MHT CET 2014 PCB May 8 Single Sitting Question Paper

Conducted by the Directorate of Medical Education and Research, Maharashtra

Time Allowed: 180 Minutes **Total Questions: 180** **Maximum Marks: 720**

General Instructions

(i) This **Physics, Chemistry and Biology** question paper is from **MH-CET 2014**, conducted by the **Directorate of Medical Education and Research, Maharashtra**.

(ii) Answer all **180 multiple choice questions**: **45 Physics**, **45 Chemistry**, **90 Biology**.

(iii) Each question offers **four choices**, with **one correct answer**.

(iv) The time allowed for this paper is **180 minutes**. All questions are compulsory.

(v) Each correct answer earns **4 marks**. **1 mark is deducted for each incorrect answer**.

(vi) Record answers on the OMR answer sheet. Unanswered questions score zero.

1. In cyclotron, for a given magnet, radius of the semicircle traced by positive ion is directly proportional to
(v = velocity of positive ion)

(A) v^{-2} (B) v^{-1}
(C) v (D) v^2

2. A particle at rest is moved along a straight line by a machine giving constant power. The distance moved by the particle in time 't' is proportional to

(A) $t^{1/2}$ (B) $t^{2/3}$
(C) t (D) $t^{3/2}$

3. In insulators (C.B. is conduction band and V.B. is valence band)

(A) V.B. is partially filled with electrons (B) C.B. is partially filled with electrons
(C) C.B. is empty and V.B. is filled with electrons (D) C.B. is filled with electrons and V.B. is empty

4. An object of radius 'R' and mass 'M' is rolling horizontally without slipping with speed 'V'. It then rolls up the hill to a maximum height $h = \frac{3V^2}{4g}$. The moment of inertia of the object is (g = acceleration due to gravity)

(A) $\frac{2}{5}MR^2$ (B) $\frac{MR^2}{2}$
(C) MR^2 (D) $\frac{3}{2}MR^2$

5. In Wheatstone's bridge, three resistors P, Q, R are connected in three arms in order and 4^{th} arm s is formed by two resistors s_1 and s_2 connected in parallel. The condition for bridge to be balanced is $\frac{P}{Q} =$

(A) $\frac{R(s_1+s_2)}{s_1 s_2}$ (B) $\frac{s_1 s_2}{R(s_1+s_2)}$
(C) $\frac{R\,s_1 s_2}{(s_1+s_2)}$ (D) $\frac{(s_1+s_2)}{R\,s_1 s_2}$

6. In common base circuit of a transistor, current amplification factor is 0.95. Calculate the emitter current if base current is 0.2 mA

(A) 2 mA (B) 4 mA
(C) 6 mA (D) 8 mA

7. The ratio of magnetic dipole moment of an electron of charge 'e' and mass 'm' in Bohr's orbit in hydrogen atom to its angular momentum is

(A) $\frac{e}{m}$ (B) $\frac{m}{e}$
(C) $\frac{2m}{e}$ (D) $\frac{e}{2m}$

8. Gases exert pressure on the walls of the container because the gas molecules

(A) have finite volume (B) obey Boyle's law
(C) possess momentum (D) collide with one another

9. Two coherent sources of intensity ratio 'α' interfere. In interference pattern $\frac{I_{max}-I_{min}}{I_{max}+I_{min}} =$

(A) $\frac{2\alpha}{1+\alpha}$ (B) $\frac{2\sqrt{\alpha}}{1+\alpha}$
(C) $\frac{2\alpha}{1+\sqrt{\alpha}}$ (D) $\frac{1+\alpha}{2\alpha}$

10. Light of wavelength λ_A and λ_B falls on two identical metal plates A and B respectively. The maximum kinetic energy of photoelectrons in K_A and K_B respectively, then which one of the following relations is true ? ($\lambda_A = 2\lambda_B$)

(A) $K_A < \frac{K_B}{2}$ (B) $2K_A = K_B$
(C) $K_A = 2K_B$ (D) $K_A > 2K_B$

11. If an electron in hydrogen atom jumps from an orbit of level n = 3 to an orbit of level n = 2, emitted radiation has a frequency (R = Rydberg's constant, C = velocity of light)

(A) $\frac{3RC}{27}$ (B) $\frac{RC}{25}$
(C) $\frac{8RC}{9}$ (D) $\frac{5RC}{36}$

12. In electromagnetic wave, according to Maxwell, changing electric field gives

(A) stationary magnetic field (B) conduction current
(C) eddy current (D) displacement current

13. The de-Broglie wavelength of an electron in 4^{th} orbit is (r = radius of 1^{st} orbit)

(A) $2\pi r$ (B) $4\pi r$
(C) $8\pi r$ (D) $16\pi r$

14. A string of length 'L' and force constant 'K' is stretched to obtain extension 'l'. It is further stretched to obtain extension 'l_1'. The work done in second stretching is

(A) $\frac{1}{2}K\,l_1(2l + l_1)$ (B) $\frac{1}{2}K\,l_1^2$

(C) $\frac{1}{2}K(l^2 + l_1^2)$ (D) $\frac{1}{2}K(l_1^2 - l^2)$

15. The equiconvex lens has focal length 'f'. If it is cut perpendicular to the principal axis passing through optical centre, then focal length of each half is

(A) $\frac{f}{2}$ (B) f

(C) $\frac{3f}{2}$ (D) 2f

16. If 'N' is the number of turns in a circular coil then the value of self inductance varies as

(A) N^0 (B) N

(C) N^2 (D) N^{-2}

17. Surface density of charge on a sphere of radius 'R' in terms of electric intensity 'E' at a distance 'r' in free space is
(ϵ_0 = permittivity of free space)

(A) $\epsilon_0 E\left(\frac{R}{r}\right)^2$ (B) $\frac{\epsilon_0 ER}{r^2}$

(C) $\epsilon_0 E\left(\frac{r}{R}\right)^2$ (D) $\frac{\epsilon_0 Er}{R^2}$

18. A body at rest starts sliding from top of a smooth inclined plane and requires 4 second to reach bottom. How much time does it take, starting from rest at top, to cover one-fourth of a distance ?

(A) 1 second (B) 2 second

(C) 3 second (D) 4 second

19. In vacuum, to travel distance 'd', light takes time 't' and in medium to travel distance '5d', it takes time 'T'. The critical angle of the medium is

(A) $\sin^{-1}\left(\frac{5T}{t}\right)$ (B) $\sin^{-1}\left(\frac{5t}{3T}\right)$

(C) $\sin^{-1}\left(\frac{5t}{T}\right)$ (D) $\sin^{-1}\left(\frac{3t}{5T}\right)$

20. In electromagnetic spectrum, the frequencies of γ-rays, X-rays and ultraviolet rays are denoted by n_1, n_2 and n_3 respectively then

(A) $n_1 > n_2 > n_3$ (B) $n_1 < n_2 < n_3$

(C) $n_1 > n_2 < n_3$ (D) $n_1 < n_2 > n_3$

21. In LCR series circuit, an alternating e.m.f. 'e' and current 'i' are given by the equations
$e = 100\sin(100\,t)$ volt,
$i = 100\sin\left(100\,t + \frac{\pi}{3}\right)$ mA.
The average power dissipated in the circuit will be

(A) 100 W (B) 10 W

(C) 5 W (D) 2.5 W

22. A block resting on the horizontal surface executes S.H.M. in horizontal plane with amplitude 'A'. The frequency of oscillation for which the block just starts to slip is (μ = coefficient of friction, g = gravitational acceleration)

(A) $\frac{1}{2\pi}\sqrt{\frac{\mu g}{A}}$ (B) $\frac{1}{4\pi}\sqrt{\frac{\mu g}{A}}$

(C) $2\pi\sqrt{\frac{A}{\mu g}}$ (D) $4\pi\sqrt{\frac{A}{\mu g}}$

23. A plane sound wave travelling with velocity 'v' in a medium A reaches a point on the interface of medium A and medium B. If velocity of sound in medium B is 2v, the angle of incidence for total internal reflection of the wave will be greater than ($\sin 30^\circ = 0.5$ and $\sin 90^\circ = 1$)

(A) 15° (B) 30°

(C) 45° (D) 90°

24. A gas is compressed isothermally. The r.m.s. velocity of its molecules

(A) increases (B) decreases

(C) first increases and then decreases (D) remains the same

25. Two concentric spheres kept in air have radii 'R' and 'r'. They have similar charge and equal surface charge density 'σ'. The electric potential at their common centre is
(ϵ_0 = permittivity of free space)

(A) $\frac{\sigma(R+r)}{\epsilon_0}$ (B) $\frac{\sigma(R-r)}{\epsilon_0}$

(C) $\frac{\sigma(R+r)}{2\epsilon_0}$ (D) $\frac{\sigma(R+r)}{4\epsilon_0}$

26. The velocity of water in river is 9 km/hr of the upper surface. The river is 10 m deep. If the coefficient of viscosity of water is 10^{-2} poise then the shearing stress between horizontal layers of water is

(A) 0.25×10^{-2} N/m^2 (B) 0.25×10^{-3} N/m^2

(C) 0.5×10^{-3} N/m^2 (D) 0.75×10^{-3} N/m^2

27. A sphere 'P' of mass 'm' moving with velocity 'u' collides head-on with another sphere 'Q' of mass 'm' which is at rest. The ratio of final velocity of 'Q' to initial velocity of 'P' is (e = coefficient of restitution)

(A) $\frac{e-1}{2}$ (B) $\left[\frac{e+1}{2}\right]^{1/2}$

(C) $\frac{e+1}{2}$ (D) $\left[\frac{e+1}{2}\right]^{2}$

28. Magnetic induction produced at the centre of a circular loop carrying current is 'B'. The magnetic moment of the loop of radius 'R' is (μ_0 = permeability of free space)

(A) $\frac{BR^3}{2\pi\mu_0}$ (B) $\frac{2\pi BR^3}{\mu_0}$

(C) $\frac{BR^2}{2\pi\mu_0}$ (D) $\frac{2\pi BR^2}{\mu_0}$

29. In air, a charged soap bubble of radius 'r' is in equilibrium having outside and inside pressures being equal. The charge on the drop is (ϵ_0 = permittivity of free space, T = surface tension of soap solution)

(A) $4\pi r^2\sqrt{\frac{2T\epsilon_0}{r}}$ (B) $4\pi r^2\sqrt{\frac{4T\epsilon_0}{r}}$

(C) $4\pi r^2\sqrt{\frac{6T\epsilon_0}{r}}$ (D) $4\pi r^2\sqrt{\frac{8T\epsilon_0}{r}}$

30. A block is pushed momentarily on a horizontal surface with initial velocity 'v'. If 'μ' is the coefficient of sliding friction between the block and surface, the block will come to rest after time ('g' = acceleration due to gravity)

(A) $\frac{v}{\mu g}$ (B) $\frac{vg}{\mu}$

(C) $\frac{v\mu}{g}$ (D) $\frac{\mu g}{v}$

31. Two charges of equal magnitude 'q' are placed in air at a distance '2a' apart and third charge '$-2q$' is placed at midpoint. The potential energy of the system is (ϵ_0 = permittivity of free space)

(A) $-\frac{q^2}{8\pi\epsilon_0 a}$ (B) $-\frac{3q^2}{8\pi\epsilon_0 a}$

(C) $-\frac{5q^2}{8\pi\epsilon_0 a}$ (D) $-\frac{7q^2}{8\pi\epsilon_0 a}$

32. An electron in potentiometer wire experiences a force 2.4×10^{-19} N. The length of potentiometer wire is 6m. The e.m.f. of the battery connected across the wire is (electronic charge = 1.6×10^{-19}C)

(A) 6 V (B) 9 V

(C) 12 V (D) 15 V

33. The dimensional formula for Reynold's number is

(A) $[L^0M^0T^0]$ (B) $[L^1M^1T^1]$

(C) $[L^{-1}M^1T^1]$ (D) $[L^1M^1T^{-1}]$

34. Calculate angular velocity of earth so that acceleration due to gravity at 60° latitude becomes zero. (Radius of earth = 6400 km, gravitational acceleration at poles = 10 m/s^2, $\cos 60° = 0.5$)

(A) 7.8×10^{-2} rad/s (B) 0.5×10^{-3} rad/s

(C) 1×10^{-3} rad/s (D) 2.5×10^{-3} rad/s

35. A stationary object explodes into masses m_1 and m_2. They move in opposite directions with velocities V_1 and V_2. The ratio of kinetic energy E_1 to kinetic energy E_2 is

(A) $\frac{m_2}{m_1}$ (B) $\frac{m_1}{m_2}$

(C) $\frac{2m_2}{m_1}$ (D) $\frac{2m_1}{m_2}$

36. The moment of inertia of a thin uniform rod rotating about the perpendicular axis passing through one end is 'I'. The same rod is bent into a ring and its moment of inertia about the diameter is 'I_1'. The ratio $\frac{I}{I_1}$ is

(A) $\frac{4\pi}{3}$ (B) $\frac{8\pi^2}{3}$

(C) $\frac{5\pi}{3}$ (D) $\frac{8\pi^2}{5}$

37. Three identical spheres each of mass 1 kg are placed touching one another with their centres in a straight line. Their centres are marked as A, B, C respectively. The distance of centre of mass of the system from A is

(A) $\frac{AB+AC}{2}$ (B) $\frac{AB+BC}{2}$

(C) $\frac{AC-AB}{3}$ (D) $\frac{AB+AC}{3}$

38. The relation between force 'F' and density 'd' is $F = \frac{x}{\sqrt{d}}$. The dimensions of x are

(A) $[L^{-1/2}M^{3/2}T^{-2}]$ (B) $[L^{-1/2}M^{1/2}T^{-2}]$

(C) $[L^{-1}M^{3/2}T^{-2}]$ (D) $[L^{-1}M^{1/2}T^{-2}]$

39. When a wave travels in a medium, displacement of a particle is given by $y = a\sin 2\pi(bt - cx)$ where 'a', 'b', 'c' are constants. The maximum particle velocity will be twice the wave velocity if

(A) $b = ac$ (B) $b = \frac{1}{ac}$

(C) $c = \pi a$ (D) $c = \frac{1}{\pi a}$

40. Electromagnets are made of soft iron because soft iron has

(A) high susceptibility and low retentivity
(B) low susceptibility and high retentivity
(C) low susceptibility and low retentivity
(D) high susceptibility and high retentivity

41. The masses of three copper wires are in the ratio 1 : 3 : 5 and their lengths are in the ratio 5 : 3 : 1. The ratio of their resistance is

(A) 25 : 1 : 125
(B) 1 : 125 : 25
(C) 125 : 1 : 25
(D) 125 : 25 : 1

42. A body of mass 'm' is raised to a height '10 R' from the surface of earth, where 'R' is the radius of earth. The increase in potential energy is (G = universal constant of gravitation, M = mass of earth and g = acceleration due to gravity)

(A) $\frac{GMm}{11R}$
(B) $\frac{GMm}{10R}$
(C) $\frac{mgR}{11G}$
(D) $\frac{10GMm}{11R}$

43. The angle θ between the vector $\vec{p} = \hat{i} + \hat{j} + \hat{k}$ and unit vector along x-axis is

(A) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$
(B) $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$
(C) $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$
(D) $\cos^{-1}\left(\frac{1}{2}\right)$

44. A small metal ball of mass 'm' is dropped in a liquid contained in a vessel, attains a terminal velocity 'v'. If a metal ball of same material but of mass '8m' is dropped in same liquid then the terminal velocity will be

(A) V
(B) 2V
(C) 4V
(D) 8V

45. A wooden block of mass 8 kg slides down an inclined plane of inclination 30° to the horizontal with constant acceleration 0.4 m/s^2. The force of friction between the block and inclined plane is (g = 10 m/s^2)

(A) 12.2 N
(B) 24.4 N
(C) 36.8 N
(D) 48.8 N

46. Which of the following complexes has lowest molar conductance ?

(A) $CoCl_3 \cdot 3NH_3$ (B) $CoCl_3 \cdot 4NH_3$

(C) $CoCl_3 \cdot 5NH_3$ (D) $CoCl_3 \cdot 6NH_3$

47. The volume of oxygen evolved at STP, by decomposition of 0.68 g '20 volume' hydrogen peroxide solution, is

(A) 2.24 mL (B) 22.4 mL

(C) 224 mL (D) 2240 mL

48. What is the molality of a solution containing 200 mg of urea (molar mass 60 g mol^{-1}) dissolved in 40 g of water ?

(A) 0.0825 (B) 0.825

(C) 0.498 (D) 0.0013

49. Alkaline hydrolysis of which among the following compounds leads to the formation of a racemate ?

(A) 1-Bromo-1-phenylethane (B) 1-Chloro-3-methylbutane

(C) Bromoethane (D) 1-Chloropropane

50. The work done when two mole of an ideal gas is compressed from a volume of 5 m^3 to 1 dm^3 at 300 K, under a pressure of 100 kPa is

(A) 499.9 kJ (B) − 499.9 kJ

(C) −99.5 kJ (D) 42495 kJ

51. Which among the following group 16 elements exists in more than two allotropic states ?

(A) Polonium (B) Tellurium

(C) Selenium (D) Oxygen

52. Solubility of which among the following substances in water increases slightly with rise in temperature ?

(A) Potassium bromide (B) Potassium chloride

(C) Potassium nitrate (D) Sodium nitrate

53. Assuming enthalpy of combustion of hydrogen at 273 K, −286 kJ and enthalpy of fusion of ice at the same temperature to be + 6.0 kJ, calculate enthalpy change during formation of 100 g of ice

(A) + 1622 kJ (B) − 1622 kJ

(C) +292 kJ (D) −292 kJ

54. How is electrical conductance of a conductor related with length and area of cross section of the conductor ?

(A) G = l . a. k^{-1} (B) G = k . l. a^{-1}

(C) G = k. a. l^{-1} (D) G = k. l. a^{-2}

55. What is the orbital angular momentum of an electron in 'f' orbital ?

(A) $\frac{1.5\,h}{\pi}$ (B) $\frac{\sqrt{6}\,h}{\pi}$

(C) $\frac{\sqrt{3}\,h}{\pi}$ (D) $\frac{\sqrt{3}\,h}{2\pi}$

56. Which statement is NOT correct about fullerene C_{60} ?

(A) It contains 20 six membered rings and 12 five membered rings

(B) All carbon atoms undergo SP^2 hybridization

(C) A six membered ring is fused with six membered rings only

(D) A five membered ring is fused with six membered ring only

57. The product of molar concentrations of hydrogen ions and hydroxide ions in a 0.01 M aqueous solution of sodium chloride is known as

(A) Hydrolysis constant of salt (B) Dissociation constant of acid

(C) Dissociation constant of base (D) Ionic product of water

58. Select the coloured compound amongst the following :
(Atomic no. Ti = 22, Cr = 24, Cu = 29, Zn = 30)

(A) $TiCl_4$ (B) $CrCl_3$

(C) $ZnCl_2$ (D) CuCl

59. Which among the following solids crystalises as a face centred cube ?

(A) Iron (B) Rubidium

(C) Uranium (D) Platinum

60. What is the pH of millimolar solution of ammonium hydroxide which is 20% dissociated ?

(A) 3.699 (B) 10.301

(C) 4.691 (D) 9.301

61. What is the geometry of molecule of bromine penta fluoride ?

(A) square planar
(B) trigonal bipyramidal
(C) square pyramidal
(D) octahedral

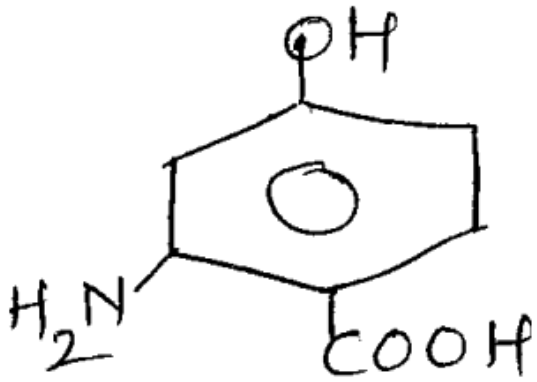
62. Identify the compound 'D' in the following series of reactions

$CH_3 - CH(CH_3) - CH_2 - CH_2 - Br \xrightarrow{\text{alc. KOH}}{\Delta}$ 'A' $\xrightarrow[\text{(ii) } H_2O,\ \Delta]{\text{(i) Conc. } H_2SO_4}$ 'B' + 'C' (Major product) (Minor product)

'B' $\xrightarrow[-H_2O]{HI,\ \Delta}$ 'D' + 'E' (Major product) (Minor product)

(A) $CH_3 - CH(CH_3) - CH(I) - CH_3$
(B) $CH_3 - C(CH_3)(I) - CH_2 - CH_3$
(C) $CH_3 - CH(CH_3) - CH_2 - CH_2 - I$
(D) $CH_3 - CH_2 - CH(CH_3) - CH_2 - I$

63. Write IUPAC name of following compound



(A) 2-Amino-4-hydroxybenzoic acid
(B) 6-Amino-4-hydroxybenzoic acid
(C) 3-Amino-4-carboxyphenol
(D) 2-Carboxy-5-hydroxyaniline

64. Which among the following metals is employed to provide cathodic protection to iron ?

(A) Zinc
(B) Nickel
(C) Tin
(D) Lead

65. Oxidation number of nitrogen in which among the oxides of nitrogen is the lowest ?

(A) Nitric oxide
(B) Nitrous oxide
(C) Nitrogen dioxide
(D) Nitrogen trioxide

66. Select the ether among following that yields methanol as one of the products on reaction with cold hydroiodic acid

(A) 1-Methoxybutane
(B) 1-Methoxy-2-methylpropane
(C) 2-Methoxy-2-methylpropane
(D) Methoxybenzene

67. Rate law for the reaction A + B $\rightarrow$ product is rate = k $[A]^2$ [B]. What is the rate constant, if rate of reaction at a given temperature is 0.22 Ms^{-1}, when [A] = 1 M and [B] = 0.25 M.

(A) 3.52 $M^{-2}\,s^{-1}$
(B) 0.88 $M^{-2}\,s^{-1}$
(C) 1.136 $M^{-2}\,s^{-1}$
(D) 0.05 $M^{-2}\,s^{-1}$

68. Presence of nitrogen in which among the following compounds can NOT be detected by Lassaigne method ?

(A) Hydrazine
(B) Aniline
(C) p-Toluidine
(D) Picric acid

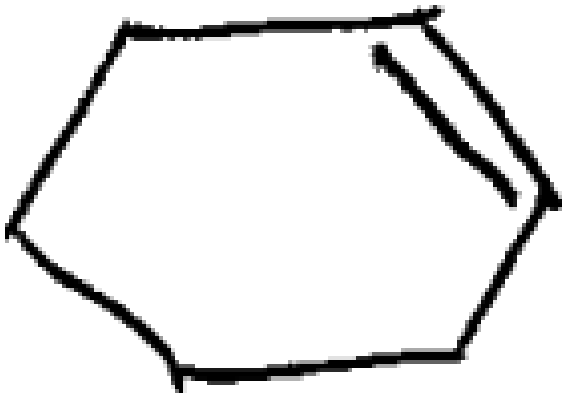
69. 20 ml solution of 0.1 M ferrous sulphate was completely oxidised using a suitable oxidising agent. What is the number of electrons exchanged ?

(A) 1.204×10^{22}
(B) 193
(C) 1930
(D) 1.204×10^{21}

70. Among the following select the alkane that is expected to have lowest boiling point

(A) Hexane
(B) 2-Methylpentane
(C) 3-Methylpentane
(D) 2, 2-Dimethylbutane

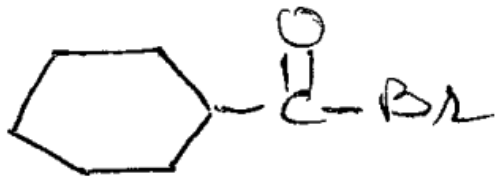
71.



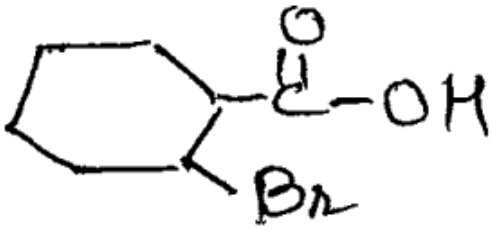
$\xrightarrow{HBr}$ 'A' $\xrightarrow{KCN}$ 'B' $\xrightarrow{H_3O^+}$ 'C' $\xrightarrow[(ii)\ H_2O]{(i)\ Br_2/red\ P}$ 'D'

Identify the compound 'D' in above mentioned series of reactions.

(A)



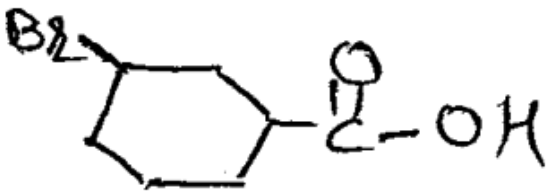
(B)



(C)



(D)



72. Which among the following gases can be liquified easily ?

(A) Chlorine (B) Nitrogen

(C) Oxygen (D) Hydrogen

73. What is the mass of one molecule of yellow phosphorus ? (Atomic mass, P = 30)

(A) 1.993×10^{-22} kg (B) 1.993×10^{-19} mg

(C) 4.983×10^{-20} mg (D) 4.983×10^{-23} kg

74. Ozone is present as a chief constituent in which region of the atmosphere ?

(A) Troposphere (B) Stratosphere

(C) Mesosphere (D) Thermosphere

75. The plot of square root of frequency of X-ray emitted against atomic number led to suggestion of which law/rule ?

(A) Periodic law (B) Modern periodic law

(C) Hund's rule (D) Newland's law

76. The compound that yields only ketonic compound/s on ozonolysis is

(A) But-2-ene (B) Pent-2-ene

(C) 2, 3-Dimethylbut-2-ene (D) 2-Methylbut-2-ene

77. Which among the following metals is refined by electrolytic method ?

(A) Aluminium (B) Bismuth

(C) Tin (D) Lead

78. The two monomers used in the preparation of dextron are

(A) 3-hydroxy butanoic acid and 3-hydroxy pentanoic acid (B) $\in$ amino caproic acid and glycine

(C) Isobutylene and isoprene (D) Lactic acid and glycolic acid

79. Which oxyacid of sulphur contains S-S single bond ?

(A) Oleum (B) Marshall's acid

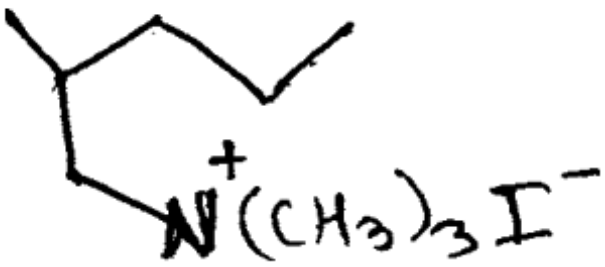
(C) Dithionic acid (D) Thiosulphuric acid

80. Amongst the followings, select the element having highest ionization enthalpy

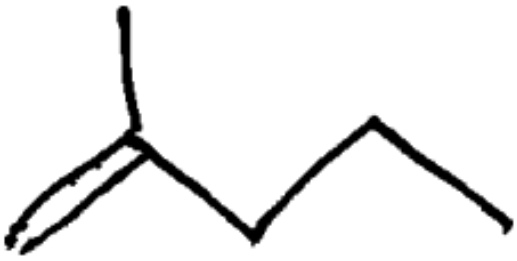
(A) Sodium (B) Potassium

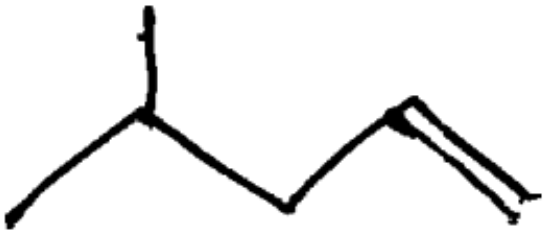
(C) Beryllium (D) Magnesium

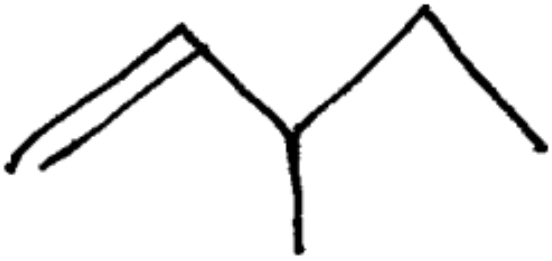
81. Identify the alkene that is produced in the following series of reactions



$\xrightarrow[\text{moist}]{Ag_2O}$ 'X' $\xrightarrow{\Delta}$ Alkene + tert. amine + H_2O

(A) 

(B) 

(C) 

(D) 

82. 'X' is an optically active alkane having lowest molecular mass. Predict the structure of the major product obtained on monochlorination of 'X'

(A) $CH_3 - CH_2 - CH_2 - C(CH_3)(Cl) - CH_2 - CH_3$

(B) $CH_3 - CH_2 - CH_2 - CH(CH_3) - CH(Cl) - CH_3$

(C) $CH_3 - CH_2 - CH_2 - CH(CH_3) - CH_2 - CH_2 - Cl$

(D) $Cl - CH_2 - CH_2 - CH_2 - CH(CH_3) - CH_2 - CH_3$

83. Butylated hydroxy toluene is used in

(A) preventing oxidative rancidity of fats

(B) preserving food grains

(C) killing bacteria in living tissues

(D) reducing stress and anxiety

84. Deficiency of which vitamin causes degeneration of spinal cord ?

(A) E

(B) K

(C) B_{12}

(D) A

85. Bond order of which among the following molecules is zero ?

(A) F_2

(B) O_2

(C) Be_2

(D) Li_2

86. Benzene can be conveniently converted into n-propyl benzene by

(A) Friedel - Craft alkylation with n-propyl chloride

(B) Friedel - Craft acylation with propionyl chloride followed by Wolff - Kishner reduction

(C) Friedel - Craft acylation with propionyl chloride followed by catalytic hydrogenation

(D) Friedel - Craft acylation with propionyl chloride followed by reduction with $LiAlH_4$

87. Select the diamagnetic complex ion amongst the following complexes
(Atomic No. Fe = 26, Co = 27)

(A) $K_3[Fe(CN)_6]$

(B) $[Co(NH_3)_6]Cl_3$

(C) $K_3[FeF_6]$

(D) $K_3[CoF_6]$

88. One mole of stachyose on hydrolysis yields

(A) 1 mole of glucose + 1 mole of fructose + 2 mole of galactose

(B) 2 mole of glucose + 1 mole of fructose + 1 mole of galactose

(C) 1 mole of glucose + 2 mole of fructose + 1 mole of galactose

(D) 2 mole of glucose + 2 mole of fructose

89. An organic compound 'X' having molecular formula $C_4H_{11}N$ reacts with p-toluene sulphonyl chloride to form a compound 'Y' that is soluble in aqueous KOH. Compound 'X' is optically active and reacts with acetyl chloride to form compound 'Z'. Identify the compound 'Z'

(A) $CH_3CH_2CH_2CH_2NHCOCH_3$

(B) $CH_3CH_2CH(CH_3)NHCOCH_3$

(C) $(CH_3)_2CHCH_2NHCOCH_3$

(D) $(CH_3)_3C - NHCOCH_3$

90. If average velocity of a sample of gas molecules at 300 K is 5 $cm\,s^{-1}$, what is RMS velocity of same sample of gas molecules at the same temperature ? (Given, α : u : v = 1 : 1.224 : 1.127)

(A) 6.112 cm/s

(B) 4.605 cm/s

(C) 4.085 cm/s

(D) 5.430 cm/s

91. Animals obtain all their carbon through

(A) plants (B) soil
(C) air (D) water

92. Which one of the following is NOT true about monocotyledonae ?

(A) embryo has single cotyledon (B) leaves show parallel venation
(C) flowers are generally trimerous (D) vascular bundles are conjoint, collateral and open

93. How many NAD molecules get reduced in complete oxidation of one glucose molecule ?

(A) 2 (B) 5
(C) 10 (D) 12

94. Which one of the following is used in the production of citric acid ?

(A) *Aspergillus niger* (B) *Rhizopus arrhizus*
(C) *Acetobacter aceti* (D) *Saccharomyces cerevisiae*

95. What will be the number of histone molecules in a chromatin fibre having 50 nucleosomes ?

(A) 400 (B) 450
(C) 500 (D) 1000

96. Which one of the following is the first group of vascular plants ?

(A) Thallophyta (B) Bryophyta
(C) Pteridophyta (D) Spermatophyta

97. An angiospermic male plant with 24 chromosomes in its pollen mother cells is crossed with female plant bearing 24 chromosomes in its root cells. What would be the ploidy of embryo and endosperm respectively formed after this cross ?

(A) 24 and 48 (B) 24 and 24
(C) 48 and 72 (D) 24 and 36

98. Which one of the following has bast fibres ?

(A) parenchyma (B) sclerenchyma
(C) phloem (D) xylem

99. In how many interlocking rings are the carbon atoms arranged in a steroid molecule ?

(A) 1 (B) 2
(C) 3 (D) 4

100. What are the spindle fibres that connect the centromere of chromosome to the respective poles called ?

(A) Astral rays (B) Interpolar fibres
(C) Chromosomal fibres (D) Inter chromosomal fibres

101. In plant breeding, the entire collection of plants/seeds having the diverse alleles of all genes in a particular organism is called

(A) gene bank (B) cDNA library
(C) genomic library (D) germ plasm

102. Acetylation of Pyruvate takes place in the _____

(A) perimitochondrial space (B) mitochondrial matrix
(C) cristae (D) F_1 particles

103. Cross pollination does not occur in

(A) allogamous flowers (B) geitonogamous flowers
(C) cleistogamous flowers (D) chasmogamous flowers

104. Which one of the following is a dicot weedicide ?

(A) 2, 4-D (B) NAA
(C) IBA (D) IAA

105. Senescence in plants leads into _____ of cells.

(A) increase in size (B) increase in number
(C) death (D) differentiation

106. In *Albizzia*, vegetative propagation takes place with the help of

(A) fasciculated tuberous roots (B) epiphyllous buds
(C) subaerial branches (D) nonfleshy roots

107. Which of the following cross will give recessive progeny in F_1 generation ?

(A) TT × tt
(B) Tt × TT
(C) tt × tt
(D) TT × TT

108. Select the correct statements from the following :
I. Endosperm is generally triploid in angiosperms.
II. All angiosperms have monosporic and endosporic embryo sac.
III. Angiosperms are characterised by double-fertilization.
IV. All angiosperms show-indirect pollination and siphonogamy.

(A) I, II and III
(B) II, III and IV
(C) I, II and IV
(D) I, II, III and IV

109. The structure producing basidium in Basidiomycetes is formed by the fusion of

(A) two vegetative cells
(B) two male gametes
(C) two female gametes
(D) male and female gametes

110. The sequence of nucleotides AUGCUUCUC indicates that it is a segment of

(A) sense strand of DNA
(B) anti sense strand of DNA
(C) RNA
(D) polypeptide chain

111. The largest collection of herbarium in India is

(A) Central National Herbarium, Kolkata
(B) Southern Circle Herbarium, Coimbatore
(C) Central Circle Herbarium, Allahabad
(D) Blatter Herbarium, Mumbai

112. Enzyme enolase catalyses the conversion of 2 PGA to phosphoenol Pyruvic acid in presence of _____ which is the cofactor.

(A) Mn^{++}
(B) Fe^{++}
(C) Mg^{++}
(D) Zn^{++}

113. Excess of Manganese inhibits the translocation of _____ to the shoot apex.

(A) Calcium
(B) Potassium
(C) Iron
(D) Magnesium

114. The correct sequence of the substages of Prophase I is

(A) Diakinesis → Pachytene → Diplotene → Zygotene → Leptotene
(B) Leptotene → Zygotene → Pachytene → Diplotene → Diakinesis
(C) Pachytene → Zygotene → Leptotene → Diplotene → Diakinesis
(D) Leptotene → Zygotene → Diplotene → Diakinesis → Pachytene

115. Capsule is a kind of _____ fruit.

(A) simple, dry and dehiscent
(B) simple, dry and indehiscent
(C) an aggregate
(D) simple and fleshy

116. The inactive protoxin is activated in the gut of the insect by

(A) acidic pH
(B) alkaline pH
(C) low temperature
(D) high temperature

117. In angiosperms, the formation of two male gametes from a pollen grain involves _____ divisions.

(A) one meiotic and one mitotic
(B) two meiotic and two mitotic
(C) only two mitotic
(D) only two meiotic

118. In a plant cell the Diffusion Pressure Deficit is zero when it is_____

(A) plasmolysed
(B) turgid
(C) flaccid
(D) incipient

119. The life cycle of algae such as *Spirogyra* is

(A) haplontic
(B) diplontic
(C) haplo-diplontic
(D) diplo-haplontic

120. During which stage of Prophase I, genetic recombination of parental characters, takes place ?

(A) Zygotene
(B) Pachytene
(C) Diplotene
(D) Diakinesis

121. Multicostate divergent reticulate venation is seen in _____ leaf.

(A) *Zizyphus*
(B) Bamboo
(C) Castor
(D) Mango

122. Synthesis of one glucose molecule requires _____ reduced NADP molecules.

(A) 6 (B) 12
(C) 18 (D) 24

123. The arrangement of vascular tissue in hadrocentric vascular bundle is_____

(A) concentric (B) radial
(C) collateral (D) bicollateral

124. 'Cry' gene is obtained from

(A) *Agrobacterium tumefaciens* (B) *Bacillus thuringiensis*
(C) *Rhizobium leguminosarum* (D) *Rhizobium phaseoli*

125. Identify the incorrect match between the protein and its role.

(A) Keratin – structural component of hair (B) Immunoglobulins – protection of body against diseases
(C) Haemoglobin – transport of O_2 in muscles (D) Thrombin – blood clotting

126. In India, research in genetic modification of organisms and safety issues are controlled by

(A) DBT (B) IARI
(C) CSIR (D) GEAC

127. Guttation occurs through_____

(A) roots (B) hydathode
(C) trichome (D) stomata

128. A couple, both carriers for the gene sickle cell anaemia planning to get married, wants to know the chances of having anaemic progeny ?

(A) 100% (B) 75%
(C) 50% (D) 25%

129. A simple, living permanent tissue which is absent in roots is_____

(A) Collenchyma (B) Chlorenchyma
(C) Aerenchyma (D) Parenchyma

130. Which of the following show dimorphic chloroplast ?

(A) Mango (B) Castor
(C) Banyan (D) Amaranthus

131. Gross primary productivity is the rate of production of _____ during photosynthesis.

(A) organic matter (B) oxygen
(C) carbon di-oxide (D) Chlorophyll

132. Flowers showing basipetal succession are observed in

(A) *Caesalpinia* and *Clerodendron* (B) Jasmine and Gold mohar
(C) Gold mohar and *Caesalpinia* (D) *Clerodendron* and Jasmine

133. The total number of types of gametes produced in a cross between a negro and albino parent is

(A) 64 (B) 16
(C) 08 (D) 04

134. Enzymes required for phosphorylation are located in _____ of chloroplast.

(A) Peristromium (B) Plastidome
(C) Stroma (D) Quantosome

135. Afforestation is

(A) restoring a forest (B) plantation in barren lands
(C) cultivation under agriculture (D) jhum cultivation

136. Cellular organization of body is present in

(A) Annelida (B) Platyhelminthes
(C) Porifera (D) Urochordata

137. In the following process of digestion, the enzymes at location 'X' and 'Y' are respectively proteins $\xrightarrow{X}$ proteoses and peptones $\xrightarrow{Y}$ Dipeptides

(A) Chymotrypsin and pepsin (B) Pepsin and trypsin
(C) Ptyalin and pepsin (D) Trypsin and di-peptidase

collegedunia

138. Find out the correct match from the following table :
Column I | Column II | Column III
i. Corpus luteum | Progesteron | Degeneration of endometrium
ii. Pineal gland | Vasopressin | Intracellular transport
iii. Pars nervosa | Coherin | Induces contraction of jejunum

(A) i only
(B) i and ii
(C) iii only
(D) ii and iii

139. The colostrum provides_____

(A) Naturally acquired active immunity
(B) Naturally acquired passive immunity
(C) Artificially acquired active immunity
(D) Artificially acquired passive immunity

140. Identify and select the correct Match in the Columns I, II and III.
I | II | III

(A) Earthworm - Annelida - Superclass
(B) Frog - *Rana* - Species
(C) Lancelet - Vertebrata - Division
(D) Walrus - Mammalia - Class

141. The structural unit of bone is_____

(A) chondrin
(B) cyton
(C) osteon
(D) ossein

142. The stato-acoustic receptor responds to changes in the_____

(A) Light and pressure
(B) Pressure and touch
(C) Pain and pressure
(D) Sound and equilibrium

143. The chromosome with centromere near the end is called_____

(A) Acrocentric
(B) Metacentric
(C) Sub-metacentric
(D) Telocentric

144. One of the following is NOT a possible reason for use of CNG in automobiles

(A) It can be adulterated
(B) It is cheaper than petrol
(C) It burns more efficiently
(D) It reduces pollution

145. Oviparous mammal is_____

(A) *Equus*
(B) *Macropus*
(C) *Ornithorhynchus*
(D) *Pteropus*

146. The salivary amylase shows maximum digestive action at pH_____

(A) 3.6
(B) 6.8
(C) 7.5
(D) 8.5

147. The central hollow portion of the vertebra is called_____

(A) Neural canal
(B) Central canal
(C) Auditory canal
(D) Vertebro-arterial canal

148. The depolarization of nerve membrane takes place through influx of _____ ions.

(A) Calcium
(B) Potassium
(C) Sodium
(D) Magnesium

149. Which of the following is used to promote growth of new blood vessels, thus helping in wound healing ?

(A) HUMULIN
(B) TPA
(C) TGF – B
(D) α – 1 antitrypsin

150. Select the correct statement regarding the Schwann cells

(A) Surround axon of myelinated nerve fibre
(B) Support muscle fibres
(C) Found in Haversian system of bones
(D) Form basement membrane of epithelium

151. The correct match is
I. DCT – Secretion of H^+ and K^+ ions
II. Henle's loop – Reabsorption of glucose, water and Na^+ ions
III. Podocytes – Attached to parietal layer of Bowman's capsule
IV. JGA – Rise in glomerular blood pressure activates it to release rennin

(A) III
(B) II
(C) I
(D) IV

152. The diurnal rhythms are regulated by_____

(A) Adrenalin
(B) Melatonin
(C) Serotonin
(D) Vasopressin

153. In DNA fingerprinting technique, _____ probe is used for hybridization of DNA fragments.

(A) Double stranded RNA
(B) Double stranded non-radio active DNA
(C) Single stranded radio active DNA
(D) Single stranded radio active RNA

154. Find the Odd one out :

(A) *Adamsia*
(B) *Astraea*
(C) *Physalia*
(D) *Pleurobrachia*

155. The totipotent cell can form a _____

(A) Bud
(B) Cell membrane
(C) Cell organelle
(D) Complete new organism

156. The nodal tissue located in the lower left corner of the right atrium is _____

(A) SA node
(B) AV node
(C) AV bundle
(D) Purkinje fibres

157. Which of the following hormones initiate the parturition ?

(A) ACTH, HCG, Oxytocin
(B) ACTH, Corticosteroid, Oxytocin
(C) Corticosteroid, ACTH, Prostaglandin
(D) ACTH, Progesteron, HCG

158. The primary lymphoid organ is_____

(A) Tonsils
(B) Payer's patches
(C) Lymph nodes
(D) Thymus

159. Synapse is_____

(A) Crossing over between non-homologous chromosomes
(B) Pairing of homologous chromosomes
(C) Junction between axon and dendrites of two different neurons
(D) Zig zag junctions in cardiac muscle fibres

160. Which of the following animal has enucleated erythrocytes ?

(A) Earthworm
(B) Sepia
(C) Frog
(D) Rat

161. Which of the following produces erythropoietin ?

(A) Kidney
(B) Pancreas
(C) Pineal gland
(D) Thyroid gland

162. Identify the correct match from the Columns I, II and III.
I: 1. Interstitial cells, 2. Sertoli cells, 3. Granulosa cells, 4. Cells of corpus luteum
II: a. Cortex of ovary, b. Ovarian follicle, c. Testis, d. Seminiferous tubules
III: i. Follicular fluid, ii. Progesterone, iii. Attachment of sperm bundle, iv. Testosterone

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

163. Which of the following is correct match ?
I | II | III

(A) Thalassemia - a) XO - i) Flat nose, simian crease
(B) Down's syndrome - b) 42 AA + XY - ii) Webbing of neck
(C) Turner's syndrome - c) 44 AA + XXX - iii) Anaemia, jaundice
(D) Klinefelter's syndrome - d) 44 AA + XXY - iv) Tall thin eunuchoid

164. Which is CORRECT regarding genetically engineered insulin using *E. coli* ?

(A) Difficult to purify
(B) Obtained in large unlimited quantities
(C) Possibility of transmission of animal diseases
(D) Insulin obtained varies in chemical structure

165. Dobson unit is used in measurement of _____ level.

(A) Chlorofluoro carbons
(B) Nitrous oxide
(C) Ozone
(D) UV – B radiation

166. In cockroach, the common duct of salivary reservoir opens at the base of the _____

(A) Pharynx
(B) Maxilla
(C) Mandible
(D) Hypopharynx

167. The wall of urinary bladder in humans shows a thick layer of smooth muscle called_____

(A) Dartos
(B) Detrusor
(C) Deltoid
(D) Depressor

168. Identify the correct match :
Accessory glands: i. Seminal vesicles, ii. Prostate gland, iii. Cowper's gland
Functions: a. Lubricates vagina, b. Provide energy, coagulation of sperm, c. Neutralizes acidity of vagina

(A) i-b, ii-c, iii-a
(B) i-c, ii-b, iii-a
(C) i-a, ii-c, iii-b
(D) i-c, ii-a, iii-b

169. The technique used to block the passage of sperm in male_____

(A) Tubectomy
(B) Vasectomy
(C) Coitus interruptus
(D) Rhythm method

170. Find the incorrect match :
I | II | III
i. Crab | Sacculina | Interaction + +
ii. Human being | Mosquito | Interaction – +
iii. Sea anemone | Hermit crab | Interaction + 0

(A) i only
(B) ii and iii
(C) iii and i
(D) ii only

171. The structure which prevents the entry of food particles into the respiratory passage is ____

(A) Epiglottis
(B) Glottis
(C) Larynx
(D) Pharynx

172. Identify vertebrochondral ribs from the following :

(A) All 12 pairs of ribs
(B) 1^{st} to 7^{th} pairs of ribs
(C) 8^{th}, 9^{th} and 10^{th} pairs of ribs
(D) 11^{th} and 12^{th} pairs of ribs

173. "Testis are extraabdominal in position". Which of the following is most appropriate reason ?

(A) Narrow pelvis in male
(B) Special protection for testis
(C) Prostate gland and seminal vesicles occupy maximum space
(D) 2.0 – 2.5° C lower than the normal body temperature

174. The Malignant malaria is caused by _____

(A) *Plasmodium vivax*
(B) *Plasmodium malariae*
(C) *Plasmodium ovale*
(D) *Plasmodium falciparum*

175. The total number of podomeres in each leg of cockroach is_____

(A) 5
(B) 6
(C) 7
(D) 8

176. Which of the following store proteins ?

(A) Chromoplasts
(B) Aleuroplasts
(C) Amyloplasts
(D) Elaioplasts

177. Pneumotaxic centre is located in_____

(A) Medulla oblongata
(B) Pons
(C) Cerebrum
(D) Diencephalon

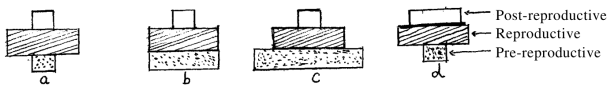
178. In case of a couple where a man is having very low sperm count, which of the following technique will be suitable for fertilization ?

(A) Infra uterine transfer
(B) Gamete intra cytoplasmic fallopian transfer
(C) Artificial insemination
(D) Intra cytoplasmic sperm injection

179. The rise of 1^{st} primates occurred in _____ epoch.

(A) Palaeocene
(B) Oligocene
(C) Miocene
(D) Eocene

180. Which of the following statements correctly correlates with the diagrams ?



(A) a and b are steady population
(B) a and d are declining population
(C) c and d are growing population
(D) b and d are declining population

- End of Question Paper -