# Physics - Section A

1. The refractive index of a material of a plano-concave lens is 5/3, and the radius of curvature is 0.3 m. The focal length of the lens in air is:
1. -0.45 m
2. -0.6 m
3. -0.75 m
4. -1.0 m

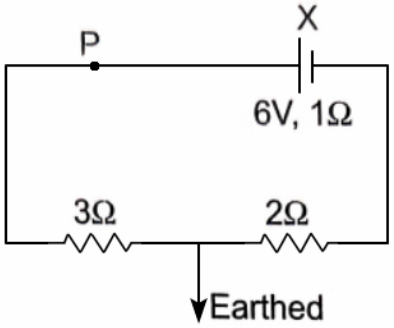
2. The far point of a short-sighted eye is 200 cm. The power of the corrective lens is:
1. -0.5 D
2. 2 D
3. 1 D
4. -1.5 D

3. The refractive index of glass is 1.9. If light travels through a glass slab of thickness d in time t and takes the same time to travel through a transparent beaker filled with water upto a thickness 1.5 d, then the refractive index of water is:
1. 1.27
2. 1.33
3. 1.20
4. 1.50

4. Two electric bulbs, one of 200 V - 40 W and the other of 200 V - 100 W are connected in a domestic circuit. Then:
1. they have equal currents through them.
2. the resistances of both the bulbs are same.
3. the resistance of the bulb of 40 watt is more.
4. the resistance of the bulb of 100 watt is more.

5. A house is served by 220 V supply line. In a circuit protected by a fuse marked by 9 amp, the maximum number of 60- W lamps in parallel that can be turned on, is:
1. 44
2. 20
3. 22
4. 33

6. X is a battery of emf 6 V and internal resistance 1 ohm. The potential at point P in the figure is:




1. 6 V
2. 5 V
3. 3 V
4. 2 V

7. Two charged particles are projected into a region in which a magnetic field is perpendicular to their velocities. After they enter the magnetic field, it must be true that:
1. the charges are deflected in opposite directions
2. the charges continue to move in a straight line
3. the charges move in circular paths
4. the charges move in circular paths but in opposite directions

8. An electron moves in a circular orbit with a uniform speed v. It produces a magnetic field B at the centre of the circle. If velocity is increased to 4v and the magnetic field at the center remains unchanged, the radius changes to:
(Take Initial radius = r)
1. r/2
2. r/3
3. 2r
4. 3r

9. A photon with energy E has same energy as kinetic energy of a proton. Let $\lambda_1$ be the de-Broglie wavelength of the proton and $\lambda_2$ be the wavelength of the photon. The ratio $\lambda_1/\lambda_2$ is proportional to:
1. $c^0$
2. $c^{1/2}$
3. $c^{-1}$
4. $c^{-2}$

10. The threshold frequency for a certain metal is $\nu_0$. When the light of frequency $\nu = 2\nu_0$ is incident on it, the maximum velocity of photoelectrons is $4 \times 10^6$ m/s. If the frequency of incident radiation is increased to $5\nu_0$ then the maximum velocity of photoelectrons (in m/s) will be:
1. $(4/5) \times 10^6$
2. $2 \times 10^6$
3. $8 \times 10^6$
4. $2 \times 10^7$

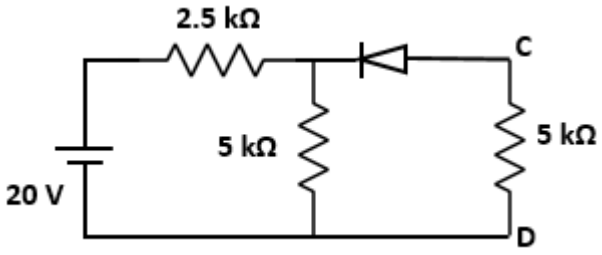
11. Representing the stopping potential V along y-axis and $(1/\lambda)$ along x-axis for a given photocathode, the curve is a straight line, the slope of which is equal to:
1. $\frac{e}{hc}$
2. $\frac{hc}{e}$
3. $\frac{ec}{h}$
4. $\frac{he}{c}$

12. Thermal neutrons are those which:
1. are at very high temperatures.
2. move with high velocities.
3. have kinetic energies similar to those of surrounding molecules.
4. are at rest.

13. An element has binding energy 8 eV/nucleon. If it has total binding energy 128 eV, then the number of nucleons are:
1. 8
2. 14
3. 16
4. 32

14. If $R_1$ is the input resistance and $R_2$ is the output resistance, the voltage gain A in common-emitter configuration is:
1. $A=\alpha\,(R_2/R_1)$
2. $A=\beta\,(R_2/R_1)$
3. $A=\alpha$
4. $A=\beta$

15. For the given circuit, the potential difference between C and D is:




1. 0
2. 5 volt
3. 10 volt
4. 15 volt

16. In the case of p-n junction diode at a high value of reverse bias, the current rises sharply. The value of reverse bias is known as:
1. zero voltage
2. zener voltage
3. inverse voltage
4. critical voltage

17. A mass is suspended from a vertical string in the cabin of a lift moving uniformly upwards, then tension in the string is:
1. $T = T_0$
2. $T > T_0$
3. $T < T_0$
4. $T = 2T_0$

(where $T_0$ is the tension in the string when the lift is in rest position)

18. A bullet is fired from a gun. The force on the bullet is given by:
$F=600-2\times10^5t$
Where F is in newton and t in second. The force on the bullet becomes zero as soon as it leaves the barrel. What is the average impulse imparted to the bullet?
1. 9 N-s
2. zero
3. 0.9 N-s
4. 1.8 N-s

19. If the kinetic energy of a particle is doubled, the de-Broglie wavelength becomes:
1. 2 times
2. 4 times
3. $\sqrt{2}$ times
4. $\left(1/\sqrt{2}\right)$ times

20. Force on an object constrained to move along Z-direction is given by:
$\vec{\mathbf{F}}=\left(5\hat{i}+10\hat{j}-6\hat{k}\right)N$
The work done by this force in moving the body a distance of 8 m along the z-axis is:
1. 24 J
2. -24 J
3. 48 J
4. -48 J

21. A body of mass 5 kg falls from a height of 20 m on the ground and it rebounds to a height of 0.2 m. If the loss in potential energy is used up by the body, then what will be the temperature rise? (Specific heat of the material = 0.09 cal $gm^{-1}\,{}^oC^{-1}$)
1. $5^oC$
2. $4^oC$
3. $8^oC$
4. none of these.

22. Two particles of equal masses have velocities $\vec{v}_1 = 2\hat{i}\ m/s$ and $\vec{v}_2 = 2\hat{j}\ m/s$. The first particle has an acceleration $\vec{a} = \left(3\hat{i} + 3\hat{j}\right) m/s^2$, while the acceleration of the other particle is zero. The centre of mass of the two particles moves in a:
1. circle
2. parabola
3. straight line
4. ellipse

23. A closed tube partly filled with water lies in a horizontal plane. The tube rotates about a perpendicular bisector with angular velocity ω. If the tube stops rotating, the moment of inertia of the system:
1. increases.
2. decreases.
3. remains constant.
4. depends on the sense of rotation.

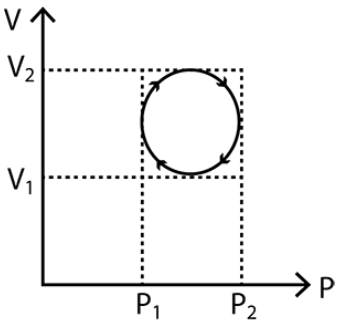
24. A uniform sphere of mass 200 gm rolls without slipping on a plane surface so that its centre moves at a speed of 2.00 cm/sec. Its kinetic energy is:
1. $5.6 \times 10^{-5} J$
2. $5.6 \times 10^{-4} J$
3. $5.6 \times 10^{-3} J$
4. $5.6 \times 10^{-2} J$

25. A disc and a hoop (ring) of the same mass and size roll down an inclined plane simultaneously. The object which reaches the bottom of the incline first is:
1. hoop
2. disc
3. both the hoop and the disc
4. none of these

26. The surface tension of the soap solution is 0.03 N/m. The work done in blowing to form a soap bubble of surface area 40 $cm^2$ is:
1. $1.2 \times 10^{-4}\ J$
2. $2.4 \times 10^{-4}\ J$
3. $12 \times 10^{-4}\ J$
4. $24 \times 10^{-4}\ J$

27. Two substances of relative densities $\rho_1$ and $\rho_2$ are mixed in equal volume and relative density of mixture is 4. When they are mixed in equal masses, the relative density of mixture is 3. The values of $\rho_1$ and $\rho_2$ are:
1. $\rho_1$ = 6 and $\rho_2$ = 2
2. $\rho_1$ = 3 and $\rho_2$ = 5
3. $\rho_1$ = 12 and $\rho_2$ = 4
4. none of these

28. For the cyclic process shown , the work done is:



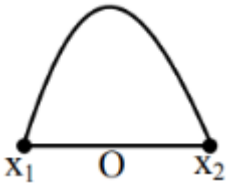

1. Negative
2. Positive
3. Zero
4. Can't say

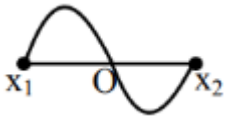
29. In an adiabatic process wherein pressure is increased by $\frac{2}{3}$% if $\frac{C_p}{C_v} = \frac{3}{2}$, then the volume decreases by about:
1. $\frac{4}{9}$%
2. $\frac{2}{3}$ %
3. 4 %
4. $\frac{9}{4}$ %

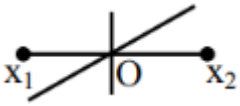
30. Six moles of $O_2$ gas is heated from 20°C to 35°C at constant volume. If specific heat capacity at constant pressure is 8 cal/mol-K. What is the change in the internal energy of the gas?[Take R = 2 cal/mol-K]
1. 180 cal
2. 300 cal
3. 360 cal
4. 540 cal

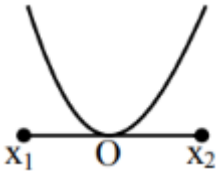
31. Internal energy of $n_1$ moles of hydrogen at temperature T is equal to the internal energy of $n_2$ mole of helium at temperature 2T. Then the ratio $n_1/n_2$ is:
1. 3/5
2. 2/3
3. 6/5
4. 3/7

32. A particle of mass m oscillates in simple harmonic motion between points $X_1$ and $X_2$, the equilibrium position being O. Its kinetic energy will be as shown in the following graph:

1. 


2. 


3. 


4. 


33. If a particle takes 0.5 sec to reach position of minimum velocity from previous such position, then:
1. T = 6 sec, v = 1/6 Hz
2. T = 2 sec, v = 1 Hz
3. T = 3 sec, v = 3 Hz
4. T = 1 sec, v = 1 Hz

34. A simple pendulum is made of a body which is a hollow sphere containing mercury suspended by means of a wire. If a little mercury is drained off, the period of the pendulum will:
1. remain unchanged
2. increase
3. decrease
4. become erratic

35. Two concentric coils of 10 turns each are situated in the same plane. Their radii are 20 and 40 cm and they carry respectively 0.2 and 0.3 ampere current in opposite direction. The magnetic field in $Wb/m^2$ at the centre is:
1. $\frac{35}{4}\mu_0$
2. $\frac{\mu_0}{80}$
3. $\frac{7}{80}\mu_0$
4. $\frac{5}{4}\mu_0$

# Physics - Section B

36. When a hydrogen atom is raised from the ground state to the fifth state, then:
1. both K.E. and P.E. increase
2. both K.E. and P.E. decrease
3. the P.E. increases and K.E. decreases
4. the P.E. decreases and K.E. increases

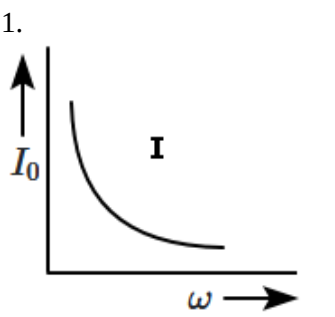
37. In the interference pattern, the energy is:
1. created at the position of maxima.
2. destroyed at the position of minima.
3. conserved but redistributed.
4. all of the above.

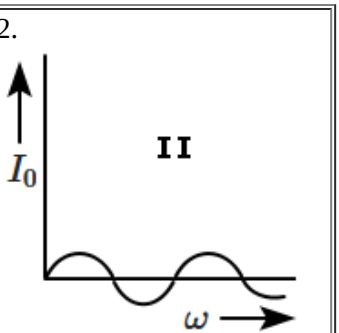
38. Two point charges $+3\mu C$ and $+8\mu C$ repel each other with a force of 40 N. If a charge of $-5\mu C$ is added to each of them then the force between them will become:
1. +10 N
2. +20 N
3. -20 N
4. -10 N

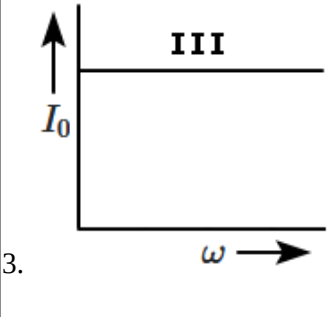
39. The magnetic lines of force inside a bar magnet:
1. do not exist
2. are from N-pole to S-pole of the magnet
3. are from S-pole to N-pole of the magnet
4. depend upon the area of cross-section of the bar magnet

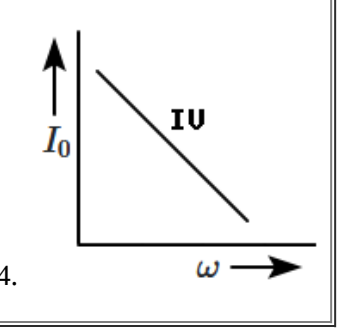
40. Energy stored in the choke coil in the form of:
1. heat
2. electric energy
3. magnetic energy
4. chemical energy

41. In a purely resistive AC circuit, which of the following sketches represents the variation of the current amplitude $I_0$ with the frequency $\omega$?

1. 


2. 

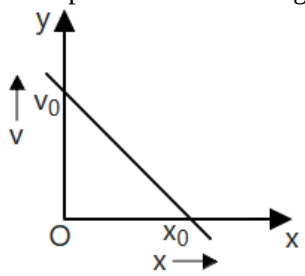

3. 

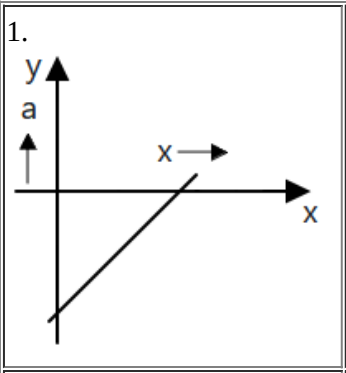

4. 


42. A plane EM wave of frequency 30 MHz travels in free space along the X-direction. The electric field component of the wave at a particular point of space and time is E = 6 V/m along Y-direction. Its magnetic field component B at this point would be:
1. $2 \times 10^{-8}$ T along Z-direction
2. $6 \times 10^{-6}$ T along X-direction
3. $6 \times 10^{-8}$ T along Y-direction
4. $6 \times 10^{-8}$ T along Z-direction

43. Given that $T$ stands for time period and $l$ stands for the length of simple pendulum. If $g$ is the acceleration due to gravity, then which of the following statements about the relation $T^2 = l/g$ is correct?
1. It is correct both dimensionally as well as numerically.
2. It is neither dimensionally correct nor numerically.
3. It is dimensionally correct but not numerically.
4. It is numerically correct but not dimensionally.

44. Depict the shown v-x graph in the a-x graph:




1.
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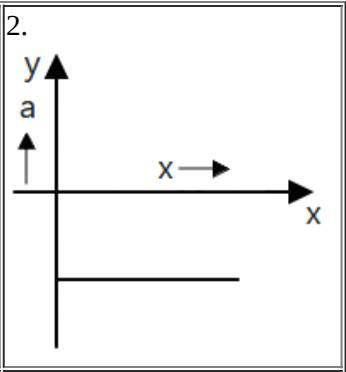


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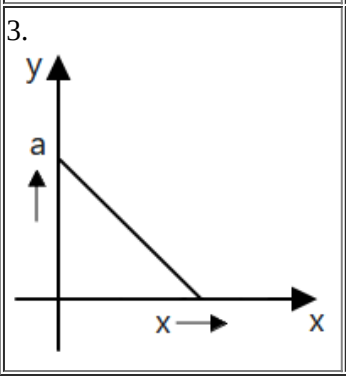


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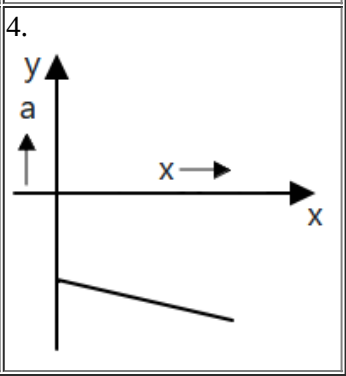



45. The friction of the air causes vertical retardation equal to 10% of the acceleration due to gravity. The maximum height will be decreased by: (Take g = 10 $ms^{-2}$)
1. 8%
2. 9%
3. 10%
4. 11%

46. At what height h above the earth, the value of g becomes g/2? (R = Radius of the earth)
1. 3R
2. $\sqrt{2}R$
3. $\left(\sqrt{2}-1\right)R$
4. $\frac{1}{\sqrt{2}}R$

47. One end of a uniform bar of weight $W_1$ is suspended from the roof and a weight $W_2$ is suspended from the other end. The area of cross-section is A. What is the stress at the midpoint of the rod?
1. $\frac{(W_1+W_2)}{A}$
2. $\frac{(W_1-W_2)}{A}$
3. $\frac{(W_1/2)+W_2}{A}$
4. $\frac{(W_2/2)+W_1}{A}$

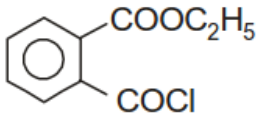
48. The equation of state corresponding to 8 g of $O_2$ is:
1. $PV = 8RT$
2. $PV=\frac{RT}{4}$
3. $PV = RT$
4. $PV=\frac{RT}{2}$

49. Two rods of equal length and area of the cross-section are kept parallel and lagged between temperatures $20^oC$ and $80^oC$. The ratio of the effective thermal conductivity to that of the first rod is:
[the ratio $(K_1/K_2)$ = 3:4]
1. 7:4
2. 7:6
3. 4:7
4. 7:8

50. In the equation
$y=4\cos\left(\frac{2\pi x}{50}\right)\sin(100\pi t)$
where x and y are in cm, t in sec, the node appears at x equal to (in cm):
1. 12.5
2. 50
3. 20
4. $100/2\pi$

# Chemistry - Section A

51. The IUPAC name of the following compound is




1. 2-(Ethoxycarbonyl)benzoylchloride
2. Ethyl 2-(chlorocarbonyl)benzoate
3. Ethyl 2-(chloromethanoyl)benzoate
4. Methyl 2-(Chlorocarbonyl)benzene carboxylate.

52. In context with beryllium, which one of the following statements is incorrect?
1. it is rendered passive by nitric acid
2. it forms $Be_2C$
3. its salts rarely hydrolyze
4. its hydride is electron-deficient and polymeric

53. The quantum number of four electrons are given below :

I. $n = 4, l = 2, m_l = -2, m_s = -\frac{1}{2}$

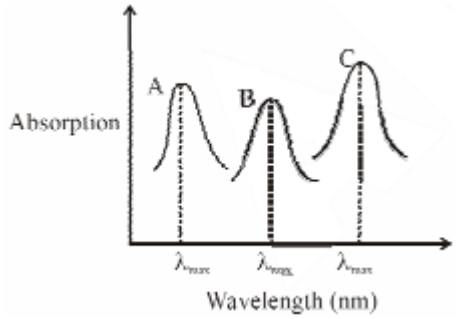
II. $n = 3, l = 2, m_l = 1, m_s = +\frac{1}{2}$

III. $n = 4, l = 1, m_l = 0, m_s = +\frac{1}{2}$

IV. $n = 3, l = 1, m_l = 1, m_s = -\frac{1}{2}$

The correct order of their increasing energies will be -
1. I < III < II < IV
2. IV < II < III < I
3. I < II < III < IV
4. IV < III < II < I

54. Simplified absorption spectra of three complexes ((i), (ii) and (iii)) of $M^{n+}$ ion are provided below; their $\lambda_{max}$ values are marked as A, B and C respectively. The correct match between the complexes and their $\lambda_{max}$ values is:




(i) $[M(NCS)_6]^{(-6+n)}$

(ii) $[MF_6]^{(-6+n)}$

(iii) $[M(NH_3)_6]^{n+}$

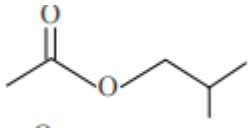
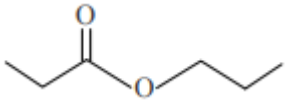
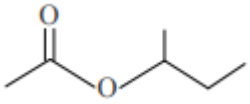
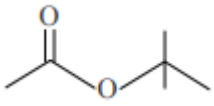
1. A-(ii), B-(i), C-(iii)
2. A-(iii), B-(i), C-(ii)
3. A-(ii), B-(iii), C-(i)
4. A-(i), B-(ii), C-(iii)

55. The total number of monohalogenated organic products (excluded stereoisomer) in the following reaction is-

A (simplest optically active alkene) $\xrightarrow[2.Cl_2/hv]{1.H_2/Ni}$ Products

1. 5
2. 4
3. 6
4. 8

56. An organic compound (A) (molecular formula $C_6H_{12}O_2$) was hydrolyzed with dil. $H_2SO_4$ to give a carboxylic acid (B) and alcohol (C). 'C' gives white turbidity immediately when treated with anhydrous $ZnCl_2$ and conc. HCl. The organic compound (A) is-

1. 
2. 
3. 
4. 

57. The molecule in which hybrid MOs involve only one d-orbital of the central atom is :
1. $XeF_4$
2. $[Ni(CN)_4]^{2-}$
3. $BrF_5$
4. $[CrF_6]^{3-}$

58. The increasing order of the reactivity of the following compounds in nucleophilic addition reaction is :
Propanal, Benzaldehyde, Propanone, Butanone
1. Butanone < Propanone < Benzaldehyde < Propanal
2. Propanal < Propanone < Butanone < Benzaldehyde
3. Benaldehyde < Propanal < Propanone < Butanone
4. Benzaldehyde < Butanone < Propanone < Propanal

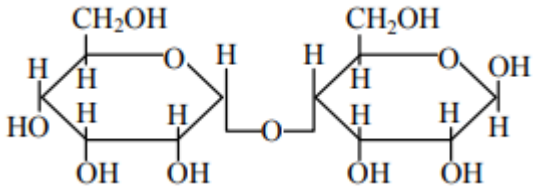
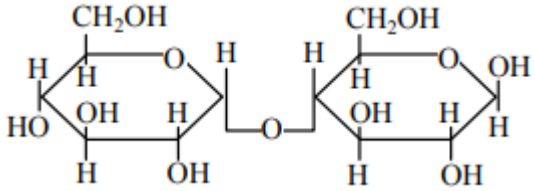
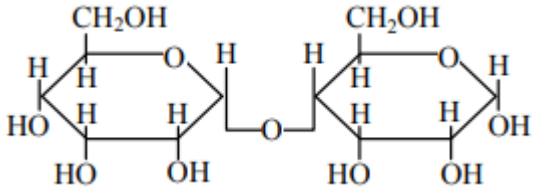
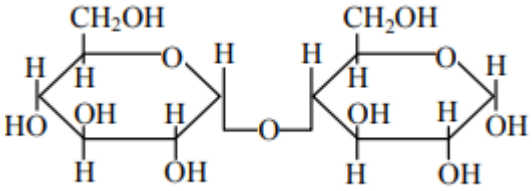
59. Lattice energy and enthalpy of solution of NaCl are 788 kJ $mol^{-1}$ and 4 kJ $mol^{-1}$ , respectively. The hydration enthalpy of NaCl is:

1. –780 kJ $mol^{-1}$
2. –784 kJ $mol^{-1}$
3. 780 kJ $mol^{-1}$
4. 784 kJ $mol^{-1}$

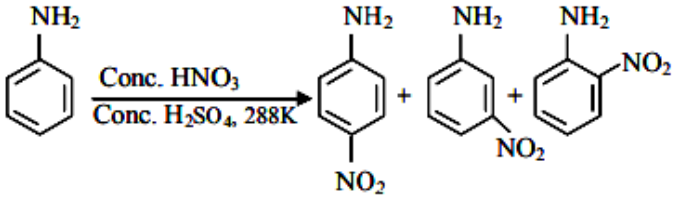
60. For a dimerization reaction, $2A_{(g)} \rightarrow A_{2(g)}$ a t 298 K , $\Delta U^{\Theta}$ = -20 kJ $mol^{-1}$ $\Delta S^{\Theta}$ = - 30 J $K^{-1}mol^{-1}$ , then the $\Delta G^{\Theta}$ will be- .

1. -10. 4 kJ
2. 18.9 kJ
3. -13.5 kJ
4. 17. 4 kJ

61. The correct structure of $\alpha$-anomer of maltose, among the following is-

1. 
2. 
3. 
4. 

62. In the following reaction the reason why meta-nitro product also formed is:

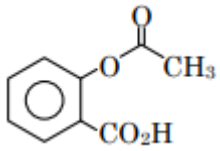
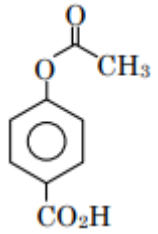
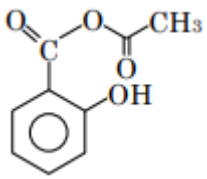
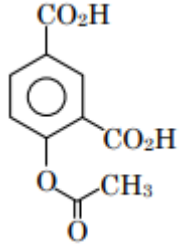



1. Low temperature
2. $-NH_2$ group is highly meta-directive
3. Formation of anilinium ion
4. $-NO_2$ substitution always takes place at meta-position

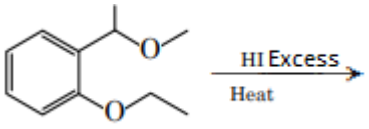
63. Total number of lone pair of electrons in $I_3^-$ ion is-

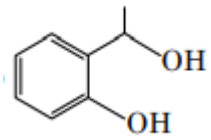
1. 3
2. 6
3. 9
4. 12

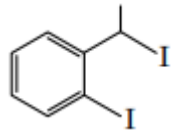
64. Phenol on treatment with $CO_2$ in the presence of NaOH followed by acidification produces compound X as the major product. X on treatment with $(CH_3CO)_2O$ in the presence of catalytic amount of $H_2SO_4$ produces :

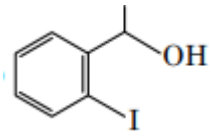
1. 
2. 
3. 
4. 

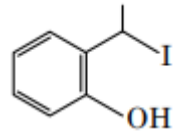
65. The major product formed in the following reaction is :




1. 


2. 


3. 


4. 


66. The lanthanoid that does NOT show +4 oxidation state is
1. Dy
2. Eu
3. Ce
4. Tb

67. Match the following :

| | Test/Method | | Reagent |
|---|---|---|---|
| (i) | Lucas Test | (a) | $C_6H_5SO_2Cl$ / aq. KOH |
| (ii) | Dumas method | (b) | $HNO_3$ / $AgNO_3$ |
| (iii) | Kjeldahl's method | (c) | CuO / $CO_2$ |
| (iv) | Hinsberg Test | (d) | Conc. HCl and $ZnCl_2$ |
| | | (e) | $H_2SO_4$ |

1. (i)-(d). (ii)-(c), (iii)-(e), (iv)-(a)
2. (i)-(b), (ii)-(d), (iii)-(e), (iv)-(a)
3. (i)-(d), (ii)-(c), (iii)-(b), (iv)-(e)
4. (i)-(b), (ii)-(a), (iii)-(c), (iv)-(d)

68. A solution of phenol in chloroform when treated with aqueous NaOH gives compound P as a major product. The mass percentage of carbon in P is-
(to the nearest integer)
(Atomic mass : C =12; H=1; O=16)

1. 65
2. 69
3. 73
4. 76

69. The rate of a reaction decreased by 3.555 times when the temperature was changed from 40°C to 30°C. The activation energy (in kJ $mol^{-1}$) of the reaction is-
Take; R=8.314 J $mol^{-1}$ $K^{-1}$ In 3.555=1.268

1. 100 kJ/mol
2. 120 kJ/mol
3. 95 kJ/mol
4. 108 kJ/mol

70. Among the following, the order presents the correct sequence of the increasing basic nature of the given oxides is -
1. $Al_2O_3 < MgO < Na_2O < K_2O$
2. $MgO < K_2O < Al_2O_3 < Na_2O$
3. $Na_2O < K_2O < MgO < Al_2O_3$
4. $K_2O < Na_2O < Al_2O_3 < MgO$

71. If $10^{-4}$ $dm^3$ of water is introduced into a 1.0 $dm^3$ flask at 300 K. The total number of moles of water are in the vapour phase (equilibrium is established)is-
(Given: Vapour pressure of $H_2O$ at 300 K is 3170 pa; R = 0.0821 atm L $K^{-1}$ $mol^{-1}$ )
1. 1.26 x $10^{-3}$ mol
2. 5.56 x $10^{-3}$ mol
3. 1.53 x$10^{-2}$ mol
4. 4346 x 10-$^2$ mol

72. Among the following, the mixture will produce a buffer solution when mixed in equal volumes is-
1. 0.1 mol $dm^{-3}$ $NH_4OH$ and 0.1 mol $dm^{-3}$ HCl
2. 0.05 mol $dm^{-3}$ $NH_4OH$ and 0.1 mol $dm^{-3}$ HCl
3. 0.1 mol $dm^{-3}$ $NH_4OH$ and 0.05 mol $dm^{-3}$ HCl
4. 0.1 mol $dm^{-3}$ $CH_3COONa$ and 0.1 mol $dm^{-3}$ NaOH

73. For the reaction: $FeO_{(s)} + CO_{(g)} \rightleftharpoons Fe_{(s)} + CO_{2(g)}$, $K_p = 0.265$ at 1050K. If the initial partial pressures are: $p_{CO}$= 1.4 atm and $p_{CO_2}$= 0.80 atm, the partial pressure of $CO_2$ at equilibrium at 1050 K would be -
(1) 4.61 atm
(2) 1.74 atm
(3) 0.46 atm
(4) 0.17 atm

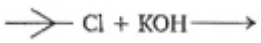
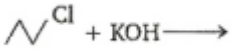
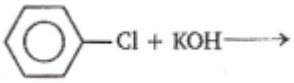
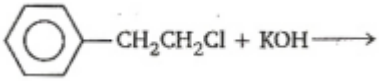
74. Proper management of disposal of household and industrial wastes can be done by
1. Recycling the waste material to give useful products again
2. Burning and incineration of combustible waste
3. Sewage treatment
4. All of the above

75. The freezing point of a solution containing 8.1 g HBr in 100 g water assuming the acid to be 90% ionised is- ( $k_f$ for water $= 1.86\ K\ mol^{-1}$)
1. 0.85˚C
2. -3.53˚C
3. 0˚C
4. -0.35˚C

76. In the reaction
$C_6H_5CH_3 \xrightarrow{\text{Oxidation}} A \xrightarrow{NaOH} B \xrightarrow{\text{Sodalime}} C$
Identify *C* is
1. $C_6H_5OH$
2. $C_6H_6$
3. $C_6H_5COONa$
4. $C_6H_5ONa$

77. The standard emf of a cell, involving one electron change is found to be 0.591 V at 25°C. The equilibrium constant of the reaction is (F=96,500 C $mol^{-1}$):
1. $1.0\times10^{1}$
2. $1.0\times10^{5}$
3. $1.0\times10^{10}$
4. $1.0\times10^{30}$

78. $PCl_3$ and $PCl_5$ both exist ; $NCl_3$ exists but $NCl_5$ does not exist. It is due to :
1. Lower electronegativity of P and N
2. Lower tendecy of N to form covalent bond
3. Availability of vacant d-orbital in P but not in N
4. Statement is itself incorrect

79. $SN^1$ reaction is feasible in-
1. 
2. 
3. 
4. 

80. The term infinite dilution refers when :
1. $\alpha \longrightarrow 1$, for weak electrolytes
2. An electrolyte is 100% dissociated
3. All interionic effects disappears
4. All of the above

81. For the reaction:
$Fe_3O_4$ (s) + Al (s) → Fe (s) + $Al_2O_3$ (s)

The correct statement(s) in the equation is(are):

a. Stoichiometric coefficient of Fe is 9.
b. Aluminium is oxidized
c. Ferrous ferric oxide ($Fe_3O_4$) is oxidized
d. Aluminium is reduced.

1. a, c
2. a, b
3. b, c
4. c, d

82. Consider the following reaction:
$PCl_5 + H_2O \rightarrow A + 2HCl$

The product A is -

1. $H_3PO_2$
2. $H_3PO_4$
3. $POCl_3$
4. None of the above

83. $BeSO_4$ and $MgSO_4$ readily soluble in water while $CaSO_4$, $SrSO_4$ and $BaSO_4$ are insoluble because-

1. Down the group hydration energy decreases
2. Down the group lattice energy increases
3. Down the group both hydration and lattice energy increases
4. None of the above

84. The compound prepared by prolonged electrolysis of water is-

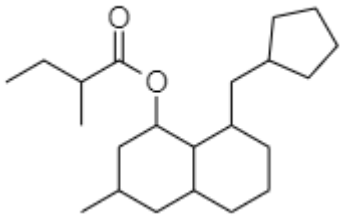
1. $CO_2$
2. Methanol
3. Formaldehyde
4. Heavy water

85. The correct options to distinguish nitrate salts of $Mn^{2+}$ and $Cu^{2+}$ taken separately is
a. $Mn^{2+}$ shows the characteristic green color in the flame test
b. Only $Cu^{2+}$ shows the formation of a precipitate by passing $H_2S$ in acidic medium
c. Only $Mn^{2+}$ shows the formation of precipitate by passing $H_2S$ in faintly basic medium
d. $Cu^{2+}/Cu$ has higher reduction potential than $Mn^{2+}/Mn$ (measured under similar conditions)

1. Both a, and b are correct.
2. Both b, and c are correct.
3. Both c, and a are correct.
4. Both b and d are correct.

# Chemistry - Section B

86. The number of chiral centres in the following compound is-



1. 4
2. 5
3. 6
4. 7

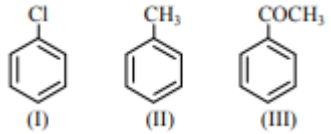
87. Mixture of chloroxylenol and terpineol acts as:
1. Antiseptic
2. Antipyretic
3. Antibiotic
4. Analgesic

88. The vapour pressures of pure liquids A and B are 400 and 600 mmHg, respectively at 298 K. On mixing the two liquids, the sum of their initial volumes is equal to the volume of the final mixture. The mole fraction of liquid B is 0.5 in the mixture. The vapour pressure of the final solution, the mole fractions of components A and B in the vapour phase, respectively are -
1. 500 mmHg, 0.5, 0.5
2. 450 mmHg, 0.5, 0.5
3. 500 mmHg, 0.4, 0.6
4. 450 mmHg, 0.4, 0.6

89. The right option for the statement "Tyndall effect is exhibited by", is:
1. Starch solution
2. Urea solution
3. NaCl solution
4. Glucose solution

90. The degenerate orbitals of $\left[Cr(H_2O)_6\right]^{3+}$ are :
1. $d_z2\ and\ d_{xz}$
2. $d_{yz}\ and\ d_z2$
3. $d_{xz}\ and\ d_{yz}$
4. $d_{x^2-y^2}\ and\ d_{xy}$

91. The increasing order of the reactivity of the following compounds toward electrophilic aromatic substitution reactions(EASR) is :




1. III < II < I
2. III < I < II
3. II < I < III
4. I < III < II

92. The molar solubility of $Cd(OH)_2$ is $1.84 \times 10^{-5}$ M in water. The expected solubility of $Cd(OH)_2$ in a buffer solution of pH = 12 is :
1. $2.49 \times 10^{-10}\ M$
2. $1.84 \times 10^{-9}\ M$
3. $6.23 \times 10^{-11}\ M$
4. $1.49 \times 10^{-9}\ M$

93. If 75% of a first order reaction was completed in 90 minutes, 60% of the same reaction would be completed in approximately (in minutes)-.
(Take : log 2 = 0.30 ; log 2.5 = 0.40)
1. 50 min
2. 60 min
3. 70 min
4. 65 min

94. According to molecular orbital theory, which of the following will not be a viable molecule?
1. $He_2^{2+}$
2. $He_2^{+}$
3. $H_2^{-}$
4. $H_2^{2-}$

95. The correct match between Item-I and Item-II :

| | Item-I | | Item-II |
|---|---|---|---|
| (a) | Natural rubber | (I) | 1,3-butadiene + styrene |
| (b) | Neoprene | (II) | 1,3-butadiene + acrylonitrile |
| (c) | Buna-N | (III) | Chloroprene |
| (d) | Buna-S | (IV) | Isoprene |

1. (a)-(III), (b)-(IV), (c)-(I), (d)-(II)
2. (a)-(IV), (b)-(III), (c)-(II), (d)-(I)
3. (a)-(IV), (b)-(III), (c)-(I), (d)-(II)
4. (a)-(III), (b)-(IV), (c)-(II), (d)-(I)

96. The correct match between Item-1 (starting material) and item-II (reagent) for the preparation of benzaldehyde is :

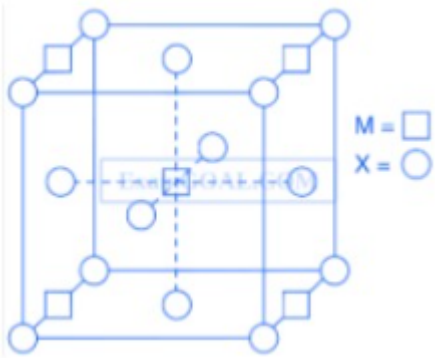
| | Item - I | | Item - II |
|---|---|---|---|
| (I) | Benzene | (P) | $HCl$ and $SnCl_2, H_3O^+$ |
| (II) | Benzonitrile | (Q) | $H_2$, $Pd - BaSO_4$, |
| (III) | Benzoyl Chloride | (R) | $CO$, $HCl$ and $AlCl_3$ |

1. (I)-(Q), (II)-(R) and (III)-(P)
2. (I)-(R), (II)-(Q) and (III)-(P)
3. (I)-(R), (II)-(P) and (III)-(Q)
4. (I)-(P), (II)-(Q) and (III)-(R)

97. Assertion : Nitrogen and Oxygen are the main components in the atmosphere but these do not react to form oxides of nitrogen.
Reason : The reaction between nitrogen and oxygen requires a high temperature.
1. Both assertion and reason are correct, and the reason is the correct explanation for the assertion
2. Both assertion and reason are correct, but the reason is not the correct explanation for the assertion
3. The assertion is incorrect, but the reason is correct
4. Both the assertion and reason are incorrect

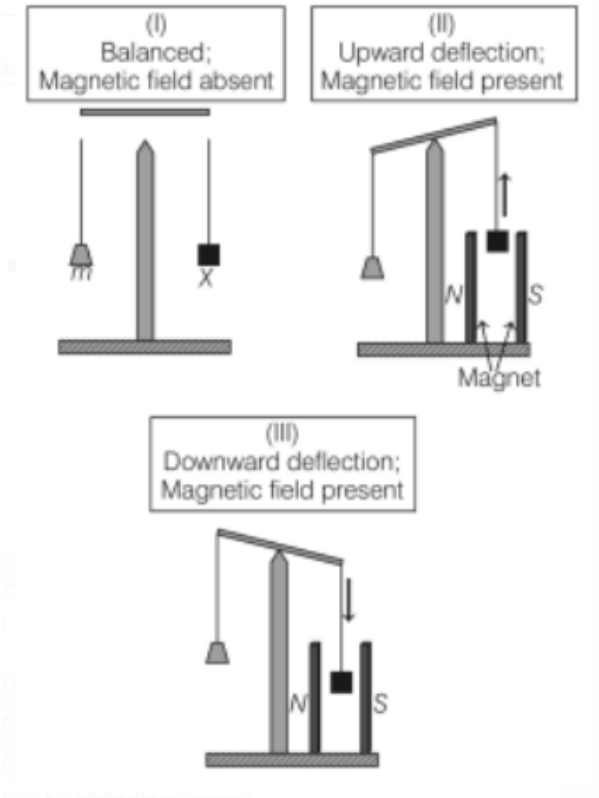
98. Consider the following reactions at $1100^oC$
$(I) 2C + O_2 \longrightarrow 2CO, \Delta G^\circ = -460 \text{ kJ mol}^{-1}$
$(II) 2Zn + O_2 \longrightarrow 2ZnO, \Delta G^\circ = -360 \text{ kJ mol}^{-1}$
Based on these, select correct alternate :
1. Zinc can be oxidised by CO
2. Zinc oxide can be reduced by carbon
3. Both 1 and 2
4. None is the correct

99. A compound $M_PX_q$ has cubic close packing (ccp) arrangement of X. Its unit cell structure is shown below. The empirical formula of the compound is




1. $MX$
2. $MX_2$
3. $M_2X$
4. $M_5X_{14}$

100. In an experiment, m grams of a compound X (gas/liquid/solid) taken in a container is loaded in a balance as shown in figure given below.




In the presence of a magnetic field, the pan with X is either deflected (Fig. I), upwards (figure II), or deflected downwards (figure III), depending on the compound X. Identify the correct statement(s).

a. If X is $H_2O(l)$, deflection of the pan is upwards
b. If X is $K_4[Fe(CN)_6](s)$, deflection of the pan is upwards
c. If X is $O_2(g)$, deflection of the pan is downwards
d. If X is $C_6H_6(l)$ deflection of the pan is downwards

1. a, b, and c are correct
2. Both b, and d are correct.
3. b, c, and d are correct.
4. a, b, and d are correct

# Zoology - Section A

101. What is true for an ideal contraceptive?
I. It should be user-friendly
II. It should be easily available
III. It should be ineffective and reversible with least side effects
IV. It should be effective and reversible with least side effects.
V. It should interfere with the sexual act of the user
1. All of the above
2. I, II, III
3. I, II, IV
4. I, II, IV, V

102. To induce uterine contractions for parturition which of the following hormones can be injected to the female?
1. hCG
2. Estrogen
3. Progesterone
4. Oxytocin

103. Fight or flight reactions cause activation of
1. the parathyroid glands, leading to increased metabolic rate
2. the kidney, leading to suppression of reninangiotensin-aldosterone pathway
3. the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine
4. the pancreas leading to a reduction in the blood sugar levels

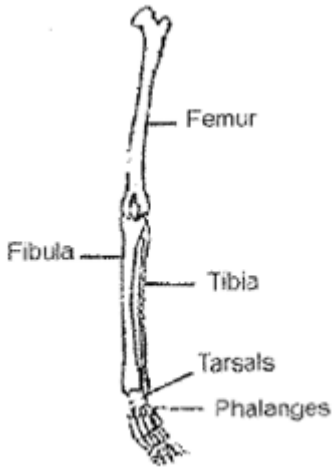
104. Serum differs from blood in
1. lacking globulins
2. lacking albumins
3. lacking clotting factors
4. lacking antibodies

105. Which one of the following correctly explains the function of a specific part of a human nephron?
1. Henle's loop - most reabsorption of the major substances from the glomerular filtrated
2. Distal convoluted tubule - reabsorption of ions into the surrounding blood capillaries
3. Afferent arteriole - carries the blood away from the glomerulus towards the renal vein
4. Podocytes- create minute spaces (slit pores) for the filtration of blood into the Bowman's capsule

106. The principal nitrogenous excretory compound in humans is synthesized.
1. in kidneys but eliminated mostly through liver
2. in kidneys as well as eliminated by kidneys
3. in liver and also eliminated by the same through bile
4. in the liver, but eliminated mostly through kidneys

107. If for some reason our goblet cells are non-functional, this will adversely affect us.
1. production of somatostatin
2. secretion of sebum From the sebaceous glands
3. maturation of sperms
4. smooth movement of food down the intestine

108. Given diagram shows bone of the left human hind limb as seen from front. It has certain mistakes in labeling. Two of the wrongly labelled bones are




1. tibia and tarsals
2. femur and fibula
3. fibula and phalanges
4. tarsals and femur

109. Select the correct statement about biodiversity:
1. The desert areas of Rajasthan and Gujarat have a very high level of desert animal species as wellas numerous rare animals.
2. Large scale planting of Bt cotton has no adverse effect on biodiversity.
3. Western Ghats have a very high degree of species richness and endemism.
4. Conservation of biodiversity is just a fad pursued by the developed countries.

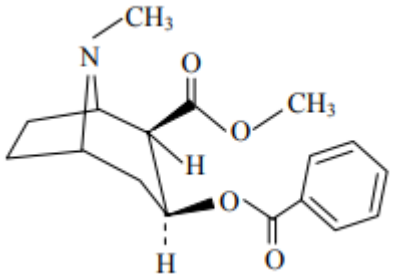
110. Which of the following is correct?
1. The chemical or metabolic conversion refers to a reaction.
2. The chemical which is converted into a product is called a substrate.
3. Proteins with three dimensional structures including an active site is called enzyme.
4. All of these

111. Enzymes enhance the rate of reaction by
1. forming a reactant-product complex
2. changing the equilibrium point of the reaction
3. combining with the product as soon as it is formed
4. lowering the activation energy of the reaction

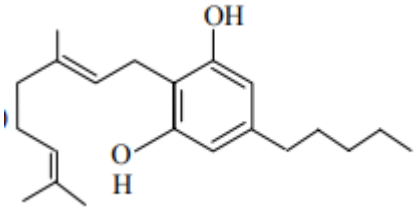
112. The structures that help some bacteria to attach to rocks and / or host tissues are:
1. Fimbriae
2. Mesosomes
3. Holdfast
4. Rhizoids

113. Which group of animals belong to the same phylum?
1. Earthworm, Pinworm, Tapeworm
2. Prawn, Scorpion, Locusta
3. Sponge, Sea anemone, Starfish
4. Malarial parasite, Amoeba, Mosquito

114. Identify the molecules (a) and (b) shown below and select the right option giving their source



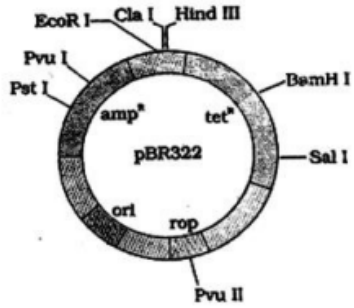

(a)




(b)

| | Molecule | Source | Use |
|---|---|---|---|
| 1. | (a) Cocaine | Erythroxylum coca | Accelerates the transport of dopamine |
| 2. | (b) Heroin | Cannabis Sativa | Depressant and slows down body functions |
| 3. | (b) Cannabinoid | Atropa belladona | Produces hallucinations |
| 4. | (a) Morphine | Papaver somniferum | Sedative and pain killer |

115. The figure below is the diagrammatic representation of the E.Coli vector pBR 322. Which one of the given options correctly identifies its certain component (s)?




1. ori - original restriction enzyme
2. rop-reduced osmotic pressure
3. Hind III, EcoRI - selectable markers
4. $amp^R$, $tet^R$- antibiotic resistance genes

116. At a particular locus, frequency A allele is 0.6 and that of a si 0.4. What would be the frequency of heterozygotes in a random mating population at equilibrium?
1. 0.24
2. 0.16
3. 0.48
4. 0.34

117. Which one of the following options gives one correct example each of convergent evolution and divergent evolution?

| | Convergent evolution | Divergent evolution |
|---|---|---|
| 1. | Bones of forelimbs of vertebrates | Wings of butterfly and birds |
| 2. | Thorn of Bougainvillea and tendrils of Cucurbita | Eye of Octopus and mammals |
| 3. | Eye of Octopus and mammals | Bones of forelimbs of vertebrates |
| 4. | Thorns of Bougainvillea and tendrils of Cucurbita | Wings of butterfly and birds |

118. The technique called gamete intrafallopian transfer (GIFT) is recommended for those females
1. Who cannot provide a suitable environment for fertilisation.
2. Who cannot produce an ovum.
3. Who cannot retain the fetus inside the uterus.
4. Whose cervical canal is too narrow to allow passage for the sperms

119. In alveoli,
1. $pCO_2$ is high and $pO_2$is low
2. $pCO_2$ is low and $pO_2$ is high
3. $pCO_2$ is low and $pO_2$ low
4. None of the above

120. An increase from pH 7.2 to pH 7.4 around hemoglobin causes
1. Hemoglobin to release all bound oxygen molecules.
2. An increase in the affinity of hemoglobin to bind oxygen molecules.
3. Hemoglobin to denature.
4. An increase in the binding of H+ by hemoglobin.

121. The second heart sound during the cardiac cycle is produced by the:
1. Simultaneous opening of the atrioventricular valves
2. Simultaneous closure of the atrioventricular valves
3. Simultaneous opening of the semilunar valves
4. Simultaneous closure of the semilunar valves

122. Which of the following hormone regulates sleep-wake cycle ?

1. Melatonin
2. Thyroxine
3. Vasopressin
4. MSH

123. Acrosome is

1. Part of sperm head
2. Caps the anterior portion of haploid nucleus
3. Has enzymes for fertilization
4. All of these

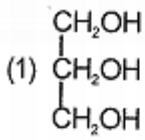
124. At puberty, how many primary follicles are there in each ovary in a female?

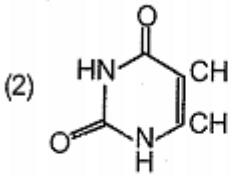
1. 60000-80000
2. 120000-160000
3. 30000-40000
4. 12000

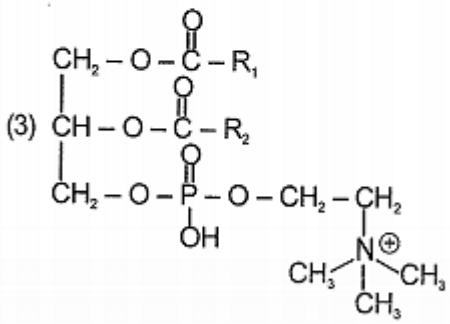
125. Which of the following represents the prokaryotic cell
1. bacteria, blue-green algae, mycoplasma, PPLO
2. bacteria, blue-green algae, microbes, chlorella
3. bacteria, blue-green algae, slime moulds and Diatoms
4. bacteria, blue-green algae only

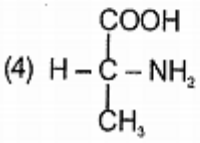
126. Choose the **correct** pair
1 Physical barriers - HCl in stomach, saliva in mouth
2 Cellular barriers - PMNL, NK cells
3 Physiological barriers - Mucosa of gut, urinogenital tract
4 Cytokine barriers - Exotoxins

127. The molecule that provides stability to cell membrane is

(1) 

(2) 

(3) 

(4) 

128. Which of the following is **not** a correct match of a nervous structure and its function?
1. Corpus striatum - Regulates planning and execution of stereotyped movements
2. Amygdala - Controls emotional behaviour like aggression and fear
3. Cerebellum - Controls rapid muscular activities like running, typing, talking etc.
4. Medulla - Controls stretch reflexes

129. Which of the following statements is not correct?
1. An action potential in an axon does not move backward because the segment behind is in a refractory phase.
2. Depolarization of hair cells of cochlea results in the opening of the mechanically gated Potassium- ion channels.
3. Rods are very sensitive and contribute to daylight vision.
4. In the knee-jerk reflex, stimulus is the stretching of muscle and response is its contraction.

130. Match the Column I and Column II

| Column-I | Column-II |
|---|---|
| (a) P-waves | (i) Depolarisation of ventricles |
| (b) QRS complex | (ii) Repolarisation of ventricles |
| (c) T-wave | (iii) Coronary ischemia |
| (d) Reduction in the size of T-wave | (iv) Depolarisation of artria |
| | (v) Repolarisation of atria |

Select the correct option

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| 1. | (ii) | (iii) | (v) | (iv) |
| 2. | (iv) | (i) | (ii) | (iii) |
| 3. | (iv) | (i) | (ii) | (v) |
| 4. | (ii) | (i) | (v) | (iii) |

131. First discovered restriction endonuclease that always cuts DNA molecule at a particular point by recognizing a specific sequence of six base pairs is:
(1) EcoR1
(2) Adenosine deaminase
(3) Thermostable DNA polymerase
(4) Hind II

132. The development of *P.americana* is
1. Holometabolous
2. Paurometabolous
3. Hemimetabolous
4. Ametabolous

133. Match List-I with List-II

| List-I | List-II |
|---|---|
| (a) Vaults | I. Entry of sperm through the Cervix is blocked |
| (b) IUDs | II. Removal of Vas deferens |
| (c) Vasectomy | III. Phagocytosis of sperms within the Uterus |
| (d) Tubectomy | IV. Removal of the fallopian tube |

Choose the correct answer from the options given below.
(a) (b) (c) (d)
1. (ii) (iv) (iii) (i)
2. (iii) (i) (iv) (ii)
3. (iv) (ii) (i) (iii)
4. (i) (iii) (ii) (iv)

134. Which one of the following organisms bears hollow and pneumatic long bones?
1. Macropus
2. Ornithorhynchus
3. Neophron
4. Hemidactylus

135. The Adenosine deaminase deficiency results into:
1. Digestive disorder
2. Addison's disease
3. Dysfunction of Immune system
4. Parkinson's disease

# Zoology - Section B

136. Match the source gland with its respective hormone and function and select the correct option.

| Source gland | Hormone | Function |
|---|---|---|
| 1. Anterior pituitary | Oxytocin | Contraction of uterine muscles |
| 2. Anterior pituitary | Vasopressin | Induces reabsorption of water in nephron |
| 3. Thymus | Thymosin | Proliferation of T-lymphocytes |
| 4. $\alpha$-cells of islets of Langerhans | Glucagon | Uptake of glucose into the cell. |

137. Bicarbonate is not reabsorbed by
1. PCT
2. DCT
3. Henle's Loop
4. All of these

138. Which one of the following is the correct matching of the events occurring during menstrual cycle?

| | Column I | Column II |
|---|---|---|
| 1. | Ovulation | LH and FSH attain peak level and sharp fall in the secretion of progesterone |
| 2. | Proliferative phase | Rapid regeneration of myometrium and maturation of Graafian follicle |
| 3. | Development of corpus luteum | Secretory phase and increased secretion of progesterone |
| 4. | Menstruation | Breakdown of myometrium and ovum not fertilized |

139. Which one of the following is False?
1.Fatty acids and glycerol are soluble in water
2.Phospholipids are found in the cell membrane
3.Oils have lower melting point.
4.In lipids fatty acids are found esterified with glycerol

140. Select the correct statement from the following regarding cell membrane.
1. $Na^+$ and $K^+$ ions move across cell membrane by passive transport
2. Proteins make up 60 to 70% of the cell membrane.
3. Lipids are arranged in a bilayer with polar heads towards the inner part.
4. Fluid mosaic model of cell membrane was proposed by Singer and Nicolson

141. Which one of the following statements about certain given animals is correct?
1. Molluscs are acoelomates
2. Insects are pseudocoelomoates
3. Flatworms (Platyhelminthes) are coelomates
4. Roundworms (Aschelminthes) are pseudocoelomates.

142. Consider the following four statements (a-d) regarding kidney transplant and select the two correct ones out of these.
(a) Even if a kidney transplant is proper the recipient may need to take immuno suppresants for a long time
(b) The cell-mediated immune response is responsible for the graft regection
(c) The B- lymphocytes are responsible for rejection of the graft
(d) The acceptance or rejection of a kidney transplant depends on specific interferons
The two correct statements are
1. (c) and (d)
2. (a) and (c)
3. (a) and (b)
4. (b) and (c)

143. Given below is a sample of a portion of DNA strand. What is so special shown in it

5' GAATTC 3'
3' CTTAAG 5'
1. Replication completed
2. Deletion mutation
3. Start codon at the 5' end
4. Palindromic sequence of base pairs

144. The two polypeptides of human insulin are linked together by
1. Hydrogen bonds.
2. Phosphodiester bond.
3. Covalent bond.
4. Disulphide bridges.

145. Vitreous humor is found in vitreous chamber

1. Between lens and retina
2. Between cornea and lens
3. Between sclera and lens
4. Between choroid and lens

146. All the ribs are attached to
(1) Sternum
(2) Verterbal column
(3) Clavicle
(4) lium

147. In a species, the weight of newborn ranges from 2 to 5 kg. 97% of the newborn with an average weight between 3 to 3.3 kg survive whereas 99% of the infants born with weights from 2 to 2.5 kg or 4.5 kg to 5 kg die. Which type of selection process is taking place?
1. Cyclical selection
2. Directional selection
3. Stabilizing selection
4. Disruptive selection

148. Match the following structures with their respective location in organs:

| | |
|---|---|
| (a) Crypts of Lieberkuhn | (i) Pancreas |
| (b) Glisson's Capsule | (ii) Duodenum |
| (c) Islets of Langerhans | (iii) Small intestine |
| (d) Bruunner's Glands | (iv) Liver |

Select the correct option from the following:

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| 1. | (iii) | (ii) | (i) | (iv) |
| 2. | (iii) | (i) | (ii) | (iv) |
| 3. | (ii) | (iv) | (i) | (iii) |
| 4. | (iii) | (iv) | (i) | (ii) |

149. Select the incorrectly matched pair from the following:
1. Chondrocytes - Smooth muscle cells
2. Neurons - Nerve cells
3. Fibroblast - Areolar tissue
4. Osteocytes - Bone cells

150. Match the following columns and select the correct option :

| **Column - I** | **Column - II** |
|---|---|
| (a) Pneumotaxic Centre | (i) Alveoli |
| (b) $O_2$ Dissociation curve | (ii) Pons region of brain |
| (c) Carbonic Anhydrase | (iii) Haemoglobin |
| (d) Primary site of exchange of gases | (iv) R.B.C. |

(1) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(3) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)
(4) (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)

# Botany - Section A

151. Which element is required by the plants for uptake and utilization of calcium and carbohydrate translocation ?
1. Manganese
2. Boron
3. Chlorine
4. Selenium

152. In vehicles, catalytic converters are used
1. to increase mileage of vehicles
2. to convert $CO_2$ into carbonates
3. to increase the efficiency of lead mixed petrol
4. to convert CO to $CO_2$.

153. How do herbivores and other animals obtain Phosphorous?
1. From soil in the dissolved form
2. From plants
3. From drinking water
4. Synthesized in the body.

154. If one wants to write a whole reaction of Krebs' cycle, then how many water molecules are utilizing in net calculation?

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

155. An increase in the concentration of the toxicant at successive trophic levels is called
1. Biopiracy
2. Biomagnification
3. Biomanagement
4. Biosystematics

156. A biologist studied the population of rats in a barn. He found that the average natality was 250, average mortality 240, immigration 20 and emigration 30. The net increase in population is
1. 10
2. 15
3. 5
4. zero

157. Which of the following was presented as evidence in favor of "the RNA world" hypothesis?
1. The fact that DNA can encode genetic information
2. The fact that enzymes, made of protein, can catalyze biological reactions
3. The discovery that some enzymes are composed of RNA rather than protein
4. The discovery of new life forms that encode their genetic information in RNA rather than DNA

158. What type of ecological pyramid would be obtained with the following data?
Secondary consumer: 120 g
Primary consumer: 60 g
Primary producer: 10 g
1. Inverted pyramid of biomass
2. Pyramid of energy
3. Upright pyramid of numbers
4. Upright pyramid of biomass

159. Match the items given in Column I with those in Column II and select the *correct* option given below-

| Column I | Column II |
|---|---|
| a. Herbarium | i. It is a place having a collection of preserved plants and animals. |
| b. Key | ii. A list that enumerates methodically all the species found in an area with brief description aiding identification. |
| c. Museum | iii. Is a place where dried and pressed plant specimens mounted on sheets is kept. |
| d. Catalogue | iv. A booklet containing a list of characters and their alternates which are helpful in identification of various taxa. |

1. a-I b-iv c-iii d-ii
2. a-iii b-ii c-I d-iv
3. a-ii b-iv c-iii d-i
4. a-iii b-iv c-i d-ii

160. Select the wrong statement.
1. Diatoms are microscopic and float passively in water.
2. The walls of diatoms are easily destructible.
3. 'Diatomaceous earth' is formed by the cell walls of diatoms.
4. Diatoms are chief producers in the oceans.

161. In angiosperms, microsporogenesis and megasporogenesis:
1. form gametes without further divisions
2. Involve meiosis
3. occur in ovule
4. occur in anther

162. Which of the following statements is not correct?
1. Some reptiles have also been reported as pollinators in some plant species. ,
2. Pollen grains of many species can germinate on the stigma of a flower, but only one pollen tube of the same species grows into the style.
3. Insects that consume pollen or nectar without bringing about pollination are called pollen/ nectar robbers.
4. Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil

163. The ovule of an angiosperm is technically equivalent to
1. megaspore
2. megasporangium
3. megasporophyll
4. megaspore mother cell

164. Commonly used vectors for human genome sequencing are:
1. T - DNA
2. BAC and YAC
3. Expression Vectors
4. T/A Cloning Vectors

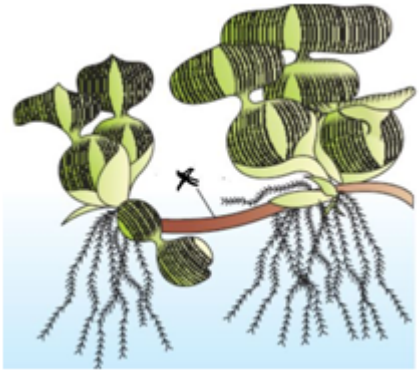
165. Why photorespiration does not take place in $C_4$ plants?
1. Do not contain RuBisCo.
2. Have a mechanism that increases the concentration of $CO_2$ at the enzyme site.
3. Cells do not allow oxygen to accumulate in them.
4. Cells are impermeable to oxygen

166. Select the correct statement about $G_1$ phase:
1. Cell is metabolically inactive
2. DNA in the cell does not replicate
3. It is not a phase of synthesis of macromolecules
4. Cell stops growing

167. Xylem transports from roots to the aerial parts of the plants

1. Water, mineral salt
2. Some organic Nitrogen
3. Inorganic solutes, Hormones
4. All of these

168. Identify X



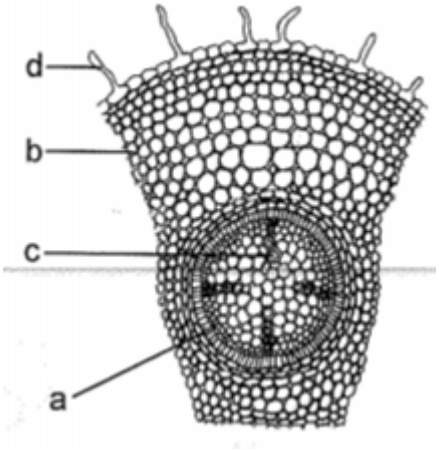
1. Stem
2. Runner
3. Offset
4. Bud

169. Incomplete dominance is present in
1. Snapdragon flower
2. Dog flower
3. Antirrhinum flower
4. All of the above

170. Wine and beer are produced
1. By distillation only
2. By fermentation and distillation
3. By fermentation but without distillation
4. Without fermentation and distillation

171. How many possible genotypes can be observed in a human population for ABO blood group system?
1. 3
2. 6
3. 10
4. 4

172. Mark a, b, c, and d




1. Metaxylem, protoxylem, cortex, trichome
2. Endodermis, cortex, protoxylem, root hair
3. Endodermis, cortex, metaxylem, root hair
4. Pericycle, cortex, metaxylem, trichome

173. At which stage of mitotic cell division, the following characteristics are first seen?
(a) Chromosome as two stranded structure
(b) Spindle fibre formation at poles
(c) Formation of interzonal fibres (IZF)
1. (a)-Prophase, (b)-Metaphase, (c)-Anaphase
2. (a) and (b)-Prophase, (c)-Anaphase
3. (a)-Prophase, (b) and (c)-Metaphase
4. (a)-Prophase, (b)-Metaphase, (c)-Telophase

174. What will be the sequence of mRNA produced by the following stretch of DNA?
3' ATGCATGCATGCATG 5' TEMPLATE STRAND
5' TACGTACGTACGTAC 3' CODING STRAND
1. 3' AUGCAUGCAUGCAUG 5'
2. 5' UACGUACGUACGUAC 3'
3. 3' UACGUACGUACGUAC 5'
4. 5' AUGCAUGCAUGCAUG 3'

175. Match the organisms in column I with habitats in column II.

| Column I | Column II |
|---|---|
| (a) Halophiles | (i) Hot springs |
| (b) Thermoacidophiles | (ii) Aquatic environment |
| (c) Methanogens | (iii) Guts of ruminants |
| (d) Cyanobacteria | (iv) Salty areas |

Select the correct answer from the options given below:
1. (a)-(iv), (b)-(i), (c)-(iii), (d)-(ii)
2. (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
3. (a)-(iii), (b)-(iv), (c)-(i), (d)-(i)
4. (a)-(ii). (b)-(iv), (c)-(iii), (d)-(i)

176. Match the following genes of Lac operon with their respective products:

(a) i gene (i) $\beta$-galactosidase
(b) Z gene (ii) Permease
(c) A gene (iii) Repressor
(d) Y gene (iv) transacetylase

Select the correct option

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| 1. | (iii) | (iv) | (i) | (ii) |
| 2. | (i) | (iii) | (ii) | (iv) |
| 3. | (iii) | (i) | (ii) | (iv) |
| 4. | (iii) | (i) | (iv) | (ii) |

177. Pinus seed cannot germinate and establish without fungal association. This is because:
1. its seeds contain inhibitors that prevent germination.
2. its embryo is immature.
3. it has obligate association with mycorrhizae.
4. it has very hard seed coat.

178. Identify the correct statement with regard to $G_1$ phase (Gap 1) of interphase.
1. The reorganisation of all cell components takes place.
2. The cell is metabolically active, grow but does not replicate its DNA
3. Nuclear Division takes place
4. DNA synthesis or replication takes place.

179. Match the following concerning the activity/function and the phytohormone involved :-
(a) Fruit ripener (i) Abscisic acid
(b) Herbicide (ii) GA 3
(c) Bolting agent (iii) 2, 4-D
(d) Stress hormone (iv) Ethephon
Select the correct option from following :-
1. (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
2. (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
3. (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
4. (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

180. Choose correct pair

| Placentation | | Example |
|---|---|---|
| 1. Marginal | - | Dianthus, Silene |
| 2. Axile | - | Pea, Acacia |
| 3. Parietal | - | Lemon, Petunia |
| 4. Basal | - | Triticum, Sunflower |

181. **Assertion (A) :**
A person goes to high altitude and experiences 'altitude sickness' with symptoms like breathing difficulty and heart palpitations.
**Reason (R) :**
Due to low atmospheric pressure at high altitude, the body does not get sufficient oxygen.
In the light of the above statements, choose the correct answer from the options given below.
1. (A) is true but (R) is false
2. (A) is false but (R) is true
3. Both (A) and (R) are true and (R) is the correct explanation of (A)
4. Both (A) and (R) are true but (R) is not the correct explanation of (A)

182. The production of gametes by the parents, formation of zygotes, the $F_1$ and $F_2$ plants, can be understood from a diagram called:
1. Punnett square
2. Net square
3. Bullet square
4. Punch square

183. Match List - I with List-II.

| List-I | List-II |
|---|---|
| (a) Cohesion | (i) More attraction in liquid phase |
| (b) Adhesion | (ii)Mutual attraction among water molecules |
| (c) Surface tension | (iii)Water loss in liquid phase |
| (d) Guttation | (iv) Attraction towards polar surfaces |

Choose the correct answer from the options given below.

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| 1. | (iii) | (i) | (iv) | (ii) |
| 2. | (ii) | (i) | (iv) | (iii) |
| 3. | (ii) | (iv) | (i) | (iii) |
| 4. | (iv) | (iii) | (ii) | (i) |

184. Match Column-I with Column-II

| | Column-I | | Column-II |
|---|---|---|---|
| a | $\%\male K_{(5)}C_{1+2+(2)}A_{(9)+1}\underline{G}_1$ | i | Brassicaceae |
| b | $\oplus\male K_{(5)}\overbrace{C_{(5)}A_5}\underline{G}_2$ | ii | Liliaceae |
| c | $\oplus\male\overbrace{P_{(3+3)}A_{3+3}}\underline{G}_{(3)}$ | iii | Fabaceae |
| d | $\oplus\male K_{2+2}C_4A_{2-4}\underline{G}_{(2)}$ | iv | Solanaceae |

Select the correct answer from the options given below.

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

1. (ii) (iii) (iv) (i)
2. (iv) (ii) (i) (iii)
3. (iii) (iv) (ii) (i)
4. (i) (ii) (iii) (iv)

185. Identify the incorrect pair.

1. Lectins - Concanavalin A
2. Drugs - Ricin
3. Alkaloids - Codeine
4. Toxin - Abrin

# Botany - Section B

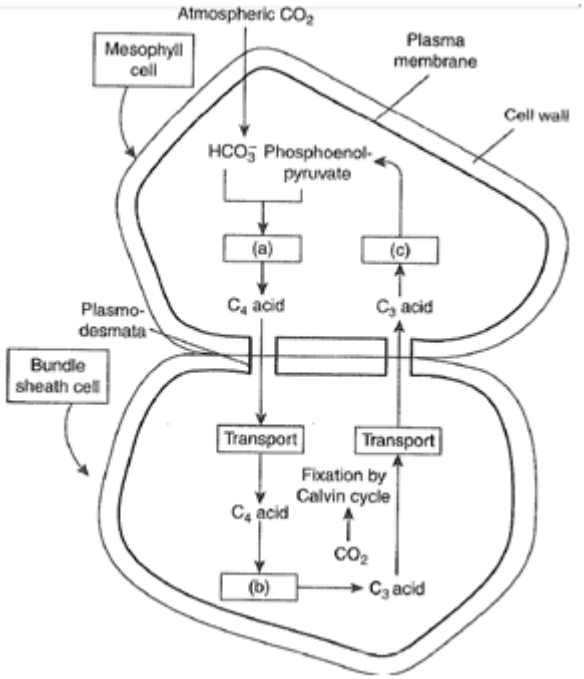
186. DNA dependent RNA polymerase catalyzes polymerization in:

1. Only in 3' – 5' direction
2. Only in 5' – 3' direction
3. In both directions
4. In neither directions

187. The motion of sister Chromatids toward opposite poles of the cell occurs by

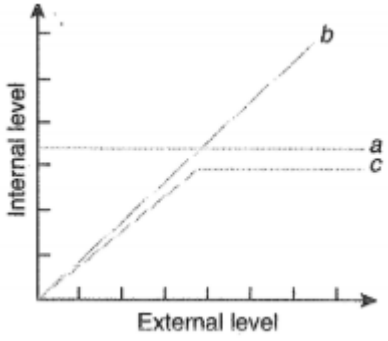
1. Shortening of microtubules attached to centromere
2. Shortening of microtubules attached to kinetochores
3. Shortening of microtubules attached to Metaphase plate
4. Shortening of microtubules attached to other homologous chromosomes

188. Study the pathway given below. In which of the following options correct words for all the three blanks a,b and c are indicated.




| | (a) | (b) | (c) |
|---|---|---|---|
| 1. | Carboxylation | Decarboxylation | Reduction |
| 2. | Decarboxylation | Reduction | Regeneration |
| 3. | Fixation | Transamination | Regeneration |
| 4. | fixation | Decarboxylation | Regeneration |

189. Graph below is a diagrammatic representation of response of organisms to biotic factors. What do a,b,c represent respectively?




1. Partial regulator, conformer, regulator
2. Regulator, conformer, Partial regulator
3. Conformer, regulator, Partial, regulator
4. Regulator, Partial conformer, regulator

190. Companion cells are closely associated with
1. Sieve elements
2. Vessel elements
3. Trichomes
4. Guard cells

191. Isogamous condition with non-flagellated gametes is found in:

1. Spirogyra
2. Volvox
3. Fucus
4. Chlamydomonas

192. Most favourite and ideal material for researches in genetics is
1. Housefly
2. Mosquito
3. Frog
4. Fruitfly.

193. Which of the following are the important floral rewards to the animal pollinators?
1. Nectar and pollen grains
2. Floral fragrance and calcium crystals
3. Protein pellicle and stigmatic exudates
4. Colour and large size of flower

194. Agarose extracted from sea weeds finds use in
1. Spectrophotometry
2. Tissue Culture
3. PCR
4. Gel electrophoresis

195. Read the following statement and select the right choice
a. Semi-dwarf varieties, Jaya and Ratna were developed in IRRI, Philippines.
b. Classical plant breeding involves crossing or hybridisation of pure lines.
*c. Saccharum barberi* was originally grown in South India.
d. Genetic variability is the root of any breeding programme.
1. Only a is correct
2. b & d are correct
3. a, b & c are correct
4. c & d are correct

196. Which one of the following is a correct statement?
1. In the cymose type of inflorescence, the main axis continues to grow
2. The ovary is half inferior in the flowers of cucumber
3. In castor, the endosperm is not present in mature seeds
4. Seeds of dicot and monocot plants vary in shape, size and period viability

197. Mad cow disease in cattle is caused by an organism which has :
1. Inert crystalline
2. Abnormally folded protein
3. Free RNA without protein coat
4. Free DNA without protein coat

198. Select the correct group of biocontrol agents
1. Nostoc, Azospirillium, Nucleopolyhedrovirus
2. Bacillus thuringiensis. Tobacco mosaic virus, Aphids
3. Trichoderma, Baculovirus, Bacillus thuringiensis
4. Oscilatoria, Rhizobium, Trichoderma

199. The Earth Summit held in Rio de Janeiro in 1992 was called:
1. for immediate steps to discontinue use of CFCs that were damaging the ozone layer
2. to reduce $CO_2$ emissions and global warming
3. for conservation of biodiversity and sustainable utilization of its benefits
4. to asess threat posed to native species by invasive weed species

200. Yeasts poison themselves to death when the concentration of alcohol reaches about
1. 5 percent
2. < 5 percent
3. < 8 percent
4. 13 percent

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