Bioinformatices

| 11P/212/24 | Question Booklet No..........9.7..........

INSTRUCTIONS TO CANDIDATES

(Use only **blue/black ball-point pen** in the space above and on both sides of the Answer Sheet)

1. Within 10 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.

2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope.*

3. A separate Answer Sheet is given. *It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.*

4. Write your *Roll Number and Serial Number of the Answer Sheet by pen* in the space provided above.

5. **On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.**

6. No overwriting is allowed in the entries of Roll No., Question Booklet No. and Set No. (if any) on OMR sheet and also Roll No. and OMR Sheet No. on the Question Booklet.

7. Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfair means.

8. Each question in this Booklet is followed by four alternative answers. *For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle* in the corresponding row of the Answer Sheet, by ball-point pen as mentioned in the guidelines given on the first page of the Answer Sheet.

9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.

10. *Note that the answer once filled in ink cannot be changed. If you do not wish to attempt* a question, leave all the circles in the corresponding row blank (such question will be awarded zero mark).

11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.

12. Deposit *only the OMR Answer Sheet* at the end of the Test.

13. You are not permitted to leave the Examination Hall until the end of the Test.

14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण–पृष्ठ पर दिये गए हैं]   [No. of Printed Pages : 38+2

Time/समय : 2½ Hours/घण्टे   **Full Marks/पूर्णांक :** 450

Note/नोट : (1) This paper comprises of Four Sections, viz., Section—A (Physics), Section—B (Chemistry), Section—C (Mathematics) and Section—D (Biology) each having 50 Multiple Choice Questions. A candidate has to attempt any **Three** Sections only, i.e., **150** questions as per his/her choice.

(2) Attempt as many questions as you can. Each question carries **3 marks. One** mark will be deducted for each incorrect answer. Zero mark will be awarded for each unattempted question.

(3) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

Section—A

PHYSICS

1. A shell is fired from a canon with velocity V at an angle θ with the horizontal. At the highest point in its path it explodes into two pieces of equal mass. If one of the pieces retraces its path to the canon, the speed of the other piece immediately after explosion is

   (1) $V \cos \theta$ (2) $2V \cos \theta$ (3) $3V \cos \theta$ (4) $4V \cos \theta$

2. A thin circular ring of mass M and radius R is rotating about its axis with an angular speed ω. Two particles having mass m each are now attached at diametrically opposite points. The angular speed of the ring will become

(1) $\dfrac{\omega M}{M+m}$ (2) $\dfrac{\omega M}{(M+2m)}$ (3) $\dfrac{\omega(M+m)}{M}$ (4) $\dfrac{\omega(M+2m)}{M}$

3. Newton's first law of motion is not valid in

(1) inertial frame of reference

(2) reference from moving with constant speed

(3) non-inertial frame of reference

(4) stationary frame of reference

4. Suppose a tunnel could be dug through the earth from one side to the other along a diameter and a particle of mass m is dropped into the tunnel. If we assume frictional forces and assume that the earth has uniform density ρ, then the particle will execute SHM with time period

(1) $T = \sqrt{\dfrac{3\pi}{G\rho}}$ (2) $T = \sqrt{\dfrac{6\pi}{G\rho}}$ (3) $T = 2\pi\sqrt{\dfrac{3}{G\rho}}$ (4) $T = 2\pi\sqrt{\dfrac{6}{G\rho}}$

5. The equation $\dfrac{d^2y}{dt^2} + 4\dfrac{dy}{dt} + 25y = 0$ represents

(1) damped oscillatory motion   (2) critically damped motion

(3) undamped oscillatory motion   (4) Nonoscillatory motion

6. Imagine a light planet revolving round a very massive star in a circular orbit of radius R with a period of revolution T. If the gravitational force of attraction between the planet and star is proportional to $R^{-5/2}$, then

(1) T^2 is proportional to R^3 (2) T^2 is proportional to $R^{7/2}$

(3) T^2 is proportional to $R^{3/2}$ (4) T^2 is proportional to $R^{5/2}$

7. Four wires of different lengths and diameters are made from the same material. Which of these will have the largest extension when the same force is applied to them?

   (1) Length 300 cm, diameter 3 mm   (2) Length 200 cm, diameter 2 mm

   (3) Length 100 cm, diameter 1 mm   (4) Length 50 cm, diameter 0·5 mm

8. A force F acts tangentially at the highest point of a sphere of mass M kept on a rough horizontal plane. If the sphere rolls without slipping, then the linear acceleration of the centre of mass of the sphere will be

   (1) $\dfrac{3F}{10M}$ (2) $\dfrac{7F}{5M}$ (3) $\dfrac{10F}{7M}$ (4) $\dfrac{5F}{3M}$

9. A thin needle of steel can be made to float in a bowl of pure water without any external support. Its weight is balanced by

   (1) the surface tension of water   (2) the viscosity of water

   (3) the strain energy   (4) the elasticity of water

10. For what value of $\dfrac{v}{c}$ will the relativistic mass of a particle exceed its rest mass by a given fraction f ?

   (1) $\dfrac{\sqrt{f(1+f)}}{2+f}$ (2) $\dfrac{\sqrt{f(2+f)}}{1+f}$ (3) $\dfrac{\sqrt{2f(1+2f)}}{1+f}$ (4) $\dfrac{\sqrt{2f(1+f)}}{2+f}$

11. The velocity of an object whose length appears to be contracted to half of its proper length is

   (1) $\dfrac{1}{\sqrt{3}}c$ (2) $\dfrac{1}{\sqrt{2}}c$ (3) $\dfrac{2}{\sqrt{3}}c$ (4) $\dfrac{\sqrt{3}}{2}c$

12. According to van der Waals' equation of state of a gas, the critical temperature for any gas is given by

   (1) $\dfrac{2a}{Rb}$ (2) $\dfrac{4a}{23Rb}$ (3) $\dfrac{8a}{27Rb}$ (4) $\dfrac{a}{27b^2}$

13. An ideal gas engine operates in a Carnot cycle between 227 °C and 127 °C. It absorbs 6.0×10^4 calories of heat at high temperature. How much work per cycle is this engine capable of performing?

(1) 2.0×10^4 joules approximately

(2) 5.0×10^4 joules approximately

(3) 4.0×10^4 joules approximately

(4) 3.0×10^4 joules approximately

14. Indicate the wrong $T\, dS$ equation from the equations given below

(1) $T\, dS = C_V\, dT + T\left(\dfrac{\partial S}{\partial V}\right)_T dV$

(2) $T\, dS = C_V\, dT + T\left(\dfrac{\partial P}{\partial T}\right)_V dV$

(3) $T\, dS = C_P\, dT + T\left(\dfrac{\partial S}{\partial P}\right)_T dP$

(4) $T\, dS = C_P\, dT + T\left(\dfrac{\partial V}{\partial T}\right)_P dP$

15. 10 gm of water at 0 °C is heated and transformed to 10 gm steam at 100 °C. If the latent heat of vaporization at 100 °C is 538 cal/gm, then the change in entropy is

(1) 14·44 cal/°K

(2) 17·54 cal/°K

(3) 4·56 cal/°K

(4) 14·72 cal/°K

16. The change in the boiling point of water, when the pressure is increased by 10^6 dynes/cm^2 will be about (specific volume of steam 1677 c.c./gm, latent heat of vaporization 540 cal/gm, normal boiling point of water 100 °C)

(1) 28 °C

(2) 12 °C

(3) 15 °C

(4) 40 °C

17. S-T diagram can be plotted for

(1) irreversible processes only

(2) reversible processes only

(3) both reversible and irreversible processes

(4) throttling processes only

18. A solid sphere cools at the rate of 2·8 °C/min, when its temperature is 127 °C. At what rate a solid sphere of copper of twice its radius and having temperature 127 °C will cool if in both cases the surroundings are maintained at 27 °C ?

(1) 0·7 °C/min

(2) 5·6 °C/min

(3) 1·4 °C

(4) 4·2 °C/min

4

19. In solar radiation, the maximum wavelength is 4753 Å. If the constant appearing in 0·00293 °K/m, then the temperature of the sun is

(1) 5040 °K (2) 5742 °K (3) 6060 °K (4) 6238 °K

20. For a van der Waals' gas, the Joule-Thomson coefficient is given by

(1) $\dfrac{1}{C_P}\left[b-\dfrac{2a}{RT}\right]$ (2) $\dfrac{1}{C_V}\left[\dfrac{2a}{RT}-b\right]$ (3) $\dfrac{1}{C_P}\left[\dfrac{2a}{RT}-b\right]$ (4) $\dfrac{1}{C_V}\left[b-\dfrac{2a}{RT}\right]$

21. If $C_{r.m.s.}, \overline{C}$ and C_m denotes respectively, the r.m.s. speed, average speed and maximum probable speed in a gas obeying Maxwellian distribution of molecular speed, then

(1) $C_m>\overline{C}>C_{r.m.s.}$ (2) $\overline{C}>C_{r.m.s.}>C_m$ (3) $C_{r.m.s.}>C_m>\overline{C}$ (4) $C_{r.m.s.}>\overline{C}>C_m$

22. If we pour some drops of water between the plate and lens in Newton's ring experiment, then the rings

(1) will increase in diameter (2) will decrease in diameter

(3) will become elliptical (4) will disappear

23. If mirror M_2 in Michelson interferometer is moved through 0·233 mm, then 792 fringes are counted. The wavelength of the light is

(1) 7000 Å (2) 6560 Å (3) 5880 Å (4) 5330 Å

24. A single slit is illuminated by light whose wavelengths are λ_a and λ_b, so chosen that the first diffraction minima of λ_a coincide with the second diffraction minima of λ_b. The relationship between the two wavelengths is

(1) $\lambda_a=2\lambda_b$ (2) $\lambda_b=2\lambda_a$ (3) $\lambda_a=4\lambda_b$ (4) $\lambda_b=4\lambda_a$

25. If α is equal to half of the phase difference between rays diffracted from the top and bottom of the single slit, then the values of α, at which intensity maxima for single slit diffraction are obtained, are given by

(1) $\sin\alpha=\alpha$ (2) $\tan\alpha=\alpha$ (3) $\cot\alpha=\alpha$ (4) $\cos\alpha=\alpha$

5

26. Two polarizing sheets have their polarizing directions parallel so that the intensity I_m of the transmitted light is maximum. Through what angle must other sheet be turned, if the intensity is to drop by one-half ?

(1) $\pm 60°$ (2) $\pm 90°$ (3) $\pm 30°$ (4) $\pm 45°$

27. A circularly polarized light can be distinguished from unpolarized light by passing it through a

(1) polarising sheet   (2) half-wave plate

(3) quarter-wave plate   (4) Nicol prism

28. A quarter-wave plate is to be used with sodium light ($\lambda = 5890$ Å). What must be its thickness? (Refractive indices for extraordinary and ordinary rays are respectively 1·553 and 1·544)

(1) 0·016 mm   (2) 0·032 mm   (3) 0·008 mm   (4) 0·024 mm

29. The short-term frequency stability of a He-Ne Laser at $\lambda = 1153$ nm is approximately 8 parts in 10^{14}. What is the coherence time?

(1) 28 ms   (2) 96 ms   (3) 48 ms   (4) 64 ms

30. At what angle of incidence should a beam of sodium light be incident on the surface of a diamond to produce a completely polarized reflected light? Assume that the critical angle for diamond is 24·5°

(1) 36·5°   (2) 54·5°   (3) 67·5°   (4) 45·5°

31. The photoelectric threshold for tungsten is 2300 Å. The energy of the emitted electrons from the surface of tungsten by ultraviolet light of wavelength 1800 Å is (Planck's constant $h = 6·6 \times 10^{-34}$ joules-sec)

(1) $2·39 \times 10^{-12}$ joules   (2) $2·39 \times 10^{-19}$ joules

(3) $1·48 \times 10^{-19}$ joules   (4) $3·56 \times 10^{-12}$ joules

32. The Fourier series

$$F(x) = \frac{3}{2} + \frac{6}{\pi}\left(\sin\frac{\pi x}{5} + \frac{1}{3}\sin\frac{3\pi x}{5} + \frac{1}{5}\sin\frac{5\pi x}{5} + \cdots\right)$$

represents

(1) a square wave of amplitude 3 and time period 5

(2) a square wave of amplitude 3 and time period 10

(3) a sawtooth wave of amplitude 3 and time period 5

(4) a sawtooth wave of amplitude 3 and time period 10

33. The average value of the Poynting vector for a plane polarized electromagnetic wave in free space is given by

(1) $\frac{1}{2}\varepsilon_0 E^2$ (2) $\frac{1}{2}C\varepsilon_0 E^2$ (3) $\frac{1}{2}\mu_0 E^2$ (4) $\frac{1}{2}\frac{\mu_0 E^2}{C}$

34. The skip distance for the propagation of electromagnetic waves is defined as

(1) the shortest distance from transmitter for radio wave reception for ionospheric wave propagation

(2) the longest distance from transmitter for radio wave reception for ionospheric wave propagation

(3) the shortest distance from transmitter for radio wave reception for space wave propagation

(4) the longest distance from transmitter for radio wave reception for ground wave propagation

35. A plane transmission grating has 14000 lines/inch and has a length of 6 inches. The smallest wavelength difference that can be resolved in first order for light of wavelength $\lambda = 5 \times 10^{-5}$ cm is

(1) 0·01 Å   (2) 0·36 Å   (3) 0·059 Å   (4) 0·118 Å

36. Which one of the following is not a correct boundary condition at the interface of two different media?

(1) The tangential component of $\vec{E}$ is continuous

(2) The tangential component of $\vec{H}$ is continuous

(3) Normal component of $\vec{B}$ is continuous

(4) Normal component of $\vec{P}$ is continuous

37. Which one of the following is not a Maxwell's equation?

(1) $\oint \vec{D} \cdot \vec{dS} = q$

(2) $\oint \vec{B} \cdot \vec{dl} = \mu_0 I$

(3) $\oint \vec{H} \cdot \vec{dl} = I + \dfrac{\partial}{\partial t} \int \vec{D} \cdot \vec{dS}$

(4) $\oint \vec{E} \cdot \vec{dl} = -\dfrac{\partial}{\partial t} \int \vec{B} \cdot \vec{dS}$

38. For plane electromagnetic waves in vacuum, which of the following statements is false?

(1) These are transverse in nature

(2) Electric and magnetic fields are always in phase

(3) Electric and magnetic fields are mutually perpendicular

(4) Electric and magnetic fields are 90° out of phase

39. Skin depth for electromagnetic waves in a conductor

(1) increases with frequency

(2) decreases with frequency

(3) is independent of frequency

(4) increases with conductivity

40. A thin film of kerosine oil floating on water appears to be multicoloured in sunlight due to

(1) dispersion of light

(2) diffraction of light

(3) polarization of light

(4) interference of light

41. At a given temperature, any semiconductor has the minimum conductivity given by

(1) $2en_i\sqrt{\mu_n/\mu_p}$
(2) $2en_i\sqrt{\mu_n\mu_p}$
(3) $en_i\dfrac{\mu_n^2}{2\mu_p}$
(4) $en_i\dfrac{\mu_p^2}{2\mu_n}$

42. Indicate the false statement about the depletion width in case of a P-N junction diode

(1) It decreases with increasing doping concentration

(2) It decreases with increasing reverse bias

(3) Decrease in depletion width causes increase in junction capacitance

(4) It decreases with increasing forward bias

43. Which of the following Boolean expressions is equivalent to the Boolean expression for OR gate?

(1) $A + \overline{A}B$
(2) $\overline{A} + AB$
(3) $A + A\overline{B}$
(4) $\overline{A} + A\overline{B}$

44. If magnetic monopole is existed, then which of the following Maxwell's equations will be modified?

(1) $\vec{\nabla}\cdot\vec{D}=\rho$
(2) $\vec{\nabla}\cdot\vec{B}=0$
(3) $\vec{\nabla}\times\vec{E}=-\dfrac{\partial\vec{B}}{\partial t}$
(4) $\vec{\nabla}\times\vec{H}=\vec{J}+\dfrac{\partial\vec{D}}{\partial t}$

45. The 'red shift' observed in the spectrum of a galaxy shows that

(1) the universe is contracting

(2) the universe is expanding

(3) the galaxy is red hot

(4) the stars emitting red light are present in the galaxy in large number

46. For a transistor $\alpha =0\cdot98$ and $I_{CO} =25\,\mu A$. If $I_B =0\cdot12$ mA, then I_C will be

(1) 7·13 mA
(2) 5·88 mA
(3) 4·63 mA
(4) 1·25 mA

47. In the output characteristics of any transistor, the saturation region is obtained when

    (1) both junctions are reverse biased

    (2) *E-B* junction forward biased and *C-B* junction reverse biased

    (3) *E-B* junction reverse biased and *C-B* junction forward biased

    (4) both junctions are forward biased

48. On increasing the temperature of *n*-type semiconductor, its *Fermi level*

    (1) moves inside the conduction band

    (2) moves very near the valence band

    (3) moves towards the *centre of the forbidden band*

    (4) moves very near to the conduction band

49. If two soap bubbles of different radii are connected by a tube

    (1) air flows from bigger bubble to the smaller bubble till the sizes become equal

    (2) air flows from bigger bubble to the smaller bubble till the sizes are interchanged

    (3) air flows from smaller bubble to the larger bubble till the sizes become equal

    (4) there is no flow of air

50. A solid sphere falls with a terminal velocity of 20 m/sec in air. If it is allowed to fall in vacuum

    (1) terminal velocity will be greater than 20 m/sec

    (2) terminal velocity will be less than 20 m/sec

    (3) terminal velocity will be 20 m/sec

    (4) there will be no terminal velocity

Section—B

CHEMISTRY

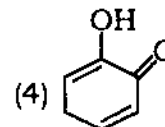51. The number of stereoisomers possible for a compound of the molecular formula, $H_3CCH=CH-CH(OH)Me$ is
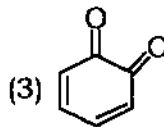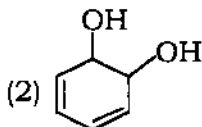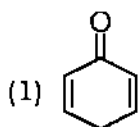
(1) 2   (2) 3   (3) 4   (4) 6

52. Pick out the correct order of the following acids according to decreasing acid strengths

(I) CH_3CH_2COOH, (II) $CH_2=CHCOOH$ and (III) $H-C\equiv C-COOH$

(1) I > II > III   (2) III > I > II   (3) II > I > III   (4) III > II > I

53. Which of the following can show tautomerism?

54. The most stable carbocation is
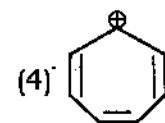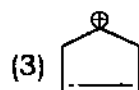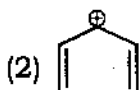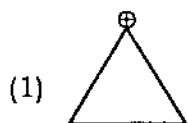
55. The correct order of basicity of the following compounds is

(I) $H_3C-C{\overset{=NH}{\underset{NH_2}{}}}$ (II) $CH_3CH_2NH_2$ (III) $(CH_3)_2NH_2$ (IV) CH_3CONH_2
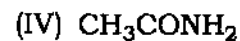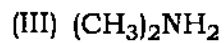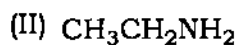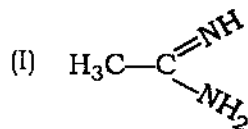
(1) II > I > III > IV   (2) I > III > II > IV   (3) III > I > II > IV   (4) III > II > I > IV

56. Among the following, the most reactive compound towards alcoholic KOH is

(1) $CH_2{=}CHBr$

(2) $CH_3CH_2CH_2Br$

(3) $CH_3COCH_2CH_2Br$

(4) CH_3CH_2Br

57. One mole of an alcohol of molar mass 92 reacts with acetyl chloride to produce acetyl ester of molar mass 218. The number of OH groups present in the alcohol is

(1) 5   (2) 2   (3) 3   (4) 4

58. The isomer of vinyl alcohol is

(1) ethanol   (2) acetaldehyde   (3) propanol   (4) methanol

59. The major product obtained on reaction of phenol with NaOH and CO_2 is

(1) benzoic acid

(2) salicylaldehyde

(3) salicylic acid

(4) phthalic acid

**60.** An organic compound A with molecular formula $C_5H_{10}O$ yields phenylhydrazone and gives a negative iodoform test with Tollens' reagent. Compound A produces pentane on reduction. Identify the compound A

(1) 3-pentanone   (2) 2-pentanone   (3) pentanal   (4) amyl alcohol

61. How many streoisomers are possible for the complex $[M(ABC)(ABC)]^{+2}$ where the ligand is tridentate?

(1) 9   (2) 11   (3) 7   (4) 48

62. EDTA can form complexes with most metal ions. How many coordination numbers can a metal ion have in these complexes?

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

63. The EAN of platinum in $[PtCl_2(NH_3)_4]Cl_2$ is

(1) 86   (2) 36   (3) 54   (4) 18

64. In the year 1960, J. Podlaha and M. Ebert reported a purely inorganic optically active complex $[Cr(HPO_4)_3]^{-3}$. With this discovery, the number of existing purely inorganic optically active complex becomes

(1) 2   (2) 3   (3) 4   (4) many

65. Name of the complex $K_3[Fe(CN)_5NO]$ is

(1) potassium pentacyanonitrosylferrate(III)

(2) potassium pentacyanonitrosylferrate(II)

(3) potassium pentacyanonitrosylferrate(I)

(4) potassium pentacyanonitrosylferrate

66. Which compound from the following has highest covalent character?

(1) $BeCl_2$ (2) $MgCl_2$ (3) $CaCl_2$ (4) $SrCl_2$

67. The shape of $N(SiH_3)_3$ is

(1) planar triangular   (2) trigonal pyramid

(3) tetrahedral   (4) bent

68. Which one of the following is the wrong statement about ClF_3 ?

(1) ClF_3 has two lone pairs

(2) ClF_3 is T-shaped molecule

(3) Two lone pairs occupy equatorial positions of an irregular trigonal bipyramid

(4) Two lone pairs occupy axial positions of an irregular trigonal bipyramid

69. For stationary states described by wave function $\psi(x, t)$, probability density

(1) depends both on time and position

(2) depends only on time

(3) is independent of both time and position

(4) depends only on position

70. Which of the following terms has dominant contribution towards attraction between HCl molecules?

(1) Dipole-dipole interaction

(2) Dipole-induced dipole interaction

(3) Hydrogen bonding

(4) Induced dipole-induced dipole interaction

71. Which is the correct order of elements according to increasing ionization potential?

(1) $Be < B < N < O$ (2) $Be < B < O < N$ (3) $B < Be < O < N$ (4) $B < Be < N < O$

72. Which one of the following is the strongest Lewis acid?

(1) BI_3 (2) BF_3 (3) BCl_3 (4) BBr_3

73. The metal which does not liberate H_2 reacting with dilute acid is

(1) Zn   (2) Mg   (3) Ca   (4) Cu

74. Electronegativity generally increases

(1) erratically across the periodic table   (2) across the period from right to left

(3) descending the group   (4) across the period from left to right

75. Oxidation number of oxygen in NaO_2 is

(1) -2 (2) $-0\cdot5$ (3) $+2$ (4) -1

76. Hess's law is consequence of

    (1) zeroth law of thermodynamics   (2) first law of thermodynamics

    (3) second law of thermodynamics   (4) third law of thermodynamics

77. At constant temperature and pressure a reaction is spontaneous when

    (1) ΔG is negative   (2) ΔH is negative

    (3) ΔS is positive   (4) ΔG° is negative

78. For the endothermic reaction $N_2 + O_2 = 2NO$, equilibrium constant

    (1) increases with decrease in temperature

    (2) decreases with increase in temperature

    (3) remains unaffected by temperature change

    (4) increases with increase in temperature

79. On application of pressure freezing point of water

    (1) remains same   (2) increases   (3) decreases   (4) disappears

80. At constant temperature, enthalpy change (ΔH) and internal energy change (ΔU) for the reaction $Fe_2O_3(s) + 3H_2(g) = 2Fe(s) + 3H_2O(l)$ are related as

    (1) $\Delta H = \Delta U - 3RT$ (2) $\Delta H = \Delta U + RT$ (3) $\Delta H = \Delta U$ (4) $\Delta H = \Delta U + 3RT$

81. The half-life of a reaction is independent of initial concentrations of reactants. So, order of the reaction is

    (1) zero   (2) one   (3) two   (4) three

82. Michaelis constant has a unit of

    (1) sec^{-1} (2) mol   (3) $mol\ lit^{-1}$ (4) $lit\ mol^{-1}$

83. A catalyst

(1) reduces activation energy of a specific path

(2) changes chemically after the reaction

(3) initiates the reaction

(4) shifts the position of equilibrium

84. Unit of specific rate constant (k) for second-order reaction is

(1) sec^{-1} (2) $lit\ mol^{-1}$ (3) $mol\ lit^{-1}\ sec^{-1}$ (4) $lit\ mol^{-1}\ sec^{-1}$

85. The rate of a reaction, $A + B \rightarrow$ products, remains unchanged when the concentration of A is doubled and B is halved. It is also unchanged when the concentration of A is halved and B is doubled. The rate of the reaction is given by

(1) $[A]^2[B]$ (2) $[A]^2[B]^{1/2}$ (3) $[A]^2[B]^2$ (4) $[A][B]^2$

86. In the ^1H NMR spectrum, a singlet at $\delta\ 1\cdot8$ p.p.m. is found for a compound of molecular formula C_4H_6. The compound is

(1) 1-butyne   (2) 2-butyne   (3) cyclobutene   (4) 1,3-butadiene

87. Absorption of infrared radiation by a molecule leads to

(1) electronic transition   (2) vibrational transition

(3) nuclear spin transition   (4) dissociation of molecule

88. The molecule which responds to microwave spectroscopy is

(1) H_2 (2) SO_2 (3) CH_4 (4) SF_6

89. In comparison to the frequency of the vibrational transition the electronic transition frequency is

(1) much higher   (2) much lower   (3) same   (4) slightly lower

90. The frequency of light of wavelength $\lambda = 400$ nm is

(1) $7 \cdot 4945 \times 10^{16}$ Hz

(2) $1 \cdot 3343 \times 10^{-15}$ Hz

(3) $7 \cdot 4945 \times 10^{14}$ Hz

(4) $7 \cdot 4945 \times 10^{-14}$ Hz

91. HCl gas is passed through a saturated solution of NaCl. What will happen?

(1) Solubility of NaCl will increase

(2) HCl will not get into solution

(3) Nothing will happen

(4) Some amount of NaCl will precipitate

92. Solubility of AgCl in water is 10^{-5} mol/lit. What will happen if AgCl is added to 0·02 (M) $NaNO_3$ solution?

(1) Solubility of AgCl increases

(2) Solubility of AgCl decreases

(3) Solubility of AgCl remains same

(4) Some amount of $NaNO_3$ will precipitate

93. In the titration of weak acid by weak base, the suitable indicator is

(1) not available

(2) phenolphthalein

(3) methyl red

(4) methyl orange

94. pH at half-neutralization point of a titration of 10 c.c. 0·1 (N) weak acid ($pK_a = 5$) by a 0·1 (N) strong base is given by

(1) 1·5

(2) 8·9

(3) 5

(4) 5·3

95. Solubility of gas in water

   (1) decreases with increase in pressure

   (2) increases with increase in temperature

   (3) decreases with decrease with temperature

   (4) increases with increase in pressure

96. If K_w and K_d are ionic product and dissociation constant of water respectively, where all the concentration terms are expressed in mol lit^{-1}, then

   (1) $K_w = K_d$ (2) $K_w < K_d$ (3) $K_w > K_d$ (4) $K_w K_d = 1$

97. Buffer capacity is maximum, when

   (1) $\text{pH} = 2pK_a$ (2) $\text{pH} = pK_a$ (3) $\text{pH} \times pK_a = 1$ (4) $\text{pH} = 3pK_a$

98. If some salt is added to water, its boiling point increases because

   (1) entropy of solvent increases   (2) entropy of solute increases

   (3) ΔH_{mix} is positive   (4) ΔH_{mix} is negative

99. Which of the following 0·1 molal solutions has the lowest freezing point?

   (1) Na_2SO_4 (2) $NaCl$ (3) Benzoic acid   (4) Urea

100. An ideal solution is characterized by

   (1) $\Delta S_{mix} = 0$

   (2) $\Delta G_{mix} = 0$

   (3) absence of intermolecular interactions

   (4) $\Delta H_{mix} = 0$

Section—C

MATHEMATICS

101. $\lim\limits_{x \to 0} \left(\dfrac{a^x + b^x + c^x}{3} \right)^{1/x}$ is

(1) $(abc)^{1/3}$ (2) $(abc)^{2/3}$ (3) $(abc)^{-1/3}$ (4) $(abc)^{-2/3}$

102. The function

$$f(x) = \begin{cases} x^3 & \text{when} \quad x \neq 1 \\ 3 & \text{when} \quad x = 1 \end{cases}$$

is

(1) continuous on the left only, at $x = 1$

(2) continuous on the right only, at $x = 1$

(3) continuous at $x = 1$

(4) discontinuous at $x = 1$

103. The function

$$f(x) = x \sin \frac{1}{x}, \quad x \neq 0$$
$$= 0 \qquad , \quad x = 0$$

at $x = 0$ is

(1) continuous and differentiable

(2) continuous but not differentiable

(3) discontinuous but not differentiable

(4) None of these

104. nth derivative of $e^{ax}\cos(bx+c)$ is

   (1) $(a^2+b^2)^{n/2}e^{ax}\cos(bx+c+n\tan^{-1}b/a)$

   (2) $(a^2+b^2)^{n/2}e^{ax}\cos(bx+c-n\tan^{-1}b/a)$

   (3) $(a^2+b^2)^{n/2}e^{ax}\sin(bx+c+n\tan^{-1}b/a)$

   (4) $(a^2+b^2)^{n/2}e^{ax}\sin(bx+c-n\tan^{-1}b/a)$

105. If $y=(\sin^{-1}x)^2$, then

   (1) $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-n^2y_n=0$

   (2) $(1-x^2)y_{n+2}-(2n-1)xy_{n+1}-n^2y_n=0$

   (3) $(1-x^2)y_{n+2}-(2n-1)xy_{n+1}+n^2y_n=0$

   (4) $(1-x^2)y_{n+2}+(2n+1)xy_{n+1}+n^2y_n=0$

106. The asymptotes of the curve $x^2y^2-x^2y-xy^2+x+y+1=0$ parallel to the axis of x are

   (1) $y=0$ and $y=-1$ (2) $y=0$ and $y=1$

   (3) $y=-1$ and $y=1$ (4) $y=1$ and $y=2$

107. The value of

$$\int_{-1}^{1} x\,|x|\,dx$$

is

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

108. The value of

$$\int_0^\pi \log_e (1+\cos x)\, dx$$

is

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

109. If

$$I_n = \int_0^{\pi/4} \tan^n x\, dx$$

then $I_8 + I_6$ is equal to

(1) $\dfrac{1}{4}$ (2) $\dfrac{1}{5}$ (3) $\dfrac{1}{6}$ (4) $\dfrac{1}{7}$

110. If $\phi(a-x) = \phi(x)$, then

$$\int_0^a x\phi(x)\, dx$$

is equal to

(1) $a \int_0^a \phi(x)\, dx$ (2) $x \int_0^a \phi(x)\, dx$ (3) $2a \int_0^{a/2} \phi(x)\, dx$ (4) $\dfrac{a}{2} \int_0^a \phi(x)\, dx$

111. If m is the degree and n the order of the following differential equation

$$\left(\frac{d^2y}{dx^2}\right)^3 + 4\left(\frac{dy}{dx}\right)^2 + 3y^2 + y = 0$$

then

(1) $m = n$ (2) $m > n$ (3) $m < n$ (4) $m \geq n$

112. The differential equation $P\, dx + Q\, dy = 0$ is exact, if

(1) $\dfrac{\partial^2 P}{\partial x\, \partial y} = 0$ (2) $\dfrac{\partial P}{\partial x} = \dfrac{\partial Q}{\partial y}$ (3) $\dfrac{\partial P}{\partial y} = \dfrac{\partial Q}{\partial x}$ (4) $\dfrac{\partial P}{\partial y} \neq \dfrac{\partial Q}{\partial x}$

113. Solution of differential equation $(xy^3 + y)\,dx + 2\,(x^2y^2 + x + y^4)\,dy = 0$ is

(1) $\frac{1}{2}x^2y^4 + xy^2 + \frac{1}{3}y^6 = c$

(2) $\frac{1}{2}x^2y^3 + xy^2 + \frac{1}{3}y^6 = c$

(3) $\frac{1}{2}x^3y + x^2y + \frac{1}{3}y^6 = c$

(4) $\frac{1}{2}x^3y + xy + \frac{1}{3}y^6 = c$

114. $L^{-1}\left\{\log\frac{s+1}{s-1}\right\}$ is

(1) $(2\sinh t)/t$ (2) $(2\cosh t)/t$ (3) $2\sinh t \sin t$ (4) $2\sinh t \cos t$

115. $L\{\,te^{at}\sin(at)\}$, $t > 0$ is

(1) $\dfrac{s-a}{(s-a)^2 + a^2}$ (2) $\dfrac{a(s-a)}{(s-a)^2 + a^2}$ (3) $\dfrac{2a(s-a)}{[(s-a)^2 + a^2]^2}$ (4) $\dfrac{(s-a)^2}{(s-a)^2 + a^2}$

116. $\begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix} \times [\,4 \; 5 \; 2\,] \times \begin{bmatrix} 2 \\ -3 \\ 5 \end{bmatrix} \times [\,3 \; 2\,]$ is matrix having

(1) 2 rows, 3 columns

(2) 3 rows, 2 columns

(3) 3 rows, 1 column

(4) The product is not conformable

117. The equations $3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$ have the solution

(1) $x = 1, \; y = 1, \; z = 2$

(2) $x = 1, \; y = 2, \; z = -1$

(3) $x = -1, \; y = 2, \; z = 1$

(4) $x = -1, \; y = 1, \; z = -2$

118. The system of equations

$$2x + 2y - 3z = 1$$
$$4x + 4y + z = 2$$
$$6x + 6y - z = 3$$

has

(1) a unique solution

(2) infinite solutions

(3) no solution

(4) two solutions

119. If $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$, then A^8 equals to

(1) $25I$

(2) $125I$

(3) $425I$

(4) $625I$

120. The matrix

$$\begin{bmatrix} 0 & 3 & 5+2i \\ 3 & 0 & -9 \\ -5-2i & 9 & 0 \end{bmatrix}$$

is a

(1) symmetric matrix

(2) skew-symmetric matrix

(3) Hermitian matrix

(4) skew-Hermitian matrix

121. The rank of the matrix

$$\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$

is

(1) 4

(2) 3

(3) 2

(4) 1

122. Set of all integers is

(1) a multiplicative group

(2) an additive group

(3) a finite group

(4) not a group

123. Let f be a function of R into itself given by $f(x) = x^3$, then f is

(1) neither one-one nor onto

(2) one-one and onto

(3) onto but not one-one

(4) one-one but not onto

124. Which one of the following groups is non-Abelian?

(1) The additive group of integers

(2) The multiplicative group of non-zero rational numbers

(3) Klein's four-group

(4) Hamiltonian group

125. Taylor's expansion of the function

$$f(x) = \frac{1}{1+x^2}$$

is

(1) $\displaystyle\sum_{n=0}^{\infty} (-1)^n x^{2n}$ for $-1 < x < 1$

(2) $\displaystyle\sum_{n=0}^{\infty} x^{2n}$ for $-1 < x < 1$

(3) $\displaystyle\sum_{n=0}^{\infty} (-1)^n x^{2n}$ for any real x

(4) $\displaystyle\sum_{n=0}^{\infty} (-1)^n x^n$ for $-1 < x < 1$

126. For the function $f(x) = |x|$, Lagrange's mean value theorem does not hold in the interval

(1) $[-1, 0]$

(2) $[0, \frac{1}{2}]$

(3) $[0, 1]$

(4) $[-1, 1]$

127. The third term in the expansion of $x^4 - 3x^3$ in powers of $x - 2$ is

(1) $12(x-2)^3$ (2) $12(x-2)^2$ (3) $6(x-2)$ (4) $6(x-2)^2$

128. Series

$$1 + \frac{2!}{2^2} + \frac{3!}{3^3} + \frac{4!}{4^4} + \cdots$$

is

(1) convergent   (2) divergent   (3) oscillatory   (4) None of these

129. The series $\Sigma \dfrac{1}{n(\log n)^p}$ is

(1) convergent if $p > 0$ (2) convergent if $p > 1$

(3) divergent if $p > 1$ (4) convergent if $0 < p < 1$

130. Series

$$\sum_{n=2}^{\infty} \frac{(-1)^{n-1} x^n}{n(n-1)}, \quad 0 < x < 1$$

is

(1) convergent   (2) divergent   (3) oscillatory   (4) None of these

131. A sequence (a_n) is said to be bounded, if there exists a number k such that for every n

(1) $a_n > k$ (2) $a_n < k$ (3) $a_n = k$ (4) $a_n \geq k$

132. The planes $ax + by + cz + d = 0$ and $a'x + b'y + c'z + d' = 0$ are parallel to each other if

(1) $\dfrac{a}{a'} = \dfrac{b}{b'} = \dfrac{c}{c'}$

(2) $\dfrac{a}{a'} = \dfrac{b}{b'} = \dfrac{d}{d'}$

(3) $aa' + bb' + cc' = 0$

(4) $aa' + bb' + cc' + dd' = 0$

133. The plane $2x + y - z = 12$ touches the sphere $x^2 + y^2 + z^2 = 24$ at the point

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

134. Two spheres of radii 3 and 4 cut orthogonally. The radius of the common circle is

(1) $\dfrac{12}{5}$

(2) $\dfrac{3}{4}$

(3) 1

(4) $\dfrac{4}{3}$

135. The equation of the straight line joining the origin to the point of intersection of the lines $\dfrac{x}{a} + \dfrac{y}{b} = 1$ and $\dfrac{x}{b} + \dfrac{y}{a} = 1$ is

(1) $x = ay$ (2) $x = by$ (3) $x = -by$ (4) $x = y$

136. The distance of the point $(1, 2, 0)$ from the plane $4x + 3y + 12z + 16 = 0$ is

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

137. A tangent plane to the sphere $x^2 + y^2 + z^2 = r^2$ makes intercepts a, b, c on the coordinate axes, then

(1) $\dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{c} = r$

(2) $\dfrac{1}{a^2} + \dfrac{1}{b^2} + \dfrac{1}{c^2} = \dfrac{1}{r^2}$

(3) $\dfrac{1}{a^4} + \dfrac{1}{b^4} + \dfrac{1}{c^4} = \dfrac{1}{r^4}$

(4) $\dfrac{1}{a} + \dfrac{1}{b} + \dfrac{1}{c} = \dfrac{1}{r}$

138. The equation $ax^2 + by^2 + cz^2 + 2ux + 2vy + 2wz + d = 0$ represents a cone, if $\dfrac{u^2}{a} + \dfrac{v^2}{b} + \dfrac{w^2}{c}$ is equal to

(1) 1   (2) d (3) 2   (4) $2d$

139. The plane $x + 2y + \lambda z = 0$ cuts the cone $xy + yz + zx = 0$ in mutually perpendicular generators if λ is equal to

(1) $-\dfrac{3}{2}$ (2) $-\dfrac{2}{3}$ (3) -2 (4) -3

140. The semi-vertical angle of a right circular cone having sets of three mutually perpendicular generators is

(1) $\tan^{-1}\left(\dfrac{1}{\sqrt{2}}\right)$ (2) $\tan^{-1}(\sqrt{2})$ (3) $\tan^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$ (4) $\tan^{-1}(\sqrt{3})$

141. The equation $\sqrt{fx} + \sqrt{gy} + \sqrt{hz} = 0$ represents a

(1) sphere   (2) cylinder   (3) cone   (4) pair of planes

142. The vectors $\langle 1, -2, 1 \rangle$, $\langle 2, 1, -1 \rangle$ and $\langle 7, -4, 1 \rangle$ of R^3 are

(1) linearly dependent

(2) linearly independent

(3) linearly dependent as well as linearly independent

(4) None of these

143. If $f(x) = (x-1)^{2/3} - 1$, then Rolle's theorem is

(1) applicable in $[0, 1]$ (2) applicable in $[0, 2]$

(3) applicable in $[-1, 1]$ (4) not applicable in any interval

144. If $f(x)$ defined on $[a, b]$, is continuous on $[a, b]$ and differentiable in (a, b), then there exists at least one point $c \in (a, b)$ such that

(1) $f(c) = \dfrac{f(b) - f(a)}{b - a}$

(2) $f'(c) = \dfrac{f(b) - f(a)}{b - a}$

(3) $f(c) = 0$

(4) $f'(c) = 0$

145. If λ and μ are the greatest lower bound and the least upper bound respectively of the set $\left\{ 1, \dfrac{1}{2}, \dfrac{1}{3}, \cdots, \dfrac{1}{n} \cdots \right\}$, then the value of $\lambda + \mu$ is

(1) 0

(2) 1

(3) ∞

(4) 2

146. The linear transformation $y = Ax$ is said to be orthogonal if it transforms

(1) $y_1^2 + y_2^2 + y_3^2 + \cdots + y_n^2$ into $x_1^2 + x_2^2 + x_3^2 + \cdots + x_n^2$

(2) $y_1 + y_2 + y_3 + \cdots + y_n$ into $x_1 + x_2 + x_3 + \cdots + x_n$

(3) $y_1^2 + y_2^2 + y_3^2 + \cdots + y_n^2$ into $x_1 + x_2 + x_3 + \cdots + x_n$

(4) $y_1 + y_2 + y_3 + \cdots + y_n$ into $x_1^2 + x_2^2 + x_3^2 + \cdots + x_n^2$

147. The inverse of the matrix

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

is

(1) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{3} \end{bmatrix}$

(2) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{2} \end{bmatrix}$

(3) $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & \frac{1}{3} \end{bmatrix}$

(4) None of these

148. The trace A, where

$$A = \begin{bmatrix} 2 & -1 & 3 \\ 3 & 4 & 5 \\ 4 & 5 & 6 \end{bmatrix}$$

is

(1) 16   (2) 12   (3) $2\sqrt{3}$ (4) 1

149. Let $u = \{(a, b, c, d),$ such that $a + c + d = 0,\ b + c + d = 1\}$ be a subspace of $\mathbb{R}^4$. The dimension of subspace is

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

150. Set of natural numbers is not closed

(1) for subtraction operation   (2) for addition operation

(3) for multiplication operation   (4) for squaring operation

Section—D

BIOLOGY

151. The sub-viral entities devoid of their own DNA/RNA are called

   (1) Gemini viruses (2) Meta viruses   (3) Prions   (4) Caulimo viruses

152. Acquired Immuno Deficiency Virus is also called

   (1) Human Immunodeficiency Virus   (2) Pleuro Pneumonia like Organisms

   (3) Wound Tumor Virus   (4) Satellite Tobacco Necrosis Virus

153. In the family Fabaceae root nodules are formed by various species of *Rhizobium*. Which one of the following is not correct with regard to the root nodules?

   (1) Root nodules are usually exclusively formed in the family Papilionaceae

   (2) Root nodules contain a red-haemoglobin like pigment called leg-haemoglobin

   (3) Leg-haemoglobin can be formed in either partner i.e., *Rhizobium* or legume when grown separately

   (4) Leg-haemoglobin facilitates the diffusion of oxygen for bacterial respiration

154. Plasmids are groups of genes found in the extra-chromosomal state and composed of

   (1) circular double-stranded DNA   (2) single-stranded DNA

   (3) double-stranded RNA   (4) single-stranded RNA

155. *Spirulina maxima* is the richest source of protein in the Plant Kingdom. Which one of the following statements is not correct with regard to *Spirulina*?

   (1) It grows in acidic habitats

   (2) It contains 65% proteins and 3% fiber

   (3) It contains 19% carbohydrate and 4% fats

   (4) At pH 11 it grows almost as monoculture

156. Select the incorrect statement

(1) *Vaucheria* possess multi-flagellate zoospores called synzoospores

(2) *Chlamydomonas nivalis* causes the 'red snow'

(3) The red coloration of the Red Sea is due to a blue-green alga *Trichodesmium erythreum*

(4) *Batrachospermum* is a marine alga

157. Macrandrous and Nannandrous types of Antheridia are produced in

(1) *Oedogonium*   (2) *Vaucheria*   (3) *Ectocarpus*   (4) *Polysiphonia*

158. Which one of the following is an incorrect statement?

(1) *Claviceps purpurea* is the source of Ergot

(2) Work on *Neurospora* resulted in 'one gene one enzyme' concept

(3) Parasexuality was discovered in *Aspergillus nidulans*

(4) In *Pencillium* the conidiophores arise from the foot cell

159. The annual recurrence of rust of wheat in India was first studied by

(1) K. C. Mehta   (2) P. Maheshwari   (3) P. N. Mehra   (4) Birbal Sahani

160. Select out the incorrect statement

(1) Sporophyte of *Riccia* is simplest consisting of capsule only

(2) In *Marchantia*, Antheridia and Archegonia are borne on antheridiophores and archeogoniophores

(3) *Lycopodium* is homosporous and *Selaginella* is heterosporous

(4) Origin of seed habit is indicated by the Bryophytes like *Polytrichum* or *Funaria*

161. Mycorrhiza is the association between the roots of the higher plants and fungi. This relationship is

    (1) parasite   (2) saprophytic   (3) symbiotic   (4) epiphytic

162. The vascular system in the Rhizome of Maiden Hair Fern is usually

    (1) protostele   (2) siphonostele   (3) dictyostele   (4) solenostele

163. In a test cross which one of the following is always used?

    (1) Homozygous recessive   (2) Heterozygous recessive

    (3) Dominant factor   (4) Removal of the nucleotide

164. The alleles undergo interactions that affect the phenotype. Which one of the following statements does not subscribe to this fact?

    (1) Incomplete dominance produces intermediate phenotypes

    (2) Epistasis occurs when one gene interacts with one another

    (3) Certain traits are controlled by several genes

    (4) A single gene cannot have multiple effects on the phenotypes

165. Choose the incorrect statement

    (1) DNA replication is unidirectional

    (2) DNA replication begins at a specific nucleotide sequence

    (3) Synthesis of new DNA strand is catalyzed by the enzyme DNA polymerase

    (4) Okazaki fragments are joined together by DNA ligase

166. Pick up the incorrect statement

(1) A group of adjacent genes that function as a regulatory unit are called operon

(2) Using DNA recombinant technology novel genotypes can be created

(3) DNA library can be genomic or complementary

(4) Polymerase chain reaction cannot amplify segments of DNA

167. Nutmeg of commerce which is extensively used as a spice belongs to the genus

(1) Myristica   (2) Eugenia   (3) Cinnamomum   (4) Strychnos

168. Which one of the following plants is the source of Bhang, Ganja, Charas and fiber?

(1) *Linum usitassimum*   (2) *Cannabis sativa*

(3) *Crotolaria juncea*   (4) *Corchorus capsularis*

169. If cell A with DPD = 5 atm is surrounded by many cells with DPD = 4 atm

(1) the net movement of water will be from the cell A to the surrounding cells

(2) net movement of water will be from the surrounding cells to the cell A

(3) water will not move at all

(4) water movement will depend upon other unknown factors

170. In photosynthesis, how many molecules of ATP and $NADPH_2$ are used?

(1) 12 ATP and 18 $NADPH_2$ (2) 10 ATP and 12 $NADPH_2$

(3) 18 ATP and 12 $NADPH_2$ (4) 38 ATP and 23 $NADPH_2$

171. In the oxidation of one molecule of glucose during respiration 36 molecules of ATP are released as follows

    (1) 2 ATP molecules during glycolysis and 34 ATP molecules during respiratory chain

    (2) 2 ATP molecules during glycolysis and 34 molecules during Krebs' cycle

    (3) All 36 molecules inside mitochondria

    (4) 2 ATP molecules outside the mitochondria and 34 ATP molecules inside the mitochondria

172. National Botanical Research Institute is located in

    (1) Delhi   (2) Mysore   (3) Kolkata   (4) Lucknow

173. Gases responsible for the greenhouse effect are

    (1) CO_2, CH_4 and NO_2 (2) CO_2, CO and NH_3

    (3) CO_2, CH_4, NO_2 and SO_2 (4) CO_2, NO_2 and water vapors

174. The correct path of energy flow in an ecosystem is

    (1) producers → carnivores → herbivores → decomposers

    (2) herbivores → carnivores → decomposers → producers

    (3) producers → herbivores → carnivores → decomposers

    (4) herbivores → producers → carnivores → decomposers

175. Gibberellins are

    (1) growth inhibitors   (2) growth promoters

    (3) not concerned with the growth   (4) of no potential use in agriculture

176. Juvenile hormone is secreted

(1) corpora allata

(2) corpora cardiaca

(3) prothoracic gland

(4) ink gland

177. Centrum of snake is

(1) acoelous

(2) procoelous

(3) heterocoelous

(4) amphicoelous

178. Seymouria is a connecting link between

(1) Arthropoda and Annelida

(2) Amphibia and Reptilia

(3) Aves and Reptilia

(4) Pisces and Amphibia

179. Triple helix structure is exhibited by

(1) myoglobin

(2) ribonuclease

(3) keratin

(4) collagen

180. Which of the following sets is a mismatch?

(1) Glycolysis—PFK

(2) Gluconeogenesis—PEPCK

(3) Krebs' cycle—SDH

(4) Urea cycle—Urease

181. Restriction enzymes are

(1) enzymes that restrict uncontrolled growth of cell which results in cancer

(2) enzymes that restrict DNA synthesis to the minimum necessary level and prevent polyploidy

(3) enzymes that cleave phosphodiester linkages in DNA only at a specific sequence yielding fragments of reproducible sizes

(4) enzymes that cleave polycistronic mRNA to yield individual cistrons

182. A limbless amphibian is

(1) *Siren* (2) *Ophiosaurus* (3) *Triturus* (4) *Ichthyophis*

183. Sea snakes have

(1) laterally compressed tail

(2) dorsoventrally flattened tail

(3) horny scales in tail

(4) cylindrical tail

184. The phenomenon of blocking of pregnancy in a newly conceived female mouse by the odour of a strange male is known as

(1) Whitten effect

(2) Lee-Boot effect

(3) Bruce effect

(4) Sewall-Wright effect

185. In meiosis, synaptonemal complex appears during

(1) diplotene (2) pachytene (3) zygotene (4) metaphase I

186. Gynaecophoric canal is found in

(1) *Hirudinaria* (2) *Schistosoma* (3) *Wuchereria* (4) *Echinococcus*

187. The building block of chitin is

(1) α-D-glucose

(2) β-D-fructose

(3) N-acetyl-β-D-glucosamine

(4) β-D-glucose

188. Which of the following is mismatch?

(1) Ascorbic acid—Scurvy

(2) Thiamine—Beriberi

(3) Niacin—Pellagra

(4) α-Tocopherol—Night blindness

189. Hirudin is secreted by

(1) *Schistosoma*

(2) Salivary gland of Leech

(3) Oesophageal gland of *Nereis*

(4) Albumen gland of Leech

190. Which of the following enzymes catalyzes the formation of acetyl CoA from pyruvate?

(1) Pyruvate decarboxylase

(2) Pyruvate dehydrogenase

(3) Pyruvate carboxylase

(4) Pyruvate kinase

191. The immunoglobulin which gives mucosal immunity is

(1) IgG　　　(2) IgD　　　(3) IgA　　　(4) IgM

192. The name of the plasma protein that enhances the capability of neutrophils to recognize any invading bacteria is

(1) Fibrinogen　　(2) Transferrin　　(3) Opsonins　　(4) Gluten

193. Which of the following is mismatch?

(1) Granulosa cells—Estrogen

(2) Zona glomerulosa—Glucocorticoids

(3) Corpus luteum—Progesterone

(4) Leydig cells—Testosterone

194. Cartilaginous fishes have

(1) ganoid scales　(2) placoid scales　(3) ctenoid scales　(4) cycloid scales

195. Erythropoietin is produced by

(1) liver　　　(2) kidney　　　(3) brain　　　(4) adrenal cortex

196. Taxonomically which of the following set is matched correctly?

   (1) Cuttlefish, Jellyfish, Silverfish

   (2) Bat, Pigeon, Crow

   (3) Lobsters, Cray fishes, Shrimps

   (4) Oyster, Otter, Octopus

197. Indian Rhinoceros is the most important protected species in

   (1) Gir National Park

   (2) Corbett National Park

   (3) Bandipur National Park

   (4) Kaziranga National Park

198. The only poisonous lizard of the world is

   (1) *Varanus*   (2) *Heloderma*   (3) *Draco*   (4) *Ophiosaurus*

199. The archentron develops into

   (1) placenta

   (2) mesoderm

   (3) lumen of the digestive tract

   (4) blastocoel

200. Centrolecithal eggs are found in

   (1) frog   (2) insects   (3) birds   (4) man

★ ★ ★

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली या काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 10 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।

2. परीक्षा भवन में *लिफाफा रहित प्रवेश-पत्र के अतिरिक्त,* लिखा या सादा कोई भी खुला कागज साथ में न लायें।

3. उत्तर-पत्र अलग से दिया गया है। *इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा, केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।*

4. अपना *अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर* पेन से निर्धारित स्थान पर लिखें।

5. उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।

6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक सं० और ओ० एम० आर० पत्र सं० की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।

7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।

8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। *प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिये आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।*

9. प्रत्येक प्रश्न के उत्तर के लिये केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।

10. ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का *उत्तर नहीं देना चाहते हैं,* तो सम्बन्धित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।

11. रफ़ कार्य के लिये प्रश्न-पुस्तिका के मुखपृष्ठ के अन्दर वाले पृष्ठ तथा अंतिम पृष्ठ का प्रयोग करें।

12. परीक्षा के उपरान्त केवल *ओ०एम०आर० उत्तर-पत्र* परीक्षा भवन में जमा कर दें।

13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।

14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की, भागी होगा/होगी।