

SEAL

Test Booklet Number

22756

[Time : 3 Hours]

Subject Code - 1302

**PHYSICS, CHEMISTRY &
BIOLOGY**

Roll Number

[Maximum Marks : 600]

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you answer the questions given in this Test Booklet :

1. Answers to questions in this Test Booklet are to be given on an **OMR Answer Sheet** provided to the candidate **separately**.
2. Candidate must fill up Name, Category, Test Booklet Number, Subject Code and Roll Number in the Answer Sheet carefully as per instructions given.
3. This Test Booklet consists of 150 questions. All questions are compulsory and carry equal marks.
4. Each question in this Test Booklet has four possible alternative answers namely, (A), (B), (C) and (D), one of which is correct. Candidate should choose the correct answer against each question out of four alternative answers.
5. Candidate is instructed to answer the questions by **darkening (●)** with **Ball Point Pen** only in the circle bearing the correct answer.
6. Candidate should not attempt more than one answer in each question. More than one attempt in any form against a question shall be treated as incorrect.
7. Marking of answer other than darkening shall be cancelled and darkening should remain within the circle or otherwise computer shall not accept during evaluation of answer-script.
8. Rough work must not be done on the Answer Sheet. Use the blank space given in the Test Booklet for rough work.
9. Candidate is to hand over the Answer Sheet to the Invigilator before leaving the Examination Hall.
10. **NEGATIVE MARKING** : Each question carries 4 (four) marks for correct response. For each incorrect response, 1 (one) mark will be deducted from the total score. More than one answer indicated against a question will be deemed as incorrect response and will be negatively marked.

SEAL

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PHYSICS

1. Which of the following has the different dimension than all others ?
 (A) Pressure
 (B) Stress
 (C) Strain
 (D) Young's modulus
2. The time of flight of the projectile is T . There are two values of time for which a projectile is at the same height. The sum of these two times is equal to
 (A) $\frac{T}{2}$
 (B) $\frac{3T}{4}$
 (C) T
 (D) $\frac{3T}{2}$
3. A body of mass M is dropped from a height h cm on a sand floor. If the body penetrates x cm into the sand, the average distance offered by the sand to the body is
 (A) $Mg \left(\frac{h}{x} \right)$
 (B) $Mg \left(1 + \frac{h}{x} \right)$
 (C) $Mg h + Mg x$
 (D) $Mg \left(1 - \frac{h}{x} \right)$
4. A solid sphere is rotating in free space. If the radius of the sphere is increased keeping mass same, which one of the following will not be affected ?
 (A) Angular momentum
 (B) Angular velocity
 (C) Moment of inertia
 (D) Rotational kinetic energy
5. A wheel of radius 1 m rolls forward half a revolution on a horizontal ground. The magnitude of the displacement of the point of the wheel initially in contact with the ground is
 (A) 2π
 (B) $\sqrt{2}\pi$
 (C) π
 (D) $\sqrt{\pi^2 + 4}$
6. A block of mass m is placed on a rough floor of a lift. The coefficient of friction between the block and the floor is μ . When the lift falls freely, the block is pulled horizontally on the floor. The force of friction will be
 (A) μmg
 (B) $\frac{1}{2} \mu mg$
 (C) $2 \mu mg$
 (D) zero

7. A long spring is stretched by 2 cm, its potential energy is U . If the spring is stretched by 10 cm, the potential energy stored in it will be
- (A) $25 U$
- (B) $5 U$
- (C) $\frac{U}{5}$
- (D) $\frac{U}{25}$
8. A ball of mass M_1 collides elastically head on with another ball of mass M_2 initially at rest. In which of the following cases the transfer of momentum will be maximum?
- (A) $M_1 > M_2$
- (B) $M_1 = M_2$
- (C) $M_1 < M_2$
- (D) Data insufficient to predict it
9. There are four point masses m each on the corners of a square of side length l . What is the moment of inertia of the system about one of its diagonals?
- (A) $2 ml^2$
- (B) $4 ml^2$
- (C) ml^2
- (D) $6 ml^2$
10. A satellite of mass m is revolving at a height R above the surface of earth. The radius of earth is R . The gravitational potential energy of this satellite is
- (A) $-mgR$
- (B) $-\frac{mgR}{2}$
- (C) $-\frac{1}{3} mgR$
- (D) $-\frac{1}{7} mgR$
11. If two identical mercury drops are merged to form a bigger drop, then its temperature
- (A) is decreased
- (B) remains the same
- (C) is increased
- (D) is increased or decreased depending on initial size of mercury drops
12. In old age, the blood arteries contract as a consequence of which the blood pressure increases. This follows from
- (A) Pascal's law
- (B) Archimedes principle
- (C) Newton's law
- (D) Bernoulli's principle

13. If a pressure 'p' is applied normal to a wire of Young's modulus Y, the energy stored per unit volume is
- (A) $\frac{1}{2} p^2 Y$
 (B) $\frac{1}{2} \frac{p^2}{Y}$
 (C) $\frac{1}{2} p Y^2$
 (D) $\frac{1}{2} p Y$
14. For a particle executing simple harmonic motion, the kinetic energy K is given by $K = K_0 \cos^2 \omega t$. The maximum value of potential energy is
- (A) K_0
 (B) zero
 (C) $\frac{1}{2} K_0$
 (D) $2 K_0$
15. The amplitude of a wave propagating in the positive y-direction is $y = \frac{1}{1+x^2}$ at $t=0$ s and $y = \frac{1}{[1+(x-1)^2]}$ at $t=2$ s. The speed of the wave is
- (A) 1.0 m/s
 (B) 1.5 m/s
 (C) 0.5 m/s
 (D) 2.0 m/s
16. When a wave travels in a medium, the particle displacements are given by $y(x, t) = 0.03 \sin \pi (2t - 0.01x)$ where y and x are in metres and t in seconds. What is the phase difference at a given instant of time between two particles 25 m apart?
- (A) $\frac{\pi}{8}$
 (B) $\frac{\pi}{4}$
 (C) $\frac{\pi}{2}$
 (D) π
17. An observer moves towards a stationary source of sound with a velocity one-tenth the velocity of sound. The apparent increase in frequency is
- (A) zero
 (B) 5 %
 (C) 10 %
 (D) 0.1 %
18. Which of the following functions represents a travelling wave? Here a, b, c are constants
- (A) $y = a \cos bx \sin ct$
 (B) $y = a \sin bx \cdot \cos ct$
 (C) $y = a \sin (bx + ct) - a \sin (bx - ct)$
 (D) $y = a \sin (bx + ct)$
19. The frequency of a fork is 200 Hz. The distance through which sound travels by the time the fork makes 20 vibrations is (velocity of sound in air is 340 m/s)
- (A) 17 m
 (B) 10 m
 (C) 21.25 m
 (D) 34 m

20. 15 g of air is heated from 0°C to 5°C at constant volume by adding 150 calories of heat. The change in internal energy per gram is
- 150 calories
 - 10 calories
 - 750 calories
 - 30 calories
21. Which of the following cylindrical rods, of the same material will conduct most heat, when their ends are maintained at the same steady temperature?
- Length 1 m, radius 1 cm
 - Length 2 m, radius 1 cm
 - Length 2 m, radius 2 cm
 - Length 1 m, radius 2 cm
22. 22 g of CO_2 at 27°C is mixed with 16 g of O_2 at 37°C . The temperature of the mixture is
- 27°C
 - 32°C
 - 37°C
 - 30°C
23. When the temperature of a rod increases from T to $T + \Delta T$, the moment of inertia increases from I to $I + \Delta I$. The coefficient of linear expansion of the rod is α . The ratio $\frac{\Delta I}{I}$ is
- $\frac{\Delta T}{T}$
 - $\frac{2\Delta T}{T}$
 - $\alpha \Delta T$
 - $2\alpha \Delta T$
24. A vessel contains 1 mol of O_2 gas (molar mass 32) at a temperature T . The pressure of the gas is P . An identical vessel containing one mol of He gas (molar mass 4) at a temperature $2T$ has a pressure of
- $\frac{P}{8}$
 - P
 - $2P$
 - $8P$
25. The average kinetic energy of a gas molecule at absolute temperature T is
- $\frac{1}{2} kT$
 - $\frac{3}{4} kT$
 - kT
 - $\frac{3}{2} kT$
26. Given $\vec{E} = (10\hat{i} + 7\hat{j}) \text{ V/m}$. The electric flux through 1 m^2 area in xz plane is
- 10 Vm
 - 7 Vm
 - 70 Vm
 - zero
27. Force of attraction between the plates of a parallel plate capacitor is
- $\frac{q^2}{2\epsilon_0 A K}$
 - $\frac{q^2}{K \epsilon_0 A}$
 - $\frac{q}{2\epsilon_0 A}$
 - $\frac{q^2}{2\epsilon_0 A^2 K}$

28. A 100 W bulb and a 200 W bulb are designed to operate at 110 V and 220 V respectively. The ratio of their resistances is
- (A) $\frac{1}{2}$
 (B) 1
 (C) $\frac{1}{4}$
 (D) 2
29. A galvanometer of resistance $10\ \Omega$ gives full-scale deflection when 1 mA current passes through it. The resistance required to convert it into a voltmeter reading up to 2.5 V is
- (A) $2490\ \Omega$
 (B) $240\ \Omega$
 (C) $24990\ \Omega$
 (D) $15\ \Omega$
30. Which one of the following statements regarding the electric fields $\vec{E}_1 = x\hat{i} + y\hat{j}$ and $\vec{E}_2 = xy^2\hat{i} + y^3\hat{j}$ is correct?
- (A) Both \vec{E}_1 and \vec{E}_2 can represent an electrostatic field
 (B) Neither \vec{E}_1 nor \vec{E}_2 can represent an electrostatic field
 (C) Only \vec{E}_2 can represent an electrostatic field
 (D) Only \vec{E}_1 can represent an electrostatic field
31. Time period for a magnet is T. If it is divided into four equal parts, then the time period for each part will be
- (A) $4T$
 (B) $\frac{T}{4}$
 (C) $\frac{T}{2}$
 (D) T
32. For 100 % efficiency of d.c. motors, the applied potential should be
- (A) half of back e.m.f.
 (B) twice of back e.m.f.
 (C) equal to back e.m.f.
 (D) one-fourth of back e.m.f.
33. A given length of wire can be bent to form a circle or a square of single turn and a current may be established in it. The ratio of magnetic induction at the centre of the square to the magnetic induction at the centre of the circle is
- (A) $\frac{\pi^2}{2\sqrt{2}}$
 (B) $\frac{2\sqrt{2}}{\pi^2}$
 (C) $\frac{\pi^2}{8\sqrt{2}}$
 (D) 1 : 1
34. Which of the following has zero average value in a plane electromagnetic wave?
- (A) Magnetic potential
 (B) Electric energy
 (C) Electric field
 (D) Magnetic energy

35. The deflection in a moving coil galvanometer falls from 100 divisions to 20 divisions when a shunt of $12\ \Omega$ is used. The resistance of the galvanometer coil is
- (A) $3\ \Omega$
 (B) $12\ \Omega$
 (C) $\frac{48}{5}\ \Omega$
 (D) $48\ \Omega$
36. An alternating voltage (in volts) varies with time t (in seconds) as
- $$V = 100 \sin(50\pi t)$$
- The r.m.s. value of the voltage and the frequency respectively are
- (A) $\frac{100}{\sqrt{2}}$ V, 50 Hz
 (B) 100 V, 25 Hz
 (C) $100\sqrt{2}$ V, 50 Hz
 (D) $\frac{100}{\sqrt{2}}$ V, 25 Hz
37. Which image is the brightest in a thick mirror?
- (A) 1st
 (B) 2nd
 (C) 3rd
 (D) All are of equal brightness
38. If red light is incident on seawater ($\mu = \frac{4}{3}$), it appears
- (A) red
 (B) green
 (C) yellow
 (D) blue
39. The magnifying power of an astronomical telescope is 8 and the distance between two lenses is 54 cm. The focal length of objective and eyepiece are respectively (in cm)
- (A) 8, 64
 (B) 6, 48
 (C) 48, 6
 (D) 64, 8
40. The distance between an object and a divergent lens is m times the focal length of the lens. The linear magnification produced by the lens will be
- (A) m
 (B) $\frac{1}{m}$
 (C) $(m+1)$
 (D) $\frac{1}{(m+1)}$
41. Light of wavelength λ is incident on a slit of width 'd'. The resulting diffraction pattern is observed on a screen at a distance 'D'. The linear width of the principal maxima is then equal to the width of the slit. The distance 'D' is equal to
- (A) $\frac{d^2}{2\lambda}$
 (B) $\frac{\lambda^2}{2d}$
 (C) $\frac{2d^2}{3\lambda}$
 (D) $\frac{2\lambda^2}{3d}$

42. The displacements of interfering light waves are $y_1 = 5 \sin \omega t$ and $y_2 = 12 \cos \omega t$. The amplitude of the resulting wave is
 (A) 17
 (B) 13
 (C) 7
 (D) zero
43. A ray of light is incident on the surface of a glass plate at an angle of incidence equal to Brewster's angle ϕ . If μ represents the refractive index of glass with respect to air, the angle between the reflected and the refracted rays is
 (A) $90 + \phi$
 (B) $\sin^{-1}(\mu \cos \phi)$
 (C) 90°
 (D) $\sin^{-1}\left(\frac{\sin \phi}{\mu}\right)$
44. The nuclear radius of ${}^{16}_8\text{O}$ is $3 \times 10^{-15} \text{ m}$. If an atomic mass unit is $1.67 \times 10^{-27} \text{ kg}$, then the nuclear density is approximately
 (A) $2.35 \times 10^{17} \text{ g/c.c.}$
 (B) $2.35 \times 10^{17} \text{ kg/c.c.}$
 (C) $2.35 \times 10^{17} \text{ g/m}^3$
 (D) $2.35 \times 10^{17} \text{ kg/m}^3$
45. The half-life of a radioactive decay is x times its mean life. The value of x is
 (A) 0.3010
 (B) 0.6930
 (C) 0.6020
 (D) $\frac{1}{0.6930}$
46. The critical mass of a fissionable material can be reduced by
 (A) heating it
 (B) cooling it
 (C) adding impurities to it
 (D) surrounding it with a shield that will reflect neutrons
47. The different lines in the Lyman series have their wavelengths lying between
 (A) zero to infinite
 (B) 900 \AA to 1200 \AA
 (C) 1000 \AA to 1500 \AA
 (D) 500 \AA to 1000 \AA
48. A p - n junction diode cannot be used for
 (A) converting light energy into electrical energy
 (B) getting light radiation
 (C) increasing the amplitude of an a.c. signal
 (D) rectification
49. Which one of the following nuclear reactions is a source of energy in the sun?
 (A) ${}_4\text{Be}^9 + {}_2\text{He}^4 \rightarrow {}_6\text{C}^{12} + {}_0\text{n}^1$
 (B) ${}_2\text{He}^3 + {}_2\text{He}^3 \rightarrow {}_2\text{He}^4 + {}_1\text{H}^1 + {}_1\text{H}^1$
 (C) ${}_{56}\text{Ba}^{144} + {}_{36}\text{Kr}^{92} \rightarrow {}_{92}\text{U}^{235} + {}_0\text{n}^1$
 (D) ${}_{56}\text{Fe}^{56} + {}_{48}\text{Ca}^{112} \rightarrow {}_{74}\text{W}^{167} + {}_0\text{n}^1$
50. At what temperature, an electron will jump from valence band to conduction band if $E_g = 0.23 \text{ eV}$?
 (A) 230 K
 (B) 326 K
 (C) 3260 K
 (D) 2670 K

CHEMISTRY

51. The empirical formula and molecular mass of a compound are CH_2O and 180 u respectively. The molecular formula of the compound will be
- (A) $\text{C}_2\text{H}_4\text{O}_2$
 (B) $\text{C}_9\text{H}_{18}\text{O}_9$
 (C) $\text{C}_6\text{H}_{12}\text{O}_6$
 (D) $\text{C}_8\text{H}_{12}\text{O}_{11}$
52. Among the following options, the one which does not represent ground state electronic configuration is
- (A) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$
 (B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$
 (C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^1$
 (D) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$
53. Rutherford performed α -scattering experiment. Which of the following conclusions could not be derived?
- (A) Electron and nucleus are held by electric forces of attraction
 (B) Most of the space in the atom is empty
 (C) The radius of atom is about 5 times bigger than the radius of the nucleus
 (D) Electrons move in a circular path of fixed energy
54. Amount of oxygen (in moles) that can be obtained by electrolytic decomposition of 90 g of water will be
- (A) 1
 (B) 2
 (C) 2.5
 (D) 3
55. For the reaction,
 $\text{C (s)} + \text{CO}_2 \text{ (g)} \rightleftharpoons 2 \text{CO (g)}$,
 the partial pressures of CO and CO_2 are 4.0 and 2.0 atmospheres respectively at equilibrium. The value of equilibrium constant, K_p , for the reaction is
- (A) 0.5
 (B) 4.0
 (C) 8.0
 (D) 32.0
56. Which of the following equations represents standard enthalpy of formation of methane?
- (A) $\text{C (g)} + 4 \text{H (g)} \rightarrow \text{CH}_4 \text{ (g)}$
 (B) $\text{C}_{\text{graphite}} + 4 \text{H (g)} \rightarrow \text{CH}_4 \text{ (g)}$
 (C) $\text{C}_{\text{diamond}} + 2 \text{H}_2 \text{ (g)} \rightarrow \text{CH}_4 \text{ (g)}$
 (D) $\text{C}_{\text{graphite}} + 2 \text{H}_2 \text{ (g)} \rightarrow \text{CH}_4 \text{ (g)}$
57. Of the given anions, the strongest Brønsted base is
- (A) ClO^-
 (B) ClO_2^-
 (C) ClO_3^-
 (D) ClO_4^-

58. Which of the following is an isoelectronic pair ?
- H^- , He^+
 - Li , Be^+
 - Cl^- , Ne
 - Na , Mg^{2+}
59. Type of hybrid orbitals used by Cl atom in ClO_2^- is
- sp^3
 - sp^2
 - sp^2d
 - $\text{sp}^2\text{.d}$
60. A saturated solution of silver acetate (CH_3COOAg) contains 2×10^{-3} mol of silver ion/litre of solution. The solubility product (K_{sp}) for the silver acetate will be
- 4×10^{-3}
 - 4×10^{-6}
 - 2×10^{-3}
 - 2×10^{-5}
61. The enthalpy of neutralization of four acids A, B, C and D when neutralized against a common base are 57.7, 39.7, 47.3 and 52.2 kJ mol^{-1} respectively. The weakest one among the acids is
- A
 - B
 - C
 - D
62. 1.00 g of a non-electrolyte solute dissolved in 50.0 g of benzene lowered the freezing point of benzene by 0.40 K. The freezing point depression constant of benzene is 5.12 K kg mol^{-1} . The molar mass of the solute is
- 220 g mol^{-1}
 - 236 g mol^{-1}
 - 256 g mol^{-1}
 - 200 g mol^{-1}
63. Three sets of quantum numbers are given
- $n = 4, l = 0, m_l = 0, m_s = +\frac{1}{2}$
 - $n = 3, l = 1, m_l = 1, m_s = -\frac{1}{2}$
 - $n = 3, l = 2, m_l = 0, m_s = +\frac{1}{2}$
- The correct decreasing order of energy of electrons represented by above sets of quantum numbers is
- $c > a > b$
 - $c > b > a$
 - $a > b > c$
 - $a > c > b$
64. The half-life period of a radioactive element is 120 days. After 480 days one gram of element will be reduced to
- $\frac{1}{2}$ g
 - $\frac{1}{4}$ g
 - $\frac{1}{8}$ g
 - $\frac{1}{16}$ g

65. The rate of a reaction can be expressed by

$$k = Ae^{-E_a/RT}$$

In this equation, which one of the following does E_a represent ?

- (A) Total energy of the molecules at a temperature T
 - (B) Energy above which all colliding molecules will react
 - (C) Energy below which colliding molecules will not react
 - (D) The average energy of all the reacting molecules
66. For a body-centred ionic solid xy , which one of the following expressions is correct ? (r is used for radius and a is edge length)

- (A) $r_{x^+} + r_{y^-} = 2a$
- (B) $r_{x^+} + r_{y^-} = \frac{a}{\sqrt{2}}$
- (C) $r_{x^+} + r_{y^-} = \frac{\sqrt{3}}{2}a$
- (D) $r_{x^+} + r_{y^-} = \frac{3a}{2}$

67. Unit of molar conductivity is

- (A) $S \text{ mol}^{-1}$
- (B) $S \text{ cm}^2 \text{ mol}$
- (C) $S \text{ cm}^2 \text{ mol}^{-1}$
- (D) $S \text{ mol}$

68. For the reaction $A \rightarrow B$, it was found that the rate of reaction increases by a factor of 6.25 when concentration of A is increased by a factor of 2.5. The order of this reaction is

- (A) 2.5
- (B) 2
- (C) 1
- (D) 0

69. The order of decreasing ionization enthalpy in alkali metals is

- (A) $K < Li < Na < Rb$
- (B) $Na > Li > K > Rb$
- (C) $Rb < Na < K < Li$
- (D) $Li > Na > K > Rb$

70. Some of Group-2 metal halides are of covalent nature and therefore are soluble in organic solvents. Which one among the following chlorides is soluble in ethanol ?

- (A) BeCl_2
- (B) MgCl_2
- (C) CaCl_2
- (D) SrCl_2

71. In manufacture of sodium carbonate the recovery of ammonia is done by treating ammonium chloride with calcium hydroxide. The by-product obtained in this process is

- (A) NaCl
- (B) CaCl_2
- (C) NaOH
- (D) NaHCO_3

72. Boric acid is an acid because its molecule
 (A) gives up a proton
 (B) contains replaceable H^+ ion
 (C) accepts OH^- from water releasing proton
 (D) combines with proton from water molecule
73. Given
 $Fe^{3+}/Fe^{2+} = +0.77\text{ V}$, $I_2(s)/I^- = +0.54\text{ V}$
 $Cu^{2+}/Cu = +0.34\text{ V}$, $Ag^+/Ag = +0.80\text{ V}$
 Strongest oxidizing agent will be
 (A) Fe^{3+}
 (B) I_2
 (C) Cu
 (D) Ag^+
74. Which one of the following statements is *not* correct?
 (A) In many of its properties, beryllium resembles aluminium
 (B) Sulphate of alkaline earth metals are white solids and are stable to heat
 (C) Bond in BeO is essentially covalent
 (D) The alkaline earth metals do not react with acids
75. Which one of the following configurations of the elements will have highest ionization enthalpy?
 (A) $[Ne] 3s^2 3p^1$
 (B) $[Ne] 3s^2 3p^3$
 (C) $[Ne] 3s^2 3p^2$
 (D) $[Ar] 3d^{10} 4s^2 4p^3$
76. Which one of the following expressions correctly represents electron gain enthalpy?
 (A) $X(g) \rightarrow X^+(g) + e^-$; ΔH_1
 (B) $X(g) + e^- \rightarrow X^-(g)$; ΔH_2
 (C) $\frac{1}{2} X_2(g) \rightarrow X(g)$; ΔH_3
 (D) $X(s) \rightarrow X(g)$; ΔH_4
77. CO_2 is isostructural with
 (A) H_2O
 (B) $SnCl_2$
 (C) C_2H_2
 (D) NO_2
78. Which one of the following pairs of ions has almost the same spin magnetic moment?
 (A) Co^{2+} and Cr^{3+}
 (B) Co^{2+} and Cr^{2+}
 (C) Mn^{2+} and Cr^{3+}
 (D) Cr^{2+} and Mn^{2+}
 (Atomic number $Cr=24$, $Co=27$, $Mn=25$)
79. When one mole of $CrCl_3 \cdot 6H_2O$ is treated with excess of $AgNO_3$, 3 mol of $AgCl$ are formed. The formula of the complex is
 (A) $[CrCl(H_2O)_5]Cl_2 \cdot H_2O$
 (B) $[Cr(H_2O)_6]Cl_3$
 (C) $[CrCl_2(H_2O)_4]Cl \cdot 2H_2O$
 (D) $[CrCl_3(H_2O)_3] \cdot 3H_2O$

80. What will be magnetic moment (μ) of a divalent ion in aqueous solution if its atomic number is 25?

- (A) 4.90 BM
- (B) 5.92 BM
- (C) 3.87 BM
- (D) 2.84 BM

81. Which one of the following ions forms a colourless solution in aqueous medium?

- (A) Cr^{3+}
- (B) Ti^{3+}
- (C) Se^{3+}
- (D) V^{3+}

82. $[\text{Co}(\text{NH}_3)_5\text{ONO}] \text{Cl}_2$ and

$[\text{Co}(\text{NH}_3)_5\text{NO}_2] \text{Cl}_2$ show

- (A) geometrical isomerism
- (B) ionization isomerism
- (C) linkage isomerism
- (D) coordination isomerism

83. IUPAC name of the coordination compound

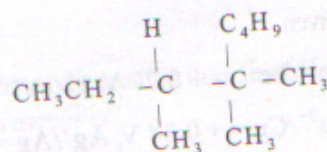
$[\text{Pt}(\text{NH}_3)_5\text{Cl}] \text{Br}_3$ is

- (A) pentaamminechloridoplatinum (II) bromide
- (B) pentaamminechloridoplatinum (IV) bromide
- (C) chloridopentaamineplatinum (O) bromide
- (D) pentaminechloridoplatinum (III) bromide

84. The colour discharge tubes for advertisement mainly contains

- (A) Xenon
- (B) Helium
- (C) Neon
- (D) Argon

85. The IUPAC name of the following compound



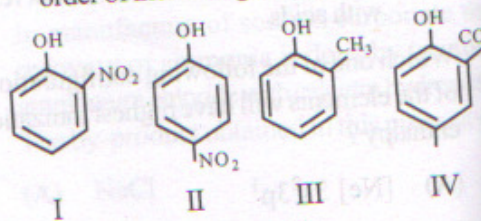
is

- (A) 2-ethyl-3,3-dimethylheptane
- (B) 2-isobutyl-2-methylhexane
- (C) 3,4,4-trimethyl octane
- (D) 2-butyl-2,3-dimethylpentane

86. Which of the following has the higher nucleophilicity in polar aprotic solvent?

- (A) I^-
- (B) Cl^-
- (C) Br^-
- (D) F^-

87. Arrange the following compounds in order of increasing acidity:



- (A) $\text{III} < \text{I} < \text{II} < \text{IV}$
- (B) $\text{III} < \text{II} < \text{I} < \text{IV}$
- (C) $\text{IV} < \text{III} < \text{I} < \text{II}$
- (D) $\text{III} < \text{IV} < \text{II} < \text{I}$

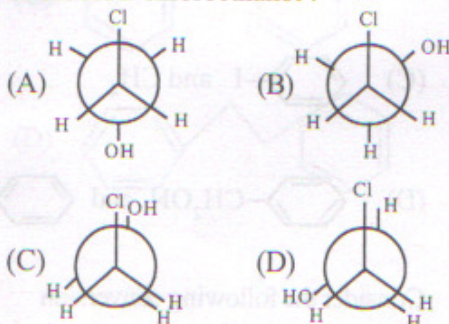
88. A liquid that decomposes at its boiling point can be purified by

- (A) steam distillation
- (B) distillation under reduced pressure
- (C) simple distillation
- (D) fractional distillation

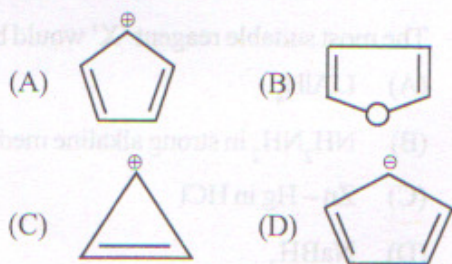
89. Carbocations have

- (A) sp^2 hybridized carbon with empty p orbital
- (B) sp^3 hybridized carbon
- (C) sp hybridized carbon
- (D) sp^2 hybridized carbon with filled p orbital

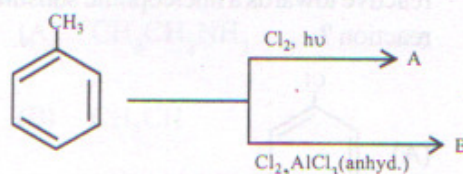
90. Which of the following conformations is most stable for 2-chloroethanol?



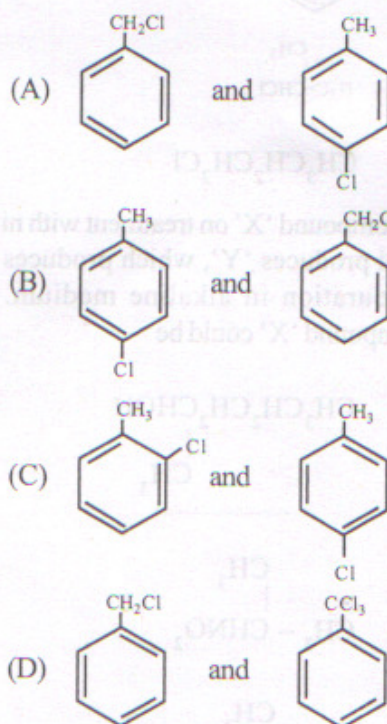
91. Which of the following species is *not* aromatic?



92. Consider the following reactions:



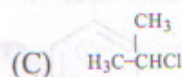
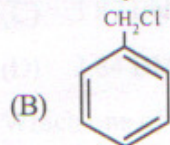
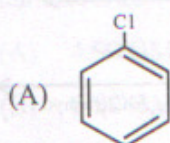
A and B are respectively



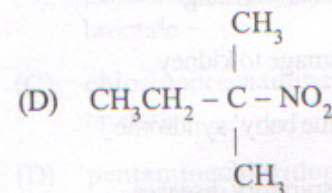
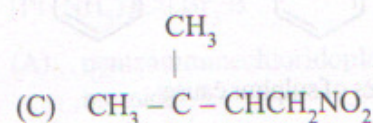
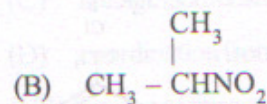
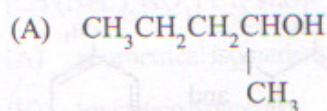
93. Oxides of sulphur cause

- (A) Global warming
- (B) Damage to kidney
- (C) 'Blue baby' syndrome
- (D) Respiratory diseases

94. Which of the following compounds is least reactive towards a nucleophilic substitution reaction?



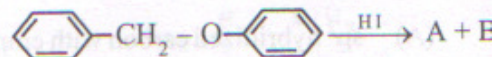
95. A compound 'X' on treatment with nitrous acid produces 'Y', which produces blue colouration in alkaline medium. The compound 'X' could be



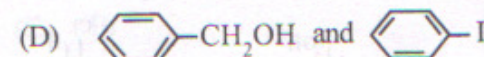
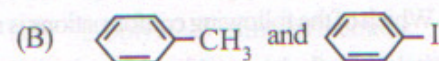
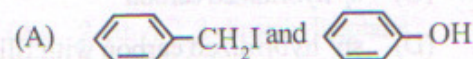
96. In $\text{S}_{\text{N}}1$ reaction

- (A) Inversion > Retention
(B) Inversion = Retention
(C) Inversion < Retention
(D) No change in configuration

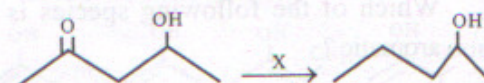
97. Consider the following reaction:



Products 'A' and 'B' are respectively



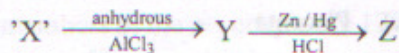
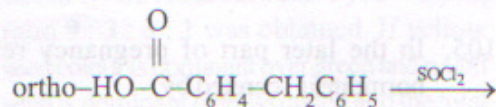
98. Consider the following conversion



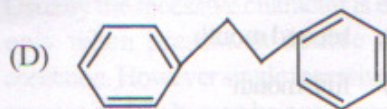
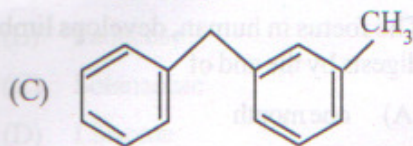
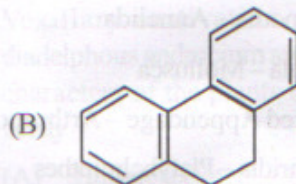
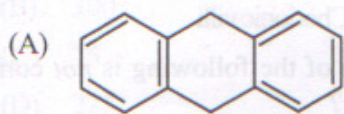
The most suitable reagent 'X' would be

- (A) LiAlH_4
(B) NH_2NH_2 in strong alkaline medium
(C) Zn-Hg in HCl
(D) NaBH_4

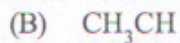
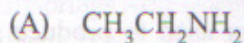
99. In the given sequence of reactions,



the compound Z is



100. Acetamide on treatment with NaOBr yields,



BIOLOGY

101. The mechanism used to produce seeds without fertilization is
 (A) Apomixis
 (B) Parthenogenesis
 (C) Parthenocarp
 (D) Polyembryony
102. Identify the correct sequence of taxonomical categories
 (A) Species → Order → Genus → Class → Phylum → Kingdom
 (B) Order → Species → Class → Genus → Kingdom → Phylum
 (C) Genus → Species → Order → Class → Phylum → Kingdom
 (D) Species → Genus → Order → Class → Phylum → Kingdom
103. When pollen grains of a flower pollinate the stigma of another flower of the same plant, it is called
 (A) Autogamy
 (B) Herkogamy
 (C) Geitonogamy
 (D) Dichogamy
104. Which of the following characteristics does not relate to pteridophytes?
 (A) They are the first terrestrial plants to possess vascular tissue
 (B) They are used for medicinal purpose and as soil binders
 (C) They reproduce asexually by fragmentation of their thalli and specialised structures called gemmae
 (D) Some of them are grown as ornamentals
105. In the later part of pregnancy relaxin hormone is secreted by
 (A) Placenta
 (B) Ovary
 (C) Wall of the uterus
 (D) Chorionic villi
106. Which of the following is *not* correctly paired?
 (A) Parapodia – Annelida
 (B) Radula – Mollusca
 (C) Jointed Appendage – Arthropoda
 (D) Nephridia – Platyhelminthes
107. The foetus in human, develops limbs and digests by the end of
 (A) one month
 (B) fourth month
 (C) second month
 (D) fifth month
108. In which of the following, velamen tissue is found?
 (A) Parasitic roots
 (B) Tuberous roots
 (C) Epiphytic roots
 (D) Respiratory roots
109. Purpose of vasectomy is to prevent
 (A) Insemination
 (B) Sperm formation
 (C) Fertilisation
 (D) Implantation

110. In a dihybrid cross between $YyRr \times YyRr$, ratio 9 : 3 : 3 : 1 was obtained. If yellow seed colour is dominant over green and round seed is dominant over wrinkled and the total members of the progeny were 1200, how many of them are likely to be green ?
- (A) 675
(B) 300
(C) 75
(D) 225
111. Vexillary aestivation of corolla and diadelphous androecium are important floral characters of the plants belonging to the family
- (A) Brassicaceae
(B) Fabaceae
(C) Solanaceae
(D) Liliaceae
112. Usually the recessive character is expressed only when present in double recessive condition. However single recessive gene can express itself in human beings, when the gene is present on
- (A) any autosome of female
(B) X - chromosome of female
(C) X - chromosome of male
(D) any autosome of male
113. Vascular bundle in which the protoxylem is pointing to the centre is called
- (A) Conjoint
(B) Radial
(C) Endarch
(D) Exarch
114. In a cross of tall pea plant with dwarf, offsprings were in a ratio of 1 : 1 for tall and dwarf. Which of the following cross will give the above result ? (T = Tall ; t = dwarf)
- (A) $Tt \times TT$
(B) $Tt \times Tt$
(C) $Tt \times tt$
(D) $TT \times tt$
115. Which of the following blood groups is possible among the offsprings of a parent in which mothers blood is 'O' and that of father is 'AB' ?
- (A) B
(B) AB
(C) O
(D) Both AB and O
116. In earthworm, testes are present in segments
- (A) 10 and 11
(B) 12 and 13
(C) 14 and 15
(D) 17 and 18
117. Which of the following observations drawn from human genome project is *not* correct ?
- (A) Human genome contains 3164.7 million nucleotide bases
(B) Chromosome 1 has the fewest genes
(C) Less than 2 % of the genome codes for proteins
(D) Repeated sequences make up very large portion of the human genome

118. Which is not consistent with double helical structure of DNA ?
 (A) $A = T, C \equiv G$
 (B) Density of DNA decreases on heating
 (C) Ten base pairs in each turn of the helix
 (D) $A + T / C + G$ is not constant
119. How does a cell get rid its defective or malfunctioning organelles ?
 (A) Defective and useless parts are thrown out by exocytosis
 (B) They are engulfed by plastids and stored until export from the cell is possible
 (C) Lysosomes assist in their removal by digesting them
 (D) Oxidised by mitochondria during cell respiration
120. Select the incorrectly matched pair
 (A) Repressor – binds to operator region and prevents RNA polymerase from transcribing
 (B) Cistron – A segment of DNA coding for a polypeptide
 (C) RNA polymerase – Catalyse polymerisation in only one direction
 (D) tRNAs – undergoes processing like capping and tailing
121. During interphase replication of DNA takes place in
 (A) G_0 phase
 (B) G_1 phase
 (C) S phase
 (D) G_2 phase
122. DNA is the genetic material was proved by
 (A) Alfred Griffith
 (B) J. D. Watson
 (C) Hershey and Chase
 (D) Boveri and Suttan
123. Carbohydrate is translocated in plants in the form of
 (A) starch
 (B) glucose
 (C) fructose
 (D) sucrose
124. Homologous structures have
 (A) dissimilar origin and dissimilar functions
 (B) dissimilar origin but similar functions
 (C) dissimilar origin and dissimilar structure
 (D) similar origin and similar or dissimilar functions
125. Which of the following was absent in the primordial atmosphere according to Oparin ?
 (A) Oxygen
 (B) Methane
 (C) Ammonia
 (D) Hydrogen
126. Which of the following elements plays important role in biological nitrogen fixation ?
 (A) Molybdenum
 (B) Zinc
 (C) Sodium
 (D) Manganese

127. A person is suffering with internal bleeding, muscular pain, fever, anaemia and blockage of the intestinal passage. He might be suffering with
- Filariasis
 - Ascariasis
 - Ringworms
 - Amoebiasis
128. C_4 plants are functionally efficient than C_3 plants, because in C_4 plants
- photorespiration is checked
 - PEP is the initial acceptor of CO_2
 - two types of chloroplasts are present
 - photophosphorylation is checked
129. An antibiotic is a
- drug extracted from the roots of certain plants
 - chemical produced in the blood of a disease-infected animal
 - chemical which may cause blood clotting
 - product of the metabolism of certain fungi
130. The process used in conversion of pyruvate to acetyl CoA is
- oxidative carboxylation
 - oxidative decarboxylation
 - oxidative dehydrogenation
 - oxidative dehydration
131. Fertilizers are added to the soil
- to supply the nutrients
 - to increase absorption of organic matter
 - to kill the pests
 - to destroy the weeds
132. Which of the following is a correct sequence of artificial hybridisation technique ?
- selection, emasculation, crossing, bagging
 - selection, crossing, emasculation, bagging
 - crossing, emasculation, selection, bagging
 - selection, bagging, crossing, emasculation
133. What is the response of plants to the relative length of day and night called ?
- Geotropism
 - Phototropism
 - Photoperiodism
 - Vernalisation
134. Broad spectrum antibiotic refers to the antibiotic which
- acts on both pathogens and hosts
 - acts on all bacteria
 - acts on a variety of pathogenic micro-organism
 - is effective in very small amounts

135. Bt cotton has been produced by inserting Bt toxic gene from
 (A) a bacterium
 (B) virus
 (C) a protozoan
 (D) an insect
136. The release of pancreatic juice from the pancreas in human is stimulated by
 (A) secretion
 (B) cholecystokinin
 (C) trypsinogen
 (D) enterokinase
137. Consider the following steps during recombinant DNA technology
 I. Breaking dense DNA using restriction enzyme
 II. Culture of cloned bacteria containing the fragment of dense DNA
 III. Insertion of suitable plasmid
 IV. Insertion of recombinant DNA through cloning
 V. Joining of donor DNA with suitable plasmid using ligase
 The correct sequence is :
 (A) (I), (III), (II), (IV), (V)
 (B) (I), (III), (V), (IV), (II)
 (C) (III), (II), (I), (V), (IV)
 (D) (V), (I), (III), (IV), (II)
138. PCR is used for
 (A) Obtaining the foreign gene product
 (B) Insertion of recombinant DNA into host cell
 (C) Amplification of gene of interest
 (D) Isolation of genetic material
139. Which is the correct sequence of air passage during inhalation ?
 (A) Nostrils → larynx → pharynx → bronchus → alveoli → bronchioles
 (B) Nostrils → pharynx → larynx → trachea → bronchi → bronchioles → alveoli
 (C) Nostrils → mouth → trachea → lungs
 (D) Nostrils → pharynx → larynx → bronchioles → bronchi → alveoli
140. Amensalism is the interaction between two species where
 (A) One species is benefitted and the other is neither benefitted nor harmed
 (B) One species is harmed whereas the other is unaffected
 (C) Both the species are benefitted
 (D) One species is benefitted and the other is harmed
141. Pulmonary artery carries
 (A) Oxygenated blood from heart to lung
 (B) Deoxygenated blood from lungs to heart
 (C) Oxygenated blood from lungs to heart
 (D) Deoxygenated blood from heart to lungs
142. Gross primary productivity of an ecosystem is equal to
 (A) net primary productivity – respiratory losses
 (B) net primary productivity + respiratory losses
 (C) net primary productivity
 (D) respiratory losses – net primary productivity

143. Which of the following blood vessels carries digested food absorbed in the small intestine to the liver ?
- Hepatic vein
 - Pulmonary artery
 - Hepatic portal vein
 - Pulmonary vein
144. Endemic plants are those which are
- found in arctic region
 - gregarious in habit
 - cosmopolitan
 - found in a specific region and not found anywhere else
145. The dumping of untreated sewage in a river decreases the oxygen content of the water because
- the animal life in the water cannot respire
 - it results in an increase in numbers of bacteria
 - it kills the photosynthesizing plants
 - poisons are added to the water
146. Chlorofluorocarbons release which of the following chemicals which has resulted in ozone layer depletion ?
- Chlorine
 - Fluorine
 - Nitrogen peroxide
 - Sulphur dioxide
147. During contraction and relaxation of striated muscle fibre the length of A band usually
- increases
 - decreases
 - remains same and does not change
 - decreases too much
148. Which of the following is not a part of *in situ* conservation ?
- Biosphere reserves
 - National park
 - Sacred groves
 - Wildlife safari parks
149. The protective ozone shield is to be found the
- Stratosphere
 - Troposphere
 - Hydrosphere
 - Ionosphere
150. Which structure of human ear helps to maintain equilibrium ?
- Eustachian tube
 - Cochlea
 - Semicircular canals
 - Malleus