

(BT)

BIO TECHNOLOGY**INSTRUCTIONS TO CANDIDATES**

1. Candidates should write their Hall Ticket Number only in the space provided at the top left hand corner of this page, on the leaflet attached to this booklet and also in the space provided on the OMR Response Sheet. **BESIDES WRITING, THE CANDIDATE SHOULD ENSURE THAT THE APPROPRIATE CIRCLES PROVIDED FOR THE HALL TICKET NUMBERS ARE SHADED USING H.B. PENCIL ONLY ON THE OMR RESPONSE SHEET. DO NOT WRITE HALL TICKET NUMBER ANY WHERE ELSE.**
2. Immediately on opening this Question Paper Booklet, check:
 - (a) Whether **200** multiple choice questions are printed (**50** questions in Mathematics, **25** questions in Physics, **25** questions in Chemistry and **100** questions in Engineering)
 - (b) In case of any discrepancy immediately exchange the Question paper Booklet of same code by bringing the error to the notice of invigilator.
3. Use of Calculators, Mathematical Tables and Log books is not permitted.
4. **Candidate must ensure that he/she has received the Correct Question Booklet, corresponding to his/her branch of Engineering.**
5. **Candidate should ensure that the booklet Code and the Booklet Serial Number, as it appears on this page is entered at the appropriate place on the OMR Response Sheet by shading the appropriate circles provided therein using H.B. pencil only. Candidate should note that if they fail to enter the Booklet Serial Number and the Booklet Code on the OMR Response Sheet, their Answer Sheet will not be valued.**
6. **Candidate shall shade one of the circles 1, 2, 3 or 4 corresponding question on the OMR Response Sheet using H.B. Pencil only. Candidate should note that their OMR Response Sheet will be invalidated if the circles against the question are shaded using Black / Blue ink pen / Ball pen / any other pencil other than H.B. Pencil or if more than one circle is shaded against any question.**
7. One mark will be awarded for every correct answer. **There are no negative marks™**
8. The OMR Response Sheet will not be valued if the candidate :
 - (a) Writes the Hall Ticket Number in any part of the OMR Response Sheet except in the space provided for the purpose.
 - (b) Writes any irrelevant matter including religious symbols, words, prayers or any communication whatsoever in any part of the OMR Response Sheet.
 - (c) Adopts any other malpractice.
9. Rough work should be done only in the space provided in the Question Paper Booklet.
10. No loose sheets or papers will be allowed in the examination hall.
11. Timings of Test: 10.00 A.M. to 1.00 P.M.
12. Candidate should ensure that he / she enters his / her name and appends signature on the Question paper booklet, leaflet attached to this question paper booklet and also on the OMR Response Sheet in the space provided. Candidate should ensure that the invigilator puts his signature on this question paper booklet, leaflet attached to the question paper booklet and also on the OMR Response Sheet.
13. Before leaving the examination hall candidate should **return both the OMR Response Sheet and the leaflet attached to this question paper booklet** to the invigilator. Failure to return any of the above shall be construed as malpractice in the examination. **Question paper booklet may be retained by the candidate.**
14. This booklet contains a total of **32** pages including Cover page and the pages for Rough Work.

Set Code : **T2**Booklet Code : **A**

- Note: (1) Answer all questions.
(2) Each question carries 1 mark. There are no negative marks.
(3) Answer to the questions must be entered only on OMR Response Sheet provided separately by completely shading with H.B. Pencil, only one of the circles 1, 2, 3 or 4 provided against each question, and which is most appropriate to the question.*

MATHEMATICS

1. If $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then $A^4 =$

- (1) $3I$ (2) $9I$ (3) $27I$ (4) $81I$

2. If $A = \begin{bmatrix} 0 & 2 & 1 \\ -2 & 0 & -2 \\ -1 & x & 0 \end{bmatrix}$ is a skew symmetric matrix, then the value of x is

- (1) 1 (2) 2 (3) 3 (4) 4

3. What is the number of all possible matrices with each entry as 0 or 1 if the order of matrices is 3×3

- (1) 64 (2) 268 (3) 512 (4) 256

4. If $A = \begin{bmatrix} 1 & i & -i \\ i & -i & 1 \\ -i & 1 & i \end{bmatrix}$, then $|A| =$

- (1) 1 (2) 2 (3) 3 (4) 4

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5. The solution of a system of linear equations $2x - y + 3z = 9, x + y + z = 6, x - y + z = 2$ is
- (1) $x = -1, y = -2, z = -3$ (2) $x = 3, y = 2, z = 1$
 (3) $x = 2, y = 1, z = 3$ (4) $x = 1, y = 2, z = 3$

6. If $\frac{1}{x^2 + a^2} = \frac{A}{x + ai} + \frac{B}{x - ai}$ then $A =$ _____, $B =$ _____.

- (1) $\frac{1}{2ai}, -\frac{1}{2ai}$ (2) $-\frac{1}{2ai}, \frac{1}{2ai}$ (3) $\frac{1}{ai}, -\frac{1}{ai}$ (4) $-\frac{1}{ai}, \frac{1}{ai}$

7. If $\frac{2x+4}{(x-1)^3} = \frac{A_1}{(x-1)} + \frac{A_2}{(x-1)^2} + \frac{A_3}{(x-1)^3}$ then $\sum_{i=1}^3 A_i$ is equal to

- (1) A_2 (2) $2A_2$ (3) $4A_2$ (4) $4A_1$

8. The period of the function $f(x) = |\sin x|$ is

- (1) π (2) 2π (3) 3π (4) 4π

9. If $A+B=45^\circ$, then $(1-\cot A) \cdot (1-\cot B)$ is

- (1) 1 (2) 0 (3) 2 (4) -1

10. The value of $\sin 78^\circ + \cos 132^\circ$ is

- (1) $\frac{\sqrt{5}+1}{4}$ (2) $\frac{\sqrt{5}+1}{2}$ (3) $\frac{\sqrt{5}-1}{2}$ (4) $\frac{\sqrt{5}-1}{4}$

11. If $A+B+C = \pi$, then $\sin 2A + \sin 2B + \sin 2C =$

- (1) $4 \cos A \sin B \cos C$ (2) $4 \sin A \cos B \sin C$
 (3) $4 \cos A \cos B \cos C$ (4) $4 \sin A \sin B \sin C$

12. The principal solution of $\tan x = 0$ is

- (1) $x = n\pi, n \in \mathbb{Z}$ (2) $x = 0$
 (3) $x = (2n+1)\pi/2, n \in \mathbb{Z}$ (4) $x = n\pi + \alpha, n \in \mathbb{Z}$

Set Code : **T2**Booklet Code : **A**13. The value of $\tan^{-1}(2) + \tan^{-1}(3)$ is

- (1) $\frac{\pi}{4}$ (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{3}$ (4) $\frac{3\pi}{4}$

14. If the sides of a right angle triangle are in A.P., then the ratio of its sides is

- (1) 1:2:3 (2) 2:3:4 (3) 3:4:5 (4) 4:5:6

15. The value of $r_1 r_2 r_3$ is

- (1) Δ^2 (2) Δ^2 (3) Δ^3 (4) Δ^4

16. $\frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} =$

- (1) $\frac{1}{r}$ (2) $\frac{1}{2r}$ (3) $\frac{1}{R}$ (4) $\frac{1}{\Delta}$

17. If $a=6, b=5, c=9$, then the value of angle A is

- (1) $\cos^{-1}(2/9)$ (2) $\cos^{-1}(2/5)$ (3) $\cos^{-1}(7/9)$ (4) $\cos^{-1}(1/3)$

18. The polar form of complex number $1-i$ is

- (1) $\sqrt{2}e^{-i\pi/4}$ (2) $\sqrt{2}e^{i\pi/4}$ (3) $\sqrt{2}e^{i\pi/2}$ (4) $\sqrt{2}e^{-i\pi/2}$

19. If $1, \omega, \omega^2$ be the cube roots of unity, then the value of $2^{\omega^3} \cdot 2^{\omega^5} \cdot 2^{\omega}$ is

- (1) ω (2) ω^2 (3) 1 (4) 0

20. The intercept made on X-axis by the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is

- (1) $\sqrt{g^2 - c}$ (2) $\sqrt{f^2 - c}$ (3) $2\sqrt{g^2 - c}$ (4) $2\sqrt{f^2 - c}$

21. If one end of the diameter of the circle $x^2 + y^2 - 5x - 8y + 13 = 0$ is (2, 7), then the other end of the diameter is

- (1) (3, 1) (2) (1, 3) (3) (-3, -1) (4) (-1, -3)

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22. The radius of the circle $\sqrt{1+m^2}(x^2+y^2)-2cx-2mcy=0$ is
 (1) $2c$ (2) $4c$ (3) $c/2$ (4) c
23. The parametric equations of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ are
 (1) $x = a \sec\theta, y = b \tan\theta$ (2) $x = b \sin\theta, y = a \cos\theta$
 (3) $x = a \cos\theta, y = b \sin\theta$ (4) $x = a \operatorname{cosec}\theta, y = b \cot\theta$
24. The equation of the directrix of the parabola $2x^2 = -7y$ is
 (1) $8y+7=0$ (2) $8y-7=0$ (3) $7y+8=0$ (4) $8x-7=0$
25. The condition for a straight line $y = mx+c$ to be a tangent to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is
 (1) $c = a/m$ (2) $c^2 = a^2m^2 - b^2$ (3) $c^2 = a^2m^2 + b^2$ (4) $c^2 = a/m$
26. $\lim_{x \rightarrow 1} \frac{\sqrt{5x-4}-\sqrt{x}}{x-1}$ is
 (1) 3 (2) 2 (3) 4 (4) 1
27. $\log i =$
 (1) $\pi/2$ (2) $\pi/4$ (3) $i\pi/2$ (4) $i\pi/4$
28. $\frac{d}{dx}[\log_7 X] =$
 (1) $\frac{1}{x}$ (2) $X \log_7 e$ (3) $\frac{1}{x} \log_7 e$ (4) $\frac{1}{x} \log_7 e$
29. $\frac{d}{dx}[2 \cosh x] =$
 (1) $\frac{e^x + e^{-x}}{2}$ (2) $\frac{e^x - e^{-x}}{2}$ (3) $e^x + e^{-x}$ (4) $e^x - e^{-x}$

$$30. \frac{d}{dx} \left[\cos^{-1} \left(\frac{1-x^2}{1+x^2} \right) \right] =$$

- (1) $\frac{1}{1+x^2}$ (2) $\frac{-1}{1+x^2}$ (3) $\frac{2}{1+x^2}$ (4) $\frac{-2}{1+x^2}$

$$31. \text{ If } x = at^2, y = 2at, \text{ then } \frac{dy}{dx} =$$

- (1) $\sqrt{\frac{y}{x}}$ (2) $\sqrt{\frac{x}{a}}$ (3) $\sqrt{\frac{a}{x}}$ (4) $\sqrt{\frac{x}{y}}$

$$32. \text{ The derivative of } e^x \text{ with respect to } \sqrt{x} \text{ is}$$

- (1) $\frac{2\sqrt{x}}{e^x}$ (2) $2\sqrt{x}e^x$ (3) $\frac{e^x}{2\sqrt{x}}$ (4) $\sqrt{x}.e^x$

$$33. \text{ The equation of the normal to the curve } y = 5x^4 \text{ at the point } (1, 5) \text{ is}$$

- (1) $x + 20y = 99$ (2) $x + 20y = 101$ (3) $x - 20y = 99$ (4) $x - 20y = 101$

$$34. \text{ The angle between the curves } y^2 = 4x \text{ and } x^2 + y^2 = 5 \text{ is}$$

- (1) $\frac{\pi}{4}$ (2) $\tan^{-1}(2)$ (3) $\tan^{-1}(3)$ (4) $\tan^{-1}(4)$

$$35. \text{ If } u = x^3y^3 \text{ then } \frac{\partial^3 u}{\partial x^3} + \frac{\partial^3 u}{\partial y^3} =$$

- (1) $6(x^3+y^3)$ (2) $6x^3y^3$ (3) $6x^3$ (4) $6y^3$

$$36. \int \operatorname{cosec} x \, dx =$$

- (1) $\log(\operatorname{cosec} x + \cot x) + C$ (2) $\log(\cot x/2) + C$
 (3) $\log(\tan x/2) + C$ (4) $-\operatorname{cosec} x \cdot \cot x + C$

Set Code : **T2**Booklet Code : **A****CHEMISTRY**

76. The valency electronic configuration of Phosphorous atom (At.No. 15) is
(1) $3s^2 3p^3$ (2) $3s^1 3p^3 3d^1$ (3) $3s^2 3p^2 3d^1$ (4) $3s^1 3p^2 3d^2$
77. An element 'A' of At.No.12 combines with an element 'B' of At.No.17. The compound formed is
(1) covalent AB (2) ionic AB_2 (3) covalent AB_2 (4) ionic AB
78. The number of neutrons present in the atom of ${}_{56}\text{Ba}^{137}$ is
(1) 56 (2) 137 (3) 193 (4) 81
79. Hydrogen bonding in water molecule is responsible for
(1) decrease in its freezing point (2) increase in its degree of ionization
(3) increase in its boiling point (4) decrease in its boiling point
80. In the HCl molecule, the bonding between hydrogen and chlorine is
(1) purely covalent (2) purely ionic (3) polar covalent (4) complex coordinate
81. Potassium metal and potassium ions
(1) both react with water (2) have the same number of protons
(3) both react with chlorine gas (4) have the same electronic configuration
82. 5.85 gms of sodium chloride were dissolved in water and the solution made upto 100 ml in a standard flask. 10 ml of this solution were pipetted out into another flask and made up with distilled water into 100 ml of solution. The concentration of the sodium chloride solution now is
(1) 0.1 M (2) 1.0 M (3) 0.5 M (4) 0.25 M
83. Concentration of a 1.0 M solution of phosphoric acid in water is
(1) 0.33 N (2) 1.0 N (3) 2.0 N (4) 3.0 N
84. Which of the following is a Lewis acid?
(1) Ammonia (2) Beryllium chloride
(3) Boron trifluoride (4) Magnesium oxide

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85. Which of the following constitutes the components of a buffer solution?
(1) Potassium chloride and potassium hydroxide
(2) Sodium acetate and acetic acid
(3) Magnesium sulphate and sulphuric acid
(4) Calcium chloride and calcium acetate
86. Which of the following is an electrolyte?
(1) Acetic acid (2) Glucose (3) Urea (4) Pyridine
87. Calculate the Standard emf of the cell, $\text{Cd}/\text{Cd}^{2+}/\text{Cu}^{2+}/\text{Cu}$ given that $E^{\circ} \text{Cd}/\text{Cd}^{2+} = 0.44\text{V}$ and $E^{\circ} \text{Cu}/\text{Cu}^{2+} = (-) 0.34\text{V}$.
(1) $(-) 1.0\text{V}$ (2) 1.0V (3) $(-) 0.78\text{V}$ (4) 0.78V
88. A solution of nickel chloride was electrolysed using Platinum electrodes. After electrolysis,
(1) nickel will be deposited on the anode (2) Cl_2 gas will be liberated at the cathode
(3) H_2 gas will be liberated at the anode (4) nickel will be deposited on the cathode
89. Which of the following metals will undergo oxidation fastest?
(1) Cu (2) Li (3) Zinc (4) Iron
90. Which of the following cannot be used for the sterilization of drinking water?
(1) Ozone (2) Calcium Oxychloride
(3) Potassium Chloride (4) Chlorine water
91. A water sample showed it to contain 1.20 mg/litre of magnesium sulphate. Then, its hardness in terms of calcium carbonate equivalent is
(1) 1.0 ppm (2) 1.20 ppm (3) 0.60 ppm (4) 2.40 ppm
92. Soda used in the L-S process for softening of water is, Chemically.
(1) sodium bicarbonate (2) sodium carbonate decahydrate
(3) sodium carbonate (4) sodium hydroxide (40%)
93. The process of cementation with zinc powder is known as
(1) sherardizing (2) zincing (3) metal cladding (4) electroplating

Set Code : **T2**Booklet Code : **A****PHYSICS**

51. Two quantities A and B are related by the relation $A/B = m$ where m is linear mass density and A is force. The dimensions of B will be
- (1) same as that of latent heat (2) same as that of pressure
 (3) same as that of work (4) same as that of momentum
52. The dimensional formula of capacitance in terms of M, L, T and I is
- (1) $[ML^2T^2I^2]$ (2) $[ML^{-2}T^4I^2]$ (3) $[M^{-1}L^3T^3I]$ (4) $[M^{-1}L^{-2}T^4I^2]$
53. If l , m and n are the direction cosines of a vector, then
- (1) $l + m + n = 1$ (2) $l^2 + m^2 + n^2 = 1$ (3) $\frac{1}{l} + \frac{1}{m} + \frac{1}{n} = 1$ (4) $lmn = 1$
54. The angle between $i+j$ and $j+k$ is
- (1) 0° (2) 90° (3) 45° (4) 60°
55. A particle is moving eastwards with a velocity of 5 ms^{-1} . In 10 seconds the velocity changes to 5 ms^{-1} northwards. The average acceleration in this time is
- (1) $\frac{1}{\sqrt{2}} \text{ ms}^{-2}$ towards north-west (2) zero
 (3) $\frac{1}{2} \text{ ms}^{-2}$ towards north (4) $\frac{1}{\sqrt{2}} \text{ ms}^{-2}$ towards north-east
56. The linear momentum of a particle varies with time t as $p = a+bt+ct^2$ which of the following is correct?
- (1) Force varies with time in a quadratic manner.
 (2) Force is time-dependent.
 (3) The velocity of the particle is proportional to time.
 (4) The displacement of the particle is proportional to t .
57. A shell of mass m moving with a velocity v suddenly explodes into two pieces. One part of mass $m/4$ remains stationary. The velocity of the other part is
- (1) v (2) $2v$ (3) $3v/4$ (4) $4v/3$

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58. The velocity of a freely falling body after 2s is
(1) 9.8 ms^{-1} (2) 10.2 ms^{-1} (3) 18.6 ms^{-1} (4) 19.6 ms^{-1}
59. A large number of bullets are fired in all directions with the same speed u . The maximum area on the ground on which these bullets will spread is
(1) $\frac{\pi u^2}{g^2}$ (2) $\frac{\pi u^4}{g^2}$ (3) $\frac{\pi u^2}{g^4}$ (4) $\frac{\pi u}{g^4}$
60. The minimum stopping distance for a car of mass m , moving with a speed v along a level road, if the coefficient of friction between the tyres and the road is μ , will be
(1) $\frac{v^2}{2\mu g}$ (2) $\frac{v^2}{\mu g}$ (3) $\frac{v^2}{4\mu g}$ (4) $\frac{v}{2\mu g}$
61. When a bicycle is in motion, the force of friction exerted by the ground on the two wheels is such that it acts
(1) In the backward direction on the front wheel and in the forward direction on the rear wheel
(2) In the forward direction on the front wheel and in the backward direction on the rear wheel
(3) In the backward direction on both the front and the rear wheels
(4) In the forward direction on both the front and the rear wheels
62. In a perfectly inelastic collision, the two bodies
(1) strike and explode (2) explode without striking
(3) implode and explode (4) combine and move together
63. Under the action of a constant force, a particle is experiencing a constant acceleration, then the power is
(1) zero (2) positive
(3) negative (4) increasing uniformly with time

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64. Consider the following two statements:
 A : Linear momentum of a system of particles is zero.
 B : Kinetic energy of a system of particles is zero.
 Then
 (1) A implies B & B implies A (2) A does not imply B & B does not imply A
 (3) A implies B but B does not imply A (4) A does not imply B but B implies A
65. An engine develops 10 kW of power. How much time will it take to lift a mass of 200 kg to a height of 40 m? (Given $g = 10 \text{ ms}^{-2}$)
 (1) 4s (2) 5s (3) 8s (4) 10s
66. If a spring has time period T , and is cut into n equal parts, then the time period will be
 (1) $T\sqrt{n}$ (2) $\frac{T}{\sqrt{n}}$ (3) nT (4) $\frac{T}{n}$
67. When temperature increases, the frequency of a tuning fork
 (1) increases
 (2) decreases
 (3) remains same
 (4) increases or decreases depending on the materials
68. If a simple harmonic motion is represented by $\frac{d^2x}{dy^2} + \alpha x = 0$, its time period is
 (1) $2\pi\sqrt{\alpha}$ (2) $2\pi\alpha$ (3) $\frac{2\pi}{\sqrt{\alpha}}$ (4) $\frac{2\pi}{\alpha}$
69. A cinema hall has volume of 7500 m^3 . It is required to have reverberation time of 1.5 seconds. The total absorption in the hall should be
 (1) 850 w-m^2 (2) 82.50 w-m^2 (3) 8.250 w-m^2 (4) 0.825 w-m^2

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70. To absorb the sound in a hall which of the following are used
- (1) Glasses, stores (2) Carpets, curtains
(3) Polished surfaces (4) Platforms
71. If N represents avagadro's number, then the number of molecules in 6 gm of hydrogen at NTP is
- (1) $2N$ (2) $3N$ (3) N (4) $N/6$
72. The mean translational kinetic energy of a perfect gas molecule at the temperature T K is
- (1) $\frac{1}{2}kT$ (2) kT (3) $\frac{3}{2}kT$ (4) $2kT$
73. The amount of heat given to a body which raises its temperature by 1°C
- (1) water equivalent (2) thermal heat capacity
(3) specific heat (4) temperature gradient TM
74. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio C_p/C_v for gas is
- (1) $\frac{3}{2}$ (2) $\frac{4}{3}$ (3) 2 (4) $\frac{5}{3}$
75. Cladding in the optical fiber is mainly used to
- (1) to protect the fiber from mechanical stresses
(2) to protect the fiber from corrosion
(3) to protect the fiber from mechanical strength
(4) to protect the fiber from electromagnetic guidance

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37. $\int_0^{\pi} \cos^{11} x \, dx =$

- (1) $\frac{256}{693}$ (2) $\frac{256\pi}{693}$ (3) $\frac{\pi}{4}$ (4) $\frac{128}{693}$

38. $\int f'(x)[f(x)]^n \, dx =$

- (1) $\frac{[f(x)]^{n-1}}{n-1} + C$ (2) $\frac{[f(x)]^{n+1}}{n+1} + C$ (3) $n[f(x)]^{n-1} + C$ (4) $(n+1)[f(x)]^{n+1} + C$

39. $\int \frac{dx}{(x+7)\sqrt{x+6}} =$

- (1) $\tan^{-1}(\sqrt{x+6}) + C$ (2) $2\tan^{-1}(\sqrt{x+6}) + C$ TM
 (3) $\tan^{-1}(x+7) + C$ (4) $2\tan^{-1}(x+7) + C$

40. $\int \tan^{-1} x \, dx =$

- (1) $x \cdot \tan^{-1} x + \frac{1}{2} \log(1+x^2) + C$ (2) $\frac{1}{1+x^2} + C$
 (3) $x^2 \cdot \tan^{-1} x + C$ (4) $x \cdot \tan^{-1} x - \log \sqrt{1+x^2} + C$

41. $\int \frac{dx}{1+e^{-x}} =$

- (1) $\log(1+e^{-x}) + C$ (2) $\log(1+e^x) + C$
 (3) $e^{-x} + C$ (4) $e^x + C$

42. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin |x| \, dx =$

- (1) 0 (2) 1 (3) 2 (4) -1

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43. Area under the curve $f(x) = \sin x$ in $[0, \pi]$ is
 (1) 4 sq. units (2) 2 sq. units (3) 6 sq. units (4) 8 sq. units
44. The order of $x^3 \frac{d^3 y}{dx^3} + 2x^2 \frac{d^2 y}{dx^2} - 3y = x$ is
 (1) 1 (2) 4 (3) 3 (4) 2
45. The degree of $\left[\frac{d^2 y}{dx^2} + \left(\frac{dy}{dx} \right)^2 \right]^3 = a \frac{d^2 y}{dx^2}$ is
 (1) 4 (2) 2 (3) 1 (4) 3
46. The family of straight lines passing through the origin is represented by the differential equation
 (1) $ydx + xdy = 0$ (2) $xdy - ydx = 0$ (3) $x dx + y dy = 0$ (4) $x dx - y dy = 0$
47. The differential equation $\frac{dy}{dx} + \frac{ax + hy + g}{hx + by + f} = 0$ is called
 (1) Homogeneous (2) Exact (3) Linear (4) Legendre
48. The solution of differential equation $\frac{dy}{dx} = e^{-x^2} - 2xy$ is
 (1) $y \cdot e^{-x^2} = x + c$ (2) $ye^x = x + c$ (3) $ye^{x^2} = x + c$ (4) $y = x + c$
49. The complementary function of $(D^3 + D^2 + D + 1)y = 10$ is
 (1) $C_1 \cos x + C_2 \sin x + C_3 e^{-x}$ (2) $C_1 \cos x + C_2 \sin x + C_3 e^x$
 (3) $C_1 + C_2 \cos x + C_3 \sin x$ (4) $(C_1 + C_2 x + C_3 x^2) e^x$
50. Particular Integral of $(D-1)^4 y = e^x$ is
 (1) $x^4 e^x$ (2) $\frac{x^4}{24} e^{-x}$ (3) $\frac{x^4}{12} e^x$ (4) $\frac{x^4}{24} e^x$

Set Code : **T2**Booklet Code : **A**

94. Corrosion of a metal is fastest in
(1) rain-water (2) acidulated water (3) distilled water (4) de-ionised water
95. Which of the following is a thermoset polymer?
(1) Polystyrene (2) PVC
(3) Polythene (4) Urea-formaldehyde resin
96. Chemically, neoprene is
(1) polyvinyl benzene (2) polyacetylene
(3) polychloroprene (4) poly-1,3-butadiene
97. Vulcanization involves heating of raw rubber with
(1) selenium element (2) elemental sulphur
(3) a mixture of Se and elemental sulphur (4) a mixture of selenium and sulphur dioxide
98. Petrol largely contains
(1) a mixture of unsaturated hydrocarbons $C_5 - C_8$
(2) a mixture of benzene, toluene and xylene
(3) a mixture of saturated hydrocarbons $C_{12} - C_{14}$
(4) a mixture of saturated hydrocarbons $C_6 - C_8$
99. Which of the following gases is largely responsible for acid-rain?
(1) SO_2 & NO_2 (2) CO_2 & water vapour
(3) CO_2 & N_2 (4) N_2 & CO_2
100. BOD stands for
(1) Biogenetic Oxygen Demand (2) Biometric Oxygen Demand
(3) Biological Oxygen Demand (4) Biospecific Oxygen Demand

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BIO TECHNOLOGY

101. Agar-agar was used for the first time for culturing microbes in 1882 by
- (1) Louis Pasteur (2) Robert Koch
(3) Beijernick (4) Joseph Lister
102. What are pesticides used to kill weeds called?
- (1) Biopesticides (2) Antimicrobials
(3) Fungicides (4) Herbicides
103. Which on of the following is not a nitrogen-fixing organism?
- (1) Anabaena (2) Nostoc
(3) Azotobacter (4) Pseudomonas TM
104. Addition of blood to a culture medium only allows the hemolytic bacteria that grow on the plate to be picked out. This is an example of a
- (1) Differential media (2) Liquid media
(3) Chemically defined media (4) Selective media
105. For what purpose are semisolid media used?
- (1) Isolation of discrete colonies
(2) Subculturing microorganisms
(3) Obtaining growth throughout the tube
(4) Determination of motility of a culture
106. The endotoxins released from *Bacillus thuringiensis* are known as
- (1) Cry proteins (2) Toxin proteins
(3) Bacilli proteins (4) Sat proteins

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107. Phosphate solubilizing bacteria converts
- (1) Soluble to insoluble form of phosphorous
 - (2) Insoluble to soluble form of phosphorous
 - (3) Soluble to inactive insoluble form of phosphorous
 - (4) Insoluble to inactive soluble form of phosphorous
108. Azolla sps are used as biofertilizers to control mosquito larvae in
- (1) Rice fields
 - (2) Wheat fields
 - (3) Jowar fields
 - (4) Millet fields
109. Wilson & Blair's medium is used for isolation of
- (1) Pseudomonas sps
 - (2) Enterobacter sps
 - (3) Lactobacillus sps
 - (4) Salmonella sps
110. Photoautotrophs acquire energy from
- (1) Sunlight and methane
 - (2) Sunlight and carbon dioxide
 - (3) Sunlight and benzene
 - (4) Sunlight and ammonia
111. Living, unstained cells and organisms can be observed best using
- (1) Fluorescent microscopy
 - (2) TEM
 - (3) Phase contrast microscopy
 - (4) SEM
112. Cell theory was proposed by
- (1) Schleiden and Schwann
 - (2) Watson and Crick
 - (3) Messelson and Stahl
 - (4) Gregor and Mendel
113. Peripheral membrane proteins
- (1) are generally noncovalently bound to membrane lipids
 - (2) are usually denatured when released from membranes
 - (3) can be released from membranes only by treatment with detergents
 - (4) may have functional units on both sides of the membrane

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114. The atomic number of an element is equal to
- (1) Number of protons plus the number of electrons
 - (2) The number of protons plus the number of neutrons
 - (3) The number of protons in the atom
 - (4) The number of neutrons in the atom
115. Following are the applications of biophysics except one
- (1) Protein-metal interaction
 - (2) Development of vaccines
 - (3) Drug discovery and development
 - (4) Creating transgenic animals and plants
116. Which of the following are all present in animal cells?
- (1) Mitochondria, cell membrane, cell wall, cytoplasm
 - (2) Chloroplasts, cytoplasm, vacuole, nucleus
 - (3) Nucleus, cell membrane, mitochondria, cytoplasm
 - (4) Vacuole, cell membrane, nucleus, mitochondria
117. The first light microscope was discovered by
- | | |
|-------------------|-----------------------------|
| (1) Louis Pasteur | (2) Antonie Von leeuwenhock |
| (3) Kary Mullis | (4) Joseph Lister |
118. A sample of cells is placed in a salt solution. The cells shrink and the membrane is distorted. Relative to the cell, the solution is probably
- | | | | |
|--------------|---------------|-------------|----------------|
| (1) isotonic | (2) hypotonic | (3) osmotic | (4) hypertonic |
|--------------|---------------|-------------|----------------|
119. Phospholipids have hydrophilic and hydrophobic areas within the same molecule. This dual nature of the molecule is described by the term
- | | | | |
|-----------------|-------------------|-----------|---------------|
| (1) amphipathic | (2) electrostatic | (3) polar | (4) non-polar |
|-----------------|-------------------|-----------|---------------|

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120. Which of the following are not true about cell theory?
- (1) All living things are made of cells
 - (2) All cells come from pre-existing biotic component
 - (3) All cells come from a pre-existing abiotic component
 - (4) Cells performs all functions of the life
121. Mendel's idea that pairs of characters separate during gamete formation is called the law of
- (1) Particulate inheritance
 - (2) Dominance
 - (3) Segregation
 - (4) Independent assortment
122. What is the most common outcome in the F₂ generation of a cross between a tall plant and a dwarf plant?
- (1) 1 tall : 1 dwarf
 - (2) 3 tall : 1 dwarf
 - (3) 1 tall : 2 medium : 1 dwarf
 - (4) All tall
123. A human female has _____ pairs of autosomes and sex chromosome complement of
- (1) 23, XX
 - (2) 23, X
 - (3) 22, XY
 - (4) 22, XX
124. A replicated chromosome consists of two very long strands of identical chromosomal material called
- (1) Telomeres
 - (2) Chromatids
 - (3) Centromeres
 - (4) Genes
125. DNA synthesis occurs during the _____ phase of the cell cycle.
- (1) Gap 1 (G₁)
 - (2) Gap 2 (G₂)
 - (3) S
 - (4) Mitosis
126. X-inactivation can be used to identify individuals who are
- (1) homozygous unaffected
 - (2) heterozygous
 - (3) homozygous affected
 - (4) missing X-linked genes

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127. Hemophilia in humans is due to an X-chromosome mutation. What will be the results of mating between a normal (non-carrier) female and a hemophilic male?
- (1) half of daughters are normal and half of sons are haemophilic
 - (2) all sons are normal and all daughters are carriers
 - (3) half of sons are normal and half are hemophilic; all daughters are carriers
 - (4) all daughters are normal and all sons are carriers
128. Which of the following genetic conditions is not sex-linked?
- (1) Ichthyosis
 - (2) Colorblindness
 - (3) Sickle-cell anemia
 - (4) Haemophilia
129. Can a male be a carrier for a sex-linked disease?
- (1) yes, if the trait is recessive
 - (2) yes, if the male's father and mother were carriers
 - (3) no, males have only a single copy of sex-linked genes
 - (4) no, males have two copies of sex-linked genes
130. Histones are found in
- (1) Nucleoli
 - (2) Cytoplasm
 - (3) Cisternae
 - (4) Mitochondria
131. What is the process of heating liquids or food at high temperatures to destroy foodborne pathogens?
- (1) high pressure processing
 - (2) Pasteurization
 - (3) boiling
 - (4) irradiation
132. Which of the following is a micronutrient?
- (1) Carbon
 - (2) Manganese
 - (3) Potassium
 - (4) Magnesium
133. Marine microbes are typically _____
- (1) acidophiles
 - (2) halophiles
 - (3) alkaliphiles
 - (4) thermophiles

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134. To which kingdom do the cyanobacteria belong?
(1) Fungi (2) Eubacteria (3) Protista (4) Plantae
135. Which of the following was the first widely used antiseptic and disinfectant?
(1) Chlorine (2) Phenol (3) Iodine (4) Alcohol
136. Cryopreservation is a method used for preserving samples by
(1) freezing at 0°C (2) freezing at -50°C
(3) freezing in liquid nitrogen at -196°C (4) freezing in liquid nitrogen at -50°C
137. One of method is an indirect measurement of microorganisms
(1) pour plate method (2) Turbidity method
(3) Streat plate method (4) Microscopic method^M
138. Which of the following obtain energy from the oxidation of inorganic or organic chemicals?
(1) Chemotroph (2) Lithotroph (3) Autotroph (4) Phototroph
139. The average time required for a freshly divided cell to divide into two daughter cells is called
(1) exponential flow rate (2) generation time
(3) division time (4) growth rate
140. An organism is completely dependant on atmospheric O₂ for growth. This organism is a(n)
(1) Osmotolerant (2) Facultative anaerobe
(3) aerotolerant anaerobe (4) Obligate aerobes
141. In the Air lift bioreactor mixing is accomplished by
(1) Agitator (2) Air from sparger
(3) Baffle (4) Draught tube

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142. Main functions of baffles in a bioreactor is
- (1) To prevent a vortex
 - (2) To increase aeration
 - (3) To reduce interfacial area of oxygen transfer
 - (4) To reduce aeration rate
143. To optimize the bioreactor system, which one of the following system is least important for anaerobic fermentation?
- (1) Culture agitation to maintain oxygen supply
 - (2) Restriction of entry of contaminating organisms
 - (3) Control of parameters like pH and temperature
 - (4) Maintenance of constant culture volume
144. In large scale fermentation the preferred method of sterilization is
- (1) Chemical method
 - (2) Radiation
 - (3) Filtration
 - (4) Heat
145. For turbine aeration agitaion unit the power consumption
- (1) Is same for gassed and ungassed systems
 - (2) Increase with decreasing turbine diameter
 - (3) Decreasing with decreasing turbine diameter
 - (4) Is smaller for gassed system than for ungassed systems
146. Increasing the stirrer speed improves the value of
- (1) Reynolds number
 - (2) Power number
 - (3) Mixing time
 - (4) $K_L A$
147. A batch reactor is characterized by
- (1) Constant Residence Time
 - (2) Variation in extent of reaction and properties of the reaction mixture with time
 - (3) Variation in reactor volume
 - (4) Very low conversion

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148. Which one of the following pieces of information cannot be obtained from a computer controlled bioreactor?
- (1) Dissolved oxygen (2) Substrate concentration
(3) Molecular mass of end product (4) Rate of Biosynthesis of the end metabolite
149. Chemostat can be operated at dilution rate _____ than the specific growth rate when the cell recycle is used.
- (1) Higher (2) Lower
(3) Uncertain (4) Equal to specific growth rate
150. Plug-flow reactor is characterized by
- (1) High capacity (2) Presence of axial mixing
(3) Presence of lateral mixing (4) Constant composition and temperature
151. DNA double helix is identified by
- (1) Mendal (2) Jacob and Monod
(3) John C.Kendrew (4) Watson and Crick
152. A nucleoside molecule consists of
- (1) Chemical base + sugar & phosphate molecule
(2) Chemical base & phosphate molecule
(3) Chemical base + sugar molecule
(4) sugar & phosphate molecule
153. Okazaki fragments consists of
- (1) DNA (2) RNA (3) RNA & DNA (4) t-RNA
154. Phenylketonuria an inborn error of phenylalanine metabolism is due to
- (1) Excess of Phenylalanine hydroxylase
(2) Excess of Phenylalanine transferase
(3) Lack or reduced levels of Phenylalanine hydroxylase
(4) Excess of Phenylalanine

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155. Phenylketonuria disease is inherited as an
- (1) Autosomal recessive (2) Autosomal dominant
(3) Co-dominance (4) Dominant
156. Mutations _____ effect is called silent mutations.
- (1) with drastic (2) with partial (3) with multi (4) without apparent
157. The synthesis of the single strand of messenger RNA on the DNA is known as
- (1) replication (2) translation
(3) mutation (4) transcription
158. A weak attractive force acting over only very short distances, resulting from attraction of induced dipoles is
- (1) van der Waals force (2) hydrogen bonds
(3) electrostatic force (4) hydrophobic and hydrophilic forces
159. A mutation occurring in any cell that is not destined to become a germ cell is called as
- (1) Germ line mutation (2) silent mutation
(3) spontaneous mutation (4) somatic mutation
160. The chromosome state in which each type of chromosome except for the sex chromosomes is always represented twice is
- (1) Diploid state (2) haploid state
(3) multiploid state (4) uniploidy state
161. Totipotency refers to
- (1) Ability of single cell to undergo Apoptosis
(2) Ability of single cells to divide & differentiate
(3) Ability of single cell to stay undivided
(4) Ability of single cell to mutate

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162. Callus is

- (1) A Differentiated mass of cells
- (2) An Undifferentiated mass of cells
- (3) A dead mass of cells
- (4) An organ of a plant

163. BAP is a

- (1) Auxin
- (2) Cytokinin
- (3) Gibberellin
- (4) Ethylene

164. In in vitro culture, Excess of Cytokinin supply results in

- (1) Shoot formation
- (2) Embryo formation
- (3) Root formation
- (4) Flower induction

165. Macerozyme is

- (1) An enzyme mix used for cutting DNA
- (2) An enzyme mix used to fuse plasmids in plants
- (3) An enzyme mix used to isolate protoplast
- (4) An enzyme mix used to join DNA

166. Virus free plants can be obtained from

- (1) Callus culture
- (2) Meristem culture
- (3) Root culture
- (4) Anther culture

167. Viability of protoplasts can be assessed by

- (1) FDA
- (2) Safranin
- (3) Acetocaramine
- (4) Eosin

168. Cybrids are

- (1) Cytoplasmic bridges
- (2) Cytoplasmic hybrids
- (3) Protoplasmic bridges
- (4) Protoplasmic connections

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169. Plant Transformation refers to

- (1) Transfer of plant from *in vitro* to green house
- (2) Transfer of plant from green house to field
- (3) Transfer of foreign gene into plant
- (4) Transfer of foreign protein in plant

170. Ti plasmid contains

- (1) RDNA
- (2) TDNA
- (3) RRNA
- (4) TRNA

171. *Agrobacterium rhizogenes* mediated transformation leads to formation of

- (1) crown gall tumor
- (2) haploids
- (3) new flowers
- (4) hairy roots

172. Acetosyringone is

- (1) A secretory hormone
- (2) A secretory Enzyme
- (3) A secretory sugar
- (4) A phenolic exudate

173. Subculturing of freshly isolated cells in cultures is called as

- (1) primary culture
- (2) passages
- (3) tertiary culture
- (4) cell cultures

174. A cell which has length more than twice its width could be termed as

- (1) Epithelial
- (2) 3T3 cells
- (3) Mesenchymal cells
- (4) fibroblastic

175. Serum protect trypsinised cells from proteolysis by

- (1) proteast inhibitors
- (2) lipases
- (3) lyases
- (4) Hydrolysis

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176. RPMI 1640 stands for

- (1) Roswell park memorial Institute
- (2) Rockwell Park Memorial Institute
- (3) Rapid Prototyping and Mammal Institute
- (4) Rosewood prototyping and manufacturing institute

177. The cells that require attachment for growth is known as

- (1) Dependent cells
- (2) Anchorage Dependent cells
- (3) Independent cells
- (4) Anchorage Independent cells

178. The first attempt of organ culture was done using

- (1) Raft method
- (2) Grid method
- (3) Agar gel
- (4) Plasma clot

179. Which of the following is not the advantages of organ culture?

- (1) The development of foetal organs in vitro is comparable to that in vivo
- (2) Provide information on patterns of growth, differentiation and development
- (3) Organ cultures may replace whole animals in experimentation
- (4) Organ cultures can be maintained only for few months

180. The process of using glass micropipette (0.5 to 5 micrometer) to insert DNA into the nuclear envelope is known as

- (1) Shot gun
- (2) Microinjection
- (3) Electroporation
- (4) Gene gun

181. Typan blue will be

- (1) Uptake by living cells
- (2) uptake by death cells
- (3) Partial uptake by living cells
- (4) exclude by death cells

182. _____ can be used to increase the viscosity of the medium.

- (1) β -mercapto ethanol
- (2) carboxyl methyl cellulose
- (3) glutathione
- (4) laminin

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183. The first bioinformatics database was created by
(1) Richard Durbin (2) Dayhoff (3) Michael j.Dunn (4) D.Pearson
184. The translated genes of genomes that encode proteins are referred to as
(1) Introns (2) Codons
(3) The open reading frame (4) Pseudogenes
185. The identification of drugs through genomic study
(1) Genomics (2) Cheminformatics
(3) Pharmacogenomics (4) Pharmacogenetics
186. An example of Homology and similarity tool
(1) BLAST (2) EMBOSS (3) RASMOL (4) TEMBL
187. One of the following is a primary nucleotide database
(1) PDB (2) Gen Bank (3) Swiss Prot (4) Gen Scan
188. Which of the following levels of protein structure is often stabilized by S-S bonds?
(1) Tertiary structure (2) Primary structure
(3) Secondary structure (4) Super secondary structure
189. The level of polypeptide folding in which the primary sequence coils around itself, stabilized by regularly spaced hydrogen bonds is called
(1) Beta sheet (2) Motif (3) Alpha helix (4) Beta turn
190. The following databases are based on protein secondary structure
(1) Blocks and motif (2) SCOP and CATH
(3) PDB and NCBI (4) DDBJ and SWISSPROT
191. DNA complement of GATCCAT is
(1) TACCTAG (2) CUAGGUA (3) ATGGATC (4) CTAGGTA

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192. How many Open Reading frames do you expect from a DNA SEQUENCE ?
(1) 1 (2) 4 (3) 6 (4) 3
193. Glutamate synthetase that catalyses the formation of glutamine from glutamate and ammonia belongs to the class of _____
(1) ligases (2) transferases (3) oxidoreductases (4) isomerases
194. The covalent backbone of a peptide involves the _____ carbon of each amino acid followed by a peptide bond.
(1) Aromatic (2) α - carbon (3) β - carbon (4) aliphatic
195. Non-covalent bonds can be broken by _____
(1) Extreme pH and salt concentrations (2) formic acid
(3) hydrazine (4) Sanger's reagent
196. The type of secondary structure abundant in globular proteins is
(1) antiparallel β -sheets (2) parallel β - sheets
(3) α - helices (4) turns
197. The enzyme used for the lysis of bacterial cell wall is _____
(1) pectinase (2) cellulase (3) lysozyme (4) penicillinase
198. Clarification of fruit juices is done using _____
(1) glucose isomerase (2) invertase (3) pectinase (4) amylase
199. Which among the following is NOT a covalent modification for enzyme entrapment?
(1) Diazotization (2) transesterification
(3) alkylation (4) peptide bond formation
200. Replacement of inactivated or unwanted enzyme by reversible immobilization is possible in
(1) Entrapment (2) diazotization
(3) ionic binding (4) microencapsulation