MHT CET 2020 PCB Oct 4 Shift 2

Question Paper

Conducted by the State Common Entrance Test Cell, Maharashtra

Time Allowed: 180 Minutes **PCB Group** **Maximum Marks: 200**

General Instructions

(i) This is a **memory-based version** of the **MHT CET 2020 PCB Oct 4 Shift 2** (PCB group), conducted by the **State Common Entrance Test Cell, Maharashtra**. The questions were recalled by candidates who appeared in the exam.

(ii) This edition includes **199 of 200 questions**: **50 Physics**, **50 Chemistry**, **99 Biology**. Original subject question numbers are retained; Biology Q50 is unavailable.

(iii) The full PCB exam has **200 questions** and **200 marks**: Section 1 - **Physics and Chemistry** (50 questions each, 100 marks), followed by Section 2 - **Biology** (100 questions, 100 marks). Each section lasts **90 minutes**.

(iv) Candidates cannot switch between sections. Section 1 closes automatically after its 90 minutes, and Section 2 follows.

(v) All questions in the exam are compulsory. Each multiple choice question offers **four options**, of which **exactly one is correct**.

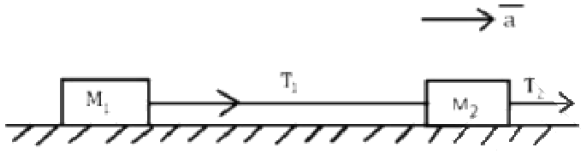
(vi) Each correct answer earns **1 mark**. There is **no negative marking**; unanswered questions carry 0 marks.

(vii) Use rough sheets for calculations and rough work. Calculators, log tables and electronic gadgets are not allowed.

1. The period of revolution of communication satellite is 24 hours. The period of satellite in an orbit at a distance three times that of the earth's radius above its surface will be

(A) 4 days (B) 16 days
(C) 24 hours (D) 8 days

2. Two masses M_1 and M_2 are accelerated uniformly on frictionless surface as shown in figure. The ratio of the tensions $\left(\frac{T_1}{T_2}\right)$ is



(A) $\frac{M_2}{M_1}$ (B) $\frac{M_1}{M_2}$
(C) $\frac{M_1}{(M_1+M_2)}$ (D) $\frac{(M_1+M_2)}{M_2}$

3. In a transverse progressive wave of amplitude 'a', the maximum particle velocity is six times its wave velocity. The wavelength of wave is

(A) $6\pi a$ (B) $3\pi a$
(C) $\frac{\pi a}{6}$ (D) $\frac{\pi a}{3}$

4. When a surface 1 cm thick is illuminated by light of wavelength 'λ', the stopping potential is 'V_0'. When the same surface is illuminated by light of wavelength '3λ', the stopping potential is $\frac{V_0}{6}$. The threshold wavelength for the metallic surface is

(A) 5λ (B) 2λ
(C) 3λ (D) 4λ

5. A cord is wound round the circumference of a wheel of radius 'r'. The axis of the wheel is horizontal and moment of inertia about it is 'I'. A block of mass 'm' is attached to free end of the cord, initially at rest. When the wheel rotates and the block moves vertically downwards through distance 'h', the angular velocity of the wheel will be (Neglect the mass of cord, g = acceleration due to gravity)

(A) $\left(\frac{2gh}{I+mr^2}\right)^{\frac{1}{2}}$ (B) $\left(\frac{2mgh}{I+mr^2}\right)^{\frac{1}{2}}$
(C) $\left(\frac{2mgh}{I+2m}\right)^{\frac{1}{2}}$ (D) $(2gh)^{\frac{1}{2}}$

6. Light rays are incident from air on a block of glass (Refractive Index = 1.5). The reflected and refracted rays are perpendicular to each other. The ratio of the wavelengths of the refracted and reflected light is

(A) 0.66 (B) 0.11
(C) 0.44 (D) 0.22

7. A sonometer wire of length L between the two bridges vibrates in 3^{rd} harmonic. Antinodes are formed at

(A) $\frac{L}{4}, L, \frac{7L}{4}$ (B) $\frac{L}{2}, L, \frac{3L}{2}$
(C) $\frac{L}{3}, \frac{2L}{3}, \frac{5L}{3}$ (D) $\frac{L}{4}, \frac{3L}{4}, \frac{5L}{4}$

8. A ball at rest falls vertically on ground from a height of 5m. The coefficient of restitution is 0.4. The maximum height of the ball after the first rebound is $[g = 10\ \text{m/s}^2]$

(A) 0.8 m (B) 0.6 m
(C) 0.2 m (D) 0.4 m

9. In parallel plate capacitor, electric field between the plates is 'E'. If the charge on the plates is 'Q', then the force on each plate is

(A) QE (B) $\frac{QE}{2}$
(C) QE^2 (D) $\frac{QE^2}{2}$

10. Average kinetic energy of H_2 molecule at 300K is 'E'. At the same temperature, average kinetic energy of O_2 molecule will be

(A) $\frac{E}{2}$ (B) E
(C) $\frac{E}{4}$ (D) $\frac{E}{8}$

11. A wire having a diameter of 3 mm is stretched by an external force to produce a longitudinal strain of 3×10^{-3}. If the Poisson's ratio of the wire is 0.4, the change in its diameter is

(A) 3.2×10^{-6} mm (B) 3.6×10^{-3} mm
(C) 1.2×10^{-6} mm (D) 1.2×10^{-3} mm

12. A body situated on earth's surface at its equator becomes weightless when the rotational kinetic energy of the earth reaches a critical value which is given by (M and R be the mass and radius of earth respectively)

(A) $\frac{MgR}{4}$ (B) $\frac{MgR}{5}$
(C) $\frac{MgR}{2}$ (D) $\frac{MgR}{3}$

13. The product of magnetic susceptibility (χ) and absolute temperature (T) is constant for a

(A) ferromagnetic material. (B) diamagnetic and ferromagnetic material.
(C) diamagnetic material. (D) paramagnetic material.

14. In a semiconductor, the number of holes and number of free electrons are represented as 'n_h' and 'n_e' respectively. Which one of the following statements is TRUE for the semiconductor?

(A) In an intrinsic semiconductor, $n_e = n_h$ (B) In an extrinsic semiconductor, $n_h = n_e$
(C) In an intrinsic semiconductor, $n_e > n_h$ (D) In an intrinsic semiconductor, $n_h > n_e$

15. Let 'R_1' and 'R_2' be radii of two mercury drops. A big mercury drop is formed from them under isothermal conditions. The radius of the resultant drop is

(A) $R = \sqrt{R_1^2 - R_2^2}$ (B) $R = (R_1^3 + R_2^3)^{\frac{1}{3}}$
(C) $R = \frac{R_1 + R_2}{2}$ (D) $R = \sqrt{R_1^2 + R_2^2}$

16. Two vectors $\vec{P}$ and $\vec{Q}$ have equal magnitudes. If $|\vec{P} + \vec{Q}| = 5|\vec{P} - \vec{Q}|$, then angle between $\vec{P}$ and $\vec{Q}$ is

(A) $\cos^{-1}\left(\frac{12}{13}\right)$ (B) $\sin^{-1}\left(\frac{12}{13}\right)$
(C) $\cos^{-1}\left(\frac{3}{5}\right)$ (D) $\sin^{-1}\left(\frac{3}{5}\right)$

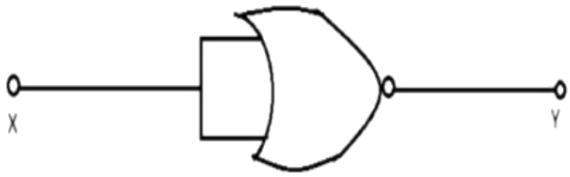
17. A thin wire of length 'L' and uniform linear mass density 'm' is bent into a circular loop. The moment of inertia of this loop about the tangential axis and in the plane of the coil is

(A) $\frac{3mL^3}{16\pi^2}$ (B) $\frac{3mL^3}{4\pi^2}$
(C) $\frac{3mL^3}{8\pi^2}$ (D) $\frac{3mL^3}{2\pi^2}$

18. If v_n and v_p are orbital velocities in n^{th} and p^{th} orbit respectively, then the ratio $v_p : v_n$ is

(A) $\frac{p^2}{n^2}$ (B) $\frac{n}{p}$
(C) $\frac{n^2}{p^2}$ (D) $\frac{p}{n}$

19. The gate represented in the given figure is



(A) NOT (B) AND
(C) OR (D) NOR

20. The energy stored per unit volume is 0.3 J/m ^{3} when a wire is stretched by 0.125 cm. When it is stretched by 0.75 cm, the increase in potential energy per unit volume stored in the wire is

(A) 10.3 J/m^3 (B) 10.1 J/m^3
(C) 10.5 J/m^3 (D) 10.8 J/m^3

21. The magnifying power of simple microscope is inversely proportional to its focal length (f) and it is maximum when image is formed at [D = Distance of distinct vision (DDV)].

(A) a distance greater than DDV. (B) DDV
(C) a distance less than DDV. (D) infinity.

22. A vector F_1 is a unit vector along the positive direction of x - axis and F_2 is of magnitude 4. If the vector product of F_1 and F_2 is zero, then F_2 is

(A) $4\hat{j}$ (B) $2\sqrt{3}\hat{i} - 2\hat{j}$
(C) $2\hat{i} + 2\sqrt{3}\hat{j}$ (D) $-4\hat{i}$

23. The average force applied on the walls of a closed container depends as "T^x", where 'T' is the temperature of an ideal gas. The value of 'x' is

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

24. A given metal wire has length 1m, linear density 0.6 kg/m and uniform cross-sectional area 10^{-7} m^2 is fixed at both ends. The temperature of wire is decreased by 40°C. The fundamental frequency of the transverse wave is [$Y = 2 \times 10^{11}$ N/m^2, coefficient of linear expansion of metal is $= 1.2 \times 10^{-5}/°C$]

(A) 0.5 Hz (B) 2 Hz

(C) 1 Hz (D) 2.5 Hz

25. For a photocell, the work function is 'ϕ' and the stopping potential is 'V_s'. The wavelength of the incident radiation can be expressed as

(A) $\frac{hc}{e\phi+V_s}$ (B) $\frac{hc}{\phi+eV_s}$

(C) $\frac{hc}{\phi-eV_s}$ (D) $\frac{hc}{\phi}$

26. If the length and diameter of a wire are decreased, then for the same tension the natural frequency of stretched wire will

(A) decrease. (B) not change.

(C) become zero. (D) increase.

27. When a capillary is dipped vertically in water, rise of water in capillary is 'h'. The angle of contact is zero. Now the tube is depressed so that its length above the water surface is $h/2$. The new apparent angle of contact is [$\cos 0° = 1$]

(A) $\sin^{-1}(0.5)$ (B) $\sin^{-1}(0.7)$

(C) $\cos^{-1}(0.5)$ (D) $\cos^{-1}(0.7)$

28. The vertical and horizontal components of earth's magnetic field at a place are 2×10^{-5} T and $2\sqrt{3} \times 10^{-5}$ T respectively. The angle of dip and resultant earth's magnetic field is

(A) $\tan^{-1}(\sqrt{3}), 2 \times 10^{-10}$ T

(B) $\tan^{-1}(\sqrt{3}), 2 \times 10^{-5}$ T

(C) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right), 4 \times 10^{-10}$ T

(D) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right), 4 \times 10^{-5}$ T

29. The frequency of a particle performing linear S.H.M. is $\frac{7}{2\pi}$ Hz. The differential equation of S.H.M. is

(A) $\frac{d^2x}{dt^2} + 14x = 0$ (B) $\frac{d^2x}{dt^2} + 64x = 0$

(C) $\frac{d^2x}{dt^2} + 49x = 0$ (D) $\frac{d^2x}{dt^2} + 25x = 0$

30. A motor cycle racer takes a round with speed 20 m/s on a curved road of radius 40 m. The leaning angle of motor cycle with vertical for safe turn is ($g = 10$ m/s^2, $\tan 45° = 1$)

(A) 75° (B) 45°

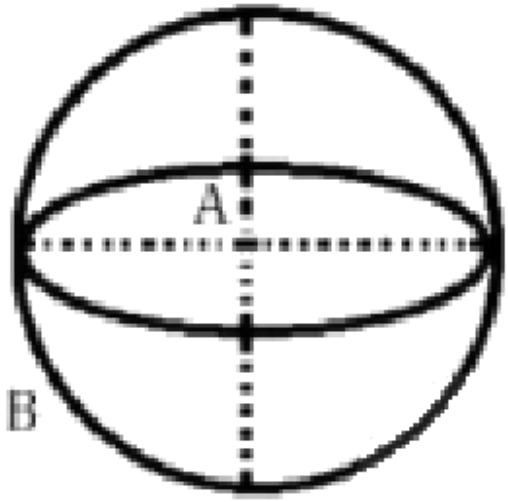
(C) 60° (D) 30°

31. Two parallel long wires 'A' and 'B' carry currents 'i_1' and 'i_2' ($i_2 < i_1$). When 'i_1' and 'i_2' are in the same direction, the magnetic field at a point midway between the wires is $10\mu T$. If 'i_2' is reversed, then the field becomes $30\mu T$. The ratio of $\frac{i_1}{i_2}$ is [$\frac{\mu_0}{4\pi} = 10^{-7}$ Wb/Am]

(A) 1 (B) 2

(C) 3 (D) 4

32. Two coils of wire A and B are placed mutually perpendicular as shown. When current is changed in any one coil,



(A) no current will be induced in another coil.

(B) magnetic field will be perpendicular to plane of another coil.

(C) magnetic flux linked with another coil is maximum.

(D) current induced in another coil is maximum.

33. A thin prism 'P' of angle 4° made up of glass of refractive index 1.48 is combined with another prism 'Q' made up of glass of refractive index 1.64 to produce dispersion without deviation. The angle of prism 'Q' is

(A) 5° (B) 3°

(C) 6° (D) 4°

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34. The magnetic moment of a circular coil carrying current (I), having radius (r) and number of turns (n) is proportional to

(A) r (B) $\frac{1}{r}$

(C) r^2 (D) $\frac{1}{r^2}$

35. A galvanometer of resistance 20Ω gives a full scale deflection when a current of 0.04 A is passed through it. To convert it into an ammeter of range 20A, the resistance that must be connected in series with the coil of the galvanometer is (Galvanometer is shunted by 0.05Ω)

(A) 5.94Ω (B) 4.95Ω

(C) 12.62Ω (D) 9.45Ω

36. A parallel monochromatic beam of light is incident normally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction of incident beam. At the first maximum of the diffraction pattern, the phase difference between the rays coming from the edges of the slit is

(A) $\frac{\pi}{4}$ rad. (B) 2π rad.

(C) $\frac{\pi}{2}$ rad. (D) π rad.

37. The pressure at the bottom of a tank containing liquid does not depend upon the

(A) area of bottom surface. (B) acceleration due to gravity.

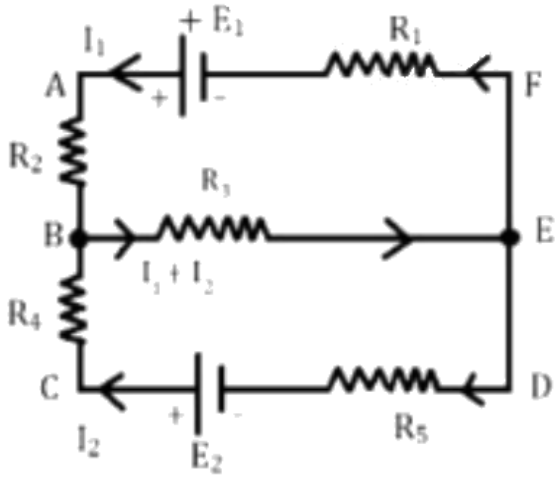
(C) density of liquid. (D) height of liquid column.

38. Which of the following molecules is a polar molecule?

(A) Oxygen (O_2) (B) Hydrogen (H_2)

(C) Carbon dioxide (CO_2) (D) Hydrogen Chloride (HCl)

39. In the given electrical network, the correct equation for the loop 'ABEFA' is



(A) $E_1 - I_1(R_1 + R_2 + R_3) - I_2R_3 = 0$

(B) $E_1 - I_1(R_1 - R_2 + R_3) + I_2R_3 = 0$

(C) $E_1 - I_1(R_1 + R_2 + R_3) + I_2R_3 = 0$

(D) $-E_1 + I_1(R_1 + R_2 + R_3) - I_2R_3 = 0$

40. A charged particle carrying a charge 'q' and moving with velocity 'v', enters into a solenoid carrying a current 'I', along its axis. If 'B' is the magnetic induction along the axis of solenoid, then the force 'F' acting on the charged particle will be

(A) $F = 0$ (B) $F = qvB$

(C) $F < qvB$ (D) $F > qvB$

41. A cube of mass 'M' and side 'L' is fixed on the horizontal surface. Modulus of rigidity of the material of cube is 'η'. A force is applied perpendicular to one of the side faces. When the force is removed, cube executes small oscillations. The time period is

(A) $\frac{2\pi\eta L}{M}$ (B) $\frac{M}{2\pi\eta L}$

(C) $2\pi\sqrt{\frac{M}{\eta L}}$ (D) $2\pi\sqrt{\frac{\eta L}{M}}$

42. A body attached to a spring oscillates in horizontal plane with frequency 'n'. Its total energy is 'E'. If the velocity in the mean position is 'v', then the spring constant is

(A) $\frac{E\pi^2n^2}{v^2}$ (B) $\frac{4E\pi^2n^2}{v^2}$

(C) $\frac{8E\pi^2n^2}{v^2}$ (D) $\frac{2E\pi^2n^2}{v^2}$

43. Two waves given as $y_1 = 10\sin\omega t$ cm and $y_2 = 10\sin(\omega t + \frac{\pi}{3})$ cm are superimposed. What is the amplitude of the resultant wave? $[\cos\frac{\pi}{3} = \frac{1}{2}]$

(A) $10\sqrt{2}$ cm (B) $5\sqrt{3}$ cm

(C) $10\sqrt{3}$ cm (D) 10 cm

44. In the equation $P = \frac{(C+S)}{D}$, P and S represent pressure and distance respectively. The dimensions of $\left(\frac{D}{C}\right)$ are

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

(C) $[L^1M^0T^{-1}]$ (D) $[L^0M^1T^1]$

45. In meter bridge experiment, null point was obtained at a distance 'ℓ' from left end. The values of resistances in the left and right gaps are doubled and then interchanged. The new position of null point is

(A) $(100 - \ell)$ (B) $\left(100 - \frac{\ell}{4}\right)$

(C) $\left(100 - \frac{\ell}{2}\right)$ (D) $(100 - 2\ell)$

46. A sample of radioactive element contains 8×10^{16} active nuclei. The half-life of the element is 15 days. The number of nuclei decayed after 60 days is

(A) 0.5×10^{16} (B) 2×10^{16}

(C) 7.5×10^{16} (D) 4×10^{16}

47. At any instant, the magnitude of the centripetal force on a particle of mass 'm' performing circular motion is given by (ω = angular velocity and v = linear velocity of the particle)

(A) $\frac{m^2\omega^2}{v}$ (B) $\frac{m\omega^2}{v}$

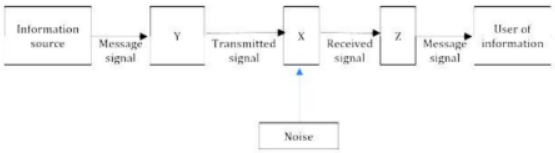
(C) $\frac{mv^2}{\omega}$ (D) $m\omega v$

48. A flywheel of mass 2 kg has radius of gyration 0.5m. If it makes 10 r.p.s. then its rotational kinetic energy will be

(A) $100\pi^2$ J (B) $50\pi^2$ J

(C) $100\pi^2$ erg (D) $50\pi^2$ erg

49. In the block diagram of generalised communication system, the element labelled as 'x' is



(A) Receiver (B) Transmitter

(C) Channel (D) Amplifier

50. The coefficient of mutual induction is 2 H and induced e.m.f. across secondary is 2 kV. Current in the primary is reduced from 6 A to 3 A. The time required for the change of current is

(A) 6×10^{-3} s (B) 5×10^{-3} s

(C) 3×10^{-3} s (D) 4×10^{-3} s

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Section 1 · Chemistry · 50 available questions

1. Identify A and B respectively in the following conversion
Ethene $\xrightarrow{A}$ Bromoethane $\xrightarrow{B}$ Δ Ethyl propionate

(A) $Br_2/AlBr_3$, C_2H_5ONa
(B) $Br_2/AlBr_3$, C_2H_5COOAg
(C) HBr , C_2H_5ONa
(D) HBr , C_2H_5COOAg

2. The most basic hydride of group 15 elements is

(A) NH_3
(B) PH_3
(C) SbH_3
(D) AsH_3

3. IUPAC name of pinacol is

(A) 2,3-dimethyl butane-1,4-diol
(B) 2,2-dimethyl butane-1,3-diol
(C) 2,3-dimethyl butane-2,3-diol
(D) 2,3-dimethyl butane-1,3-diol

4. When 46 g of ethyl alcohol is dissolved in 162 g of water, the mole fraction of ethyl alcohol and water respectively is

(A) 0.9 , 0.1
(B) 0.78 , 0.22
(C) 0.1 , 0.9
(D) 0.22 , 0.78

5. What is the position of an element in long form of periodic table if the expected electronic configuration is $[Kr]4d^9 5s^2$?

(A) Group - 6, period - 5
(B) Group - 9, period - 5
(C) Group - 5, period - 6
(D) Group - 11, period - 5

6. The compound used in Holme's signals is

(A) Ne
(B) PH_3
(C) H_2Se
(D) P_4O_{10}

7. A 5 % solution of cane sugar (molar mass 342) is isotonic with 1 % solution of non electrolyte substance X, the molar mass of substance X is

(A) 34.2 g mol^{-1}
(B) 171.2 g mol^{-1}
(C) 136.8 g mol^{-1}
(D) 68.4 g mol^{-1}

8. 0.4 g of an organic compound in Dumas method gives 22.4 mL of nitrogen collected at S. T. P. What is the percentage of nitrogen in the compound?

(A) 13.67 %
(B) 7.0 %
(C) 8.5 %
(D) 10.0 %

9. According to radius ratio rule if 'R' is radius of anion and 'r' is the radius of cation then for an atom to occupy octahedral hole, the possible relation between R and r is

(A) $r = 2.25R$
(B) $r = 0.514R$
(C) $r = 0.225R$
(D) $r = 0.314R$

10. Molecular formula C_2H_7N represents

(A) only 2° amine
(B) 1° amine and 2° amine
(C) only 1° amine
(D) 2° amine and 3° amine

11. Which of the following is obtained on dry distillation of equimolar mixture of calcium acetate and calcium propionate?

(A) Ethyl propyl ketone
(B) Propionaldehyde
(C) Acetaldehyde
(D) Ethyl methyl ketone

12. Which of the following solution is called as Lucas reagent?

(A) Concentrated carbolic acid with zinc chloride.
(B) Concentrated hydrochloric acid with zinc chloride.
(C) Concentrated sulphuric acid with zinc sulphate.
(D) Concentrated nitric acid with zinc nitrate.

13. Which among the following substituent groups increases the acidic strength of aromatic carboxylic acids?

(A) $-OH$
(B) $-CH_3$
(C) $-NH_2$
(D) $-NO_2$

14. During electrolysis of aqueous NaCl, the product obtained at cathode is

(A) $O_2(g)$
(B) $Cl_2(g)$
(C) $H_2O(g)$
(D) $H_2(g)$

15. For zero order reaction, when $[A]_t$ is plotted against time (t), the slope of the straight line obtained is equal to

(A) $-k$ (B) k

(C) $[A]_0$ (D) $-kt$

16. How many moles of fructose and galactose respectively are obtained on hydrolysis of 1 mole stachyose?

(A) 1 , 1 (B) 2 , 2

(C) 3 , 1 (D) 1 , 2

17. In colloidal dispersion of starch maximum possible size of starch particle is

(A) 0.1 nm (B) 1 nm

(C) greater than 10^3 nm (D) 10^3 nm

18. Which among the following is NOT paramagnetic in nature?

(A) Benzene (B) Oxygen

(C) Fe^{3+} (D) Cu^{2+}

19. What is the product X obtained in the following reaction?

$$C_6H_5N_2Cl \xrightarrow[i)HBF_4\ ii)NaNO_2/Cu]{\Delta} X + N_2 + NaBF_4$$

(A) $C_6H_5NH_2$ (B) $C_6H_5NO_2$

(C) C_6H_5Cl (D) C_6H_5F

20. The electronic configuration of Be_2 molecule according to MOT is

(A) $(\sigma 1s^2)(\sigma^* 1s)^2, \sigma 2s^2, \sigma^* 2s^0$

(B) $(\sigma 1s)^2(\sigma^* 1s)^2, \sigma 2s^2, \sigma^* 2s^2$

(C) $(\sigma 1s^2)(\sigma^* 1s)^2, \sigma 2s^1, \sigma^* 2s^2$

(D) $(\sigma 1s^2)(\sigma^* 1s)^1, \sigma 2s^2, \sigma^* 2s^2$

21. Which among the following pairs of percentage of carbon and the property of cast iron is true?

(A) 0.2 to 2.0 % C , forms steel alloy (B) 0.2 to 2.0 % C , very soft

(C) 4.0 % C , hard and brittle (D) Less than 0.2 % C , very soft

22. Which of the following is an intensive property?

(A) Mass (B) Melting point

(C) Internal energy (D) Volume

23. Alkyl chloride when treated with sodium iodide in presence of dry acetone forms alkyl iodide. What is the name of this reaction?

(A) Swarts reaction (B) Wurtz reaction

(C) Wurtz - Fittig reaction (D) Finkelstein reaction

24. At constant temperature and pressure when 8 volumes of dihydrogen gas react with 4 volumes of dioxygen, the mass of water vapour produced is

(A) 36 g (B) 72 g

(C) 162 g (D) 144 g

25. Identify 'A' in the following reaction.

$$CH_3 - CH_2 - CH = CH - NO_2 \xrightarrow{A} CH_3 - NO_2 + CH_3 - CH_2 - CH = O$$

(A) $K_2Cr_2O_7$ (B) $KMnO_4$

(C) H_3O^+ (D) $LiAlH_4$

26. A first order reaction is 50 % completed in 16 minutes. The percentage of reactant that will react in 32 minutes is

(A) 100 % (B) 12.5 %

(C) 25 % (D) 75 %

27. Which of the following reagents can bring about following conversion?
But-1-ene $\rightarrow$ Butan-2-ol

(A) H_2O_2 (B) KOH aqueous

(C) (i) cold Conc. H_2SO_4 , (ii) H_2O (D) B_2H_6

28. What type of isomerism is present between (I) $[Cr(H_2O)_6]Cl_3$ and (II) $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$?

(A) Ionisation (B) Coordination

(C) Hydrate (D) Linkage

29. Identify the correct statement from the following.

(A) Vapour pressure of a solution containing a non volatile solute is always less than vapour pressure of pure solvent.

(B) Liquids having greater intermolecular forces have lower boiling points.

(C) Boiling point of pure solvent is always greater than boiling point of it's solution containing a non volatile solute.

(D) Vapour pressure of a solution containing a non volatile solute is always greater than vapour pressure of pure solvent.

30. Which among the following polymers is used to obtain bullet proof vests and helmets?

(A) Dynel

(B) Glyptal

(C) Nomex

(D) Kevlar

31. Which metal from following has highest tendency to undergo oxidation?

(A) Mg

(B) Ag

(C) Al

(D) Fe

32. Which among the following elements has highest ionisation enthalpy and bears a diagonal relationship with aluminium?

(A) Magnesium

(B) Beryllium

(C) Calcium

(D) Lithium

33. Which of the following is cationic detergent?

(A) n-hexadecyl trimethyl ammonium chloride

(B) Pentaerythrityl stearate

(C) n-dodecyl benzene sulphonic acid

(D) Sodium lauryl sulphate

34. Identify compound 'A' in the following reaction.

$A \xrightarrow[ii) H_2O,\ dil\ H_2SO_4]{i) HNO_2+HCl\ 273K}$ Phenol + N_2 + HCl

(A) Benzene

(B) Chlorobenzene

(C) Aniline

(D) Cumene

35. Strength of 20 volume solution of hydrogen peroxide is

(A) 60.71 g/L

(B) 6.8 g/L

(C) 68 g/L

(D) 6.071 g/L

36. What type of geometry and magnetic behaviour is found in compound $[NiCl_4]^{2-}$? (Atomic no. Ni = 28)

(A) Square planar and Paramagnetic

(B) Tetrahedral and paramagnetic

(C) Pyramidal and diamagnetic

(D) Square planar and paramagnetic

37. Identify the compound having highest boiling point from following?

(A) Propanal

(B) Methoxy ethane

(C) Propane

(D) Propan-1-ol

38. Which among the following catalysts is used in manufacture of sulphuric acid by contact process?

(A) Ni

(B) Fe with Mo

(C) V_2O_5

(D) MnO_2

39. A balloon contains 2.27 L air and has a pressure of 1.013×10^5 nm^{-2}. The balloon rises to a certain height and expands to volume of 4540 mL. What is the final pressure of air in balloon?

(A) 2.026×10^2 Nm^{-2}

(B) 4.540×10^4 Nm^{-2}

(C) 5.065×10^{-4} Nm^{-2}

(D) 5.065×10^4 Nm^{-2}

40. Heat of combustion of liquid benzene to carbon dioxide and water is -3266 kJ mol^{-1}. What is the amount of heat liberated when 780 mg of benzene is fully oxidised? (At mass of C = 12, H = 1)

(A) 32.66 kJ

(B) 326.6 kJ

(C) 65.32 kJ

(D) 16.33 kJ

41. Total number of lone pairs of electron on oxygen atoms in carbondioxide are

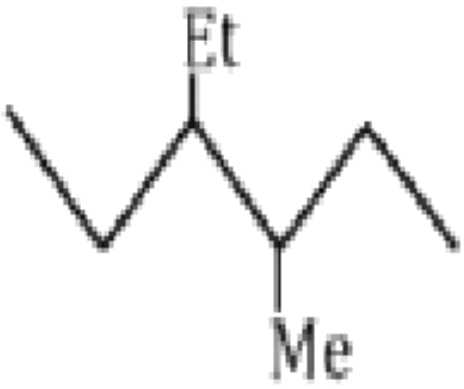
(A) 2

(B) 3

(C) 4

(D) 1

42. What is the molar mass of a compound represented below?



(A) 128 g mol^{-1}
(B) 108 g mol^{-1}
(C) 120 g mol^{-1}
(D) 126 g mol^{-1}

43. Which among the following polymers is a heteropolymer?

(A) Nylon-6
(B) Polythene
(C) Buna-N
(D) Polystyrene

44. Which of the following formulae is used to find edge length of bcc unit cell?

(A) $\frac{\sqrt{3}}{4r}$
(B) $\sqrt{8}$ r
(C) $\frac{4r}{\sqrt{3}}$
(D) $\sqrt{\frac{4r}{3}}$

45. What is the molecular formula of nitrogen sesquioxide?

(A) N_2O
(B) N_2O_3
(C) N_2O_5
(D) N_2O_4

46. Prolonged heating of glucose with HI to form n-Hexane, confirms

(A) Presence of carbonyl group
(B) Presence of all six carbon atoms in a straight chain
(C) Presence of primary alcoholic group
(D) Presence of aldehydic carbonyl group

47. When will be change in Gibb's free energy always negative?

(A) ΔH = positive, ΔS = negative at all temperatures.
(B) ΔH and ΔS both positive at low temperature.
(C) ΔH = negative, ΔS = positive, at all temperatures.
(D) ΔH and ΔS both negative at high temperature.

48. The conductivity of NaI solution is $6.0 \times 10^{-4}\ \Omega^{-1}cm^{-1}$ and molar conductivity is $120\ \Omega^{-1}cm^2mol^{-1}$. Calculate the concentration of NaI solution

(A) 0.05 M
(B) 2×10^{-2} M
(C) 0.005 M
(D) 7.2×10^{-3} M

49. Identify the oxidising agent in following reaction.
$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}$

(A) $CH_{4(g)}$
(B) $O_{2(g)}$
(C) $CO_{2(g)}$
(D) $H_2O_{(l)}$

50. Which of the following is NOT an antiseptic?

(A) Bithional
(B) Penicillin
(C) Chloroxylenol
(D) Iodine

1. How many among the sixteen offsprings produced in the F2 generation will have parental combinations of two genes controlling wheat kernel colour?

(A) Three (B) Four
(C) One (D) Two

2. In herbivorous animals, appendix helps in digestion of ____.

(A) cellulose (B) glycogen
(C) polypeptides (D) lactose

3. One of the following cell organelles is involved in synthesis and storage of fat.

(A) Glyoxysome (B) Peroxisome
(C) Sphaerosome (D) Ribosome

4. Eustachian valve guards the opening of ____.

(A) coronary sinus (B) coronary artery
(C) inferior venacava (D) superior venacava

5. The gene transfer between unrelated plants is brought about by ____.

(A) cloning (B) genetic engineering
(C) asexual reproduction (D) sexual reproduction

6. The applications of DNA finger printing technique are following EXCEPT ____.

(A) to establish parentage in disputed cases. (B) to study chromosomal types.
(C) to settle insurance claims. (D) to study phylogeny of organisms.

7. The process of tubular secretion adds following substances to the renal fluid EXCEPT ____.

(A) hydrogen ions (B) creatinine
(C) potassium ions (D) sodium ions

8. The sites of nitrogen fixation in blue green algae are ____.

(A) vegetative cells (B) apical cells
(C) heterocysts (D) basal cells

9. On sensitization, activated B-lymphocytes multiply to form clone of specific A which in turn produce B.

(A) A-cytotoxic T-cells, B-perforins (B) A-plasma cells, B-antibodies
(C) A-plasma cells, B-antigens (D) A-memory T-cells, B-lymphokines

10. Pusa Shubhra a variety of cauliflower is produced to prevent ____.

(A) black rot (B) leaf curl
(C) stripe rust (D) Hill bunt

11. The toxic substances released from *Bacillus thuringiensis* affects ____ of insect larva.

(A) brain (B) gut
(C) Malpighian tubules (D) trachea

12. Which one of the following is NOT needed to construct solenoid fibre?

(A) Nucleosome (B) DNA molecule
(C) RNA molecule (D) Basic proteins histones

13. In Column - I there are names of viral diseases while in Column-II there are names of viruses. Find out INCORRECT pair.

Column - I | Column - II
1) Yellow fever | Flavi virus
2) Swine flu | H_1N_1 virus
3) Small pox | Morbilli virus
4) AIDS | Retro virus

(A) Yellow fever – Flavi virus (B) Swine flu – H_1N_1 virus
(C) Small pox – Morbilli virus (D) AIDS – Retro virus

14. Highest taxonomic category is ____.

(A) species (B) division
(C) genus (D) kingdom

15. At how many places, Co-A is used in aerobic respiration after glycolysis?

(A) Three (B) Four
(C) One (D) Two

16. A gap present in upper jaw, between incisor and canine of ape is ____.

(A) diastema (B) diapedesis
(C) diaphysis (D) diarthrosis

17. Increased blood pressure and heart rate, deposition of fats in eye sockets and weight loss are found in ____.

(A) Addison's disease (B) Grave's disease
(C) bleeder's disease (D) Cushing's disease

18. What proportion of photosynthetically fixed CO_2 goes back to atmosphere, in C3 plants by photorespiration?

(A) 1/6 (B) 2/3
(C) 1/4 (D) 5/6

19. Cranial capacity of Java man is ____.

(A) 1600 c.c. (B) 1450 c.c.
(C) 1200 c.c. (D) 940 c.c.

20. How many of the following statements is/are true?
i) Alleles are located on different loci.
ii) An allele individually controls a trait.
iii) An allelic pair controls two traits.
iv) An allelic pair controls a single trait.

(A) Two (B) One
(C) Four (D) Three

21. Branching tree like processes of white matter called A are located in B of CNS.

(A) A - funiculi, B - spinal cord (B) A - folia, B - medulla oblongata
(C) A - corpora striata, B - cerebrum (D) A - arbor vitae, B - cerebellum

22. Exudation of water from the cut end of basal part of stem is due to ____.

(A) osmotic pressure (B) transpiration
(C) root pressure (D) low temperature

23. In *Kalanchoe*, vegetative reproduction takes place by ____.

(A) root tuber (B) stem tuber
(C) floral buds (D) epiphyllous buds

24. Which one of the following is NOT a characteristic of genetic code?

(A) It is commaless. (B) It is in triplets.
(C) It is degenerate. (D) It is ambiguous.

25. A pea plant with genotype YyRr is crossed with another pea plant with genotype yyrr. The expected phenotypic ratio of individuals formed will be ____.

(A) 2:1:1 (B) 1:2:1
(C) 1:1:2 (D) 1:1:1:1

26. Generally lower pulse rate is observed in ____.

(A) males (B) excitement
(C) standing position (D) children

27. Which one of the following is NOT an example of C4 plant?

(A) Sugarcane (B) Gram
(C) Amaranthus (D) Maize

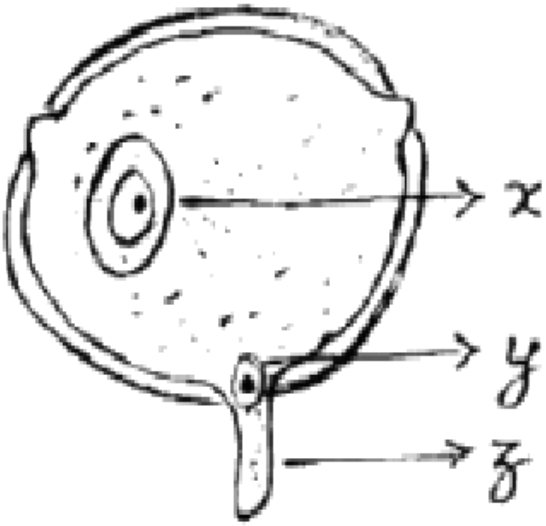
28. A protein is a sequence of amino acids. The end of polypeptide chain of $-NH_2$ end and at $-COOH$ end are respectively called ____.

(A) α-terminal and β-terminal (B) N-terminal and C-terminal
(C) C-terminal and N-terminal (D) β-terminal and α-terminal

29. Usually at which pH, the human sperms become motile?

(A) 4.5 to 5.0 (B) 6.0 to 6.5
(C) 7.5 to 8.5 (D) 4.0 to 4.5

30. Choose the correct set of labellings in the given diagram.



(A) x-generative cell, y-pollen tube, z-tube nucleus
(B) x-generative cell, y-tube nucleus, z-pollen tube
(C) x-pollen tube, y-tube nucleus, z-generative cell
(D) x-tube nucleus, y-generative cell, z-pollen tube

31. *Psilotum nudum* is a/an ____ species.

(A) endangered
(B) rare
(C) extinct
(D) exotic

32. The endocrine nature of kidney is indicated by secretion of ____.

(A) calcitriol
(B) aldosterone
(C) glucagon
(D) vasopressin

33. The law of dominance is not universally applicable because in some organisms few characters are ____.

(A) completely dominant.
(B) both, dominant and recessive
(C) completely recessive.
(D) incompletely dominant.

34. A single layer of cells that composes epicardium is called ____.

(A) endothelium
(B) mesothelium
(C) ependyma
(D) epidermis

35. The pO_2 of alveolar blood is ____ mmHg.

(A) 90
(B) 50
(C) 104
(D) 40

36. The correct group of ureotelic animals is ____.

(A) frog, shark, Labeo
(B) land snail, toad, Labeo
(C) dog, Labeo, snake
(D) frog, turtle, rat

37. Lymph contains all of the following components EXCEPT ____.

(A) platelets
(B) lymphocytes
(C) antibodies
(D) CO_2

38. Smallest bacterial genome is seen in ____.

(A) *Methanococcus jannaschii*
(B) *Mycobacterium genitalium*
(C) *Heamophilus influenzae*
(D) *Saccharomyces cerevisiae*

39. Which of the following steps involved in Calvin cycle is in sequential manner?
1) Carboxylation - reduction - regeneration - synthesis
2) Carboxylation - reduction - synthesis - regeneration
3) Reduction - carboxylation - synthesis - regeneration
4) Carboxylation - synthesis - regeneration - reduction

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

40. c DNA library is mostly constructed for organisms like ____.

(A) yeast
(B) cyanobacteria
(C) virus
(D) bacteria

41. In genetic engineering, ____ serve as agents for gene transfer.

(A) plasmids
(B) ribosomes
(C) lysosomes
(D) microbodies

42. Neurotransmitter, at a synapse, is stored temporarily in ____.

(A) synaptic vesicles.
(B) synaptic cleft
(C) pre synaptic membrane
(D) post synaptic membrane

43. Lysozyme present in tears brings about lysis of ____.

(A) bacteria
(B) fungi
(C) protists
(D) viruses

44. At the end of gestation period, the foetal hormones, which cause decrease in progesterone level in mother's blood are ____.

(A) adrenaline and noradrenaline
(B) parathyroid hormones
(C) thyroid hormones
(D) corticosteroids

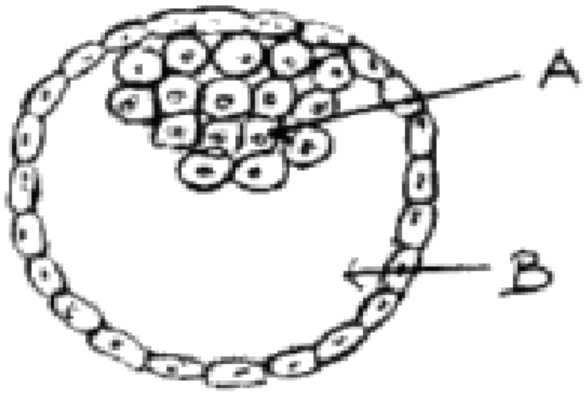
45. Total number of complete spirals occurring in a segment of DNA having 100 nucleotides will be ____.

(A) 5
(B) 6
(C) 3
(D) 4

46. Protozoan disease of poultry is ____.

(A) Favus
(B) Pullorum
(C) Ranikhet
(D) Coccidiosis

47. One of the human embryonic developmental stages has been shown in the diagram. What do the A and B indicate?



(A) A-Inner mass of cells; B- Blastocoel
(B) A- Inner mass of cells; B- Antrum
(C) A-Trophoblasts; B-Yolk sac
(D) A- Ectoderm; B-Amniotic cavity

48. Which one of the following is the correct structural organization of any animal?

(A) Tissues →Organs →Systems →Cells
(B) Cells →Tissues →Organs →Systems
(C) Cells →Organs →Systems →Tissues
(D) Systems →Organs →Cells →Tissues

49. How many ATP molecules would be produced from complete aerobic breakdown of one molecule of acetyl Co-A?

(A) 38
(B) 15
(C) 36
(D) 12

51. The source of oxygen evolved during photosynthesis is ____.

(A) light
(B) chlorophyll
(C) CO_2
(D) water

52. The initial acceptor of electrons among the cytochromes in respiratory chain is

(A) cytochrome - a_3
(B) cytochrome - a
(C) cytochrome - c
(D) cytochrome - $b - c_1$

53. During ____, variations are created.

(A) sexual reproduction
(B) vegetative propagation
(C) cloning
(D) asexual reproduction

54. If a person experiences difficulty in movements of pharynx, neck and shoulders, ____ cranial nerve may be injured.

(A) abducens
(B) hypoglossal
(C) spinal accessory
(D) vagus

55. During glycolysis, ATP generation -II step occurs between which of the two intermediates?

(A) 2- PGA and PEPA
(B) PEPA and pyruvate
(C) 3- PGA and 2 -PGA
(D) 1,3-diPGA and 3 -PGA

56. Which auxin should be used to erradicate dicotyledonous weeds from a monocotyledonous crop field?

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

57. A test cross is a back cross but back cross is not necessarily a test cross. Because a test cross is always between ____.

(A) F1 hybrid with another F1 hybrid
(B) F1 hybrid and recessive parent.
(C) F1 hybrid and dominant parent.
(D) F1 hybrid and F2 hybrid

58. In human beings, which of the following is NOT the function of vagina?

(A) It acts as a passage for urine.
(B) It receives penis during copulation.
(C) It serves as the birth canal.
(D) It allows passage of menstrual flow.

59. During gametogenesis, unequal cytoplasmic divisions take place in ____.

(A) multiplication phase of oogenesis.
(B) maturation phase of spermatogenesis.
(C) multiplication phase of spermatogenesis.
(D) maturation phase of oogenesis.

60. Match Column - I with Column -II considering mode of asexual reproduction.
Column - I | Column - II
a) Binary fission | i) Spirogyra
b) Conidia | ii) Yeast
c) Budding | iii) Amoeba
d) Fragmentation | iv) Penicillium

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

61. Select the correct statement.

(A) Striated muscles fibres are spindle shaped and show cross striations.
(B) Cardiac muscles show presence of intercalated disc.
(C) Smooth muscles show presence of large number of peripheral nuclei.
(D) Pace maker consists of nerve fibres in human beings.

62. Smooth leaved and nectarless cotton varieties are NOT affected by ____.

(A) bollworms
(B) jassids
(C) fruit borers
(D) stem borers

63. Which of the following prevents entry of food particles into the respiratory passage?

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

64. Select the correct match from Column-I with Column-II
Column - I | Column - II
a) Fibrous pericardium | i) Mesothelium
b) Lymphocyte | ii) Scavenger
c) Bundle of His | iii) Circular with kidney shaped nucleus
d) Erythrocyte | iv) Connection with AV node | v) Interventricular septum

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

65. The relation between herbivore and carnivore is an example of ____.

(A) commensalism
(B) predation
(C) parasitism
(D) mutualism

66. Match Column-I with Column-II and select the correct option.
Column - I | Column - II
a) *Seymouria* | i) fish and amphibian
b) *Ichthyostegia* | ii) reptiles and birds
c) *Archaeopteryx* | iii) ape and man
d) *Australopithecus* | iv) amphibians and reptiles

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

67. The correct group of Indian breeds of buffalo is ____.

(A) Murrah, Nagpuri, Nili
(B) Nili, Surati, Sindhi
(C) Sahiwal, Jersey, Brown swiss
(D) Sindhi, Gir, Holstein

68. Runners are slender wire like structures which develop from ____.

(A) underground part of stem.
(B) internodes of the stem.
(C) subaerial axillary buds of the stem.
(D) apical meristem.

69. During lytic cycle the enzyme endolysin causes break down of ____.

(A) bacteriophage DNA
(B) host cell wall
(C) host DNA
(D) virions

70. Match Column-I with Column-II and select the correct option.
Column - I | Column - II
a) Sunflower | i) Protogyny
b) Castor | ii) Self incompatibility
c) Michelia | iii) Protandry
d) Orchid | iv) Unisexuality

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

71. Presence of whole sets of chromosomes in an organism are indicated by the following EXCEPT ____.

(A) diploidy
(B) aneuploidy
(C) triploidy
(D) polyploidy

72. The initial development of male gametophyte from the pollen grain in angiosperms is ____.

(A) in vitro
(B) ex situ
(C) in situ
(D) ex partite

73. Normal value of serum bilirubin is usually ____ μ mol/L.

(A) 19 to 29
(B) 3 to 13
(C) 15 to 25
(D) 33 to 37

74. Select vestigial organs from the following.

(A) Vermiform appendix, wings of bat and coccyx of man.
(B) Vermiform appendix, nictitating membrane and coccyx of man.
(C) Forelimbs of whale, lizard and bat.
(D) Wings of bat, nictitating membrane and wings of insects.

75. Out of the 56 % of sunlight reaching the earth's atmosphere, ____ is used for photosynthesis.

(A) 0.05 %
(B) 0.02 %
(C) 10 %
(D) 0.2 %

76. In human beings, if the spermatozoa are not ejaculated, then ____.

(A) they are inactivated within the seminal vesicles.
(B) they are permanently stored in cauda epididymis.
(C) they are permanently stored in caput epididymis.
(D) they are re-absorbed in the vas deferens.

77. Detritus food chain always begins with ____.

(A) lichens
(B) dead organic matter
(C) phytoplanktons
(D) trees

78. Telomere has a unique property of ____.

(A) condensation of chromatin network.
(B) prevention of ends of the chromosomes from sticking together.
(C) attaching to spindle fibres.
(D) regulation of protein synthesis.

79. Which of the following is affected by injury to Broca's area of cerebrum?

(A) Vision
(B) Speech
(C) Hearing
(D) Smell

80. Which of the following is NOT a unique feature of acquired immunity?

(A) Discrimination between self and non-self
(B) Non- specificity
(C) Memory
(D) Diversity

81. How many of the nitrogen containing bases are common among both DNA and RNA?

(A) Four
(B) Two
(C) Three
(D) One

82. The white adipose tissue appears opaque due to ____.

(A) large amount of intra-cellular protein.
(B) large amount of extra-cellular fat.
(C) large number of adipocytes.
(D) more number of white fibres.

83. Neeta is assigned a project of integrated organic farming in village. Which ideal sustainable method will she use for this?

(A) include the activities of bee-keeping, dairy management, water harvesting, composting along with agriculture in the village.
(B) educate the rural women for establishment of self help groups to encourage cottage industry.
(C) form groups of youths to do street plays to educate the villagers for reduction and recycling of wastes.
(D) guide the villagers to design and build an effluent treatment and biogas plant.

84. One of the following is an example of incomplete sex linkage ____.

(A) Red green colour blindness
(B) Myopia
(C) Retinitis pigmentosa
(D) Haemophilia

85. Binomial system of nomenclature was introduced by ____.

(A) R. H. Whittaker (B) H. J. Lam
(C) Carl Woese (D) Carl Linnaeus

86. The photosynthetic pigments present only in red algae are ____.

(A) xanthophyll (B) carotene
(C) phycobilins (D) anthocyanin

87. Mark the mismatch pair.

(A) Mixing of chromosomes of male and female pronuclei – Karyogamy
(B) Morphogenetic movements so as to form germinal layers – Gastrulation.
(C) Discharge of semen in vagina during copulation – Fertilization
(D) A series of rapid mitotic divisions in zygote – Cleavage

88. During germination of seed, water absorption takes place by ____.

(A) endosmosis (B) osmotic pressure
(C) exosmosis (D) imbibition

89. What are the sediments in the settling tanks of tertiary treatment in STP called?

(A) Activated Sludge (B) Contaminants
(C) Effluents (D) Sewage

90. Wobble hypothesis explains ____.

(A) polarity of DNA molecule. (B) synthesis of protein.
(C) degeneracy of genetic code. (D) triplets of nucleotides.

91. The step followed during DNA profiling in which DNA sample is subjected to restriction endonuclease is ____.

(A) Hybridization (B) DNA isolation
(C) DNA amplification (D) DNA fragmentation

92. Bacteria possess following appendages EXCEPT ____.

(A) flagella (B) fimbriae
(C) cilia (D) pili

93. Generally callus produced during tissue culture is a mass of ____ cells.

(A) sclerenchyma (B) collenchyma
(C) parenchyma (D) chlorenchyma

94. Which of the following intermediates of Krebs cycle undergoes both oxidation and decarboxylation reactions?

(A) Oxalo acetate (B) Oxalo succinate
(C) α - ketoglutarate (D) Succinyl Co-A

95. Cell walls become brittle due to lack of ____ elements.

(A) Calcium (B) Potassium
(C) Boron (D) Copper

96. Which one of the following is NOT an example of mutualism?

(A) Plasmodium and Man (B) Ruminants and bacteria
(C) Mycorrhiza (D) Lichen

97. The narrow passage, which connects the abdominal cavity with the scrotal sacs, is ____.

(A) inguinal canal (B) iter
(C) gubernaculum (D) ejaculatory duct

98. After completing his civil engineering degree, Ramesh was appointed as trainee in the R and D city development office, he was to work on the project of laying water repellent roads in the city, which one of the following method will he decide to implement for sustainability?

(A) Mixing 'Polyblend' in bitumen to be used.
(B) Adding plastic powder in the cement to be used.
(C) Mixing wax in the cement to be used.
(D) Adding cement in the mixture to be used.

99. During the development of male gametes in angiosperms, the microspore mother cell undergoes ____ meiosis and ____ mitosis respectively.

(A) two and two (B) two and one
(C) one and two (D) one and three

100. Corona in passion flower helps the plant in achieving ____ pollination.

(A) bat (B) bird

(C) wind (D) insect

- End of Question Paper -