

1. A potentiometer is an accurate and versatile device to make electrical measurements of E.M.F, because the method involves:

- (a) Cells
- (b) Potential gradients
- (c) A condition of no current flow through the galvanometer
- (d) A combination of cells, galvanometer and resistances

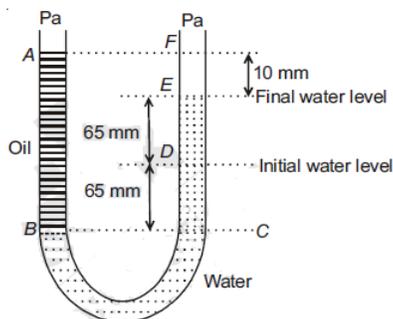
2. A gas mixture consists of 2 moles of O_2 and 4 moles of Ar at temperature T. Neglecting all vibrational modes, the total internal energy of the system is

- (a) 4 RT
- (b) 15 RT
- (c) 9 RT
- (d) 11 RT

3. Radioactive material 'A' has decay constant ' 8λ ' and material 'B' has decay constant ' λ '. Initially they have same number of nuclei. After what time, the ratio of number of nuclei of material 'B' to that 'A' will be $\frac{1}{e}$?

- (a) $\frac{1}{\lambda}$
- (b) $\frac{1}{7\lambda}$
- (c) $\frac{1}{8\lambda}$
- (d) $\frac{1}{9\lambda}$

4. A U tube with both ends open to the atmosphere is partially filled with water. Oil, which is immiscible with water, is poured into one side until it stands at a distance of 10 mm above the water level on the other side. Meanwhile the water rises by 65 mm from its original level (see diagram). The density of the oil is



- (a) 650 kg m^{-3}
- (b) 425 kg m^{-3}
- (c) 800 kg m^{-3}
- (d) 928 kg m^{-3}

5. A 250 –Turn rectangle coil of length 2.1 cm and width 1.25 cm carries a current of 85 μA and is subjected to a magnetic field of strength 0.85 T. Work done for rotating the coil by 180° against the torque is

- (a) $9.1 \mu\text{J}$
- (b) $4.55 \mu\text{J}$
- (c) $2.3 \mu\text{J}$
- (d) $1.15 \mu\text{J}$

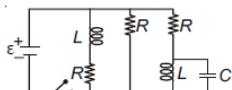
6. The de-Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature T (Kelvin) and mass m, is

- (a) $\frac{h}{\sqrt{mkt}}$
- (b) $\frac{h}{\sqrt{3mkt}}$
- (c) $\frac{2h}{\sqrt{3mkt}}$
- (d) $\frac{2h}{\sqrt{mkt}}$

7. One end of string of length l is connected to a particle of mass 'm' and the other end is connected to a small peg on a smooth horizontal table. If the particle moves in circle with speed ' v ', the net force on the particle (directed towards center) will be (T represents the tension in the string)

- (a) T
- (b) $T + \frac{mv^2}{l}$
- (c) $T - \frac{mv^2}{l}$
- (d) Zero

8. Figure shows a circuit contains three identical resistors with resistance $R = 9.0 \Omega$ each, two identical inductance $L = 2.0 \text{ mH}$ each, and an ideal battery with emf $\epsilon = 18 \text{ V}$. The current 'i' through the battery just after the switch is closed is



- (a) 2 mA
- (b) 0.2 A
- (c) 2 A
- (d) 0 ampere

9. The x and y coordinates of the particle at any time are $x = 5t - 2t^2$ and $y = 10t$ respectively, where x and y are in meters and t in seconds. The acceleration of the particle at $t = 2$ s is
 (a) 0 (b) 5 m/s^2 (c) -4 m/s^2 (d) -8 m/s^2

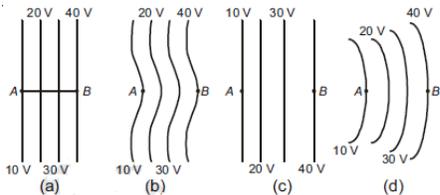
10. Suppose the charge of a proton and an electron differ slightly. One of them is $-e$, the other is $(e + \Delta e)$. If the net of electrostatic force and gravitational force between two hydrogen atoms placed at a distance d (much greater than atomic size) apart is zero, then Δe is of the order of [Given mass of hydrogen $m_H = 1.67 \times 10^{-27} \text{ kg}$]
 (a) 10^{-20} C (b) 10^{-23} C (c) 10^{-37} C (d) 10^{-47} C

11. Two rods A and B of different materials are welded together as shown in figure. Their thermal conductivities are K_1 and K_2 . The thermal conductivity of the composite rod will be



- (a) $\frac{K_1 + K_2}{2}$ (b) $\frac{3(K_1 + K_2)}{2}$ (c) $K_1 + K_2$ (d) $2(K_1 + K_2)$

12. The diagrams below show regions of equipotential



A positive charge is moved from A to B in each diagram.

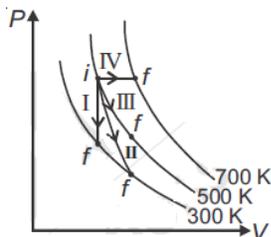
- (a) Maximum work is required to move q in figure (c).
 (b) In all the four cases the work done is the same.
 (c) Minimum work is required to move q in figure (a)
 (d) Maximum work is required to move q in figure (b)

13. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is
 (a) 2 (b) 1 (c) 4 (d) 0.5

14. Young's double slit experiment is first performed in air and then in a medium other than air. It is found that 8th bright fringe in the medium lies where 5th dark fringe lies in air. The refractive index of the medium is nearly
 (a) 1.25 (b) 1.59 (c) 1.69 (d) 1.78

15. A particle executes linear simple harmonic motion with amplitude of 3 cm. When the particle is at 2 cm from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is
 (a) $\frac{\sqrt{5}}{\pi}$ (b) $\frac{\sqrt{5}}{2\pi}$ (c) $\frac{4\pi}{\sqrt{5}}$ (d) $\frac{2\pi}{\sqrt{3}}$

16. Thermodynamic processes are indicated in the following diagram.



Match the following

Column - 1		Column - 2	
P.	Process I	a.	Adiabatic
Q.	Process II	b.	Isobaric
R.	Process III	c.	Isochoric
S.	Process IV	d.	Isothermal

- (a) $P \rightarrow a, Q \rightarrow c, R \rightarrow d, S \rightarrow b$
 (b) $P \rightarrow c, Q \rightarrow a, R \rightarrow d, S \rightarrow b$
 (c) $P \rightarrow c, Q \rightarrow d, R \rightarrow b, S \rightarrow a$
 (d) $P \rightarrow d, Q \rightarrow b, R \rightarrow a, S \rightarrow c$

17. A capacitor is charged by a battery. The battery is removed and another identical unchanged capacitor is connected in parallel. The total electrostatic energy of resulting system

- (a) Increases by a factor of 4
 (b) Decreases by a factor of 2
 (c) Remains the same
 (d) Increases by a factor of 2

18. The photoelectric threshold wavelength of silver is 3250×10^{-10} m is

(Given $h = 4.14 \times 10^{-15}$ eVs and $c = 3 \times 10^8$ ms⁻¹)

- (a) $\approx 6 \times 10^5$ ms⁻¹ (b) $\approx 0.6 \times 10^6$ ms⁻¹ (c) $\approx 61 \times 10^6$ ms⁻¹ (d) $\approx 0.3 \times 10^6$ ms⁻¹

19. A physical quantity of the dimensions of length that can be formed out of c , G and $\frac{e^2}{4\pi\epsilon_0}$ is
 [c is velocity of light, G is universal constant of gravitation and e is charge]

- (a) $\frac{1}{c^2} \left[G \frac{e^2}{4\pi\epsilon_0} \right]^{\frac{1}{2}}$ (b) $c^2 \left[G \frac{e^2}{4\pi\epsilon_0} \right]^{\frac{1}{2}}$ (c) $\frac{1}{c^2} \left[G \frac{e^2}{4\pi\epsilon_0} \right]^{\frac{1}{2}}$ (d) $\frac{1}{c} G \frac{e^2}{4\pi\epsilon_0}$

20. Two cars moving in opposite directions approach each other with speed of 22 m/s and 16.5 m/s respectively. The driver of the first car blows a horn having a frequency 400 Hz. The frequency heard by the driver of the second car is [velocity of sound 340 m/s]

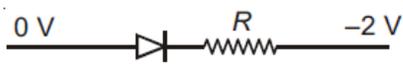
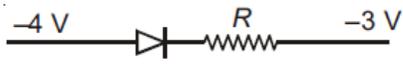
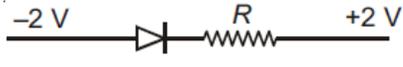
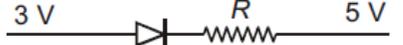
- (a) 350 Hz (b) 361 Hz (c) 411 Hz (d) 448 Hz

21. In a common emitter transistor amplifier the audio signal voltage across the collector is 3 V. The resistance of collector is 3 k Ω .

If current gain is 100 and the base resistance is 2 k Ω , the voltage and power gain of the amplifier is

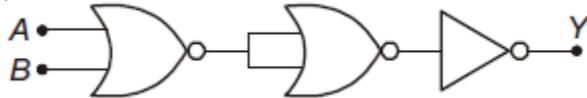
- (a) 200 and 1000 (b) 15 and 200 (c) 150 and 15000 (d) 20 and 2000

22. Which one of the following represents forward bias diode?

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

23. A spring of force constant k is cut into length of ratio $1 : 2 : 3$. They are connected in series and the new force constant is k' . Then they are connected in parallel and force constant is k'' . Then $k' : k''$ is
 (a) $1 : 6$ (b) $1 : 9$ (c) $1 : 11$ (d) $1 : 14$

24. The given electrical network is equivalent to



- (a) AND gate (b) OR gate (c) NOR gate (d) NOT gate

25. The acceleration due to gravity at a height 1 km above the earth is the same as at a depth d below the surface of earth. Then

- (a) $d = \frac{1}{2}km$ (b) $d = 1$ km (c) $d = \frac{3}{2}km$ (d) $d = 2$ km

26. Which of the following statements are correct?

- (i) Centre of mass of a body always coincides with the centre of gravity of the body.
- (ii) Centre of mass of a body is the point at which the total gravitational torque on the body is zero
- (iii) A couple on a body produces both translational and rotational motion in a body.
- (iv) Mechanical advantage greater than one means that small effort can be used to lift a large load.

- (a) (ii) and (iv) (b) (i) and (ii) (c) (ii) and (iii) (d) (iii) and (iv)

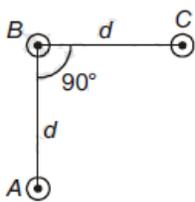
27. A Carnot engine having an efficiency of $\frac{1}{10}$ as heat engine is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is

- (a) 1 J (b) 90 J (c) 99 J (d) 100 J

28. If θ_1 and θ_2 be the apparent angles of dip observed in two vertical planes at right angles to each other, then the true angle of dip θ is given by

- (a) $\cot^2 \theta = \cot^2 \theta_1 + \cot^2 \theta_2$ (b) $\tan^2 \theta = \tan^2 \theta_1 + \cot^2 \theta_2$
 (c) $\cot^2 \theta = \cot^2 \theta_1 - \cot^2 \theta_2$ (d) $\tan^2 \theta = \tan^2 \theta_1 - \tan^2 \theta_2$

29. An arrangement of three parallel straight wires placed perpendicular to plane of paper carrying same current ' I ' along the same direction is shown in Fig. Magnitude of force per unit length on the middle wire 'B' is given by



- (a) $\frac{\mu_0 I^2}{2\pi d}$ (b) $\frac{2\mu_0 I^2}{\pi d}$ (c) $\frac{\sqrt{2}\mu_0 I^2}{\pi d}$ (d) $\frac{\mu_0 I^2}{\sqrt{2}\pi d}$

30. Two astronauts are floating in gravitational free space after having lost contact with their spaceship. The two will:

- (a) Keep floating at the same distance between them
- (b) Move towards each other
- (c) Move away from each other
- (d) Will become stationary

31. In an electromagnetic wave in free space the root mean square value of the electric field is $E_{rms} = 6$ V/m. The peak value of the magnetic field is

- (a) 1.41×10^{-8} T (b) 2.83×10^{-8} T (c) 0.70×10^{-8} T (d) 4.23×10^{-8} T

32. The bulk modulus of a spherical object is 'B'. If it is subjected to uniform pressure 'p' the fractional decrease in radius is

- (a) $\frac{P}{B}$ (b) $\frac{B}{3P}$ (c) $\frac{3P}{B}$ (d) $\frac{P}{3B}$

33. The ratio of resolving powers of an optical microscope for two wavelengths $\lambda_1 = 4000 \text{ \AA}$ and $\lambda_2 = 6000 \text{ \AA}$ is

- (a) 8 : 27 (b) 9 : 4 (c) 3 : 2 (d) 16 : 81

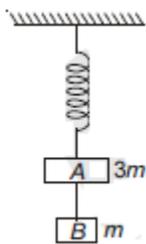
34. Consider a drop of rain water having mass 1 g falling from a height of 1 km. It hits the ground with a speed of 50 m/s. Take g constant with a value 10 m/s^2 . The work done by the (i) gravitational force and the (ii) resistive force of air is

- (a) (i) - 10 J (ii) -8.25 J
 (b) (i) - 1.25 J (ii) -8.25 J
 (c) (i) 100 J (ii) 8.75 J
 (d) (i) 10 J (ii) -8.75 J

35. A spherical black body with a radius of 12 cm radiates 450 watt power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be

- (a) 225 (b) 450 (c) 1000 (d) 1800

36. Two blocks A and B of masses $3m$ and m respectively are connected by a massless and inextensible string. The whole system is figure. The magnitudes of acceleration of A and B immediately after the string is cut, are respectively



- (a) $g, \frac{g}{3}$ (b) $\frac{g}{3}, g$ (c) g, g (d) $\frac{g}{3}, \frac{g}{3}$

37. Two Polaroids P_1 and P_2 are placed with their axis perpendicular to each other. Unpolarised light I_0 is incident on P_1 . A third Polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1 . The intensity of transmitted light through P_2 is

- (a) $\frac{I_0}{2}$ (b) $\frac{I_0}{4}$ (c) $\frac{I_0}{8}$ (d) $\frac{I_0}{16}$

38. A long solenoid of diameter 0.1 m has 2×10^4 turns per meter. At the centre of the solenoid, a coil of 100 turns and radius 0.01 m is placed with its axis coinciding with the solenoid axis. The current in the solenoid reduces at a constant rate of the coil is $10\pi^2 \text{ \Omega}$, the total charge flowing through the coil during this time is

- (a) $32\pi \text{ \mu C}$ (b) 16 \mu C (c) 32 \mu C (d) $16\pi \text{ \mu C}$

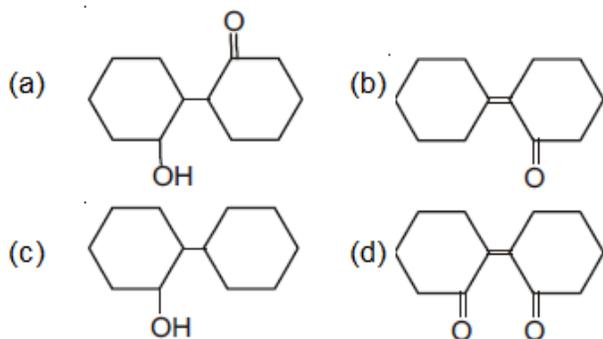
39. Two discs of same moment of inertia rotating about their regular axis passing through centre and perpendicular to the plane of disc with angular velocities ω_1 and ω_2 . They are brought into contact to face to face coinciding the axis of rotation. The expression for loss of energy during this process is

- (a) $\frac{1}{2}I(\omega_1 + \omega_2)^2$ (b) $\frac{1}{4}I(\omega_1 + \omega_2)^2$ (c) $I(\omega_1 + \omega_2)^2$ (d) $\frac{1}{8}I(\omega_1 + \omega_2)^2$

40. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1 . On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2 . The time taken by her to walk up on the moving escalator will be

- (a) $\frac{t_1+t_2}{2}$ (b) $\frac{t_1 t_2}{t_2-t_1}$ (c) $\frac{t_1 t_2}{t_2+t_1}$ (d) $t_1 - t_2$

41. A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force of 30 N?
(a) 25 m/s^2 (b) 0.25 rad/S^2 (c) 25 rad/S^2 (d) 5 m/s^2
42. A beam of light from a source L is incident normally on a plane mirror fixed at a certain distance x from a scale placed just above the source L. When the mirror is rotated through a small angle θ , the spot of the light is found to move through a distance y on the scale. The angle θ is given by
(a) $\frac{y}{2x}$ (b) $\frac{y}{x}$ (c) $\frac{x}{2y}$ (d) $\frac{x}{y}$
43. The two nearest harmonics of a tube closed at one end and open at other end are 220 Hz and 260 Hz. What is the fundamental frequency of the system?
(a) 10 Hz (b) 20 Hz (c) 30 Hz (d) 40 Hz
44. A thin prism having refracting angle 10° is made of glass of refractive index 1.42. This prism is combined with another thin prism of glass of refractive index 1.7. This combination produces dispersion without deviation. The refracting angle of second prism should be
(a) 4° (b) 6° (c) 8° (d) 10°
45. The resistance of a wire is 'R' ohm. If it is melted and stretched to 'n' times its original length, its new resistance will be
(a) nR (b) $\frac{R}{n}$ (c) n^2R (d) $\frac{R}{n^2}$
46. With respect to the conformers of ethane, which of the following statements is true?
(a) Bond angle remains same but bond length changes
(b) Bond angle changes but bond length remains same
(c) Both bond angle and bond length change
(d) Both bond angles and bond length remains same
47. Which of the following pairs of compounds is isoelectronic and isostructural?
(a) BeCl_2 , XeF_2 (b) TeI_2 , XeF_2 (c) IBr_2 , XeF_2 (d) IF_3 , XeF_2
48. HgCl_2 and I_2 both when dissolved in water containing I^- ions the pair of species formed is
(a) HgI_2 , I_3^- (b) HgI_2 , I^- (c) HgI_2 , I_3^- (d) Hg_2I_2 , I^-
49. Mixture of chloroxylenol and terpineol acts as
(a) Analgesic (b) Antiseptic (c) Antipyretic (d) Antibiotic
50. Which is the incorrect statement?
(a) $\text{FeO}_{0.98}$ has non stoichiometric metal deficiency defect
(b) Density decreases in case of crystals with Schottky defect
(c) NaCl(s) is insulator, silicon is semiconductor, silver is conductor, quartz is piezo electric crystal
(d) Frenkel defect is favored in those ionic compounds in which sizes of cation and anions are almost Equal
51. Concentration of the Ag^+ ions in a saturated solution of $\text{Ag}_2\text{C}_2\text{O}_4$ is $2.2 \times 10^{-4} \text{ mol L}^{-1}$. Solubility product of $\text{Ag}_2\text{C}_2\text{O}_4$ is
(a) 2.42×10^{-8} (b) 2.66×10^{-2} (c) 4.5×10^{-11} (d) 5.3×10^{-12}
52. Of the following, which is the product formed when cyclohexanone undergoes aldol condensation followed by heating?



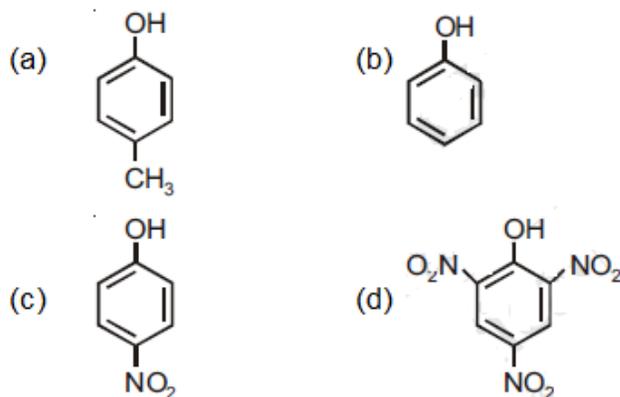
53. The species, having bond angles of 120° is

- (a) PH_3 (b) ClF_3 (c) NCl_3 (d) BCl_3

54. If molality of the dilute solution is doubled, the value of molal depression constant (K_f) will be

- (a) Doubled (b) Halved (c) Tripled (d) Unchanged

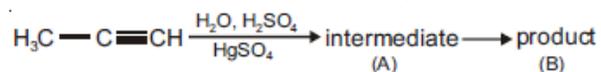
55. Which one is the most acidic compound?

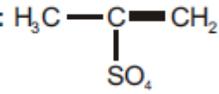
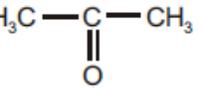
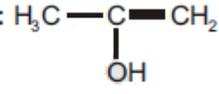
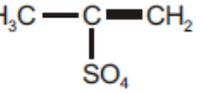
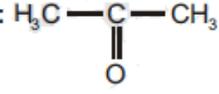
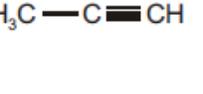
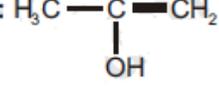
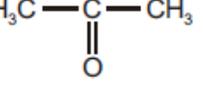


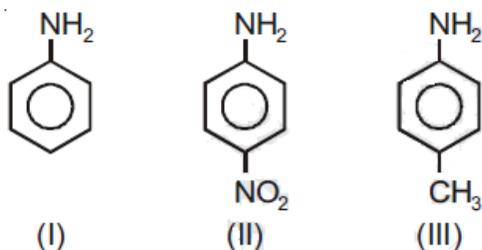
56. It is because of inability of ns^2 electrons of the valence shell to participate in bonding that

- (a) Sn^{2+} is reducing while Pb^{4+} is oxidising
 (b) Sn^{2+} is oxidising while Pb^{4+} is reducing
 (c) Sn^{2+} and Pb^{2+} are both oxidising and reducing
 (d) Sn^{4+} is reducing while Pb^{4+} is oxidising

57. Predict the correct intermediate and product in the following reaction



- (a) A:  B: 
- (b) A:  B: 
- (c) A:  B: 
- (d) A:  B: 



- (a) II < III < I (b) III < I < II (c) III < II < I (d) II < I < III

65. In which pair of ions both the species contains S – S bond?

- (a) $S_2O_7^{2-}$, $S_2O_3^{2-}$ (b) $S_4O_6^{2-}$, $S_2O_3^{2-}$ (c) $S_2O_7^{2-}$, $S_2O_8^{2-}$ (d) $S_4O_6^{2-}$, $S_2O_7^{2-}$

66. The correct order of the stoichiometry's of AgCl formed when AgNO₃ in excess is treated with the complexes: CoCl₃.6NH₃, CoCl₃.5NH₃, CoCl₃.4NH₃ respectively is

- (a) 1 AgCl, 3 AgCl, 2 AgCl (b) 3 AgCl, 1 AgCl, 2 AgCl
(c) 3 AgCl, 2 AgCl, 1 AgCl (d) 2 AgCl, 3 AgCl, 1 AgCl

67. Match the Interhalogens compounds of column I with the geometry in column II and assign the correct code

Column I	Column II
(1) XX'	(i) T-shape
(2) XX ₃	(ii) Pentagonal bipyramidal
(3) XX ₅	(iii) Linear
(4) XX ₇	(iv) Square-pyramidal
	(v) Tetrahedral

Code :

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

68. The reason for greater range of oxidation states in actinoids is attributed to

- (a) The radioactive nature of actinoids
(b) Actinoids contraction
(c) 5f, 6d and 7s levels having comparable energies
(d) 4f and 5d levels being close in energies

69. A 20 litre container at 400 k contains CO₂(g) at pressure 0.4 atm and an excess of SrO (neglect the volume of solid SrO). The volume of the containers is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of CO₂ attains its maximum value, will be

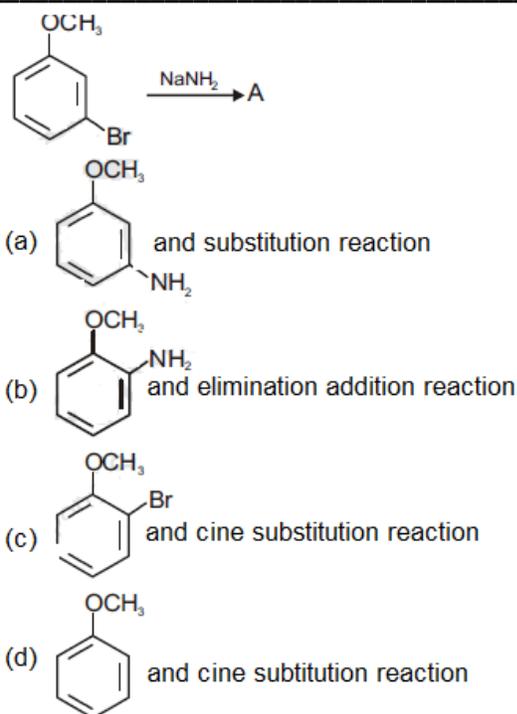
(Given that : SrCO₃ (s) = SrO(s) + CO₂(g). K_p = 1.6 atm)

- (a) 5 litre (b) 10 litre (c) 4 litre (d) 2 litre

70. The correct statement regarding electrophile is

- (a) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile
(b) Electrophile is a positively charged species and can form a bond by accepting a pair of electrons from another electrophile

- (c) Electrophiles are generally neutral species and can form a bond by accepting a pair of electrons from a nucleophile
(d) Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile
71. Which of the following is a sink for CO?
(a) Hemoglobin (b) Micro-organisms present in the soil
(c) Oceans (d) Plants
72. The element Z = 114 has been discovered recently. It will belong to which of the following family group and electronic configuration?
(a) Halogen family, $[\text{Rn}] 5f^{14}6d^{10}7s^27p^5$
(b) Carbon family, $[\text{Rn}] 5f^{14}6d^{10}7s^27p^2$
(c) Oxygen family, $[\text{Rn}] 5f^{14}6d^{10}7s^27p^4$
(d) Nitrogen family, $[\text{Rn}] 5f^{14}6d^{10}7s^27p^6$
73. Correct increasing order for the wavelength of absorption in the visible region for the complexes of Co^{3+} is
(a) $[\text{Co}(\text{en})_3]^{3+}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
(b) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Co}(\text{en})_3]^{3+}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$
(c) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{en})_3]^{3+}$
(d) $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Co}(\text{en})_3]^{3+}$, $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
74. Which of the following statement is not correct?
(a) Insulin maintains sugar level in the blood of a human body
(b) Ovalbumin is a simple food reserve in egg-white
(c) Blood proteins thrombin and fibrinogen are involved in blood clotting
(d) Denaturation makes the proteins more active
75. An example of a sigma bonded organometallic compound is:
(a) Ruthenocene (b) Grignard's reagent
(c) Ferrocene (d) Cobaltocene
76. Which of the following is dependent on temperature?
(a) Molality (b) Molarity
(c) Mole fraction (d) Weight percentage
77. For a given reaction, $\Delta H = 35.5 \text{ kJ mol}^{-1}$ and $\Delta S = 83.6 \text{ JK}^{-1} \text{ mol}^{-1}$. The reaction is spontaneous at: (Assume that ΔH and ΔS do not vary with temperature)
(a) $T < 425 \text{ K}$ (b) $T > 425 \text{ K}$ (c) All temperatures (d) $T > 298 \text{ K}$
78. The most suitable method of separation of 1 : 1 mixture of ortho and para-nitrophenols is
(a) Sublimation (b) Chromatography (c) Crystallisation (d) Steam distillation
79. Which one of the following pairs of species has the same bond order?
(a) CO, NO (b) O_2 , NO^+ (c) CN^- , CO (d) N_2 , O_2^-
80. Identify A and predict the type of reaction



81. A first order reaction has a specific reaction rate of 10^{-2} s^{-1} . How much time will it take for 20 g of the reactant to reduce to 5 g?
- (a) 238.6 second (b) 138.6 second (c) 345.5 second (d) 693.0 second
82. Name the gas that can readily decolourises acidified KMnO_4 solution:
- (a) CO_2 (b) SO_2 (c) NO_2 (d) P_2O_5
83. The heating of phenyl-methyl ethers with HI produces.
- (a) Ethyl chlorides (b) Iodobenzene (c) Phenol (d) Benzene
84. Pick out the correct statement with respect $[\text{Mn}(\text{CN})_6]^{3-}$:
- (a) It is $\text{sp}^3 \text{d}^2$ hybridised and octahedral
 (b) It is $\text{sp}^3 \text{d}^2$ hybridised and tetrahedral
 (c) It is d^2sp^3 hybridised and octahedral
 (d) It is dsp^2 hybridised and square planar
85. Ionic mobility of which of the following alkali metal ions is lowest when aqueous solution of their salts are put under an electric field?
- (a) Na (b) K (c) Rb (d) Li
86. The equilibrium constants of the following are
- $$\text{N}_2 + 3\text{H}_2 = 2\text{NH}_3 \quad K_1$$
- $$\text{N}_2 + \text{O}_2 = 2\text{NO} \quad K_2$$
- $$\text{H}_2 + \frac{1}{2}\text{O}_2 \rightarrow \text{H}_2\text{O} \quad K_3$$
- The equilibrium constant (K) of the reaction:
- $$2\text{NH}_3 + \frac{5}{2}\text{O}_2 \rightleftharpoons 2\text{NO} + 3\text{H}_2\text{O}, \text{ will be}$$
- (a) $K_1 K_3^3 / K_2$ (b) $K_2 K_3^3 / K_1$ (c) $K_2 K_3 / K_1$ (d) $K_2^3 K_3 / K_1$
87. Which of the following reaction is appropriate for converting acetamide to methanamine?
- (a) Carbylamine reaction (b) Hoffmann hypobromamide reaction
 (c) Stephens reaction (d) Gabriel's phthalimide synthesis

88. Mechanism of a hypothetical reaction $X_2 + Y_2 \rightarrow 2XY$ is given below:

(i) $X_2 \rightarrow X + X$ (fast)

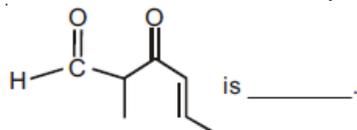
(ii) $X + Y_2 \rightarrow XY + Y$ (slow)

(iii) $X + Y \rightarrow XY$ (fast)

The overall order of the reaction will be

- (a) 1 (b) 2 (c) 0 (d) 1.5

89. The IUPAC name of the compound



- (a) 3-keto-2-methylhex-4-enal
 (b) 5-formylhex-2-en-3-one
 (c) 5-methyl-4-oxohex-2-en-5-al
 (d) 3-keto-2-methylhex-5-enal

90. Extraction of gold and silver involves leaching with CN^- ion. Silver is later recovered by
 (a) Liqation (b) Distillation (c) Zone refining (d) Displacement with Zn

91. Double fertilization is exhibited by
 (a) Gymnosperms (b) Algae (c) Fungi (d) Angiosperms

92. Which of the following are found in extreme saline conditions?
 (a) Archaeobacteria (b) Eubacteria (c) Cyanobacteria (d) Mycobacteria

93. Select the mismatch:
 (a) Frankia - Alnus
 (b) Rhodospirillum - Mycorrhiza
 (c) Anabaena - Nitrogen fixer
 (d) Rhizobium - Alfalfa

94. What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis?
 (a) The larger the fragment size, the farther it moves
 (b) The smaller the fragment size, the farther it moves
 (c) Positively charged fragments do not move
 (d) Negatively charged fragments do not move

95. Attractants and rewards are required for
 (a) Anemophily (b) Entomophily (c) Hydrophily (d) Cleistogamy

96. Which of the following is made up of dead cells?
 (a) Xylem parenchyma (b) Collenchyma
 (c) Phellem (d) Phloem

97. Which cells of 'Crypts of Lieberkühn' secrete antibacterial lysozyme?
 (a) Argentaffin cells (b) Paneth cells (c) Zymogen cells (d) Kupffer cells

98. Adult human RBCs are enucleate. Which of the following statement(s) is/are most appropriate explanation for this feature?
 (i) They do not need to reproduce
 (ii) They are somatic cells
 (iii) They do not metabolize
 (iv) All their internal space is available for oxygen transport

- (a) Only (iv) (b) Only (i) (c) (i), (iii) and (iv) (d) (ii) and (iii)

99. The hepatic portal vein drains blood to liver from

- (a) Heart (b) Stomach (c) Kidneys (d) Intestine

100. The final proof for DNA as the genetic material came from the experiments of

- (a) Griffith (b) Hershey and Chase
(c) Avery, Mcleod and McCarty (d) Hargobind Khorana

101. Which among the following are the smallest living cells, known without a definite cell wall, pathogenic to plants as well as animals and can survive without oxygen?

- (a) Bacillus (b) Pseudomonas (c) Mycoplasma (d) Nostoc

102. Which of the following options gives the correct sequence of events during mitosis?

- (a) Condensation → nuclear membrane disassembly → crossing over → segregation → telophase
(b) Condensation → nuclear membrane disassembly → arrangement at equator → centromere division → segregation → telophase
(c) Condensation → crossing over → nuclear membrane disassembly → segregation → telophase
(d) Condensation → arrangement at equator → centromere division → segregation → telophase

103. Which one of the following statements is correct, with reference to enzymes?

- (a) Apo enzyme = Holoenzyme + Coenzyme
(b) Holoenzyme = Apo enzyme + Coenzyme
(c) Coenzyme = Apo enzyme + Holoenzyme
(d) Holoenzyme = Coenzyme + Cofactor

104. During DNA replication, Okazaki fragments are used to elongate

- (a) The leading strand towards replication fork
(b) The lagging strand towards replication fork
(c) The leading strand away from replication fork
(d) The lagging strand away from the replication fork

105. Which of the following are not polymeric?

- (a) Nucleic acids (b) Proteins (c) Polysaccharides (d) Lipids

106. The region of Biosphere Reserve which is legally protected and where no human activity is allowed is known as

- (a) Core zone (b) Buffer zone (c) Transition zone (d) Restoration zone

107. A dioecious flowering plant prevents both:

- (a) Autogamy and xenogamy
(b) Autogamy and geitonogamy
(c) Geitonogamy and xenogamy
(d) Cleistogamy and xenogamy

108. A temporary endocrine gland in the human body is

- (a) Pineal gland (b) Corpus cardiacum
(c) Corpus luteum (d) Corpus allatum

109. Match the following sexually transmitted diseases (Column – I) with their causative agent (Column – II) and select the correct option.

Column – I	Column - II
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(A) Gonorrhoea	(i) HIV
(B) Syphilis	(ii) Neisseria
(C) Genital Warts	(iii) Treponema
(D) AIDS	(iv) Human Papilloma

Options:

	(A)	(B)	(C)	(D)
(a)	(ii)	(iii)	(iv)	(i)
(b)	(iii)	(iv)	(i)	(ii)
(c)	(iv)	(ii)	(iii)	(i)
(d)	(iv)	(iii)	(ii)	(i)

110. Transplantation of tissues/organs fails often due to non-acceptance by the patient's body. Which type of immune-response is responsible for such rejections?

- (a) Autoimmune response
- (b) Cell-mediated immune response
- (c) Hormonal immune response
- (d) Physiological immune response

111. Spliceosomes are not found in cells of

- (a) Plants
- (b) Fungi
- (c) Animals
- (d) Bacteria

112. An example of colonial alga is

- (a) Chlorella
- (b) Volvox
- (c) Ulothrix
- (d) Spirogyra

113. Which of the following represents order of 'Horse'?

- (a) Equidae
- (b) Perissodactyla
- (c) Caballus
- (d) Ferus

114. Which of the following cell organelles is responsible for extracting energy from carbohydrates to form ATP?

- (a) Lysosome
- (b) Ribosome
- (c) Chloroplast
- (d) Mitochondrion

115. The process of separation and purification of expressed protein before marketing is called

- (a) Upstream processing
- (b) Downstream processing
- (c) Bioprocessing
- (d) Postproduction processing

116. Mycorrhizae are the example of

- (a) Fungi stasis
- (b) Amensalism
- (c) Antibiosis
- (d) Mutualism

117. Viroids differ from viruses in having:

- (a) DNA molecules with protein coat
- (b) DNA molecules without protein coat
- (c) RNA molecules with protein coat
- (d) RNA molecules without protein coat

118. Root hairs develop from the region of

- (a) Maturation
- (b) Elongation
- (c) Root cap
- (d) Meristematic activity

119. Coconut fruit is a

- (a) Drupe
- (b) Berry
- (c) Nut
- (d) Capsule

120. Plants which produce characteristic pneumatophores and show vivipary belong to

- (a) Mesophytes
- (b) Halophytes
- (c) Psammophytes
- (d) Hydrophytes

121. Which one of the following is related to Ex-situ conservation of threatened animals and plants?
(a) Wildlife Safari parks (b) Biodiversity hot spots
(c) Amazon rainforest (d) Himalayan region
122. Select the mismatch:
(a) Pinus - Dioecious
(b) Cycas - Dioecious
(c) Salvinia - Heterosporous
(d) Equisetum - Homosporous
123. Which of the following facilitates opening of stomatal aperture?
(a) Contraction of outer wall of guard cells
(b) Decreases in turgidity of guard cells
(c) Radial orientation of cellulose micro fibrils in the cell wall of guard cells
(d) Longitudinal orientation of cellulose microfibrils in the cell wall of guard cells
124. The association of histone H1 with a nucleosome indicates:
(a) Transcription is occurring
(b) DNA replication is occurring
(c) The DNA is condensed into a Chromatin Fibre
(d) The DNA double helix is exposed
125. DNA Fragments are
(a) Positively charged
(b) Negatively charged
(c) Neutral
(d) Either positively or negatively charged depending on their size
126. Capacitation occurs in
(a) Rete testis
(b) Epididymis
(c) Vas deferens
(d) Female Reproductive tract
127. Which ecosystem has the maximum biomass?
(a) Forest ecosystem
(b) Grassland ecosystem
(c) Pond ecosystem
(d) Lake ecosystem
128. A disease caused by an autosomal primary non-disjunction is
(a) Down's syndrome (b) Klinefelter's syndrome
(c) Turner's syndrome (d) Sickle cell anemia
129. Life cycle of Ectocarpus and Focus respectively are
(a) Haplontic, Diplontic (b) Diplontic, Haplodiplontic
(c) Haplodiplontic, Diplontic (d) Haplodiplontic, Haplontic
130. If there are 999 bases in an RNA that codes for a protein with 333 amino acids, and the base at position 901 is deleted such that the length of the RNA becomes 998 bases, how many codons will be altered?
(a) 1 (b) 11 (c) 33 (d) 333
131. The pivot joint between atlas and axis is a type of
(a) Fibrous joint (b) Cartilaginous joint (c) Synovial joint (d) Saddle joint

132. A gene whose expression helps to identify transformed cell is known as
(a) Selectable marker (b) Vector
(c) Plasmid (d) Structural gene
133. Presence of plants arranged into well-defined vertical layers depending on their height can be seen best in:
(a) Tropical Savannah (b) Tropical Rain Forest
(c) Grassland (d) Temperate Forest
134. The genotypes of a Husband and Wife are $I^A I^B$ and $I^A i$. Among the blood types of their children, how many different genotypes and phenotypes are possible?
(a) 3 genotypes ; 3 phenotypes
(b) 3 genotypes ; 4 phenotypes
(c) 4 genotypes ; 3 phenotypes
(d) 4 genotypes ; 4 phenotypes
135. Zygotic meiosis is characteristic of
(a) Marchantia (b) Fucus (c) Funaria (d) Chlamydomonas
136. Which of the following is correctly matched for the product produced by them?
(a) Acetobacter aceti : Antibiotics
(b) Methanobacterium : Lactic acid
(c) Penicillium notatum : Acetic acid
(d) Saccharomyces cerevisiae : Ethanol
137. Frog's heart when taken out of the body continues to beat for some time. Select the best option from the following statements
(i) Frog is a poikilotherm
(ii) Frog does not have any coronary circulation
(iii) Heart is "myogenic" in nature
(iv) Heart is auto excitable
Options
(a) Only (iii) (b) Only (iv) (c) (i) & (ii) (d) (c) & (d)
138. Which statement is wrong for Krebs' cycle?
(a) There are three points in the cycle where NAD^+ is reduced to $NADH + H^+$
(b) There is one point in the cycle where FAD^+ is reduced to $FADH_2$
(c) During conversion of succinyl CoA to succinic acid, a molecule of GTP is synthesised
(d) The cycle starts with condensation of acetyl group (acetyl CoA) with pyruvic acid to yield citric acid
139. In case of poriferans the spongocoel is lined with flagellated cells called:
(a) Ostia (b) Oscula (c) Choanocytes (d) Mesenchymal cells
140. Which of the following RNAs should be most abundant in animal cell?
(a) r-RNA (b) t-RNA (c) m-RNA (d) mi-RNA
141. Which among these is the correct combination of aquatic mammals?
(a) Seals, Dolphins, Sharks (b) Dolphins, Seals, Trygon
(c) Whales, Dolphins, Seals (d) Trygon, Whales, Seals
142. With reference to factors affecting the rate of photosynthesis, which of the following statements is not correct?
(a) Light saturation for CO_2 fixation occurs at 10% of full sunlight
(b) Increasing atmospheric CO_2 concentration upto 0.05% can enhance CO_2 fixation rate

(c) C_3 plants responds to higher temperature with enhanced photosynthesis while C_4 plants have much lower temperature optimum

(d) Tomato is a greenhouse crop which can be grown in CO_2 – enriched atmosphere for higher yield

143. Asymptote in a logistic growth curve is obtained when

(a) The value of 'r' approaches zero

(b) $K = N$

(c) $K > N$

(d) $K < N$

144. Out of 'X' pairs of ribs in humans only 'Y' pairs are true ribs. Select the option that correctly represents values of X and Y and provides their explanation:

(a) $X = 12, Y = 7$ True ribs are attached dorsally to vertebral column and ventrally to the sternum

(b) $X = 12, Y = 5$ True ribs are attached dorsally to vertebral column and sternum on the two ends

(c) $X = 24, Y = 7$ True ribs are dorsally attached to vertebral column but are free on ventral side

(d) $X = 24, Y = 12$ True ribs are dorsally attached to vertebral column but are free on ventral side

145. The DNA fragments separated on an agarose gel can be visualized after staining with

(a) Bromophenol blue

(b) Acetocarmine

(c) Aniline blue

(d) Ethidium bromide

146. Functional megaspore in an angiosperm develops into

(a) Ovule

(b) Endosperm

(c) Embryo sac

(d) Embryo

147. Among the following characters, which one not considered by Mendel in his experiments on pea?

(a) Stem – Tall or Dwarf

(b) Trichomes – Glandular or non-glandular

(c) Seed – Green or Yellow

(d) Pod – Inflated or Constricted

148. Lungs are made up of air-filled sacs the alveoli. They do not collapse even after forceful expiration, because of:

(a) Residual Volume

(b) Inspiratory Reserve Volume

(c) Tidal Volume

(d) Expiratory Reserve Volume

149. GnRH, a hypothalamic hormone, needed in reproduction, acts on

(a) Anterior pituitary gland and stimulates secretion of LH and oxytocin

(b) Anterior pituitary gland and stimulates secretion of LH and FSH

(c) Posterior pituitary gland and stimulates secretion of oxytocin and FSH

(d) Posterior pituitary gland and stimulates secretion of LH and relaxin

150. In Bougainvillea thorns are the modifications of

(a) Stipules

(b) Adventitious root

(c) Stem

(d) Leaf

151. Which one from those given below is the period for Mendel's hybridization experiments?

(a) 1856 – 1863

(b) 1840 – 1850

(c) 1857 – 1869

(d) 1870 – 1877

152. Good vision depends on adequate intake of carotene rich food Select the best option from the following from carotene

(i) Vitamin A derivatives are formed from carotene

(ii) The photo pigments are embedded in the membrane discs of the inner segment

- (iii) Retinal is a derivative of vitamin A
(iv) Retinal is a light absorbing part of all the visual photo pigments
(a) (i) & (ii)
(b) (i), (iii) & (iv)
(c) (i) & (iii)
(d) (ii), (iii) & (iv)
153. Which one of the following statements is not valid for aerosols?
(a) They are harmful to human health
(b) They alter rainfall and monsoon patterns
(c) They cause increased agricultural productivity
(d) They have negative impact on agricultural land
154. A decrease in blood pressure/volume will not cause the release of
(a) Renin
(b) Atrial Natriuretic Factor
(c) Aldosterone
(d) ADH
155. Homozygous pure lines in cattle can be obtained by
(a) mating of related individuals of same breed
(b) mating of unrelated individuals of same breed
(c) mating of individuals of different breed
(d) mating of individuals of different species
156. The vascular cambium normally gives rise to
(a) Phelloderm (b) Primary phloem (c) Secondary xylem (d) Periderm
157. Which of the following statements is correct?
(a) The ascending limb of loop of Henle is impermeable to water
(b) The descending limb of loop of Henle is impermeable to water
(c) The ascending limb of loop of Henle is permeable to water
(d) The descending limb of loop of Henle is permeable to electrolytes
158. Fruit and leaf drop at early stages can be prevented by the application of
(a) Cytokinins (b) Ethylene (c) Auxins (d) Gibberellic acid
159. A baby boy aged two years is admitted to play school and passes through a dental check – up. The dentist observed that the boy had twenty teeth. Which teeth were absent?
(a) Incisors (b) Canines (c) Pre-molars (d) Molars
160. An important characteristic that Hemichordates share with Chordates is
(a) Absence of notochord
(b) Ventral tubular nerve cord
(c) Pharynx with gill slits
(d) Pharynx without gill slits
161. Artificial selection to obtain cows yielding higher milk output represents
(a) Stabilizing selection as it stabilizes this character in the population
(b) Directional as it pushes the mean of the character in one direction
(c) Disruptive as it splits the population into two one yielding higher output and the other lower output
(d) Stabilizing followed by disruptive as it stabilizes the population to produce higher yielding cows
162. Select the correct route for the passage of sperms in male frogs:
(a) Testes → Bidder's canal → Kidney → Vasa efferentia → Urinogenital duct → Cloaca

- (b) Testes → Vasa efferentia → Kidney → Seminal → Vesicle → Urinogenital duct → Cloaca
(c) Testes → Vasa efferentia → Bidder's canal → Ureter → Cloaca
(d) Testes → Vasa efferentia → Kidney → Bidder's canal → Urinogenital duct → Cloaca

163. Which of the following option best represents the enzyme composition of pancreatic juice?
(a) Amylase, peptidase, trypsinogen, rennin
(b) Amylase, pepsin, trypsinogen, maltase
(c) Peptidase, amylase, pepsin, rennin
(d) Lipase, amylase, trypsinogen, procarboxy-peptidase
164. Phosphoenol pyruvate (PEP) is the primary CO₂ acceptor in :
(a) C₃ plants (b) C₄ plants (c) C₂ plants (d) C₃ and C₄ plants
165. The morphological nature of the edible part of coconut is
(a) Perisperm (b) Cotyledon (c) Endosperm (d) Pericarp
166. Anaphase promoting complex (APC) is protein degradation machinery necessary for proper mitosis of animal cells. If APC is defective in a human cell, which of the following is expected to occur?
(a) Chromosomes will not condense
(b) Chromosomes will be fragmented
(c) Chromosomes will not segregate
(d) Recombination of chromosome arms will occur
167. MALT constitutes about _____ percent of the lymphoid tissue in human body.
(a) 50% (b) 20% (c) 70% (d) 10%
168. Receptor sites for neurotransmitters are present on
(a) Membranes of synaptic vesicles
(b) Pre-synaptic membrane
(c) Tips of axons
(d) Post-synaptic membrane
169. Hypersecretion of Growth Hormone in adults does not cause further increase in height, because
(a) Growth Hormone becomes inactive in adults
(b) Epiphyseal plates close after adolescence
(c) Bones loose their sensitivity to Growth Hormone in adults
(d) Muscle fibres do not grow in size after birth
170. Alexander Von Humbolt described for the first time
(a) Ecological Biodiversity
(b) Laws of limiting factor
(c) Species area relationships
(d) Population Growth equation
171. Myelin sheath is produced by
(a) Schwann Cells and Oligodendrocytes
(b) Astrocytes and Schwann Cells
(c) Oligodendrocytes and Osteoclasts
(d) Osteoclasts and Astrocytes
172. In case of a couple where the male is having a very low sperm count, which technique will be suitable for fertilization?
(a) Intrauterine transfer
(b) Gamete intracytoplasmic fallopian transfer
(c) Artificial Insemination

- (d) Intracytoplasmic sperm injection
173. Which of the following components provides sticky character to the bacterial cell?
(a) Cell wall (b) Nuclear membrane
(c) Plasma membrane (d) Glycocalyx
174. DNA replication in bacteria occurs
(a) During S-phase
(b) Within nucleolus
(c) Prior to fission
(d) Just before transcription
175. The function of copper ions in copper releasing IUD's is:
(a) They suppress sperm motility and fertilizing capacity of sperms
(b) They inhibit gametogenesis
(c) They make uterus unsuitable for implantation
(d) They inhibit ovulation
176. Which of the following in sewage treatment removes suspended solids?
(a) Tertiary treatment (b) Secondary treatment
(c) Primary treatment (d) Sludge treatment
177. The water potential of pure water is
(a) Zero (b) Less than zero
(c) More than zero but less than one (d) more than one
178. Identify the wrong statement on context of heartwood.
(a) Organic compounds are deposited in it
(b) It is highly durable
(c) It conducts water and minerals efficiently
(d) It comprises dead elements with highly lignified walls
179. Thalassaemia and sickle cell anemia are caused due to a problem in globin molecule synthesis. Select the correct statement.
(a) Both are due to a qualitative defect in globin chain synthesis
(b) Both are due to a quantitative defect in globin chain synthesis
(c) Thalassaemia is due to less synthesis of globin molecules
(d) Sickle cell anemia is due to a quantitative problem of globin molecules
180. Flowers which have single ovule in the ovary and are packed into inflorescence are usually pollinated by
(a) Water (b) Bee (c) Wind (d) Bat