.

157. According to Allen’s rule, mammals from cold climate have short ears and short limbs to minimize heat loss. Extremities like ears and limbs are reduced to decrease the area for heat loss.

158. According to Connell’s elegant field experiment, in the intertidal area of Scottland, Barnacle Balanus is a competitively superior species and predominates in the area and Barnacle

Cathamalus is competitively inferior species and is confined to a narrow zone in that area. Removal of superior Balanus led to a inferior Cathamalus. This is called competitive release.

159.

Nitrous oxide (N_2O)	Denitrification
Chlorofluorocarbons CFCs	Refrigerators, aerosol, sprays
Methane (CH_4)	Cattle dung and toilets
Ozone (O_3)	Secondary pollutant from car exhausts
Carbon dioxide (CO_2)	Combustion of fossil fuels, wood, etc.

160. Realizing the importance of maintaining the cleanliness of the water bodies, the Government of India has passed the Water (prevention and control of pollution) Act was passed in the year 1974 to safeguard our water resources from pollution.

161. T.W.Engelmann experimented on Cladophora. He illuminated Cladophora with white light after passing through a prism. He used aerobic bacteria to detect the oxygen evolution site and observed that maximum bacteria accumulated in the blue and red region of the spectrum, indicating that maximum photosynthesis occurs in the region.

162. Division of labour occurs in the chloroplast. In grana, light reaction occurs in which ATP and NADPH + H are synthesized, which are used in dark reaction to reduce carbon dioxide to glucose. All enzymes of the Calvin cycle are present in the stroma.

163. ATP is synthesized in a reaction when phosphoenol pyruvic acid is converted to pyruvic acid. This direct synthesis of ATP is called transphosphorylation or substrate-level phosphorylation.

164. Cytochrome a_3 is the terminal cytochrome of ETC. It has Fe^{+3} and Cu^{+2} both. With Fe^{+3}, it picks up electrons and through Cu^{+2}, it passes electrons to oxygen.

165. Auxin is the plant hormone that is synthesized in young stem apex. During day time, auxin redistribution occurs such that the plant side directly exposed to sunlight contains lower auxin concentration than the other side which is not exposed to light. This unequal distribution causes curvature. In plant A, redistribution of auxin leads to curvature, whereas removal of the tip in plant B leads to no auxin synthesis and no curvature. However, in plant D, where gelatin box with auxin is placed due to auxin redistribution, the curvature is observed.

166. Quantitative comparisions between the growth of living system can also be made in two ways : (i) measurement and the comparison of total growth per unit time is called the absolute growth rate.
(ii) The growth of the given system per unit time expressed on a common basis, e.g., per unit initial parameter, is called the relative growth rate.
Here absolute growth of leaf A to A' is $2.5\ cm^2$, whereas that of leaf B to B' is $10\ cm^2$. Hence, absolute growth 25% of 10, there is a total 25% increase in growth in leaf A, and in leaf B, 10 is 25% of 40, so there is also 25% increase in growth. Hence, the relative growth of two leaves is the same, that is 25%.

167. Conversion of milk to curd is done by Lactobacillus, which causes coagulation of milk protein casein. It adds vitamin B_{12} and increase the nutritional quality of curd. Curd is also useful in controlling the growth of other disease-causing microbes in the stomach.

168. After completion of the biosynthetic stage, the product has to be subjected through a series of processes before it is ready for manufacturing as a finished product. The processes include separation and purification, which are referred to as downstream processing.

169. Down's syndrome is a chromosomal disorder. The cause of this genetic disorder is the presence of an additional copy of the chromosome number 21 (trisomy of 21). This disorder was first described by Langdon Down.

170. Cystic fibrosis, haemophilia, sickle cell anemia, colour blindness, thalassemia and phenylketonuria and Mendelian disorders, which are determined by alteration or mutation in the single gene. These disorders are transmitter to the offspring on the same lines as principle of inheritance.

171. Sex-linked disorders follow cross-cross inheritance pattern which an affected father passes it on their daughters. The daughters receive one of their X chromosomes from their fathers.

172. The given pedigree shows the inheritance of a condition such as phenylketonuria as a autosomal recessive trait. Since the parents are normal and children are affected, the disease is in recessive form. In first-generation, both males and females are equally affected. Since the disease is recessive, for a girl to be affected by an unaffected father, the disease has to be autosomal recessive.

173. a) Microbes are used for commercial and industrial production of organic acids such as lactic acid. Lactic acid is produced by the bacterium Lactobacillus.

b) Cyclosporin is a new antifungal antibiotic produced commercially by the fungus Trichoderma polysporum. It is used as an immunosuppressant agent in organ-transplant patients.

c) Statins, produced by the yeast Monascus purpureus, have been commericialized as blood-chloresterol lowering agents. They act by competitively inhibiting the enzyme responsible for the synthesis of chloresterol.

d) Penicillin was the first antibiotic that was discovered by Alexander Fleming. It was found to be produced by mould Penicillium notatum.

174. % of recombination = Distance between two genes

$$= \frac{\text{Total no. of recombinant phenotypes}}{\text{Total no. of progency}} \times 100$$

$$= \frac{200 \times 100}{2000} = 10\% \text{ or 10 cm.}$$

175. For genetically modifying an organism, a specific desired gene needs to be isolated. This desired gene should be introduced in a specific host cell, where it can multiply and get transferred to all the progeny cells.

176. In gel electrophoresis, the fragmented DNA can be visualized only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation, as pure DNA fragments cannot be seen in visible light without staining.

177. The recombinant DNA technology has been very effective in therapeutic drug production, removing most of the unwanted immunological responses.

178. The grim scenario of extinction is the fact that more than 15,500 species worldwide are facing the threat of extinction. Presently, 12% of all bird species, 23% of all mammal species,

32% of all amphibian species and 31% of all gymnosperm species in the world face the threat of extinction.

179. The historic Convention of Biological Diversity ('The Earth Summit') held in Rio de Janeiro in 1992, called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilization of its benefits. In a follow-up, the World Summit on Sustainable Development held in 2002 in Johannesbuurg, South Africa, 190 countries pledged their commitment to achieve a significant reduction in the current rate of biodiversity loss at global, regional and local levels by 2010.

180. Pyramid of energy is always upright and can never be inverted because when energy flows from a particular trophic level to the next trophic level, some energy is always lost as heat at each step. Additionally, energy at a lower trophic level is always more than at a higher level.

    Detritivores (e.g., earthworm) break down detritus into smaller particles. This process is called fragmentation. Bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called catabolism.