Important Instructions:

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on side-1 and side-2 carefully with blue/black ball point pen only.

2. The test is of 3 hours duration and Test Booklet contains 180 questions. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For each incorrect response, one mark will be deducted from the total scores. The maximum marks are 720.

3. Use Blue/Black Ball Point Pen only for writing particulars on this page/marking responses.

4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.

5. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.

6. The CODE for this Booklet is G1. Make sure that the CODE printed on Side-2 of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.

7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.

8. Use of white fluid for correction is NOT permissible on the Answer Sheet.

In case of any ambiguity in translation of any question, English version shall be treated as final.
1. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to $L_1$ when mass M is suspended from its free end. The expression for Young’s modulus is:

$$E = \frac{Mg(L_1 - L)}{AL}$$

(1)

$$E = \frac{MgL}{AL_1}$$

(2)

$$E = \frac{MgL}{A(L_1 - L)}$$

(3)

$$E = \frac{MgL_1}{AL}$$

(4)

2. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature $27^\circ C$. Its density is: ($R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$)

$$\rho = \frac{249 \times 10^5}{8.3 \times 27}$$

(1) 0.2 kg/m$^3$

(2) 0.1 kg/m$^3$

(3) 0.02 kg/m$^3$

(4) 0.5 kg/m$^3$

3. Light with an average flux of 20 W/cm$^2$ falls on a non-reflecting surface at normal incidence having surface area 20 cm$^2$. The energy received by the surface during time span of 1 minute is:

$$E = 20 \times 10^{-3} \times 60 \times 10^{-2}$$

(1) $12 \times 10^3$ J

(2) $24 \times 10^3$ J

(3) $48 \times 10^3$ J

(4) $10 \times 10^3$ J

4. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is:

$$a = \frac{g}{2}$$

(1) $g/2$

(2) $g/5$

(3) $g/10$

(4) $g$
5. The mean free path for a gas, with molecular diameter \( d \) and number density \( n \) can be expressed as:

\[
\begin{align*}
(1) & \quad \frac{1}{\sqrt{2} \ n d^2} \\
(2) & \quad \frac{1}{\sqrt{2} \ n^2 d^2} \\
(3) & \quad \frac{1}{\sqrt{2} \ n^2 \pi d^2} \\
(4) & \quad \frac{1}{\sqrt{2} \ n \pi d}
\end{align*}
\]

6. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is:

\[
\begin{align*}
(1) & \quad 340 \text{ m} \\
(2) & \quad 320 \text{ m} \\
(3) & \quad 300 \text{ m} \\
(4) & \quad 360 \text{ m}
\end{align*}
\]

7. The color code of a resistance is given below:

```
Yellow Violet Brown Gold
```

The values of resistance and tolerance, respectively, are:

\[
\begin{align*}
(1) & \quad 47 \text{ k}\Omega, 10\% \\
(2) & \quad 4.7 \text{ k}\Omega, 5\% \\
(3) & \quad 470 \text{ }\text{\Omega}, 5\% \\
(4) & \quad 470 \text{ k}\Omega, 5\%
\end{align*}
\]

8. When a uranium isotope \(^{235}_{92}\text{U}\) is bombarded with a neutron, it generates \(^{89}_{36}\text{Kr}\), three neutrons and:

\[
\begin{align*}
(1) & \quad ^{91}_{40}\text{Zr} \\
(2) & \quad ^{101}_{36}\text{Kr} \\
(3) & \quad ^{103}_{36}\text{Kr} \\
(4) & \quad ^{144}_{56}\text{Ba}
\end{align*}
\]

9. किसी गैस के लिए, जिसका आण्विक व्यास \( d \) तथा संख्या घनत्व \( n \) है, मान्य मुक्त पथ को इस प्रकार व्यक्त किया जा सकता है:

\[
\begin{align*}
(1) & \quad \frac{1}{\sqrt{2} \ n d^2} \\
(2) & \quad \frac{1}{\sqrt{2} \ n^2 d^2} \\
(3) & \quad \frac{1}{\sqrt{2} \ n^2 \pi d^2} \\
(4) & \quad \frac{1}{\sqrt{2} \ n \pi d}
\end{align*}
\]

6. किसी मीनार के शिखर से किसी गेंद को 20 m/s के बेग से उठाकर अग्निशांग फेंका गया है। कुछ समय पश्चात् यह गेंद धरती से 80 m/s के बेग से उतरती है। इस मीनार की ऊंचाई है: (\( g = 10 \text{ m/s}^2 \))

\[
\begin{align*}
(1) & \quad 340 \text{ m} \\
(2) & \quad 320 \text{ m} \\
(3) & \quad 300 \text{ m} \\
(4) & \quad 360 \text{ m}
\end{align*}
\]

7. नीचे किसी प्रतिरोध का वर्ण कोड दिया गया है:

```
[ ] [ ] [ ] [ ]
[ ] [ ] [ ] [ ]
[ ] [ ] [ ] [ ]
[ ] [ ] [ ] [ ]
```

इसके प्रतिरोध और संक्षेप के मान क्रमशः हैं:

\[
\begin{align*}
(1) & \quad 47 \text{ k}\Omega, 10\% \\
(2) & \quad 4.7 \text{ k}\Omega, 5\% \\
(3) & \quad 470 \text{ }\text{\Omega}, 5\% \\
(4) & \quad 470 \text{ k}\Omega, 5\%
\end{align*}
\]

8. जब \(^{235}_{92}\text{U}\) के किसी समस्थानिक \(^{235}_{92}\text{U}\) पर न्यूट्रन बमबारी करता है, तो \(^{89}_{36}\text{Kr}\) और तीन न्यूट्रनों के साथ उत्पत्ति होने वाला नाभिक है:

\[
\begin{align*}
(1) & \quad ^{91}_{40}\text{Zr} \\
(2) & \quad ^{101}_{36}\text{Kr} \\
(3) & \quad ^{103}_{36}\text{Kr} \\
(4) & \quad ^{144}_{56}\text{Ba}
\end{align*}
\]
9. A spherical conductor of radius 10 cm has a charge of $3.2 \times 10^{-7}$ C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere?

$$\left( \frac{1}{4\pi \varepsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \right)$$

(1) $1.28 \times 10^5 \text{ N/C}$
(2) $1.28 \times 10^6 \text{ N/C}$
(3) $1.28 \times 10^7 \text{ N/C}$
(4) $1.28 \times 10^4 \text{ N/C}$

10. A ray is incident at an angle of incidence $i$ on one surface of a small angle prism (with angle of prism $A$) and emerges normally from the opposite surface. If the refractive index of the material of the prism is $\mu$, then the angle of incidence is nearly equal to:

(1) $\frac{2A}{\mu}$
(2) $\mu A$
(3) $A \frac{2}{\mu}$
(4) $A \sqrt{\frac{2}{\mu}}$

11. Two cylinders $A$ and $B$ of equal capacity are connected to each other via a stop cock. $A$ contains an ideal gas at standard temperature and pressure. $B$ is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is:

(1) adiabatic
(2) isochoric
(3) isobaric
(4) isothermal

12. An iron rod of susceptibility 599 is subjected to a magnetising field of $1200 \text{ A m}^{-1}$. The permeability of the material of the rod is:

$$\left( \mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1} \right)$$

(1) $8.0 \times 10^{-5} \text{ T m A}^{-1}$
(2) $2.4\pi \times 10^{-5} \text{ T m A}^{-1}$
(3) $2.4\pi \times 10^{-7} \text{ T m A}^{-1}$
(4) $2.4\pi \times 10^{-4} \text{ T m A}^{-1}$

13. The energy equivalent of 0.5 g of a substance is:

(1) $4.5 \times 10^{13} \text{ J}$
(2) $1.5 \times 10^{13} \text{ J}$
(3) $0.5 \times 10^{13} \text{ J}$
(4) $4.5 \times 10^{16} \text{ J}$
14. A 40 \mu F capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly:

(1) 2.05 A  
(2) 2.5 A  
(3) 25.1 A  
(4) 1.7 A

15. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is: \( c = \text{speed of electromagnetic waves} \)

(1) 1 : 1  
(2) 1 : c  
(3) 1 : c^2  
(4) c : 1

16. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass. The centre of mass of the system from the 5 kg particle is nearly at a distance of:

(1) 50 cm  
(2) 67 cm  
(3) 80 cm  
(4) 33 cm

17. In Young’s double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes:

(1) half  
(2) four times  
(3) one-fourth  
(4) double
19. A charged particle having drift velocity of $7.5 \times 10^{-4} \text{ m s}^{-1}$ in an electric field of $3 \times 10^{-10} \text{ V m}^{-1}$, has a mobility in $\text{m}^2 \text{ V}^{-1} \text{ s}^{-1}$ of:

- (1) $2.5 \times 10^6$
- (2) $2.5 \times 10^{-6}$
- (3) $2.25 \times 10^{-15}$
- (4) $2.25 \times 10^{15}$

20. Dimensions of stress are:

- (1) $[\text{M} \text{L}^2 \text{T}^{-2}]$
- (2) $[\text{M} \text{L}^0 \text{T}^{-2}]$
- (3) $[\text{M} \text{L}^{-1} \text{T}^{-2}]$
- (4) $[\text{MLT}^{-2}]$

21. For which one of the following, Bohr model is not valid?

- (1) Singly ionised helium atom (He$^+$)
- (2) Deuteron atom
- (3) Singly ionised neon atom (Ne$^+$)
- (4) Hydrogen atom

22. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is:

- (1) 0.5
- (2) 1.0
- (3) $-1.0$
- (4) zero

23. A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary is 5 g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is:

- (1) 5.0 g
- (2) 10.0 g
- (3) 20.0 g
- (4) 2.5 g

24. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is:

- (1) $1.83 \times 10^{-7}$ rad
- (2) $7.32 \times 10^{-7}$ rad
- (3) $6.00 \times 10^{-7}$ rad
- (4) $3.66 \times 10^{-7}$ rad
25. The solids which have the negative temperature coefficient of resistance are:
   (1) insulators only
   (2) semiconductors only
   (3) insulators and semiconductors
   (4) metals

26. The capacitance of a parallel plate capacitor with air as medium is 6 \( \mu \)F. With the introduction of a dielectric medium, the capacitance becomes 30 \( \mu \)F. The permittivity of the medium is:
   (1) \( 1.77 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2} \)
   (2) \( 0.44 \times 10^{-10} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2} \)
   (3) \( 5.00 \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2} \)
   (4) \( 0.44 \times 10^{-13} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2} \)

27. The energy required to break one bond in DNA is \( 10^{-20} \) J. This value in eV is nearly:
   (1) 0.6
   (2) 0.06
   (3) 0.006
   (4) 6

28. The increase in the width of the depletion region in a p-n junction diode is due to:
   (1) reverse bias only
   (2) both forward bias and reverse bias
   (3) increase in forward current
   (4) forward bias only

29. The quantities of heat required to raise the temperature of two solid copper spheres of radii \( r_1 \) and \( r_2 \) (\( r_1 = 1.5 r_2 \)) through 1 K are in the ratio:
   (1) \( \frac{9}{4} \)
   (2) \( \frac{3}{2} \)
   (3) \( \frac{5}{3} \)
   (4) \( \frac{27}{8} \)
30. For the logic circuit shown, the truth table is:

\[
\begin{array}{ccc}
\text{A} & \text{B} & \text{Y} \\
0 & 0 & 0 \\
0 & 1 & 1 \\
1 & 0 & 1 \\
1 & 1 & 1 \\
\end{array}
\]

31. For transistor action, which of the following statements is correct?

(1) Base, emitter and collector regions should have same size.
(2) Both emitter junction as well as the collector junction are forward biased.
(3) The base region must be very thin and lightly doped.
(4) Base, emitter and collector regions should have same doping concentrations.

32. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be:

(1) 524 Hz
(2) 536 Hz
(3) 537 Hz
(4) 523 Hz
33. A short electric dipole has a dipole moment of \(16 \times 10^{-9} \text{ C m}\). The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is:

\[
\frac{1}{4\pi \varepsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2
\]

(1) 200 V  
(2) 400 V  
(3) zero  
(4) 50 V

34. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth?

(1) 32 N  
(2) 30 N  
(3) 24 N  
(4) 48 N

35. Which of the following graph represents the variation of resistivity (\(\rho\)) with temperature (T) for copper?

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

36. In a certain region of space with volume 0.2 m\(^3\), the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is:

(1) 0.5 N/C  
(2) 1 N/C  
(3) 5 N/C  
(4) zero
37. The average thermal energy for a mono-atomic gas is: \( k_B \) is Boltzmann constant and \( T \), absolute temperature
(1) \( \frac{3}{2} k_B T \)
(2) \( \frac{5}{2} k_B T \)
(3) \( \frac{7}{2} k_B T \)
(4) \( \frac{1}{2} k_B T \)

38. Find the torque about the origin when a force of \( 3 \hat{J} \) N acts on a particle whose position vector is \( 2 \hat{K} \) m.
(1) \( 6 \hat{J} \) N m
(2) \( -6 \hat{I} \) N m
(3) \( 6 \hat{K} \) N m
(4) \( 6 \hat{I} \) N m

39. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled?
(1) four times
(2) one-fourth
(3) zero
(4) doubled

40. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is:
\( \mu_0 = 4 \pi \times 10^{-7} \) T m A\(^{-1} \)
(1) \( 3.14 \times 10^{-4} \) T
(2) \( 6.28 \times 10^{-5} \) T
(3) \( 3.14 \times 10^{-5} \) T
(4) \( 6.28 \times 10^{-4} \) T

41. The Brewster's angle \( i_b \) for an interface should be:
(1) \( 30^\circ < i_b < 45^\circ \)
(2) \( 45^\circ < i_b < 90^\circ \)
(3) \( i_b = 90^\circ \)
(4) \( 0^\circ < i_b < 30^\circ \)
42. An electron is accelerated from rest through a potential difference of \( V \) volt. If the de Broglie wavelength of the electron is \( 1.227 \times 10^{-2} \) nm, the potential difference is:

(1) \( 10^2 \) V  
(2) \( 10^3 \) V  
(3) \( 10^4 \) V  
(4) \( 10 \) V

43. Taking into account the significant figures, what is the value of \( 9.99 \) m \(-\) \( 0.0099 \) m?

(1) \( 9.98 \) m  
(2) \( 9.980 \) m  
(3) \( 9.9 \) m  
(4) \( 9.9801 \) m

44. A screw gauge has least count of \( 0.01 \) mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is:

(1) \( 0.25 \) mm  
(2) \( 0.5 \) mm  
(3) \( 1.0 \) mm  
(4) \( 0.01 \) mm

45. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is:

(1) \( \frac{3\pi}{2} \) rad  
(2) \( \frac{\pi}{2} \) rad  
(3) \( \pi \) rad  
(4) \( \pi \) rad

46. Match the organism with its use in biotechnology.

(a) *Bacillus thuringiensis*  
(b) *Thermus aquaticus*  
(c) *Agrobacterium tumefaciens*  
(d) *Salmonella typhimurium*

Select the correct option from the following:

(1) (iv) (iii) (i) (ii)  
(2) (iii) (ii) (iv) (i)  
(3) (iii) (iv) (i) (ii)  
(4) (ii) (iv) (iii) (i)
47. Match the following:

| (a) Inhibitor of catalytic activity | (i) Ricin |
| (b) Possess peptide bonds | (ii) Malonate |
| (c) Cell wall material in fungi | (iii) Chitin |
| (d) Secondary metabolite | (iv) Collagen |

Choose the correct option from the following:

1. (iii) (i) (iv) (ii)
2. (iii) (iv) (i) (ii)
3. (ii) (iii) (i) (iv)
4. (ii) (iv) (iii) (i)

48. The plant parts which consist of two generations - one within the other:

(a) Pollen grains inside the anther
(b) Germinated pollen grain with two male gametes
(c) Seed inside the fruit
(d) Embryo sac inside the ovule

Choose the correct option from the following:

1. (a), (b) and (c)
2. (c) and (d)
3. (a) and (d)
4. (a) only

49. The oxygenation activity of RuBisCo enzyme in photorespiration leads to the formation of:

1. 1 molecule of 3-C compound
2. 1 molecule of 6-C compound
3. 1 molecule of 4-C compound and 1 molecule of 2-C compound
4. 2 molecules of 3-C compound

50. In relation to Gross primary productivity and Net primary productivity of an ecosystem, which one of the following statements is correct?

1. Gross primary productivity is always more than net primary productivity.
2. Gross primary productivity and Net primary productivity are one and same.
3. There is no relationship between Gross primary productivity and Net primary productivity.
4. Gross primary productivity is always less than net primary productivity.
51. The product(s) of reaction catalyzed by nitrogenase in root nodules of leguminous plants is/are:
   (1) Nitrate alone
   (2) Ammonia and oxygen
   (3) Ammonia and hydrogen
   (4) Ammonia alone

52. Identify the incorrect statement.
   (1) Sapwood is involved in conduction of water and minerals from root to leaf.
   (2) Sapwood is the innermost secondary xylem and is lighter in colour.
   (3) Due to deposition of tannins, resins, oils etc., heart wood is dark in colour.
   (4) Heart wood does not conduct water but gives mechanical support.

53. Bt cotton variety that was developed by the introduction of toxin gene of *Bacillus thuringiensis* (Bt) is resistant to:
   (1) Fungal diseases
   (2) Plant nematodes
   (3) Insect predators
   (4) Insect pests

54. Which of the following pairs is of unicellular algae?
   (1) *Gelidium* and *Gracilaria*
   (2) *Anabaena* and *Volvox*
   (3) *Chlorella* and *Spirulina*
   (4) *Laminaria* and *Sargassum*

55. Strobili or cones are found in:
   (1) *Pteris*
   (2) *Marchantia*
   (3) *Equisetum*
   (4) *Salvinia*

56. Name the enzyme that facilitates opening of DNA helix during transcription.
   (1) DNA helicase
   (2) DNA polymerase
   (3) RNA polymerase
   (4) DNA ligase
57. Identify the wrong statement with reference to transport of oxygen.

(1) Partial pressure of CO\textsubscript{2} can interfere with O\textsubscript{2} binding with haemoglobin.

(2) Higher H\textsuperscript{+} conc. in alveoli favours the formation of oxyhaemoglobin.

(3) Low pCO\textsubscript{2} in alveoli favours the formation of oxyhaemoglobin.

(4) Binding of oxygen with haemoglobin is mainly related to partial pressure of O\textsubscript{2}.

58. Identify the correct statement with regard to G\textsubscript{1} phase (Gap 1) of interphase.

(1) Reorganisation of all cell components takes place.

(2) Cell is metabolically active, grows but does not replicate its DNA.

(3) Nuclear Division takes place.

(4) DNA synthesis or replication takes place.

59. Which of the following statements about inclusion bodies is incorrect?

(1) These are involved in ingestion of food particles.

(2) They lie free in the cytoplasm.

(3) These represent reserve material in cytoplasm.

(4) They are not bound by any membrane.

60. Match the following diseases with the causative organism and select the correct option.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Typhoid</td>
<td>(i) Wuchereria</td>
</tr>
<tr>
<td>(b) Pneumonia</td>
<td>(ii) Plasmodium</td>
</tr>
<tr>
<td>(c) Filariasis</td>
<td>(iii) Salmonella</td>
</tr>
<tr>
<td>(d) Malaria</td>
<td>(iv) Haemophilus</td>
</tr>
</tbody>
</table>

61. Meiotic division of the secondary oocyte is completed:

(1) At the time of copulation

(2) After zygote formation

(3) At the time of fusion of a sperm with an ovum

(4) Prior to ovulation
62. By which method was a new breed ‘Hisardale’ of sheep formed by using Bikaneri ewes and Marino rams?
   (1) Mutational breeding
   (2) Cross breeding
   (3) Inbreeding
   (4) Out crossing

63. The number of substrate level phosphorylations in one turn of citric acid cycle is:
   (1) One
   (2) Two
   (3) Three
   (4) Zero

64. Choose the correct pair from the following:
   (1) Polymerases - Break the DNA into fragments
   (2) Nucleases - Separate the two strands of DNA
   (3) Exonucleases - Make cuts at specific positions within DNA
   (4) Ligases - Join the two DNA molecules

65. The infectious stage of *Plasmodium* that enters the human body is:
   (1) Sporozoites
   (2) Female gametocytes
   (3) Male gametocytes
   (4) Trophozoites

66. Which of the following is not an attribute of a population?
   (1) Natality
   (2) Mortality
   (3) Species interaction
   (4) Sex ratio
67. Select the correct events that occur during inspiration.

(a) Contraction of diaphragm
(b) Contraction of external inter-costal muscles
(c) Pulmonary volume decreases
(d) Intra pulmonary pressure increases

(1) (c) and (d)
(2) (a), (b) and (d)
(3) only (d)
(4) (a) and (b)

68. According to Robert May, the global species diversity is about:

(1) 20 million
(2) 50 million
(3) 7 million
(4) 1.5 million

69. The QRS complex in a standard ECG represents:

(1) Depolarisation of auricles
(2) Depolarisation of ventricles
(3) Repolarisation of ventricles
(4) Repolarisation of auricles

70. Which of the following statements is not correct?

(1) The proinsulin has an extra peptide called C-peptide.
(2) The functional insulin has A and B chains linked together by hydrogen bonds.
(3) Genetically engineered insulin is produced in E-Coli.
(4) In man insulin is synthesised as a proinsulin.

71. The transverse section of a plant shows following anatomical features:

(a) Large number of scattered vascular bundles surrounded by bundle sheath.
(b) Large conspicuous parenchymatous ground tissue.
(c) Vascular bundles conjoint and closed.
(d) Phloem parenchyma absent.

Identify the category of plant and its part:

(1) Monocotyledonous root
(2) Dicotyledonous stem
(3) Dicotyledonous root
(4) Monocotyledonous stem
72. Select the correct statement.

(1) Glucagon is associated with hypoglycemia.
(2) Insulin acts on pancreatic cells and adipocytes.
(3) Insulin is associated with hyperglycemia.
(4) Glucocorticoids stimulate gluconeogenesis.

73. Montreal protocol was signed in 1987 for control of:

(1) Emission of ozone depleting substances
(2) Release of Green House gases
(3) Disposal of e-wastes
(4) Transport of Genetically modified organisms from one country to another

74. Match the following columns and select the correct option.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) कलॉम छिद्रों के 6-15 (i)</td>
<td>(i) Trygon</td>
</tr>
<tr>
<td>(b) हैटरोसकल तुळ्छ पप्प (ii)</td>
<td>(ii) Cyclostomes</td>
</tr>
<tr>
<td>(c) वायू कोष (iii)</td>
<td>(iii) Chondrichthyes</td>
</tr>
<tr>
<td>(d) चिप्स देख (iv)</td>
<td>(iv) Osteichthyes</td>
</tr>
</tbody>
</table>

(a) (b) (c) (d)
(1) (iii) (iv) (i) (ii)
(2) (iv) (ii) (iii) (i)
(3) (i) (iv) (iii) (ii)
(4) (ii) (iii) (iv) (i)

75. Identify the wrong statement with regard to Restriction Enzymes.

(1) They cut the strand of DNA at palindromic sites.
(2) They are useful in genetic engineering.
(3) Sticky ends can be joined by using DNA ligases.
(4) Each restriction enzyme functions by inspecting the length of a DNA sequence.
76. Match the following with respect to meiosis:

(a) Zygotene (i) Terminalization
(b) Pachytene (ii) Chiasmata
(c) Diplotene (iii) Crossing over
(d) Diakinesis (iv) Synapsis

Select the correct option from the following:

(a) (b) (c) (d)
(1) (iv) (iii) (ii) (i)
(2) (i) (ii) (iv) (iii)
(3) (ii) (iv) (iii) (i)
(4) (iii) (iv) (i) (ii)

77. Cuboidal epithelium with brush border of microvilli is found in:

(1) ducts of salivary glands
(2) proximal convoluted tubule of nephron
(3) eustachian tube
(4) lining of intestine

78. Name the plant growth regulator which upon spraying on sugarcane crop, increases the length of stem, thus increasing the yield of sugarcane crop.

(1) Gibberellin
(2) Ethylene
(3) Abscisic acid
(4) Cytokinin

79. Match the following columns and select the correct option.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Bt cotton</td>
<td>(i) Gene therapy</td>
</tr>
<tr>
<td>(b) Adenosine deaminase deficiency</td>
<td>(ii) Cellular defence</td>
</tr>
<tr>
<td>(c) RNAi</td>
<td>(iii) Detection of HIV infection</td>
</tr>
<tr>
<td>(d) PCR</td>
<td>(iv) Bacillus thuringiensis</td>
</tr>
</tbody>
</table>

(a) (b) (c) (d)
(1) (iii) (ii) (i) (iv)
(2) (ii) (iii) (iv) (i)
(3) (i) (ii) (iii) (iv)
(4) (iv) (i) (ii) (iii)
80. The ovary is half inferior in:
(1) Mustard
(2) Sunflower
(3) Plum
(4) Brinjal

81. Which one of the following is the most abundant protein in the animals?
(1) Collagen
(2) Lectin
(3) Insulin
(4) Haemoglobin

82. If the distance between two consecutive base pairs is 0.34 nm and the total number of base pairs of a DNA double helix in a typical mammalian cell is $6.6 \times 10^9$ bp, then the length of the DNA is approximately:
(1) 2.5 meters
(2) 2.2 meters
(3) 2.7 meters
(4) 2.0 meters

83. The first phase of translation is:
(1) Recognition of DNA molecule
(2) Aminoacylation of tRNA
(3) Recognition of an anti-codon
(4) Binding of mRNA to ribosome

84. Which of the following hormone levels will cause release of ovum (ovulation) from the graffian follicle?
(1) High concentration of Progesterone
(2) Low concentration of LH
(3) Low concentration of FSH
(4) High concentration of Estrogen

85. Flippers of Penguins and Dolphins are examples of:
(1) Convergent evolution
(2) Industrial melanism
(3) Natural selection
(4) Adaptive radiation
86. Identify the wrong statement with reference to the gene 'I' that controls ABO blood groups.
   (1) A person will have only two of the three alleles.
   (2) When \( I^A \) and \( I^B \) are present together, they express same type of sugar.
   (3) Allele 'i' does not produce any sugar.
   (4) The gene (I) has three alleles.

87. Select the option including all sexually transmitted diseases.
   (1) Gonorrhoea, Malaria, Genital herpes
   (2) AIDS, Malaria, Filaria
   (3) Cancer, AIDS, Syphilis
   (4) Gonorrhoea, Syphilis, Genital herpes

88. Match the following columns and select the correct option.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Eosinophils</td>
<td>(i) Immune response</td>
</tr>
<tr>
<td>(b) Basophils</td>
<td>(ii) Phagocytosis</td>
</tr>
<tr>
<td>(c) Neutrophils</td>
<td>(iii) Release histaminase, destructive enzymes</td>
</tr>
<tr>
<td>(d) Lymphocytes</td>
<td>(iv) Release granules containing histamine</td>
</tr>
</tbody>
</table>

89. Match the trophic levels with their correct species examples in grassland ecosystem.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Fourth trophic level</td>
<td>(i) Crow</td>
</tr>
<tr>
<td>(b) Second trophic level</td>
<td>(ii) Vulture</td>
</tr>
<tr>
<td>(c) First trophic level</td>
<td>(iii) Rabbit</td>
</tr>
<tr>
<td>(d) Third trophic level</td>
<td>(iv) Grass</td>
</tr>
</tbody>
</table>

Select the correct option:

<table>
<thead>
<tr>
<th>(a) (b) (c) (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) (iv) (i) (ii) (iii)</td>
</tr>
<tr>
<td>(2) (i) (ii) (iii) (iv)</td>
</tr>
<tr>
<td>(3) (ii) (i) (iii) (iv)</td>
</tr>
<tr>
<td>(4) (iii) (iv) (ii) (i)</td>
</tr>
</tbody>
</table>
90. In light reaction, plastoquinone facilitates the transfer of electrons from:
   (1) Cytb$_{6f}$ complex to PS-I
   (2) PS-I to NADP$^+$
   (3) PS-I to ATP synthase
   (4) PS-II to Cytb$_{6f}$ complex

91. Embryological support for evolution was disapproved by:
   (1) Alfred Wallace
   (2) Charles Darwin
   (3) Oparin
   (4) Karl Ernst von Baer

92. Bilaterally symmetrical and acoelomate animals are exemplified by:
   (1) Platyhelminthes
   (2) Aschelminthes
   (3) Annelida
   (4) Ctenophora

93. Which of the following would help in prevention of diuresis?
   (1) Reabsorption of Na$^+$ and water from renal tubules due to aldosterone
   (2) Atrial natriuretic factor causes vasoconstriction
   (3) Decrease in secretion of renin by JG cells
   (4) More water reabsorption due to undersecretion of ADH

94. Match the following columns and select the correct option.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Clostridium butylicum</td>
<td>(i) Cyclosporin-A</td>
</tr>
<tr>
<td>(b) Trichoderma polysporum</td>
<td>(ii) Butyric Acid</td>
</tr>
<tr>
<td>(c) Monascus purpureus</td>
<td>(iii) Citric Acid</td>
</tr>
<tr>
<td>(d) Aspergillus niger</td>
<td>(iv) Blood cholesterol lowering agent</td>
</tr>
</tbody>
</table>

   (a) (b) (c) (d)
   (1) (ii) (i) (iv) (iii)
   (2) (i) (ii) (iv) (iii)
   (3) (iv) (iii) (i) (ii)
   (4) (iii) (iv) (ii) (i)
95. Some dividing cells exit the cell cycle and enter vegetative inactive stage. This is called quiescent stage (G₀). This process occurs at the end of:
   (1) G₁ phase
   (2) S phase
   (3) G₂ phase
   (4) M phase

96. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive?
   (1) GIFT and ZIFT
   (2) ICSI and ZIFT
   (3) GIFT and ICSI
   (4) ZIFT and IUT

97. Which of the following statements are true for the phylum-Chordata?
   (a) In Urochordata notochord extends from head to tail and it is present throughout their life.
   (b) In Vertebrata notochord is present during the embryonic period only.
   (c) Central nervous system is dorsal and hollow.
   (d) Chordata is divided into 3 subphyla: Hemichordata, Tunicata and Cephalochordata.
   (1) (c) and (a)
   (2) (a) and (b)
   (3) (b) and (c)
   (4) (d) and (c)

98. Snow-blindness in Antarctic region is due to:
   (1) Inflammation of cornea due to high dose of UV-B radiation
   (2) High reflection of light from snow
   (3) Damage to retina caused by infra-red rays
   (4) Freezing of fluids in the eye by low temperature
99. निम्न संबंधों का मिलान कर सही विकल्प का चयन करो।

<table>
<thead>
<tr>
<th>संबंध - I</th>
<th>संबंध - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) पिटूटरीय ग्रंथि</td>
<td>(i) प्रेरक रोग</td>
</tr>
<tr>
<td>(b) थायरोइड ग्रंथि</td>
<td>(ii) डायाबिटीज मेलिटस</td>
</tr>
<tr>
<td>(c) अधिवृक्त ग्रंथि</td>
<td>(iii) डायाबिटीज इसपियडस</td>
</tr>
<tr>
<td>(d) अम्लनायक</td>
<td>(iv) एडीसन रोग</td>
</tr>
</tbody>
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<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
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<td>(i)</td>
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<td>(iv)</td>
<td>(ii)</td>
<td>(i)</td>
<td>(iv)</td>
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</tbody>
</table>

100. निम्नलिखित में से कौन या कठन सही है?

1. एडीसन एक H-बंध के द्वारा थायमीन के साथ युग्म बनाता है।
2. एडीसन तीन H-बंधों के द्वारा थायमीन के साथ युग्म बनाता है।
3. एडीसन, थायमीन के साथ युग्म नहीं बनता।
4. एडीसन दो H-बंधों के द्वारा थायमीन के साथ युग्म बनाता है।

101. अनिवार्य तत्त्वों और पदार्थों में उनके कार्यों के विषय में निम्नलिखित को सुमारित कीजिए :

| (a) स्लॉह | (i) जल का प्रकाश अपगतन |
| (b) जिर्र्क | (ii) पर्या का अंकरण |
| (c) बोरोन | (iii) क्लोरोफिल के जैव संशोधन के लिए आवश्यक |
| (d) मैंगनीज | (iv) आई.ए.ए. जैव संशोधन सही विकल्प चुनिए :

<table>
<thead>
<tr>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
<th>(d)</th>
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<tbody>
<tr>
<td>(1)</td>
<td>(iv)</td>
<td>(iii)</td>
<td>(ii)</td>
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<td>(2)</td>
<td>(iii)</td>
<td>(iv)</td>
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<td>(3)</td>
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<td>(ii)</td>
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<td>(4)</td>
<td>(ii)</td>
<td>(i)</td>
<td>(iv)</td>
</tr>
</tbody>
</table>

102. निम्नलिखित में से कौन एक बीज प्रस्थापित नियांत्रित नहीं वाला निरोधक पदार्थ नहीं है?

1. एमिसिक अम्ल
2. फिंगोलिक अम्ल
3. पैस-एक्सोविक अम्ल
4. जियोरिलिक अम्ल
103. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask:

1. $\text{CH}_3, \text{H}_2, \text{NH}_4$ and water vapor at $800^\circ \text{C}$
2. $\text{CH}_4, \text{H}_2, \text{NH}_3$ and water vapor at $600^\circ \text{C}$
3. $\text{CH}_3, \text{H}_2, \text{NH}_3$ and water vapor at $600^\circ \text{C}$
4. $\text{CH}_4, \text{H}_2, \text{NH}_3$ and water vapor at $800^\circ \text{C}$

104. Experimental verification of the chromosomal theory of inheritance was done by:

1. Sutton
2. Boveri
3. Morgan
4. Mendel

105. The body of the ovule is fused within the funicle at:

1. Micropyle
2. Nucellus
3. Chalaza
4. Hilum

106. Identify the correct statement with reference to human digestive system.

1. Serosa is the innermost layer of the alimentary canal.
2. Ileum is a highly coiled part.
3. Vermiform appendix arises from duodenum.
4. Ileum opens into small intestine.

107. Dissolution of the synaptonemal complex occurs during:

1. Zygote
2. Diplotene
3. Leptotene
4. Pachytene

108. Floridean starch has structure similar to:

1. Amylopectin and glycogen
2. Mannitol and algin
3. Laminarin and cellulose
4. Starch and cellulose
109. The specific palindromic sequence which is recognized by EcoRI is:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>5' - GGAACC - 3'</td>
</tr>
<tr>
<td></td>
<td>3' - CCTTGG - 5'</td>
</tr>
<tr>
<td>(2)</td>
<td>5' - CTTAAG - 3'</td>
</tr>
<tr>
<td></td>
<td>3' - GAATTC - 5'</td>
</tr>
<tr>
<td>(3)</td>
<td>5' - GGATCC - 3'</td>
</tr>
<tr>
<td></td>
<td>3' - CCTAGG - 5'</td>
</tr>
<tr>
<td>(4)</td>
<td>5' - GAATTC - 3'</td>
</tr>
<tr>
<td></td>
<td>3' - CTTAAG - 5'</td>
</tr>
</tbody>
</table>

110. Select the correct match.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Phenylketonuria - Autosomal dominant trait</td>
</tr>
<tr>
<td>(2)</td>
<td>Sickle cell anaemia - Autosomal recessive trait, chromosome-11</td>
</tr>
<tr>
<td>(3)</td>
<td>Thalassemia - X linked</td>
</tr>
<tr>
<td>(4)</td>
<td>Haemophilia - Y linked</td>
</tr>
</tbody>
</table>

111. Identify the substances having glycosidic bond and peptide bond, respectively in their structure:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Glycerol, trypsin</td>
</tr>
<tr>
<td>(2)</td>
<td>Cellulose, lecithin</td>
</tr>
<tr>
<td>(3)</td>
<td>Inulin, insulin</td>
</tr>
<tr>
<td>(4)</td>
<td>Chitin, cholesterol</td>
</tr>
</tbody>
</table>

112. The process of growth is maximum during:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Lag phase</td>
</tr>
<tr>
<td>(2)</td>
<td>Senescence</td>
</tr>
<tr>
<td>(3)</td>
<td>Dormancy</td>
</tr>
<tr>
<td>(4)</td>
<td>Log phase</td>
</tr>
</tbody>
</table>

113. Match the following columns and select the correct option.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Organ of Corti</td>
<td>(i) Connects middle ear and pharynx</td>
</tr>
<tr>
<td>(b) Cochlea</td>
<td>(ii) Coiled part of the labyrinth</td>
</tr>
<tr>
<td>(c) Eustachian tube</td>
<td>(iii) Attached to the oval window</td>
</tr>
<tr>
<td>(d) Stapes</td>
<td>(iv) Located on the basilar membrane</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
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<thead>
<tr>
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<tbody>
<tr>
<td>(1)</td>
<td>(iii)</td>
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<td>(iii)</td>
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<td>(3)</td>
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<td>(ii)</td>
<td>(iv)</td>
</tr>
<tr>
<td>(4)</td>
<td>(ii)</td>
<td>(iii)</td>
<td>(iv)</td>
</tr>
</tbody>
</table>
114. The process responsible for facilitating loss of water in liquid form from the tip of grass blades at night and in early morning is:
(1) Root pressure
(2) Imbibition
(3) Plasmolysis
(4) Transpiration

115. Identify the wrong statement with reference to immunity.
(1) When ready-made antibodies are directly given, it is called "Passive immunity".
(2) Active immunity is quick and gives full response.
(3) Foetus receives some antibodies from mother, it is an example for passive immunity.
(4) When exposed to antigen (living or dead) antibodies are produced in the host's body. It is called "Active immunity".

116. In water hyacinth and water lily, pollination takes place by:
(1) water currents only
(2) wind and water
(3) insects and water
(4) insects or wind

117. Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells?
(1) Peroxisomes
(2) Golgi bodies
(3) Polysomes
(4) Endoplasmic reticulum

118. Which of the following regions of the globe exhibits highest species diversity?
(1) Madagascar
(2) Himalayas
(3) Amazon forests
(4) Western Ghats of India

119. Goblet cells of alimentary canal are modified from:
(1) Columnar epithelial cells
(2) Chondrocytes
(3) Compound epithelial cells
(4) Squamous epithelial cells
120. Which of the following is correct about viroids?

(1) They have free RNA without protein coat.
(2) They have DNA with protein coat.
(3) They have free DNA without protein coat.
(4) They have RNA with protein coat.

121. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their:

(1) Growth response
(2) Defence action
(3) Effect on reproduction
(4) Nutritive value

122. Match the following columns and select the correct option.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Placenta</td>
<td>(i) Androgens</td>
</tr>
<tr>
<td>(b) Zona pellucida</td>
<td>(ii) Human Chorionic Gonadotropin (hCG)</td>
</tr>
<tr>
<td>(c) Bulbo-urethral glands</td>
<td>(iii) Layer of the ovum</td>
</tr>
<tr>
<td>(d) Leydig cells</td>
<td>(iv) Lubrication of the Penis</td>
</tr>
</tbody>
</table>

123. Ray florets have:

(1) Superior ovary
(2) Hypogynous ovary
(3) Half inferior ovary
(4) Inferior ovary

124. Which of the following is put into Anaerobic sludge digester for further sewage treatment?

(1) Floating debris
(2) Effluents of primary treatment
(3) Activated sludge
(4) Primary sludge
125. एन्टरोकाइनेज किसको बदलने में सहायता करता है?
   (1) ट्रिप्सिनोजन को ट्रिप्सिन में
   (2) केसिनोजन को केसिन में
   (3) पेप्सिनोजन को पेप्सिन में
   (4) प्रोटीन को पोलिपेप्टाइड में

126. निम्न संबंधों का मिलान कर सही विकल्प का चयन करें।

<table>
<thead>
<tr>
<th>स्तंभ - I</th>
<th>स्तंभ - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) यूथ, बहुलाई पैडक</td>
<td>(i) एस्टेरियस</td>
</tr>
<tr>
<td>(b) व्यस्कों में अरुण सम्बन्धि एवं (ii) विच्छु</td>
<td>Batch में विपाक सम्बन्धि</td>
</tr>
<tr>
<td>(c) पुष्पकमुख</td>
<td>(iii) टीनोप्लास्टा</td>
</tr>
<tr>
<td>(d) जीवसंग्रहील (iv) लोकस्ता</td>
<td></td>
</tr>
</tbody>
</table>

127. निम्न में मृत की कौनसी अवस्था डाया वाट स्टीज मेलिटस की ओर स्कित करती है?
   (1) यूरेमिया व रीनल कैल्कुली
   (2) कोटोनियरिया एवं ग्लाइकोसूरिया
   (3) रीनल कैल्कुली एवं हाइपरलाइडिआसिया
   (4) यूरेमिया एवं कोटोनियरिया

128. निम्न संबंधों का मिलान कर सही विकल्प का चयन करें।

<table>
<thead>
<tr>
<th>स्तंभ - I</th>
<th>स्तंभ - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) प्लाजी पस्सलीया</td>
<td>(i) दूयसरी एवं सातवी पस्सली के बीच रहित होती हैं</td>
</tr>
<tr>
<td>(b) एक्सोप्लाज</td>
<td>(ii) हूमरस का शीर्ष</td>
</tr>
<tr>
<td>(c) म्युफुला</td>
<td>(iii) क्लेविकल</td>
</tr>
<tr>
<td>(d) ग्लेनोव्नेड गुटा को (iv) उरेस्तुर से नाहीं जुड़ती</td>
<td></td>
</tr>
</tbody>
</table>

125. The enzyme enterokinase helps in conversion of:
   (1) trypsinogen into trypsin
   (2) caseinogen into casein
   (3) pepsinogen into pepsin
   (4) protein into polypeptides

126. Match the following columns and select the correct option.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Gregarious, polyphagous (i) Asterias pest</td>
<td></td>
</tr>
<tr>
<td>(b) Adult with radial (ii) Scorpion symmetry and larva with bilateral symmetry</td>
<td></td>
</tr>
<tr>
<td>(c) Book lungs (iii) Ctenoplosana</td>
<td></td>
</tr>
<tr>
<td>(d) Bioluminescence (iv) Locusta</td>
<td></td>
</tr>
</tbody>
</table>

127. Presence of which of the following conditions in urine are indicative of Diabetes Mellitus?
   (1) Uremia and Renal Calculi
   (2) Ketonuria and Glycosuria
   (3) Renal calculi and Hyperglycaemia
   (4) Uremia and Ketonuria

128. Match the following columns and select the correct option.

<table>
<thead>
<tr>
<th>Column - I</th>
<th>Column - II</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Floating Ribs (i) Located between second and seventh ribs</td>
<td></td>
</tr>
<tr>
<td>(b) Acromion (ii) Head of the Humerus</td>
<td></td>
</tr>
<tr>
<td>(c) Scapula (iii) Clavicle</td>
<td></td>
</tr>
<tr>
<td>(d) Glenoid cavity (iv) Do not connect with the sternum</td>
<td></td>
</tr>
</tbody>
</table>
129. How many true breeding pea plant varieties did Mendel select as pairs, which were similar except in one character with contrasting traits?
   (1) 2
   (2) 14
   (3) 8
   (4) 4

130. If the head of cockroach is removed, it may live for few days because:
   (1) the cockroach does not have nervous system.
   (2) the head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.
   (3) the head holds a 1/3 rd of a nervous system while the rest is situated along the dorsal part of its body.
   (4) the supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

131. Which of the following refer to correct example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action?
   (a) Darwin’s Finches of Galapagos islands.
   (b) Herbicide resistant weeds.
   (c) Drug resistant eukaryotes.
   (d) Man-created breeds of domesticated animals like dogs.
   (1) (a) and (c)
   (2) (b), (c) and (d)
   (3) only (d)
   (4) only (a)

132. Identify the basic amino acid from the following.
   (1) Glutamic Acid
   (2) Lysine
   (3) Valine
   (4) Tyrosine

133. In gel electrophoresis, separated DNA fragments can be visualized with the help of:
   (1) Ethidium bromide in UV radiation
   (2) Acetocarmine in UV radiation
   (3) Ethidium bromide in infrared radiation
   (4) Acetocarmine in bright blue light
134. The sequence that controls the copy number of the linked DNA in the vector, is termed:
(1) Ori site
(2) Palindromic sequence
(3) Recognition site
(4) Selectable marker

135. The roots that originate from the base of the stem are:
(1) Primary roots
(2) Prop roots
(3) Lateral roots
(4) Fibrous roots

136. The calculated spin only magnetic moment of Cr$^{2+}$ ion is:
(1) 4.90 BM
(2) 5.92 BM
(3) 2.84 BM
(4) 3.87 BM

137. Match the following and identify the correct option.
(a) CO(g) + H$_2$(g) (i) Mg(HCO$_3$)$_2$ + Ca(HCO$_3$)$_2$
(b) Temporary hardness of water (ii) An electron deficient hydride
(c) B$_2$H$_6$ (iii) Synthesis gas
(d) H$_2$O$_2$ (iv) Non-planar structure

(a) (b) (c) (d)
(1) (iii) (ii) (i) (iv)
(2) (iii) (iv) (i) (i)
(3) (i) (iii) (ii) (iv)
(4) (iii) (i) (ii) (iv)

138. The mixture which shows positive deviation from Raoult's law is:
(1) Benzene + Toluene
(2) Acetone + Chloroform
(3) Chloroethane + Bromoethane
(4) Ethanol + Acetone
139. Identify the correct statement from the following:
(1) Blister copper has blistered appearance due to evolution of CO₂.
(2) Vapour phase refining is carried out for Nickel by Van Arkel method.
(3) Pig iron can be moulded into a variety of shapes.
(4) Wrought iron is impure iron with 4% carbon.

140. Urea reacts with water to form A which will decompose to form B. B when passed through Cu²⁺ (aq), deep blue colour solution C is formed. What is the formula of C from the following?
(1) [Cu(NH₃)₄]²⁺
(2) Cu(OH)₂
(3) CuCO₃⋅Cu(OH)₂
(4) CuSO₄

141. Hydrolysis of sucrose is given by the following reaction.
Sucrose + H₂O ⇌ Glucose + Fructose
If the equilibrium constant (Kₑ) is 2 × 10¹³ at 300 K, the value of ΔG° at the same temperature will be:
(1) 8.314 J mol⁻¹ K⁻¹ × 300 K × ln(2 × 10¹³)
(2) 8.314 J mol⁻¹ K⁻¹ × 300 K × ln(3 × 10¹³)
(3) −8.314 J mol⁻¹ K⁻¹ × 300 K × ln(4 × 10¹³)
(4) −8.314 J mol⁻¹ K⁻¹ × 300 K × ln(2 × 10¹³)

142. Identify the incorrect match.

<table>
<thead>
<tr>
<th>Name</th>
<th>IUPAC Official Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Unnilunium</td>
</tr>
<tr>
<td>(b)</td>
<td>Unniltrium</td>
</tr>
<tr>
<td>(c)</td>
<td>Unnilhexium</td>
</tr>
<tr>
<td>(d)</td>
<td>Unununnium</td>
</tr>
</tbody>
</table>

143. Which of the following is a basic amino acid?
(1) Alanine
(2) Tyrosine
(3) Lysine
(4) Serine
144. What is the change in oxidation number of carbon in the following reaction?
CH\(_4\)(g) + 4Cl\(_2\)(g) → CCl\(_4\)(l) + 4HCl(g)
(1) 0 to +4
(2) −4 to +4
(3) 0 to −4
(4) +4 to +4

145. Sucrose on hydrolysis gives:
(1) α-D-Glucose + β-D-Glucose
(2) α-D-Glucose + β-D-Fructose
(3) α-D-Fructose + β-D-Fructose
(4) β-D-Glucose + α-D-Fructose

146. The number of Faradays (F) required to produce 20 g of calcium from molten CaCl\(_2\) (Atomic mass of Ca = 40 g mol\(^{-1}\)) is:
(1) 2
(2) 3
(3) 4
(4) 1

147. For the reaction, 2Cl(g) → Cl\(_2\)(g), the correct option is:
(1) \(\Delta H > 0 \text{ and } \Delta S < 0\)
(2) \(\Delta H < 0 \text{ and } \Delta S > 0\)
(3) \(\Delta H < 0 \text{ and } \Delta S < 0\)
(4) \(\Delta H > 0 \text{ and } \Delta S > 0\)

148. The following metal ion activates many enzymes, participates in the oxidation of glucose to produce ATP and with Na, is responsible for the transmission of nerve signals:
(1) Copper
(2) Calcium
(3) Potassium
(4) Iron

149. Identify the incorrect statement.
(1) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.
(2) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
(3) The oxidation states of chromium in CrO\(_4^{2-}\) and Cr\(_2\)O\(_7^{2-}\) are not the same.
(4) Cr\(^{2+}\)(d\(^4\)), Fe\(^{2+}\)(d\(^6\)) are both strong reducing agents.
150. An increase in the concentration of the reactants of a reaction leads to change in:
(1) heat of reaction
(2) threshold energy
(3) collision frequency
(4) activation energy

151. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as:
(1) Cannizzaro’s reaction
(2) Cross Cannizzaro’s reaction
(3) Cross Aldol condensation
(4) Aldol condensation

152. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following?
(1) +R effect of –CH₃ groups
(2) −R effect of –CH₃ groups
(3) Hyperconjugation
(4) −I effect of –CH₃ groups

153. Find out the solubility of Ni(OH)₂ in 0.1 M NaOH. Given that the ionic product of Ni(OH)₂ is \(2 \times 10^{-15}\).
(1) \(2 \times 10^{-8}\) M
(2) \(1 \times 10^{-13}\) M
(3) \(1 \times 10^{8}\) M
(4) \(2 \times 10^{-13}\) M

154. Identify a molecule which does not exist.
(1) Li₂
(2) C₂
(3) O₂
(4) He₂

155. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is:
(a) β-Elimination reaction
(b) Follows Zaitsev rule
(c) Dehydrohalogenation reaction
(d) Dehydration reaction
(1) (a), (c), (d)
(2) (b), (c), (d)
(3) (a), (b), (d)
(4) (a), (b), (c)
156. Measuring Zeta potential is useful in determining which property of colloidal solution?
(1) Solubility
(2) Stability of the colloidal particles
(3) Size of the colloidal particles
(4) Viscosity

157. The number of protons, neutrons and electrons in $^{175}_{71}$Lu, respectively, are:
(1) 104, 71 and 71
(2) 71, 71 and 104
(3) 175, 104 and 71
(4) 71, 104 and 71

158. Identify the correct statements from the following:
(a) CO$_2$(g) is used as refrigerant for ice-cream and frozen food.
(b) The structure of C$_{60}$ contains twelve six carbon rings and twenty five carbon rings.
(c) ZSM-5, a type of zeolite, is used to convert alcohols into gasoline.
(d) CO is colorless and odourless gas.
(1) (a) and (c) only
(2) (b) and (c) only
(3) (c) and (d) only
(4) (a), (b) and (c) only

159. An element has a body centered cubic (bcc) structure with a cell edge of 288 pm. The atomic radius is:
(1) $\frac{\sqrt{2}}{4} \times 288$ pm
(2) $\frac{4}{\sqrt{3}} \times 288$ pm
(3) $\frac{4}{\sqrt{2}} \times 288$ pm
(4) $\frac{\sqrt{3}}{4} \times 288$ pm

160. Paper chromatography is an example of:
(1) Partition chromatography
(2) Thin layer chromatography
(3) Column chromatography
(4) Adsorption chromatography
161. Which of the following oxoacid of sulphur has $-O-O-$ linkage?

(a) $H_2SO_4$, sulphuric acid
(b) $H_2S_2O_8$, peroxodisulphuric acid
(c) $H_2S_2O_7$, pyrosulphuric acid
(d) $H_2SO_3$, sulphurous acid

162. The rate constant for a first order reaction is $4.606 \times 10^{-3}$ s$^{-1}$. The time required to reduce 2.0 g of the reactant to 0.2 g is:

(a) 200 s
(b) 500 s
(c) 1000 s
(d) 100 s

163. Which of the following alkane cannot be made in good yield by Wurtz reaction?

(a) 2,3-Dimethylbutane
(b) n-Heptane
(c) n-Butane
(d) n-Hexane

164. Match the following:

<table>
<thead>
<tr>
<th>Oxide</th>
<th>Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) CO</td>
<td>(i) Basic</td>
</tr>
<tr>
<td>(b) BaO</td>
<td>(ii) Neutral</td>
</tr>
<tr>
<td>(c) $Al_2O_3$</td>
<td>(iii) Acidic</td>
</tr>
<tr>
<td>(d) $Cl_2O_7$</td>
<td>(iv) Amphoteric</td>
</tr>
</tbody>
</table>

Which of the following is correct option?

(a) (b) (c) (d)

(1) (ii) (i) (iv) (iii)
(2) (iii) (iv) (i) (ii)
(3) (iv) (iii) (ii) (i)
(4) (i) (ii) (iii) (iv)

165. A mixture of $N_2$ and Ar gases in a cylinder contains 7 g of $N_2$ and 8 g of Ar. If the total pressure of the mixture of the gases in the cylinder is 27 bar, the partial pressure of $N_2$ is:

[Use atomic masses (in g mol$^{-1}$) : $N = 14$, $Ar = 40$]

(a) 12 bar
(b) 15 bar
(c) 18 bar
(d) 9 bar
166. An alkene on ozonolysis gives methanal as one of the products. Its structure is:

\[
\text{CH}_2 = \text{CH} - \text{CH}_3
\]

167. The freezing point depression constant \(K_f\) of benzene is 5.12 K kg mol\(^{-1}\). The freezing point depression for the solution of molality 0.078 m containing a non-electrolyte solute in benzene is (rounded off upto two decimal places):

\[
\begin{align*}
\text{(1)} & \quad 0.80 \text{ K} \\
\text{(2)} & \quad 0.40 \text{ K} \\
\text{(3)} & \quad 0.60 \text{ K} \\
\text{(4)} & \quad 0.20 \text{ K}
\end{align*}
\]

168. The correct option for free expansion of an ideal gas under adiabatic condition is:

\[
\begin{align*}
\text{(1)} & \quad q = 0, \Delta T < 0 \text{ and } w > 0 \\
\text{(2)} & \quad q < 0, \Delta T = 0 \text{ and } w = 0 \\
\text{(3)} & \quad q > 0, \Delta T > 0 \text{ and } w > 0 \\
\text{(4)} & \quad q = 0, \Delta T = 0 \text{ and } w = 0
\end{align*}
\]

166. एक ऐल्कन पर ऑजोनोलिसिस द्वारा एक उत्पाद के रूप में मेथानल देती है। इसकी संरचना है:

\[
\text{CH}_2 = \text{CH} - \text{CH}_3
\]
169. Which one of the followings has maximum number of atoms?

1. 1 g of Mg(s) [Atomic mass of Mg = 24]
2. 1 g of O
3. 1 g of Li(s) [Atomic mass of Li = 7]
4. 1 g of Ag(s) [Atomic mass of Ag = 108]

170. Identify compound X in the following sequence of reactions:

\[
\text{CH}_3\text{Cl}_2 \xrightarrow{\text{hv}} \text{CHO} \xrightarrow{\text{H}_2\text{O}, 373 \text{ K}} \]

(1) CH
(2) CHCl
(3) CCl
(4) Cl
171. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds?

(1) $\text{SCN}^- < F^- < \text{CN}^- < C_2O_4^{2-}$
(2) $\text{F}^- < \text{SCN}^- < C_2O_4^{2-} < \text{CN}^-$
(3) $\text{CN}^- < C_2O_4^{2-} < \text{SCN}^- < F^-$
(4) $\text{SCN}^- < F^- < C_2O_4^{2-} < \text{CN}^-$

172. Which of the following is a natural polymer?

(1) poly (Butadiene-styrene)
(2) polybutadiene
(3) poly (Butadiene-acrylonitrile)
(4) cis-1,4-polyisoprene

173. Which of the following set of molecules will have zero dipole moment?

(1) Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene
(2) Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene
(3) Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene
(4) Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

174. HCl was passed through a solution of CaCl$_2$, MgCl$_2$ and NaCl. Which of the following compound(s) crystallise(s)?

(1) Only NaCl
(2) Only MgCl$_2$
(3) NaCl, MgCl$_2$ and CaCl$_2$
(4) Both MgCl$_2$ and CaCl$_2$
175. Which of the following is not correct about carbon monoxide?

(1) It reduces oxygen carrying ability of blood.
(2) The carboxyhaemoglobin (haemoglobin bound to CO) is less stable than oxyhaemoglobin.
(3) It is produced due to incomplete combustion.
(4) It forms carboxyhaemoglobin.

176. Anisole on cleavage with HI gives:

(1) \[ \text{I} + \text{CH}_3\text{OH} \]
(2) \[ \text{OH} + \text{C}_2\text{H}_5\text{I} \]
(3) \[ I + \text{C}_2\text{H}_5\text{OH} \]
(4) \[ \text{OH} + \text{CH}_3\text{I} \]
177. Which of the following amine will give the carbylamine test?

- (1) NHCH$_3$
- (2) N(CH$_3$)$_2$
- (3) NHCH$_2$H$_5$
- (4) NH$_2$

178. Reaction between acetone and methylmagnesium chloride followed by hydrolysis will give:

- (1) Sec. butyl alcohol
- (2) Tert. butyl alcohol
- (3) Isobutyl alcohol
- (4) Isopropyl alcohol
179. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be:

(1) Oxygen gas  
(2) H₂S gas  
(3) SO₂ gas  
(4) Hydrogen gas

180. Which of the following is a cationic detergent?

(1) Sodium stearate  
(2) Cetyltrimethyl ammonium bromide  
(3) Sodium dodecylbenzene sulphonate  
(4) Sodium lauryl sulphate
Space For Rough Work
रफ कार्य के लिए जगह / Space For Rough Work
<table>
<thead>
<tr>
<th><strong>निर्देश व्याख्या से पहले:</strong></th>
<th><strong>Read carefully the following instructions:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. पूछे जाने पर प्रत्येक परीक्षार्थी, निरीक्षक को अपना प्रवेश-पत्र दिखाए।</td>
<td>1. Each candidate must show on demand his/her Admit Card to the Invigilator.</td>
</tr>
<tr>
<td>2. अधीश्वर या निरीक्षक की विशेष अनुमति के बिना कोई परीक्षार्थी अपना स्थान न छोड़े।</td>
<td>2. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.</td>
</tr>
<tr>
<td>3. कार्यस्त निरीक्षक को अपना उत्तर पत्र दिए बिना एवं उपस्थिति-पत्रक पर दुबारा हस्ताक्षर किए बिना कोई परीक्षार्थी परीक्षा हॉल नहीं छोड़ेंगे। बाद में किसी परीक्षार्थी ने दूसरी बार उपस्थिति-पत्रक पर हस्ताक्षर नहीं किए तो वह माना जाएगा कि उसने उत्तर पत्र नहीं लौटाया है और यह अनुचित साधन का मामला माना जाएगा।</td>
<td>3. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. <strong>Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.</strong></td>
</tr>
<tr>
<td>4. इलेक्ट्रॉनिक/हस्तचारित परिकल्प का उपयोग बंद है।</td>
<td>4. Use of Electronic/Manual Calculator is prohibited.</td>
</tr>
<tr>
<td>5. परीक्षा-हॉल में आदेश के लिए परीक्षार्थी, परीक्षा के नियमों एवं विनियमों द्वारा नियंत्रित है। अनुचित साधन के सभी मामलों का फैसला इस परीक्षा के नियमों एवं विनियमों के अनुसार होगा।</td>
<td>5. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.</td>
</tr>
<tr>
<td>6. किसी हालत में परीक्षा पुस्तिका और उत्तर पत्र का कोई भाग अलग न करें।</td>
<td>6. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.</td>
</tr>
<tr>
<td>7. परीक्षा पुस्तिका / उत्तर पत्र में दिए गए परीक्षा पुस्तिका संकेत को परीक्षार्थी सही तरीके से उपस्थिति-पत्रक में लिखें।</td>
<td>7. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.</td>
</tr>
</tbody>
</table>