

SOLVED PAPER

AIIMS - 2009

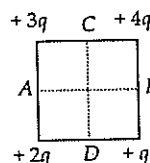
Time : 3½ hours

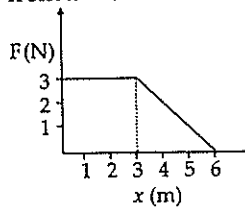
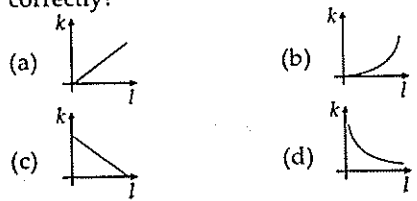
Max. Marks : 200

PHYSICS

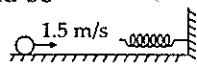
1. A convex lens of refractive index $\frac{3}{2}$ has a power of 2.5 D in air. If it is placed in a liquid of refractive index 2, then the new power of the lens is
 (a) - 1.25 D (b) - 1.5 D
 (c) 1.25 D (d) 1.5 D
2. What is ratio of Bohr magneton to the nuclear magneton?
 (a) m_p/m_e (b) m_p^2/m_e^2
 (c) 1 (d) $\frac{m_e}{m_p}$
3. When the inputs of a two input logic gate are 0 and 0, the output is 1. When the inputs are 1 and 0, the output is zero. The type of logic gate is
 (a) XOR (b) NAND
 (c) NOR (d) OR
4. de Broglie wavelength λ associated with neutrons is related with absolute temperature T as
 (a) $\lambda \propto T$ (b) $\lambda \propto \frac{1}{T}$
 (c) $\lambda \propto \frac{1}{\sqrt{T}}$ (d) $\lambda \propto T^2$
5. The dimensions of specific resistance are.
 (a) $[M L^2 T^{-2} A^{-1}]$ (b) $[M L^3 T^{-3} A^{-2}]$
 (c) $[M L^3 T^{-2} A^{-1}]$ (d) $[M L^2 T^{-2} A^{-2}]$
6. Reciprocal of impedance is
 (a) susceptance (b) conductance
 (c) admittance (d) transconductance
7. A nucleus of mass number 220 decays by α decay. The energy released in the reaction is 5 MeV. The kinetic energy of an α -particle is
 (a) $\frac{1}{54}$ MeV (b) $\frac{27}{11}$ MeV
 (c) $\frac{54}{11}$ MeV (d) $\frac{55}{54}$ MeV

8. Four charges are arranged at the corners of a square as shown in the figure. The direction of electric field at the centre of the square is along

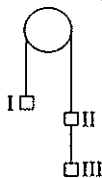


- (a) DC (b) BC
 (c) AB (d) AD
9. The wavelengths of K_α X-rays for lead isotopes Pb^{208} , Pb^{206} and Pb^{204} are λ_1 , λ_2 and λ_3 respectively. Then
 (a) $\lambda_2 = \sqrt{\lambda_1 \lambda_3}$ (b) $\lambda_2 = \lambda_1 + \lambda_3$
 (c) $\lambda_2 = \lambda_1 \lambda_3$ (d) $\lambda_2 = \frac{\lambda_1}{\lambda_3}$
 10. A force F acting on an object varies with distance x as shown in the figure. The force is in N and x in m. The work done by the force in moving the object from $x = 0$ to $x = 6$ m is

 (a) 13.5 J (b) 10 J
 (c) 15 J (d) 20 J
 11. Which of the following graph depicts spring constant k versus length l of the spring correctly?


12. A body of mass 5 kg moving with a speed of 1.5 m/s on a horizontal smooth surface collides with a nearly weightless spring of force constant $k = 5 \text{ N/m}$. The maximum compression of the spring would be



- (a) 0.5 m (b) 0.15 m
(c) 1.5 m (d) 0.12 m
13. A body is moved along a straight line by a machine delivering constant power. The distance travelled by the body in time t is proportional to
- (a) $t^{1/2}$ (b) t
(c) $t^{3/2}$ (d) t^2
14. Light with an energy flux of 18 W/cm^2 falls on a non-reflecting surface at normal incidence. The pressure exerted on the surface is
- (a) 2 N/m^2 (b) $2 \times 10^{-4} \text{ N/m}^2$
(c) 6 N/m^2 (d) $6 \times 10^{-4} \text{ N/m}^2$
15. The dimensional formula of Planck's constant is
- (a) $[\text{ML}^2\text{T}^{-1}]$ (b) $[\text{ML}^2\text{T}^{-2}]$
(c) $[\text{ML}^0\text{T}^2]$ (d) $[\text{MLT}^2]$
16. A body is projected horizontally with a velocity of $4\sqrt{2} \text{ m/sec}$. The velocity of the body after 0.7 seconds will be nearly (Take $g = 10 \text{ m/sec}^2$)
- (a) 10 m/sec (b) 9 m/sec
(c) 19 m/sec (d) 11 m/sec
17. Three equal weights of 3 kg each are hanging on a string passing over a frictionless pulley as shown in figure. The tension in the string between masses II and III will be (Take $g = 10 \text{ m/sec}^2$)



- (a) 5 N (b) 6 N
(c) 10 N (d) 20 N
18. A ball is bouncing down a flight of stairs. The coefficient of restitution is e . The height of each step is d and the ball descends one step each bounce. After each bounce it rebounds to a height h above the next lower step. The height is large enough compared with the width of step so that the impacts are effectively head-on. Find

the relationship between h and d .

(a) $h = \frac{d}{1-e^2}$ (b) $h = \frac{d}{1+e^2}$

(c) $h = \frac{d}{1+e}$ (d) $h = \sqrt{\frac{d}{1-e^2}}$

19. A conducting sphere of radius R carrying charge Q lies inside an uncharged conducting shell of radius $2R$. If they are joined by a metal wire, the amount of heat that will be produced is

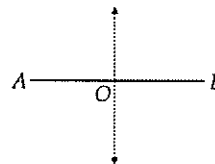
(a) $\frac{1}{4\pi\epsilon_0} \cdot \frac{Q^2}{4R}$ (b) $\frac{1}{4\pi\epsilon_0} \cdot \frac{Q^2}{2R}$

(c) $\frac{1}{4\pi\epsilon_0} \cdot \frac{Q^2}{R}$ (d) $\frac{2}{4\pi\epsilon_0} \cdot \frac{Q^2}{3R}$

20. Black holes in orbit around a normal star are detected from the earth due to the frictional heating of infalling gas into the black hole, which can reach temperatures greater than 10^6 K . Assuming that the infalling gas can be modelled as a blackbody radiator, then the wavelength of maximum power lies
- (a) in the visible region
(b) in the X-ray region
(c) in the the microwave region
(d) in the gamma-ray region of electromagnetic spectrum

21. Neglecting the density of air, the terminal velocity obtained by a raindrop of radius 0.3 mm falling through air of viscosity $1.8 \times 10^{-5} \text{ N s m}^{-2}$ will be
- (a) 10.9 m s^{-1} (b) 7.48 m s^{-1}
(c) 3.7 m s^{-1} (d) 12.8 m s^{-1}

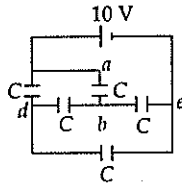
22. A particle executes simple harmonic motion of period T and amplitude l along a rod AB of length $2l$. The rod AB itself executes simple harmonic motion of the same period and amplitude in a direction perpendicular to its length. Initially, both the particle and the rod are in their mean positions. The path traced out by the particle will be



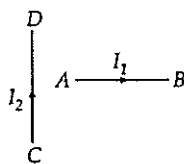
- (a) a circle of radius l
(b) a straight line inclined at $\frac{\pi}{4}$ to the rod
(c) an ellipse

(d) a figure of eight

23. What is the energy stored in the capacitor between terminals a and b of the network shown in the figure? (Capacitance of each capacitance $C = 1 \mu\text{F}$)



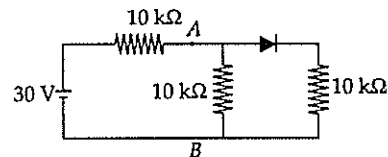
- (a) $12.5 \mu\text{J}$ (b) Zero
(c) $25 \mu\text{J}$ (d) $50 \mu\text{J}$
24. When a current is passed in a conductor, 3°C rise in temperature is observed. If the strength of current is made thrice, then rise in temperature will approximately be
- (a) 36°C (b) 27°C
(c) 18°C (d) 9°C
25. In a metal with positive Thomson coefficient, current is passed from the lower temperature to higher temperature side. Then heat will be
- (a) absorbed (b) constant
(c) evolved (d) either 'b' or 'c'
26. A moving coil galvanometer has a resistance of 900Ω . In order to send only 10% of the main current through this galvanometer, the resistance of the required shunt is
- (a) 0.9Ω (b) 100Ω
(c) 405Ω (d) 90Ω
27. A current I_1 carrying wire AB is placed near another long wire CD carrying current I_2 . If wire AB is free to move, it will have



- (a) rotational motion only
(b) translational motion only
(c) rotational as well as translational motion
(d) neither rotational nor translational motion
28. A coil of wire of a certain radius has 100 turns and a self inductance of 15 mH. The self inductance of a second similar coil of 500 turns will be
- (a) 75 mH (b) 375 mH
(c) 15 mH (d) none of these
29. In a series LCR circuit, the voltage across the

resistance, capacitance and inductance is 10 V each. If the capacitance is short circuited the voltage across the inductance will be

- (a) 10 V (b) $10\sqrt{2}$ V
(c) $10/\sqrt{2}$ V (d) 20 V
30. If v_γ , v_x and v_m are the speeds of gamma rays, X-rays and microwaves respectively in vacuum, then.
- (a) $v_\gamma > v_x > v_m$ (b) $v_\gamma < v_x < v_m$
(c) $v_\gamma > v_x > v_m$ (d) $v_\gamma = v_x = v_m$
31. Which out of following, cannot produce two coherent sources?
- (a) Lloyd's mirror (b) Fresnel biprism
(c) Young's double slit (d) Prism
32. In Young's double slit experiment, the two slits act as coherent sources of equal amplitude a and of wavelength λ . In another experiment with the same set up, the two slits are sources of equal amplitude a and wavelength λ , but are incoherent. The ratio of intensities of light at the mid point of the screen in the first case to that in the second case is
- (a) 2 : 1 (b) 1 : 2
(c) 3 : 4 (d) 4 : 3
33. If the kinetic energy of a particle is increased by 16 times, the percentage change in the de Broglie wavelength of the particle is
- (a) 25% (b) 75%
(c) 60% (d) 50%
34. If the half lives of a radioactive element for α and β decay are 4 years and 12 years respectively, the ratio of its initial activity and that after 12 years will be
- (a) 6.25% (b) 12.5%
(c) 25% (d) 50%
35. In the given circuit, the potential difference between A and B is



- (a) 0 (b) 5 volt
(c) 10 volt (d) 15 volt.
36. A ball is suspended by a thread of length L at the point O on a wall which is inclined to the vertical by α . The thread with the ball is displaced

by a small angle β away from the vertical and also away from the wall. If the ball is released, the period of oscillation of the pendulum when $\beta > \alpha$ will be

(a) $\sqrt{\frac{L}{g}} \left[\pi + 2 \sin^{-1} \frac{\alpha}{\beta} \right]$ (b) $\sqrt{\frac{L}{g}} \left[\pi - 2 \sin^{-1} \frac{\beta}{\alpha} \right]$

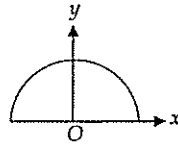
(c) $\sqrt{\frac{L}{g}} \left[2 \sin^{-1} \frac{\beta}{\alpha} - \pi \right]$ (d) $\sqrt{\frac{L}{g}} \left[2 \sin^{-1} \frac{\alpha}{\beta} + \pi \right]$

37. A radioactive nucleus is being produced at a constant rate α per second. Its decay constant is λ . If N_0 are the number of nuclei at time $t = 0$, then the maximum number of nuclei possible are

(a) $N_0 + \frac{\alpha}{\lambda}$ (b) N_0

(c) $\frac{\lambda}{\alpha} + N_0$ (d) $\frac{\alpha}{\lambda}$

38. A wire of length l and mass m is bent in the form of a semicircle. The gravitational field intensity at the centre of semicircle is



(a) $\frac{Gm}{\pi l}$ along x-axis

(b) $\frac{Gm}{\pi l}$ along y-axis

(c) $\frac{2\pi Gm}{l^2}$ along y-axis

(d) $\frac{2\pi Gm}{l^2}$ along x-axis

39. In a concave mirror, an object is placed at a distance d_1 from the focus and the image is formed at a distance d_2 from the focus. Then the focal length of the mirror is

(a) $\sqrt{d_1 d_2}$ (b) $d_1 d_2$

(c) $(d_1 + d_2) / 2$ (d) $\sqrt{d_1 / d_2}$

40. A short linear object, of length l , lies along the axis of a concave mirror, of focal length f , at a distance d from the pole of the mirror. The size of the image is then (nearly)

(a) $\frac{lf}{d-f}$ (b) $\frac{d-f}{lf}$

(c) $l \frac{f^2}{(d-f)^2}$

(d) $\frac{(d-f)^2}{f^2} l$

Directions : In the following questions (41-60), a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as :

- (a) If both assertion and reason are true and reason is the correct explanation of assertion
 (b) If both assertion and reason are true but reason is not the correct explanation of assertion
 (c) If assertion is true but reason is false
 (d) If both assertion and reason are false.

41. Assertion : Liquid molecules have greater potential energy at the melting point.

Reason : Intermolecular spacing between molecules increases at melting point.

42. Assertion : The bob of a simple pendulum is a ball full of water, if a fine hole is made in the bottom of the ball, the time period first increases and then decreases.

Reason : As water flows out of the bob the weight of bob decreases.

43. Assertion : Electric potential of earth is taken zero.

Reason : No electric field exists on earth surface.

44. Assertion : A charge, whether stationary or in motion produces a magnetic field around it.

Reason : Moving charges produce only electric field in the surrounding space.

45. Assertion : Magnetic susceptibility is a pure number.

Reason : The value of magnetic susceptibility for vacuum is one.

46. Assertion : Transformers are used only in alternating current source not in direct current.

Reason : Only a.c. can be stepped up or down by means of transformers.

47. Assertion : A total reflecting prism is used to erect the inverted image without deviation.

- Reason** : Rays of light incident parallel to base of prism emerge out as parallel rays.
48. **Assertion** : The edges of the images of white object formed by a concave mirror on the screen appear white.
Reason : Concave mirror does not suffer chromatic aberration.
49. **Assertion** : A photon has no rest mass, yet it carries definite momentum.
Reason : Momentum of photon is due to its energy and hence its equivalent mass.
50. **Assertion** : A photocell is called an electric eye.
Reason : When light is incident on some semiconductor its electrical resistance is reduced.
51. **Assertion** : Nuclei having number about 60 are most stable.
Reason : When two or more light nuclei are combined into a heavier nucleus, then the binding energy per nucleon will increase.
52. **Assertion** : In a common-emitter amplifier, the load resistance of the output circuit is 1000 times the load resistance of the input circuit. If $\alpha = 0.98$, then voltage gain is 49×10^3 .
Reason : $\alpha = \frac{\beta}{1-\beta}$ (symbols have their usual meaning).
53. **Assertion** : Most amplifiers use common emitter circuit configuration.
Reason : Its input resistance is comparatively higher.
54. **Assertion** : For an isothermal process in an ideal gas, the heat absorbed by the gas is entirely used in the work done by the gas.
Reason : During a process taking place in a system, the temperature remains constant then the process is isothermal.
55. **Assertion** : When hot water is poured in a beaker of thick glass, the beaker cracks.
Reason : Outer surface of the beaker expands suddenly.
56. **Assertion** : Generally the path of a projectile from the earth is parabolic but it is elliptical for projectiles going to a very great height.
Reason : Up to ordinary height the projectile moves under a uniform gravitational force, but for great heights, projectile moves under a variable force.
57. **Assertion** : Angular speed of a planet around the sun increases, when it is closer to the sun.
Reason : Total angular momentum of the system remains constant.
58. **Assertion** : The size and shape of the rigid body remains unaffected under the effect of external forces.
Reason : The distance between two particles remains constant in a rigid body.
59. **Assertion** : Impulsive force is large and acts for a short time.
Reason : Finite change in momentum should be produced by the force.
60. **Assertion** : The dimensional formula for product of resistance and conductance is same as for dielectric constant.
Reason : Both have dimensions of time constant.

CHEMISTRY

61. KF combines with HF to form KHF_2 . This compound contains the species
(a) K^+ , F^- and H^+ (b) K^+ , F^- and HF
(c) K^+ and $[\text{HF}_2]^-$ (d) $[\text{KHF}]^+$ and F_2
62. For a dilute solution, Raoult's law states that
(a) The relative lowering of vapour pressure is proportional to the amount of solute in solution
(b) The relative lowering of vapour pressure is equal to the mole fraction of solute
(c) The lowering of vapour pressure is equal to the mole fraction of the solute
(d) The vapour pressure of the solution is equal to the mole fraction of the solvent.
63. To a 25 ml H_2O_2 solution, excess of acidified solution of KI was added. The iodine liberated required 20 ml of 0.3 N $\text{Na}_2\text{S}_2\text{O}_3$ solution.

The volume strength of H_2O_2 solution is

- (a) 1.344 g/L (b) 3.244 g/L
(c) 5.4 g/L (d) 4.08 g/L

64. Which of the following shows bond in silicone?

- (a) Si-C-Si-C-Si (b) Si-Si-Si-Si
(c) -Si-O-Si-O-Si- (d) Si-C-Si-O-Si.

65. pH of a 0.01 M solution ($K_a = 6.6 \times 10^{-4}$)

- (a) 7.6 (b) 8
(c) 2.6 (d) 5

66. In a homogenous reaction $A \longrightarrow B + C + D$ the initial pressure was P_0 and after time t it was P . Expression for rate constant k in terms of P_0 , P and t will be

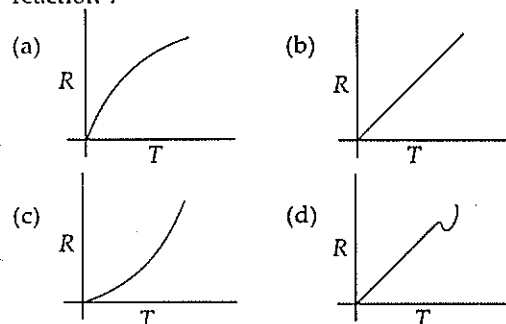
(a) $k = \frac{2.303}{t} \log \frac{2P_0}{3P_0 - P}$

(b) $k = \frac{2.303}{t} \log \frac{2P_0}{P_0 - P}$

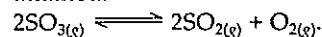
(c) $k = \frac{2.303}{t} \log \frac{3P_0 - P}{2P_0}$

(d) $k = \frac{2.303}{t} \log \frac{2P_0}{3P_0 - 2P}$

67. Which curve corresponds to the temperature dependance of the rate R of a simple one step reaction ?



68. A vessel of one litre capacity containing 1 mole of SO_3 is heated till a state of equilibrium is attained.



At equilibrium, 0.6 moles of SO_2 had formed.

The value of equilibrium constant is

- (a) 0.18 (b) 0.36
(c) 0.45 (d) 0.68.

69. A 0.1 molal solution of an acid is 4.5% ionized. Calculate freezing point. (molecular weight of the acid is 300). $K_f = 1.86 \text{ K mol}^{-1} \text{ kg}$.

- (a) -0.199°C (b) 2.00°C
(c) 0°C (d) -0.269°C

70. Which of the following is an example of chain silicates ?

- (a) Kaolinite (b) Zircon
(c) Benitonite (d) Diopside

71. Which of the element shows +4 oxidation state?

- (a) Sn (b) Ra
(d) Fr (d) Sc

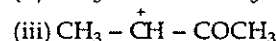
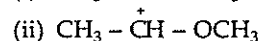
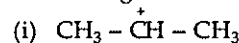
72. Tincture of iodine is

- (a) aqueous solution of I_2
(b) solution of I_2 in aqueous KI
(c) alcoholic solution of I_2
(d) aqueous solution of KI.

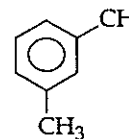
73. The specific conductance of a N/10 KCl at 25°C is $0.0112 \text{ ohm}^{-1} \text{ cm}^{-1}$. The resistance of cell containing solution at the same temperature was found to be 55 ohm. The cell constant will be

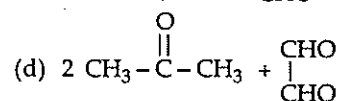
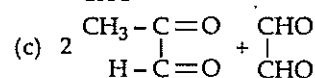
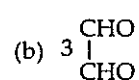
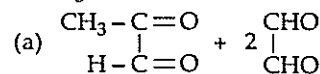
- (a) 6.16 cm^{-1} (b) 0.616 cm^{-1}
(c) 0.0616 cm^{-1} (d) 616 cm^{-1}

74. Decreasing order of stability of ions is

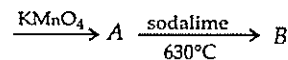


- (a) (i) > (ii) > (iii) (b) (ii) > (i) > (iii)
(c) (ii) > (iii) > (i) (d) (iii) > (i) > (ii)

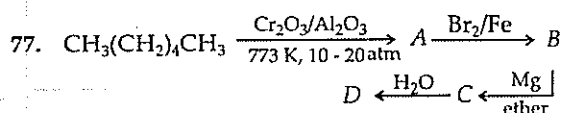
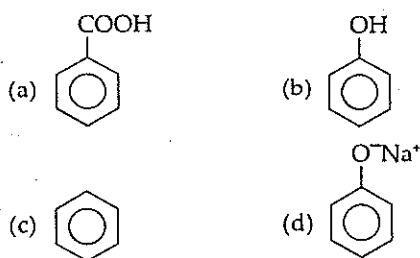
75.  $\xrightarrow{\text{O}_3}$ A, what is A ?



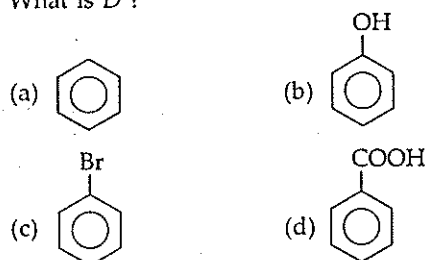
76. $\text{H}_3\text{C} - \overset{\text{O}}{\parallel}{\text{C}} - \text{CH}_3$



What is B ?



What is D ?



78. Mercurous chloride exists in the form of

- (a) Hg^+ (b) Hg_2^{2+}
 (c) Hg^{2+} (d) Hg_3^{2+}

79. Formula of microcosmic salt is

- (a) Na_2HPO_4 (b) $\text{Na}(\text{NH}_4)\text{HPO}_4$
 (c) K_2HPO_4 (d) $\text{Na}_2\text{PO}_4 \cdot \text{K}_2\text{PO}_4$

80. What is the molarity of H_2SO_4 solution that has a density of 1.84 g/cc at 35°C and contains 98% by weight ?

- (a) 4.18 M (b) 8.14 M
 (c) 18.4 M (d) 18 M.

81. A mixture of two miscible liquids A and B is distilled under equilibrium conditions at 1 atm pressure. The mole fraction of A in solution and vapour phase are 0.30 and 0.60 respectively. Assuming ideal behaviour of the solution and the vapour, calculate the ratio of the vapour pressure of pure A to that of pure B.

- (a) 4.0 (b) 3.5
 (c) 2.5 (d) 1.85

82. The variation of volume V , with temperature T , keeping pressure constant is called the coefficient of thermal expansion (α) of a gas. i.e., $\alpha = \frac{1}{V} \left(\frac{\partial V}{\partial T} \right)_P$. For an ideal gas α is equal to

- (a) T (b) $1/T$
 (c) P (d) $1/P$.

83. The molecules having the same hybridization, shape and number of lone pairs of electrons are

- (a) SeF_4 , XeO_2F_2 (b) SF_4 , XeF_2
 (c) XeOF_4 , TeF_4 (d) SeCl_4 , XeF_4

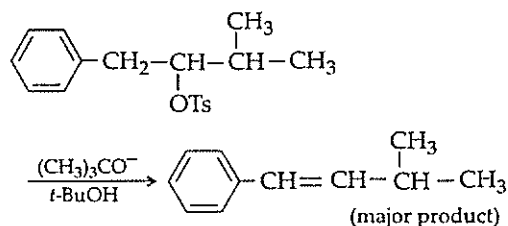
84. The correct order of stability of the superoxides is

- (a) $\text{KO}_2 > \text{RbO}_2 > \text{CsO}_2$
 (b) $\text{KO}_2 > \text{CsO}_2 > \text{RbO}_2$
 (c) $\text{CsO}_2 > \text{RbO}_2 > \text{KO}_2$
 (d) $\text{RbO}_2 > \text{CsO}_2 > \text{KO}_2$

85. Schottky defect in crystals is observed when

- (a) unequal number cations and anions are missing from the lattice
 (b) equal number of cations and anions are missing from the lattice
 (c) an ion leaves its normal site and occupies an interstitial site
 (d) density of the crystal is increased

86. Consider the reaction



The correct explanation is

- (a) The product is formed due to nucleophilic substitution
 (b) The product is formed according to Saytzeff's rule
 (c) Conjugated double bond product is formed due to higher stability because of resonance stabilization
 (d) $(\text{CH}_3)_3\text{CO}^-$ is a better leaving group












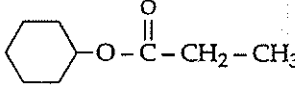
87. 2.5 g of the carbonate of a metal was treated with 100 ml of 1N H_2SO_4 . After the completion of the reaction, the solution was boiled off to expel CO_2 and was then titrated against 1N NaOH solution. The volume of alkali that would be consumed, if the equivalent weight of the metal is 20

- (a) 50 (b) 25
 (c) 75 (d) 100.

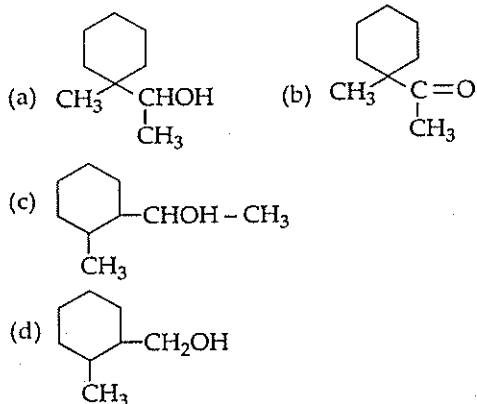
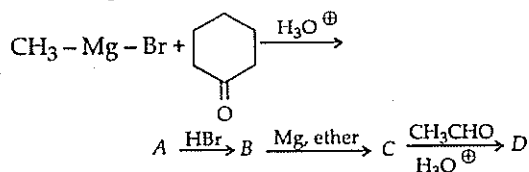
88. In solvents like DMSO, acetonitrile, F^- ion of dissolved NaF is more reactive than in methyl alcohol. Explain

- (a) CH_3OH is more polar than DMSO and CH_3CN
 (b) CH_3OH is less polar than DMSO and CH_3CN
 (c) unsolvated F^- ion in DMSO or CH_3CN acts more efficiently as nucleophile
 (d) $-\text{OH}$ group is a better leaving group than F^- ion
89. Which of the following fluorides has the lowest melting point?
 (a) BaF_2 (b) SrF_2
 (c) CaF_2 (d) BeF_2
90. Which of the following has the highest tendency to give the reaction,

$$\text{M}^+(\text{g}) \xrightarrow[\text{medium}]{\text{aqueous}} \text{M}^+(\text{aq}) ?$$

 (a) Na (b) Li
 (c) K (d) Rb
91. How many geometrical isomers are possible in the following two alkenes?
 (i) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH} = \text{CH} - \text{CH}_3$
 (ii) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH} = \text{CH} - \text{Cl}$
 (a) 4 and 4 (b) 4 and 3
 (c) 3 and 3 (d) 3 and 4.
92. The equilibrium constant for mutarotation $\alpha\text{-D Glucose} \rightleftharpoons \beta\text{-D Glucose}$ is 1.8. What percentage of α form remains at equilibrium?
 (a) 35.7 (b) 64.3
 (c) 55.6 (d) 44.4
93. 2-phenylethylbromide when heated with NaOEt , elimination takes place. No deuterium exchange takes place when the reaction is carried out in $\text{C}_2\text{H}_5\text{OD}$ solvent. The mechanism will be
 (a) E1 elimination (b) E2 elimination
 (c) E1cB elimination (d) E2 or E1cB
94. The $M - O - M$ bond angles in M_2O (where M is halogen) is in the order
 (a) $\text{Br}_2\text{O} > \text{Cl}_2\text{O} > \text{F}_2\text{O}$
 (b) $\text{F}_2\text{O} > \text{Br}_2\text{O} > \text{Cl}_2\text{O}$
 (c) $\text{F}_2\text{O} > \text{Cl}_2\text{O} > \text{Br}_2\text{O}$
 (d) $\text{Cl}_2\text{O} > \text{F}_2\text{O} > \text{Br}_2\text{O}$
95. Hydrofluoric acid is a weak acid. At 25°C , the molar conductivity of 0.002 M HF is $176.2 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$. If its $\Lambda_m^\circ = 405.2 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$. Equilibrium constant at the given concentration is
 (a) $6.7 \times 10^{-4} \text{ M}$ (b) $3.2 \times 10^{-4} \text{ M}$
 (c) $6.7 \times 10^{-5} \text{ M}$ (d) $3.2 \times 10^{-5} \text{ M}$
96. In Oppenauer's oxidation,
 (a) secondary alcohol is oxidised to carboxylic acid in acetone solvent using aluminium tertiary butoxide
 (b) secondary alcohol is oxidised to carboxylic acid without affecting the $\text{C} = \text{C}$ or $\text{C} \equiv \text{C}$ bond by aluminium tertiary butoxide in acetone solvent
 (c) secondary alcohol is oxidised to ketone without affecting $\text{C} = \text{C}$ or $\text{C} \equiv \text{C}$ bond by aluminium tertiary butoxide
 (d) secondary alcohol is oxidised to ketone by chromic acid - pyridine complex.
97. Incorrect statement about Ge is
 (a) GeO_2 is weakly acidic
 (b) $\text{Ge}(\text{OH})_2$ is amphoteric
 (c) GeCl_2 is more stable than GeCl_4
 (d) $\text{Ge}-\text{Ge}$ bond energy is lesser than that of $\text{Si}-\text{Si}$
98. In an isobaric process, when temperature changes from T_1 to T_2 , ΔS is equal to
 (a) $2.303 C_p \log (T_2/T_1)$ (b) $2.303 C_p \ln (T_2/T_1)$
 (c) $C_p \ln (T_1/T_2)$ (d) $C_v \ln (T_2/T_1)$
99. In one reaction,
 $\text{Mg}-\text{Br}$ is treated with CH_3CN and then hydrolysed. In another reaction
 $\text{Mg}-\text{Br}$ is treated with ethyl acetate and then hydrolysed.
-  $\text{MgBr} \xrightarrow[\text{(ii) H}_3\text{O}^+]{\text{(i) CH}_3\text{CN}} \text{A}$
-  $\text{MgBr} \xrightarrow[\text{(ii) H}_3\text{O}^+]{\text{(i) CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OC}_2\text{H}_5} \text{B}$
- A and B are
 (a)  CHO and  $\text{CO}-\text{CH}_3$
 (b)  $\text{CO}-\text{CH}_3$ and  $\text{CO}-\text{CH}_3$
 (c)  $\text{CO}-\text{CH}_3$ and  $\text{CO}-\text{OC}_2\text{H}_5$
 (d)  $\text{CO}-\text{CH}_3$ and  $\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_3$

100. In the following sequence of the reactions, identify the final product.



Directions : In the following questions (101-120), a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as :

- (a) If both assertion and reason are true and reason is the correct explanation of assertion
 (b) If both assertion and reason are true but reason is not the correct explanation of assertion
 (c) If assertion is true but reason is false
 (d) If both assertion and reason are false.

101. Assertion : Electromeric effect is brought into play only at the requirement of the reagent.

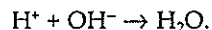
Reason : It is a temporary effect in which bond pair is shifted to one of the constituent atoms.

102. Assertion : In fused state, calcium chloride cannot be used to dry alcohol or NH_3 .

Reason : CaCl_2 is not a good desiccant.

103. Assertion : Heat of neutralisation of nitric acid with NaOH is same to that of HCl and NaOH .

Reason : In both cases strong acid and strong bases are neutralised.



104. Assertion : *Cis*-2-butene gives *meso*-2,

3-butanediol with dilute alkaline KMnO_4 solution.

Reason : Dilute alkaline KMnO_4 solution gives *trans* addition with alkenes.

105. Assertion : Ethers can be dried by using sodium wire.

Reason : Ethers do not react with sodium.

106. Assertion : In rate law, unlike in the expression for equilibrium constants, the exponents for concentrations do not necessarily match the stoichiometric coefficients.

Reason : It is the mechanism and not the balanced chemical equation for the overall change that governs the reaction rate.

107. Assertion : The presence of Ag^+ enhances the solubility of alkenes in water.

Reason : Alkenes are weakly polar in nature.

108. Assertion : A reaction which is spontaneous and accompanied by decrease of randomness must be exothermic.

Reason : All exothermic reactions are accompanied by decrease of randomness.

109. Assertion : Compressibility factor for hydrogen varies with pressure with positive slope at all pressure.

Reason : Even at low pressure, repulsive forces dominate for hydrogen gas

110. Assertion : *p*-N,N-dimethylaminobenzaldehyde undergoes benzoin condensation.

Reason : The aldehydic ($-\text{CHO}$) group is meta directing.

111. Assertion : The S-S-S bond angle in S_8 molecule is 105° .

Reason : S_8 has a V-shape.

112. Assertion : Sodium formate has both the C-O bonds have same value 1.27 \AA .

Reason : Equal bond length is due to the phenomenon of resonance.

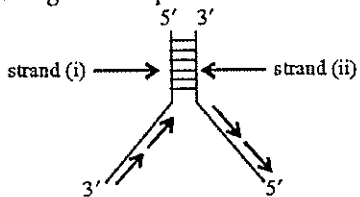
113. Assertion : $\text{C}_2\text{H}_5\text{Br}$ reacts with alcoholic solution of AgNO_2 to form nitroethane as the major product.

Reason : NO_2^- is an ambident ion.

114. Assertion : Ice \rightleftharpoons water, if pressure is applied water will evaporate.
Reason : Increases of pressure pushes the equilibrium towards the side in which number of gaseous molecule increases.
115. Assertion : Ebonite is highly vulcanised rubber.
Reason : Perlon is used in the manufacture of fibres.
116. Assertion : Al forms $[AlF_6]^{3-}$ but B does not form $[BF_6]^{3-}$.
Reason : B does not react with fluorine.
117. Assertion : Esters which contain α -hydrogens undergo Claisen condensation.
Reason : $LiAlH_4$ reduction of esters gives acids.
118. Assertion : In an acid-base titration involving strong base and a weak acid, methyl orange can be used as an indicator.
Reason : Methyl orange changes its colour in pH range of 7 to 9.
119. Assertion : Millon's test is a test for identification of proteins.
Reason : Millon's reagent is a solution of mercurous nitrate and mercuric nitrate in nitric acid containing little nitrous acid.
120. Assertion : $Cu(OH)_2$ is soluble in NH_4OH but not in $NaOH$.
Reason : $Cu(OH)_2$ forms a soluble complex with NH_3 .
- (c) abducens nerve (d) none of these
124. Delicate hair-like feathers which remain sparsely distributed over the body are
(a) coverts (b) filoplumes
(c) plumules (d) remiges
125. *Homo erectus* evolved during
(a) pleistocene (b) miocene
(c) pliocene (d) holocene
126. Which of the following postulates is related with Neo-Darwinism?
(a) mutations are believed to help form new species
(b) it incorporates isolation as an essential component of evolution
(c) it can explain the occurrence of unchanged forms over millions of years
(d) all of the above
127. Intermediate host is absent in the infection of
(a) *Plasmodium* (b) *Trypanosoma*
(c) *Entamoeba* (d) filarial worm.
128. Which one feature is common to leech, cockroach and scorpion?
(a) nephridia
(b) ventral nerve cord
(c) cephalization (d) antennae.
129. The type of epithelial cells which line the inner surface of Fallopian tubes, bronchioles and small bronchi are known as
(a) squamous epithelium
(b) columnar epithelium
(c) ciliated epithelium
(d) cuboidal epithelium
130. A person who shows unpredictable moods, outbursts of emotions, quarrelsome behaviour and conflicts with others is suffering from
(a) borderline personality disorder (BPD)
(b) mood disorder
(c) addictive disorder
(d) schizophrenia
131. In humans at the end of first meiotic division, the male germ cells differentiate into the
(a) primary spermatocytes
(b) secondary spermatocytes
(c) spermatids
(d) spermatogonia
132. Contraceptive oral pills help in birth control by
(a) killing the sperms in uterus

BIOLOGY

121. What is diapedesis?
(a) a kind of amoeboid movement
(b) the process of filtration of urea in kidney
(c) a type of locomotion found in *Hydra*
(d) migration of WBCs into the tissue spaces from blood capillaries
122. Which one of the following depresses brain activity and produces feelings of calmness, relaxation and drowsiness?
(a) morphine (b) valium
(c) amphetamines (d) hashish.
123. Which of the following nerves arises from organ of Corti?
(a) olfactory nerve (b) cochlear nerve

- (b) preventing implantation
(c) preventing ovulation
(d) both (b) and (c).
133. Which one of the following is a sesamoid bone?
(a) pelvis (b) patella
(c) pterygoid (d) pectoral girdle.
134. Respiration is controlled by
(a) medulla oblongata
(b) cerebellum
(c) hypothalamus (d) cerebrum
135. Duodenum has characteristic Brunner's gland which secretes two hormones called
(a) prolactin, parathormone
(b) secretin, cholecystokinin
(c) enterocrinin, duocrinin
(d) gastrin, euterogastrone.
136. Which of the following species has the chromosome complement similar to that of *Triticum aestivum*?
(a) *Zea mays*
(b) *Secale cereale*
(c) *Gossypium*
(d) *Aegilops*
137. Eugenics is the branch concerned with
(a) improving the quality of human race by symptomatic treatment of genetic diseases
(b) improving the quality of human populations by the application of genetic principles
(c) improving the quality of human race by providing best suitable environment
(d) none of the above.
138. What is incorrect about the following figure representing DNA replication?
- 
- (a) the direction of DNA replication in strand (i)
(b) the direction of DNA replication in strand (ii)
(c) discontinuous replication of strand (i)
(d) discontinuous replication of strand (ii)
139. Which of the following is the characteristic of PS-I.
(a) it is active only upto 680 nm of light
(b) the reaction centre of PS-I is P_{680}
(c) PS-I is reduced by the electrons released in photolysis of water
(d) PS-I is involved in non-cyclic photophosphorylation.
140. Bark refers to
(a) phellem + phellogen + phelloderm
(b) periderm + cortex
(c) phellem + phelloderm + secondary phloem
(d) periderm + cortex + pericycle + secondary phloem
141. Cotton fibres mainly contains
(a) cellulose (b) glycogen
(c) protein (d) lipid
142. The outermost limiting layer of mycoplasma is made up of
(a) cell wall (b) cell membrane
(c) mucilaginous sheath
(d) slime layer
143. Which of the following statements about *Spirogyra* is correct?
(a) lateral conjugation takes place in homothallic species
(b) scalariform conjugation takes place in homothallic species
(c) lateral conjugation takes place in heterothallic species
(d) the type of conjugation is unrelated to homothallic & heterothallic species
144. Which of the following sugars is not found in plants?
(a) sucrose (b) glucose
(c) lactose (d) fructose
145. The binding site of tRNA with mRNA & amino acids respectively are
(a) mRNA with DHU loop & amino acid with CCA end
(b) mRNA with CCA end & amino acid with anticodon loop
(c) mRNA with anticodon loop & amino acid with DHU loop
(d) mRNA with anticodon loop & amino acid with CCA end
146. Percentage of recombination between A and B is 9%, A and C is 17%, B and C is 26% , then the arrangement of genes is
(a) ABC (b) ACB
(c) BCA (d) BAC

147. Which of the following is true?
 (a) umbel is a racemose inflorescence where all stalked flower aggregate on the flat receptacle
 (b) raceme is a racemose inflorescence having main axis shortened & flower born acropetally
 (c) spadix is a racemose inflorescence having pendulous spike with main axis much flattened
 (d) spike is a racemose inflorescence having sessile flowers
148. Jute fibres deteriorate quickly because
 (a) cellulose content is high
 (b) lignin content is high
 (c) cellulose content is low
 (d) lignin content is low
149. The branched sclereids present in hydrophytes are
 (a) osteosclereids (b) trichosclereids
 (c) macrosclereids (d) astrosclereids.
150. The enzyme decarboxylase catalyses the following step
 (a) conversion of citric acid to *cis* aconitic acid
 (b) fumaric acid to malic acid
 (c) oxalosuccinic acid to α -ketoglutaric acid
 (d) malic acid to oxaloacetic acid
151. Which of the following is true regarding the given electron transport chain?
 $\text{CoQ} \rightarrow \text{Cyt } c \rightarrow \text{Cyt } aa_3 \rightarrow \text{O}_2$
 (a) $\text{CoQ} \rightarrow \text{Cyt } c$ is H^+ absorbing site
 (b) $aa_3 \rightarrow \text{O}_2$, H^+ yielding site
 (c) $\text{CoQ} \rightarrow \text{Cyt } c$ is H^+ yielding site and $aa_3 \rightarrow \text{O}_2$ is H^+ absorbing site
 (d) no H^+ is absorbed or released
152. Which one of the following is not a microelement for plants?
 (a) Cu (b) B
 (c) Zn (d) Cr
153. National bird of India is
 (a) *Psittacula* (b) *Passer domesticus*
 (c) *Pavo cristatus* (d) *Parakeet*.
154. Rain is called acid-rain when its pH is below
 (a) 7 (b) 6.5
 (c) 6 (d) 5.6
155. Cytokines that provide non specific immunity against virus are
 (a) interleukin (b) tumour necrosis
 (c) colony stimulating
 (d) interferon.
156. By all of the following ways bacteria become resistant to antibiotic except
 (a) making enzymes that inactivate the drug
 (b) becoming impermeable to the drug
 (c) modifying the target of the drug
 (d) moving away from the drug.
157. Specific proteins responsible for the flow of materials and information into the cell are called
 (a) membrane receptors
 (b) carrier proteins
 (c) integral proteins (d) none of these
158. Which of the following conditions represents a case of co-dominant genes?
 (a) a gene expresses itself, suppressing the phenotypic effect of its alleles
 (b) genes that are similar in phenotypic effect when present separately, but when together interact to produce a different trait
 (c) alleles, both of which interact to produce a trait, which may or may not resemble either of the parental types
 (d) alleles, each of which produces an independent effect in a heterozygous condition
159. The first bioherbicide developed in 1981 was based on
 (a) *Phytophthora palmivora*
 (b) *Phytophthora infestans*
 (c) *Bacillus thuringiensis*
 (d) *Azadirachta indica*
160. Upon fertilization, what structure develops from carpel?
 (a) testa (b) tegmen
 (c) pericarp (d) perisperm
- Directions :** In the following questions (161-180), a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as :
- (a) If both assertion and reason are true and reason is the correct explanation of assertion
 (b) If both assertion and reason are true but reason is not the correct explanation of assertion
 (c) If assertion is true but reason is false
 (d) If both assertion and reason are false.
161. Assertion : Secondary succession takes place in recently denuded area.
 Reason : It is caused due to baring of an area.

162. **Assertion** : Connective tissue inside the brain is essential for conduction of nerve impulse.
Reason : Connective tissue hold together the nerve cells of brain.
163. **Assertion** : Mammary glands are apocrine glands.
Reason : The distal part containing secretory granules break down and leaves as a secretion.
164. **Assertion** : Cytokinins increases shelf life of fruits and vegetables.
Reason : Cytokinins induce cell division.
165. **Assertion** : Angina pectoris means "pain in the chest".
Reason : It results due to carrying of extra blood to the heart muscle.
166. **Assertion** : Protandry and protogyny ensures cross fertilization.
Reason : Cross fertilization introduces variation in progeny.
167. **Assertion** : Bursa fabricii lies on the ventral side of the cloaca in birds.
Reason : Bursa fabricii is related with flight adaptation.
168. **Assertion** : Glycolysis is the first step of respiration in which glucose completely breaks into CO_2 and H_2O .
Reason : In this process, there is net gain of twenty four molecules of ATP.
169. **Assertion** : Restriction enzymes cut the strand of DNA to produce sticky ends.
Reason : Stickiness of the ends facilitates the action of the enzyme DNA polymerase.
170. **Assertion** : Excess of nitrates in drinking water are harmful for infants.
Reason : Nitrates are responsible for blue baby syndrome.
171. **Assertion** : Amniocentesis is a process of foetal sex determination.
Reason : Metabolic errors and other diseases can be diagnosed prenatally by this process.
172. **Assertion** : Pollen mother cells (PMCs) are the first male gametophytic cells.
Reason : Each PMC gives rise to two pollens.
173. **Assertion** : Nucleus is the controlling centre of a cell.
Reason : Pores in the nuclear envelope regulate the flow of materials in and out of the nucleus.
174. **Assertion** : Hormone calcitonin has antagonistic effect to that of parathormone.
Reason : Calcitonin decreases blood calcium level while parathormone increases blood calcium level.
175. **Assertion** : Dark reaction occurs only at night in the stroma of chloroplast.
Reason : CO_2 fixation occurs only during C_3 cycle.
176. **Assertion** : The primitive atmosphere was reducing one *i.e.* without oxygen.
Reason : In the primitive atmosphere, oxygen was involved in forming ozone layer.
177. **Assertion** : Java Ape-man, Peking man and Heidelberg man are the fossils of *Homo erectus*.
Reason : *Homo erectus* evolved from *Homo habilis*.
178. **Assertion** : Loss of water produces a negative hydrostatic pressure.
Reason : Positive hydrostatic pressure is developed due to osmotic entry of water into it.
179. **Assertion** : Mammalian ova produces hyaluronidase.
Reason : The eggs of mammal are microlecithal and telolecithal.
180. **Assertion** : A gamete may carry either of the traits but not both.
Reason : This is Mendel's second law or law of independent assortment.

GENERAL KNOWLEDGE

181. A pendulum clock is set to give correct time at the sea level. The clock is moved to a hill station at an altitude h above sea level. In order to keep correct time on the hill station which one of the following adjustments is required?
- the length of the pendulum has to be reduced
 - the length of the pendulum has to be increased
 - the mass of the pendulum has to be increased
 - the mass of the pendulum has to be reduced.
182. Match List I with List II and select the correct answer using the codes given below the lists:
- | List I
(Date) | List II
(Events) |
|--------------------|---------------------------------|
| (A) 24th October | (1) Human Rights Day |
| (B) 10th December | (2) Common wealth Day |
| (C) 24th May | (3) United Nations Day |
| (D) 21st September | (4) International Day of Peace. |
- Codes :
- | A | B | C | D |
|-------|---|---|---|
| (a) 4 | 1 | 2 | 3 |
| (b) 3 | 1 | 2 | 4 |
| (c) 3 | 2 | 1 | 4 |
| (d) 4 | 2 | 1 | 3 |
183. The President of India is elected by
- members of both Houses of Parliament
 - members of both Houses of Parliament and of State Legislatures
 - members of both Houses of Parliament and of State Legislative Assemblies
 - elected members of both Houses of Parliament and elected members of state Legislative Assemblies.
184. Who wrote the book 'India Wins Freedom'?
- Maulana Abul Kalam Azad
 - Mahatma Gandhi
 - Sir Mohammad Iqbal
 - Abdul Ghaffar Khan.
185. Consider the following statements about the National Anthem:
- It was first sung on December 27, 1911 at the Calcutta session of the Indian National Congress.
 - It was adopted by the Constituent Assembly on January 26, 1950
3. Playing time of the full version of the National Anthem is approximately 52 seconds. Which of the statements given above is/are correct?
- 1 only
 - 1 and 2
 - 1 and 3
 - 2 and 3.
186. Match List I with List II and select the correct answer using the codes given below the lists.
- | List I
(Vitamin) | List II
(Function) |
|-----------------------------|---|
| (A) Vitamin A | (1) Assists in normal reproductive function |
| (B) Vitamin C | (2) Assists in absorption and metabolism of calcium |
| (C) Vitamin D | (3) Essential for healthy skin and normal vision. |
| (D) Vitamin B ₁₂ | (4) Essential for formation of collagen. |
| | (5) Essential for red blood cell formation. |
- Codes :
- | A | B | C | D |
|-------|---|---|----|
| (a) 2 | 1 | 5 | 4 |
| (b) 3 | 4 | 2 | 5 |
| (c) 3 | 2 | 4 | 1 |
| (d) 2 | 1 | 3 | 5. |
187. The metal compound commonly found in Sindhoor or Kumkum is based on
- tin
 - lead
 - copper
 - zinc.
188. Which among the following thermometers is preferred for measuring temperature around 1250°C?
- mercury thermometer
 - constant volume gas thermometer
 - optical pyrometer
 - platinum resistance thermometer.
189. The term stagflation refers to a situation where
- growth has no relation with the change in prices
 - rate of growth and prices both are decreasing
 - rate of growth is faster than the rate of price increase
 - rate of growth is slower than the rate of price increase.
190. Which event brought about a profound change

- in Ashoka's administrative policy?
 (a) the third Buddhist council
 (b) the Kalinga war
 (c) his embracing of buddhism
 (d) his sending of missionary to Ceylon.
191. The plant dye *Henna* imparts orange-red colour to skin and hair due to its reaction with which of the following?
 (a) proteins and amino acids
 (b) lipids
 (c) carbohydrates
 (d) nucleic acids.
192. Match the List I with List II and select the correct answer using the codes given below the lists.
- | List I | | List II | |
|----------------------|--------------------------|---------|--|
| (Islands) | | (Ocean) | |
| (A) Hawaiian Islands | (1) Indian Ocean | | |
| (B) Solomon Islands | (2) North Pacific Ocean | | |
| (C) St. Helena | (3) South Pacific Ocean | | |
| (D) Seychelles | (4) South Atlantic Ocean | | |
- Codes :
- | A | B | C | D |
|-------|---|---|---|
| (a) 2 | 3 | 4 | 1 |
| (b) 1 | 4 | 3 | 2 |
| (c) 2 | 4 | 3 | 1 |
| (d) 1 | 3 | 4 | 2 |
193. Delingha came recently in news? What is this?
 (a) it is an endangered species of an Indian bird
 (b) it is place in Europe which was struck by an earthquake
 (c) China recently deployed missiles in the Delingha near Tibet sending alarming signals across political establishment in India
 (d) none of the above.
194. Octopus is an anti-terror agency of
 (a) Kerala (b) Andhra Pradesh
 (c) Karnataka (d) Gujarat.
195. Indira Gandhi Prize for peace, disarmament and development has recently been conferred on
 (a) Bill Gates (b) Jacob Zuma
 (c) Asma Jahangir
 (d) none of the above.
196. India's Deep Joshi has recently been honoured with
 (a) Magsaysay Award
 (b) Whitely Prize
 (c) Right to Livelihood Award
 (d) none of these.
197. The runner up in 2009 Wimbledon Men's Singles was
 (a) Roger Federer
 (b) Rafael Nadal
 (c) Andy Roddick
 (d) none of the above.
198. Who amongst the following cricketers has been chosen for Rajiv Gandhi Khel Ratna Award, 2007?
 (a) Rahul Dravid (b) M.S. Dhoni
 (c) Sachin Tendulkar (d) Virender Sehwag.
199. Who amongst the following became the first woman pilot in the world to fly MIG-35 fighter plane?
 (a) Suman Sharma
 (b) Saudamini Deshmukh
 (c) Kirsty Moore
 (d) Nicole Malachowski.
200. Mr. Paul Krugman whose name was in news recently is a famous
 (a) medical scientist
 (b) economist
 (c) author
 (d) astrophysicist.