SUBJECT CODE	SUBJECT
A-09-18	LIFE SCIENCES

HALL TICKET NUMBER								PAPER
								II

OMR SHEET NUMBER						NUMBER OF QUESTIONS
						100

DURATION	MAXIMUM MARKS	NUMBER OF PAGES
2 HOURS	200	24

QUESTION BOOKLET NUMBER

This is to certify that, the entries made in the above portion are correctly written and verified.

Candidates Signature **Name and Signature of Invigilator**

Instructions for the Candidates

1. Write your Hall Ticket Number in the space provided on the top of this page.
2. This paper consists of hundred multiple-choice type of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested **to open the booklet and compulsorily examine it as below** :
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal and do not accept an open booklet.
   (ii) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.**
   (iii) After this verification is over, the Test Booklet Number should be entered in the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example : (A) (B) ● (D)
   where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Answer Sheet given to you**. If you mark at any place other than in the circle or half circle or semi circle in the Answer Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your name or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
9. **The candidate must handover the OMR Answer Sheet to the invigilators at the end of the examination compulsorily** and must not carry it with you outside the Examination Hall. The candidate is allowed to take away the carbon copy of OMR Sheet and used Question paper booklet at the end of the examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There is no negative marks for incorrect answers.**

అభ్యర్థికి సూచనలు

1. ఈ పుట పై భాగంలో ఇవ్వబడిన స్థలంలో మీ హాల్‌టికెట్ నంబరు రాయండి.
2. ఈ ప్రశ్న పత్రము నంద (100) బహుళైచ్ఛిక ప్రశ్నలను కలిగి ఉంది.
3. పరీక్ష ప్రారంభమున ఈ ప్రశ్నాపత్రము మీకు ఇవ్వబడుతుంది మొదటి ఐదు నిమిషములలో **ఈ ప్రశ్నాపత్రమును తెరిచి కింద తెలిపిన అంశాలను తప్పనిసరిగా పరిచూసుకోండి.**
   (i) ఈ ప్రశ్న పత్రమును చూడడానికి కవర్ పేజి అంచున ఉన్న కాగితపు సీలును చించండి. కాగితపు సీలులేని మరియు ఇదివరకే తెరిచి ఉన్న ప్రశ్నాపత్రమును మీరు అంగీకరించవద్దు.
   (ii) **కవరు పేజి పై ముద్రించిన సమాచారం ప్రకారం ఈ ప్రశ్న పత్రములోని పేజీల సంఖ్యను మరియు ప్రశ్నల సంఖ్యను సరిచూసుకోండి.పేజీల సంఖ్యకు సంబంధించి గానీ లేదా సూచించిన సంఖ్యలో ప్రశ్నలు లేకపోవుట లేదా నిజప్రతి కాకపోవుట లేదా ప్రశ్నలు క్రమపద్ధతిలో లేకపోవుట లేదా ఏవైనా తేడాలుండుట వంటి దోషపూరితమైన ప్రశ్న పత్రాన్ని పెంటనే మొదటి ఐదు నిమిషాల్లో పరీక్షా పర్యవేక్షకునికి తిరిగి ఇచ్చివేసి దానికి బదులుగా సరిగ్గా ఉన్న ప్రశ్నపత్రాన్ని తీసుకోండి. తదనంతరం ప్రశ్నపత్రము మార్చబడదు అదనపు సమయం ఇవ్వబడదు.**
   (iii) పై విధంగా సరిచూసుకొన్న తర్వాత ప్రశ్నాపత్రం సంఖ్యను OMR పత్రము పై అదేవిధంగా OMR పత్రము సంఖ్యను ఈ ప్రశ్నాపత్రము పై నిర్దిష్ట స్థలంలో రాయవలెను.
4. ప్రతి ప్రశ్నకు నాలుగు ప్రత్యామ్నాయలు (A), (B), (C) మరియు (D) లుగా ఇవ్వబడ్డాయి. ప్రతి ప్రశ్నకు సరైన జవాబును ఎన్నుకొని OMR పత్రములో ప్రతి ప్రశ్నా సంఖ్యకు ఇవ్వబడిన నాలుగు వృత్తాల్లో సరైన జవాబు సూచించే వృత్తాన్ని బాల్ పాయింట్ పెన్‌తో కింద తెలిపిన విధంగా పూరించాలి
   ఉదాహరణ : (A) (B) ● (D)
   (C) సరైన ప్రతిస్పందన అయితే.
5. ప్రశ్నలకు జవాబును ఈ ప్రశ్నపత్రముతో ఇవ్వబడిన OMR పత్రము పైన ఇవ్వబడిన వృత్తాల్లోనే పూరించి గుర్తించాలి. అలాకాక సమాధాన పత్రం పై వేరొక చోట గుర్తించిన లేక సగ వృత్తం లేదా అసంపూర్ణ వృత్తాన్ని నింపిన మీ జవాబు మూల్యాంకనం చేయబడదు.
6. ప్రశ్న పత్రము లోపల ఇచ్చిన సూచనలను జాగ్రత్తగా చదవండి.
7. చిత్తుపనిని ప్రశ్నపత్రము చివర ఇచ్చిన ఖాళీ స్థలములో చేయాలి.
8. OMRపత్రము పై నిర్ణీత స్థలంలో సూచించబడిన వివరాలు తప్పించి ఇతర స్థలంలో మీ గుర్తింపును తెలిపే విధంగా మీ పేరు రాయడం గానీ లేదా ఇతర చిహ్నాలను పెట్టడం గానీ చేసినట్లయితే మీ అనర్హతకు మీరే బాధ్యులవుతారు.
9. **పరీక్ష పూర్తయిన తర్వాత OMR పత్రాన్ని తప్పనిసరిగా పరీక్ష పర్యవేక్షకుడికి ఇవ్వాలి.** వాటిని పరీక్ష గది బయటకు తీసుకువెళ్ళకూడదు. పరీక్ష పూర్తయిన తరువాత అభ్యర్థులు ప్రశ్న పత్రాన్ని OMR పత్రం యొక్క కార్బన్ కాపీని తీసుకువెళ్ళవచ్చు
10. **నీలి/నల్ల రంగు బాల్ పాయింట్ పెన్ మాత్రమే ఉపయోగించాలి.**
11. **లాగరిథమ్ టేబుల్స్, క్యాలిక్యులేటర్‌లు, ఎలక్ట్రానిక్ పరికరాలు మొదలగునవి పరీక్ష గదిలో ఉపయోగించడం నిషేధం.**
12. **తప్పు సమాధానాలకు మార్కుల తగ్గింపు లేదు.**

LIFE SCIENCES

Paper – II

1. The processes of two or more related species becoming more and more dissimilar is called

(A) Convergent evolution

(B) Co-evolution

(C) Homoplasy

(D) Divergent evolution

2. For culturing, plasma from the adult chicken is preferred to mammalian plasma because

(A) It forms a semi-solid coagulum

(B) It is too opaque

(C) It does not produce solid clots

(D) It forms a clear and solid Coagulum even after dilution

3. **Assertion :** Power pack employed for protein electrophoresis converts sinusoidal alternating current to direct current.

Reason : DC current dose not need ionized buffer molecules to separate charged proteins.

(A) Both (A) and (R) are true and (R) is correct explanation of (A)

(B) Both (A) and (B) are true, but (R) is not correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

4. **Assertion (A) :** Storage polysaccharides show more branches than structural polysaccharides in their structure.

Reason (R) : Branched polysaccharides have more free ends and can form more glycoside bonds.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

5. Match the following :

List – I	**List – II**
I. Reverse transcriptase	1. Adenovirus
II. DNA replication	2. Bacteriophage λ
III. Nucleic acid integration	3. Poliovirus
IV. Glycoprotein biosynthesis	4. Influenza virus
	5. HIV

	I	**II**	**III**	**IV**
(A)	5	3	4	2
(B)	3	2	1	5
(C)	3	2	5	4
(D)	5	1	2	4

6. Identify the correct statements with reference to DNA replication.

I. A covalent bond is formed between 3′ -OH and 5′ -p.

II. In general, the DNA replicating enzyme in E-coli is DNA polymerase I.

III. A single strand of DNA can be copied if the four types of nucleotides and polymerase I are provided.

IV. A RNA primer must be complementary in base sequence to some region of the DNA.

(A) I, III

(B) II, III

(C) I, IV

(D) II, IV

7. Which of the following receptors are not part of bacteria/plants ?

(A) Adhesion receptors

(B) Nuclear steroid receptors

(C) Membrane proteins

(D) GPCR

8. **Assertion (A) :** In *Fritillaria* and *plumbagella*, the ploidy of endosperm is 5n.

Reason (R) : Triploid antipodals are present in these two genera.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true, but (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

9. The transport of the liberated _____ electrons through the cytochrome b6f complex occurs with the translocation of _____ protons from the stroma to the thylakoid lumen during photophosphorylation.

(A) 2 electrons, 4 protons

(B) 4 electrons, 8 protons

(C) 3 electrons, 6 protons

(D) 8 electrons, 4 protons

10. The path of urine drainage is

(A) Renal pelvis → Major calyx → Minor calyx → Papillary duct → Ureter → Collecting duct → Urinary bladder

(B) Minor calyx → Major calyx → Papillary duct → Renal pelvis → Ureter → Urinary bladder → Collecting duct

(C) Urinary bladder → Renal pelvis → Ureter → Minor calyx → Major calyx → Collecting duct → Papillary duct

(D) Collecting duct → Papillary duct → Minor calyx → Major calyx → Renal pelvis → Ureter → Urinary bladder

11. Match the following :

List – I	**List – II**
I. ZW-ZZ	1. Grasshopper
II. ZO-ZZ	2. *Drosophila*
III. XX-XO	3. Hen
IV. XX-XY	4. Butterfly

	I	**II**	**III**	**IV**
(A)	1	4	3	2
(B)	3	2	1	4
(C)	3	4	1	2
(D)	2	4	1	3

12. **Assertion (A) :** Torsion is the characteristic feature of class : Pelecypoda.

Reason (R) : Visceral mass is spirally coiled and indicates torsion in *Pila*.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true and (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

13. The sequence of formation of biomass from the north pole to the equator of earth

I. Grassland

II. Savannah

III. Taiga

IV. Tundra

(A) IV, I, III, II

(B) IV, III, I, II

(C) IV, II, III, I

(D) IV, III, II, I

14. In a plant, red flower colour is dominant over white and is single gene controlled. In a population of this plant species, the percentage of red-flowered plants is 64. What would be the frequency of the allele for white flowers ?

(A) 0.2

(B) 0.4

(C) 0.8

(D) 0.6

15. Match the type of vaccine given in Section – A for preventing the disease given in Section – B.

Section – A	Section – B
I. Whooping cough	1. Toxoid
II. Tetanus	2. Live attenuated
III. Tuberculosis	3. Inactivated virus
IV. Hepatitis-B	4. Whole cell inactivated
V. Rabies	5. Recombinent

	I	II	III	IV	V
(A)	4	2	1	5	3
(B)	4	1	2	5	3
(C)	3	2	1	5	4
(D)	3	4	5	2	1

16. **Assertion (A) :** β-galactosidase is commonly incorporated in the plasmid vectors used for cloning.

Reason (R) : β-galactosidase lyses *E-coli* cells that do not contain the plasmid.

(A) Both (A) and (R) are true and (R) is the correct explanation for (A)

(B) Both (A) and (R) are true but (R) is not the correct explanation for (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

17. If the pH of a solution is 8, its hydroxyl ion concentration is

(A) 10^{-8}

(B) ten times more than that of pH7 solution

(C) 10^{-2}

(D) 10^{8}

18. DNA synthesis occurs in a precisely limited portion of the cell cycle in

I. Mouse cells

II. *E.coli*

III. *Saccharomyces cerevisae*

IV. Cyanobacteria

V. HeLa cells

(A) I, III, IV are correct

(B) I, III, V are correct

(C) II, III, IV are correct

(D) II, III, V are correct

19. Which of the following properties are essential for the functioning of an amino-acyl synthetase ?

I. Recognition of a codon.

II. Recognition of the anticodon of a tRNA molecule.

III. Recognition of the amino acid-recognition loop of a tRNA molecule.

IV. Ability to distinguish one amino acid from another.

(A) I, II are correct

(B) I, III are correct

(C) II, III are correct

(D) III, IV are correct

20. In terms of cell communication, what do bacterial pathogens such as *vibrio cholerae* and *Bacillus anthracis* have in common ?

(A) They destroy the receptors for key signalling molecules

(B) They prevent the production of key signalling molecules

(C) They alter the chemical structure of signalling molecules

(D) They block the normal functioning of signal transduction mechanisms

21. The protein of zona pellucida that induces sperm to undergo acrosome reaction

(A) Zona protein 1

(B) Zona protein 2

(C) Zona protein 3

(D) Zona protein 4

22. Identify the correct sequence related to the direction of electron flow during light reaction.

(A) PS II $\rightarrow$ PQ $\rightarrow$ Cytochrome b_6–f $\rightarrow$ PS I $\rightarrow$ Ferrodoxin

(B) PS I $\rightarrow$ PQ $\rightarrow$ Cytochrome b_6–f $\rightarrow$ PS II $\rightarrow$ Ferrodoxin

(C) PS I $\rightarrow$ Ferrodoxin $\rightarrow$ PS II $\rightarrow$ $NADP^+$

(D) PS I $\rightarrow$ PQ $\rightarrow$ PS II $\rightarrow$ $NADP^+$

23. Thermoregulation in animals occurs by the following :

I. Counter correct blood flow

II. Vasodilation

III. Increased aldosterone

IV. Vaso constriction

(A) I and II are correct

(B) II and III are correct

(C) III and IV are correct

(D) I and IV are correct

24. If the environmental component of variance is three times the genetic component, the heritability is

(A) $\frac{1}{4}$

(B) $\frac{1}{2}$

(C) $\frac{1}{3}$

(D) $\frac{3}{4}$

25. The following type is selected to serve as the nomenclatural type from the original material when no holotype was designated at the time of publication or when there exists a syntype

(A) Lectotype

(B) Neotype

(C) Isotype

(D) Paratype

26. **Assertion (A) :** Herbivore insects depend on plants for energy, nutrients and getting secondary metabolites.

Reason (R) : Plants can synthesize primary metabolites. The energy generated is utilized by others only.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

27. Genetic polymorphism is important to evolution because

(A) individual variability provides the raw material for natural selection to act

(B) genes cannot mutate unless they are polymorphic

(C) only heterozygous individuals are selected in natural populations

(D) the Hardy-Weinberg equilibrium is less likely to be disturbed in polymorphic populations

28. Monsanto's Bollgard is a line of transgenic cotton developed by stacking which of the following second Bt gene ?

(A) cry 2AC

(B) cry 2Ab

(C) cry 1AC

(D) cry 1Ab

29. The affinity of IgG molecule to a given antigenic determinant can be determined by one of the following technique

(A) Equilibrium dialysis

(B) LC-MS/MS

(C) Capillary electrophoresis

(D) ELISA

30. Combinations of secondary structural elements found in different proteins molecules having similar functions are called

(A) Prosthetic groups

(B) Pleated sheets

(C) Epitopes

(D) Motifs

31. Match the following :

List – I	List – II
I. DNA synthesis is cell free extracts	1. (3_H)-Thymidine
II. Determining chemical nature of the genetic material	2. (32_P)-Orthophosphate
III. Chromosome replication	3. (35_S)-amino acid
IV. Electron transport	4. (18_O)-oxygen
	5. $(\alpha\text{-}32_P)$-dATP

	I	II	III	IV
(A)	5	3	1	4
(B)	5	2	4	3
(C)	3	4	2	1
(D)	3	2	5	4

32. Assume that DNA labelled with ^{15}N was allowed to replicate on a ^{14}N containing medium. After 3 generations of replication on this medium, the number of DNA strands with ^{14}N and those with $^{15}N + {}^{14}N$ are, respectively

(A) 2, 6

(B) 4, 2

(C) 6, 2

(D) 2, 4

33. Which of the following statements is false about phagocytosis ?

(A) Macrophages die after phagocytizing bacteria but neutrophils regenerate their Lysosomes and survive

(B) Phagocytes have receptors that recognize complement proteins bound to bacteria

(C) Phagocytes move towards an area of infection by a process called chemotaxis

(D) The vacuole in which bacteria are exposed to degradative enzymes is called phagolysosome

34. Out of 1090 cells produced during development of *Caenorhabditis elegans,* how many cells are normally destined to die by apoptosis ?

(A) 111

(B) 121

(C) 131

(D) 141

35. Which one of the following acts as the precursor for the biosynthesis of lysine ?

(A) Cysteine

(B) Pyrroline-5-carboxylate

(C) 2-oxoglutarate

(D) Ornithine

36. **Assertion (A) :** Enterokinase acts on trypsinogen and converts it to trypsin.

Reason (R) : Enterokinase breaks the lysyl bond if there are three acidic amino acid residues before it.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true and (R) is not the correct explanation of (A)

(C) (A) is true and (R) is false

(D) (A) is false and (R) is true

37. Nullisomy is represented as

(A) 2n – 1

(B) 2n + 1

(C) 2n – 2

(D) 2n + 2

38. **Assertion (A) :** Malarial parasite is kept under subclinical levels in the liver and spleen of man.

Reason (R) : Liver and spleen cells actively phagocytose malarial parasites.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true and (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

39. Identify the correct statement.

I. Species that are no longer known to exist in the wild-EXTINCT

II. Species that have a high likelihood of going to extinct in the near future-ENDANGERED

III. Species that may become endangered in the near future-THREATENED

IV. Species that have small total numbers-RARE

(A) I, II, IV are correct

(B) I, II, III are correct

(C) II, III, IV are correct

(D) I, II, III, IV are correct

40. Identify the correct statement among the following :

(A) Monophyletic origin has many common ancestors

(B) Paraphyletic origin has a recent common ancestor but does not contain all descendants

(C) Polyphyletic origin is consistent with recent common ancestor

(D) Paraphyletic origin has no recent common ancestor but contains all descendants

41. Cheese cancer of swiss and similar cheese is caused by

(A) *Oospora crustaceae*

(B) *Oospora caseovorans*

(C) *Oospora auriamticum*

(D) *Bacillus*

42. The structure of 25 KDa protein can be determined at atomic resolution by one of the following spectroscopic techniques

(A) FT-IR spectroscopy

(B) NMR spectroscopy

(C) Raman spectroscopy

(D) UV-Vis-NIR spectroscopy

43. Based on the function, identify the *odd* RNA

(A) sh-RNA

(B) sn-RNA

(C) mi-RNA

(D) si-RNA

44. Microtubules are responsible for

(A) Cytokinesis

(B) The movement of chromosomes during anaphase

(C) Maintaining cell shape

(D) Dynamic cellular processes

45. A certain protein has 124 amino acids. The minimum number of nucleotides expected in the gene encoding this protein, assuming that methionine is not the first amino acid, is

(A) 372

(B) 375

(C) 378

(D) 381

46. Which of the following act as endogenous pyrogens ?

I. Interleukin-1

II. Interleukin-10

III. TNF-α

IV. Histamine

(A) I & III

(B) IV & II

(C) I & II

(D) III & IV

47. Which of the following pairs is not correctly matched ?

(A) Release of more than 2 sperms in an embryo sac is called polyspermy

(B) Polysiphonous pollen grains are present in *HaWa neglecta*

(C) Nucellar adventive embryony is common in *Mangifera*

(D) Endothelium is helpful in the dehiscence of anther at maturity

48. Which of the following act as building blocks for the biosynthesis of terpenes in plants ?

(A) Activated isopentenyl pyrophosphate and activated dimethylallyl pyrophosphate

(B) Gernanyl pyrophosphate and glutamate

(C) Farnesyl pyrophosphate and aspartate

(D) Pyrophosphate and acetyl salicylic acid

49. Arctic and Antarctic fish have significant resistance to freezing because their blood contains much of the following content that has remarkable antifreezing capacity

(A) Glycoproteins

(B) Cholesterol

(C) Amino acids

(D) Carbohydrates

50. When populations are small, gene frequencies can change from generation to generation and some alleles may become fixed in a population. This is called

(A) Assortative mating

(B) Inbreeding

(C) Heterosis

(D) Genetic drift

51. Which of the following is not an indirect drives of Biodiversity change ?

(A) Demographic change

(B) Deforestation

(C) Socio-political factor

(D) Cultural and religious factor

52. **Assertion (A) :** The atmospheric concentration of CO_2 at which photosynthesis just compensates for respiration is referred to as CO_2 compensation point.

Reason (R) : The CO_2 compensation point is reached when the amount of CO_2 uptake is less than that generated through respiration because the level of CO_2 in the atmosphere is more than that required for achieving CO_2 compensation point.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

53. Match the following :

List – I	**List – II**
I. Factor V	1. Hageman factor
II. Factor IX	2. Stuart factor
III. Factor X	3. Labile factor
IV. Factor XII	4. Christmas factor

	I	**II**	**III**	**IV**
(A)	4	3	1	2
(B)	3	4	2	1
(C)	2	4	1	3
(D)	3	2	4	1

54. In a Co-transformation experiment the following data were obtained

Co-transformed genes	**Frequency**
I. pil A and pil B	0.12%
II. pil A and pil C	0.9%
III. pil B and pil C	0.78%

From the frequency of co-transformation, find which gene(s) is/are in the middle position ?

(A) pil A

(B) pil B

(C) pil C

(D) pil A and pil B

55. When heart contracts dorso ventrally, the blood circulation in *Herdmania* is in the order of

(A) Heart → Dorsal aorta → Visceral organs → Ventral aorta → Branchial vessels → Heart

(B) Heart → Branchial vessels → Dorsal aorta → Visceral organs → Ventral aorta → Heart

(C) Heart → Visceral organs → Dorsal aorta → Branchial vessels → Ventral aorta → Heart

(D) Heart → Ventral aorta → Visceral organs → Dorsal aorta → Branchial vessels → Heart

56. Match the following :

List – I	List – II
I. Shannon-Wiener index	1. $(S_1 - C) + (S_2 - C)$
II. Simpson's index	2. $D = \sum_{1=1}^{S} \frac{n_1(n_1 - 1)}{N(N-1)}$
III. Gamma diversity	3. $H = \Sigma [CP_i . \ln (P_i)]$
IV. Beta diversity	4. $S_1 + S_2 - C$

	I	II	III	IV
(A)	2	3	4	1
(B)	2	4	1	3
(C)	3	1	4	2
(D)	3	2	4	1

57. _____ speciation is genetic divergence permitted by geographic location.

(A) Allopatric

(B) Allosteric

(C) Sympatric

(D) Natural selection

58. Consider the following statements in relation to continuous fermentation.

I. Steady state conditions do not exist

II. Rate of product formation changes

III. Mixed cultures can be maintained using chemostat cultures

IV. Substrate content and the biochemical reactions within the cells change

Which pair of the above statements is/are correct ?

(A) I and II

(B) II and III

(C) III and IV

(D) I and IV

59. **Assertion (A) :** Dideoxy nucleoside triphosphates (dd NTPs) are used in DNA sequencing.

Reason (R) : dd NTPs are incorporated very efficiently into DNA.

(A) Both (A) and (R) are true and (R) is the correct explanation for (A)

(B) Both (A) and (R) are true but (R) is not the correct explanation for (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

60. Match the following :

List – I	List – II
I. Nucleotide that is similar to adenosine monophosphate except that its phosphate group is bonded back on to the sugar	1. Cistron
II. A 'G' nucleotide that is added to the 5′ end of eukaryotic m-RNA after transcription	2. CAMP
III. Regulatory protein that activated by cyclic AMP and is involved in transcription of the Lac Operon of *E.coli*	3. CaP
IV. Region of DNA comprising coding sequence for one protein	4. CAP

	I	II	III	IV
(A)	2	4	1	3
(B)	4	3	2	1
(C)	3	4	2	1
(D)	2	3	4	1

61. The generation and maintenance of a membrane electric potential requires

I. Selectively permeable membrane

II. Ion-specific membrane channel proteins

III. Active pumping ions

IV. The presence of cardiolipin in the membrane

(A) I, II, III are correct

(B) I, II, IV are correct

(C) I, III, IV are correct

(D) II, III, IV are correct

62. Exonuclease III attacks preferentially

(A) The 5′ end of a linear DNA

(B) The 5′ end of a linear DNA with 5′ protruding ends

(C) The 3′ end of a linear DNA

(D) The 3′ end of a linear DNA with 5′ protruding ends

63. **Assertion (A) :** p^{53} is a tumor-suppressor protein.

Reason (R) : Several tumors contain mutations in the gene coding for p^{53}.

(A) Both (A) and (R) are true and (R) is the correct explanation for (A)

(B) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

64. In *Plumbago zeylanica*, the pollen is 3-celled and the two sperms and the vegetative nucleus occur in intimate association. Find out the correct sequence of their association.

I. Smaller sperm

II. Vegetative nucleus

III. Larger sperm

(A) I, II and III

(B) III, II and I

(C) II, III and I

(D) III, I and II

65. Match the following :

List – I	**List – II**
I. Zinc	1. Photolysis of water
II. Copper	2. N_2 fixation
III. Manganese	3. Cytochromosome oxidase
IV. Molybdinum	4. IAA biosynthesis

	I	**II**	**III**	**IV**
(A)	3	4	2	1
(B)	3	2	4	1
(C)	2	3	1	4
(D)	4	3	1	2

66. The direction of light striking the retina is in the order of

(A) Bipolar cells → Ganglionic cells → Photo sensory cells → Sensory nerves

(B) Sensory nerves → Ganglionic cells → Bipolar cells → Photo sensory cells

(C) Ganglionic cells → Sensory nerves → Photo sensory cells → Bipolar cells

(D) Photo sensory cells → Ganglionic cells → Bipolar cells → Sensory nerves

67. How many genotypes are present at a locus with five alleles ?

(A) 17

(B) 15

(C) 27

(D) 10

68. **Assertion (A) :** *Peripatus* is a terrestrial animal with elongated and cylindrical body.

Reason (R) : *Peripatus* has haemocoel, jaws, antennal and chitinous external covering which are annelidan affinities.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true and (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

69. Which are not the characters of *Elephas maximus* ?

I. Tip of trunk has two finger like lips

II. Forehead is low and flat without cleft

III. Both male and female have 3.5 meters long tusks

IV. Five nails on each foot

(A) I, II and III are correct

(B) II, III and IV are correct

(C) III, IV and I are correct

(D) IV, I and II are correct

70. **Assertion (A) :** Beelice invade the nests of bees and devour the food in it.

Reason (R) : Robbing is a typical social prey mechanism found in beelice.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true and (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

71. Consider the following in relation to the production of glutamic acid

I. Addition of penicillin to culture increases permeability of cells and produces high amounts of glutamic acid.

II. Addition of saturated fatty acids to culture increases permeability of cells and produces high amounts of glutamic acid.

III. Addition of biotin to culture increases permeability of cells and produces high amounts of glutamic acid.

IV. Creating oleic acid deficiency in oleic acid auxotrophs decreases permeability of cells and produces low amounts of glutamic acid.

Which of the above pair of statements is correct ?

(A) I and II

(B) III and I

(C) IV and III

(D) II and IV

72. A Kanamycin (k^+) and Ampicillin (a^+) resistant plasmid is treated with Bgl I enzyme that cuts in ampicillin gene. The resulting plasmid is annealed to *Drosophila* DNA and then was used to transform *E.Coli*. Which phenotype of the resulting bacterial colonies will have the *Drosophila* DNA ?

(A) $k^+ a^+$

(B) $k^+ a^-$

(C) $k^- a^+$

(D) $k^- a^-$

73. If the average molecular weight of an amino acid is 120 daltons, then what is the weight in grams of a single molecule of protein containing 300 amino acids ?

(A) 6.02×10^{-23} g

(B) 270×10^{-18} g

(C) 53.85×10^{-22} g

(D) 5.98×10^{-20} g

74. Match the following :

List – I	**List – II**
I. Tunica mycin	1. Dimeric proteins present as coating on vesicles
II. Chaperones	2. Blocks addition of N-linked oligosaccharides to proteins
III. Clathrin	3. Proteins that help folding of other proteins
IV. Flippases	4. Aid movement of lipids from one side of the membrane to other side

	I	**II**	**III**	**IV**
(A)	2	3	1	4
(B)	2	1	4	3
(C)	3	2	4	1
(D)	3	4	1	2

75. **Assertion (A) :** A double-strand break in DNA is difficult to repair.

Reason (R) : One strand of DNA acts as a template for the synthesis of new strand of DNA.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true but (R) is not the correct explanation for (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

76. Match the following :

List – I	List – II
I. MAP kinase	1. Signal transduction
II. Nitric oxide	2. Specific to serine and Threonine
III. Calcium	3. Lipid regulators
IV. Phosphoinositides	4. Free radical

	I	II	III	IV
(A)	1	2	3	4
(B)	4	3	2	1
(C)	2	4	1	3
(D)	3	2	1	4

77. The composition and nature of the rays in the secondary xylem can be known in

(A) Transverse Section (T.S.)

(B) Tangential Longitudinal Section (T.L.S.)

(C) Radial Longitudinal Section (R.L.S.)

(D) Transverse and Tangential Longitudinal Sections (T.S. and T.L.S.)

78. Arrange the following processes of Nitrogen cycle in correct sequence :

I. Denitrification

II. Nitrogen fixation

III. Ammonification

IV. Nitrification

(A) II $\rightarrow$ III $\rightarrow$ IV $\rightarrow$ I

(B) I $\rightarrow$ II $\rightarrow$ III $\rightarrow$ IV

(C) I $\rightarrow$ III $\rightarrow$ II $\rightarrow$ IV

(D) IV $\rightarrow$ III $\rightarrow$ II $\rightarrow$ I

79. **Assertion (A) :** Oxygen carrying capacity of blood is reduced by carbon monoxide poisoning.

Reason (R) : Haemoglobin has more affinity to oxygen than carbon monoxide

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true and (R) is not the correct explanation of (A)

(C) (A) is true and (R) is false

(D) (A) is false and (R) is true

80. How many types of X-linked haemophilia have been recognised ?

(A) 2

(B) 4

(C) 3

(D) 5

81. Which of the following combinations is not true ?

(A) Dengue – Virus – Mosquitoes – Diptera

(B) Bubonic plague – Bacteria – Fleas – Siphonaptera

(C) Filaria – Nematode – Mosquitoes – Diptera

(D) African sleeping sickness – Protozoa – Mosquitoes – Diptera

82. **Assertion (A) :** The grazing food chain which starts from a green plant, goes to grazing herbivores and then on to carnivores.

Reason (R) : The detritus food chain goes from non-living organic matter to microorganisms and then to detritus-feeding organisms and their predators.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

83. Match the following :

List – I	**List – II**
I. Two groups are formed with few common traits from a single initial population	1. Adaptive radiation
II. Several groups are formed from a single initial population with increasing degree of difference in a single trait	2. Stabilizing selection
III. Majority of individuals showing a trait increases in a single population	3. Directional selection
IV. Several small populations with widely different characters appear	4. Disruptive selection
	5. No selection

	I	**II**	**III**	**IV**
(A)	3	4	5	2
(B)	4	2	1	5
(C)	4	3	2	1
(D)	5	1	3	4

84. Avermectins (AVM) is a macrocyclic lactones which have potent antihelminthic and insecticidal action. They are generally derived from the mycelia of

(A) *Streptomyces avermitilis*

(B) *Bacillus thuringiensis*

(C) *Pseudomonas bluorescens*

(D) *Lycopersicum peruvianum*

85. Match the correct methods of sterilization from the given groupings

Group – I	**Group – II**
I. Biosafety hood	1. Autoclave
II. Serum	2. γ-radiation
III. Disposable polycarbonate plasticware	3. Filter sterilization
IV. Luria broth	4. Shortwave UV light
	5. Hot air oven

	I	**II**	**III**	**IV**
(A)	4	1	5	3
(B)	2	4	3	1
(C)	2	3	1	5
(D)	4	3	2	1

86. An increase in entropy

I. is an increase in order

II. occurs when a NaCl solution is diluted

III. occurs when a hydrocarbon molecule is removed from an aqueous environment

IV. Occurs in the system when amino acids are linked to form a protein

(A) I, II are correct

(B) I, IV are correct

(C) II, III are correct

(D) II, IV are correct

87. The correct sequence of usage of the following techniques during cell fractionation is

I. Equilibrium density gradiation

II. Sonication

III. Rate-zonal centrifugation

IV. Binding to antibody-coated beads

(A) III, II, IV, I

(B) II, I, IV, III

(C) II, III, I, IV

(D) III, I, II, IV

88. Match the following :

List – I	List – II
I. UV light	1. DNA strand breakage
II. Ionizing radiations	2. Interstrand cross-linking in DNA
III. Alkylating agents	3. Thymidine dimers
IV. Nitrous Acid	4. Depurination

	I	II	III	IV
(A)	3	4	2	1
(B)	2	3	1	4
(C)	3	1	4	2
(D)	2	3	4	1

89. Some of the steps involved in the production of Humulin are given below.

Choose the correct order of sequence of events involved in the production of recombinant Humulin.

I. Synthesis of gene (DNA) for human insulin artificially

II. Culturing recombinant *E.coli* in bioreactors

III. Purification of Humulin

IV. Insertion of human insulin gene into plasmid

V. Introduction of recombinant plasmid into *E.coli*

VI. Extraction of recombinant gene product from *E.coli*

(A) I, III, V, II, IV, VI

(B) II, I, IV, III, V, VI

(C) I, IV, V, II, VI, III

(D) III, V, II, I, VI, IV

90. Match the following :

List – I	List – II
I. Unipotent	1. Cell that can differentiate into cell types of the adult organism
II. Oligopotent	2. Cell that differentiates into multiple different, but closely related all types
III. Pluripotent	3. Cell is more restricted than multipotent but can still differentiate into a few closely related cell types
IV. Multipotent	4. Cell that differentiates into any one cell-type but capable of self renewal

	I	II	III	IV
(A)	4	3	1	2
(B)	2	3	4	1
(C)	4	1	3	2
(D)	4	3	2	1

91. Arrange the intermediate carbon compounds in order of their occurrence in the Calvin cycle.

I. Hexose

II. Heptose

III. Triose

IV. Tetrose

(A) III, I, IV, II

(B) I, II, III, IV

(C) III, IV, I, II

(D) IV, III, II, I

92. Match the following :

List – I Pumping of blood to different organs	List – II Amount
I. Brain	1. 10%
II. Heart	2. 20%
III. Kidneys	3. 25%
IV. Digestive system	4. 15%

	I	II	III	IV
(A)	2	1	4	3
(B)	4	3	2	1
(C)	3	4	1	2
(D)	4	1	2	3

93. **Assertion (A) :** Mendel's law of segregation is also known as purity of gametes.

Reason (R) : The segregation of the two Mendelian factors of a trait results in gametes receiving only one factor out of a pair.

(A) Both (A) and (R) are true and R is the correct explanation of A

(B) Both (A) and (R) are true but R is not the correct explanation of A

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

94. Which of the following combination is not permitted in the IUCN scale ?

(A) Extinct/Vulnerable (Ex/V)

(B) Endangered/Vulnerable (E/V)

(C) Endangered/Rare (E/R)

(D) Vulnerable/Rare (V/R)

95. Which one is not one of the four models of ecological succession ?

(A) Non-random colonization

(B) Facilitation (primary and secondary succession)

(C) Tolerance

(D) Inhibition

Read the passage and answer the questions given below **(96 – 100)** :

Community is an assemblage of various interacting populations living in a particular ecosystem at a given point of time. It comprises of many kinds of plants, animals and microorganisms. The species diversity differs from habitat to habitat. e.g. Marine, terrestrial and desert. *Eichhornia crassipes* is known as common water hyacinth and *Pistia stratiotes*, is often called water cabbage or water lettuce. Fishes, frogs, insects, crustaceans, microorganism, etc., are found in a pond community. Trees, shrubs, hare, buffalo, deer, foxes, tigers etc., are part of forest community. They interact with each other and several types of interactions like prey-predator, host-parasite etc., exist. The community study is not considered as autecology and it is synecology. Similarly, community dominance occurs due to few species that play a dominant role. Grasses are the dominant group in grassland ecosystem and similarly trees in the forest. It can be pine forest or Himalayan cedar (Pinaceae) or teak or Bamboo forest. Thus, the name of dominant plant is given to the community. Community exhibits stratification, which is two types,

(i) *Vertical* (vertical distribution of organisms) and (ii) *Horizontal* (horizontal distribution in a community). Forest community comes under first category as it has trees, shrubs and herbs. Thermal stratification is found among different communities, especially in aquatic ecosystem. Interdependence among the members of community is for food, shelter and reproduction. Finally, it is recorded that a community is stable, dynamic and perennial in an ecosystem.

96. Himalayan cedar is a

(A) Shrub

(B) Epiphyte

(C) Vesicular Arbuscular Mycorrhiya dependent herb

(D) Three

97. Match the following :

List – I	List – II
I. Vertical stratification	1. Forest ecosystem
II. Teak dominance	2. Food
III. Water lettuce and water hyacinth	3. Name of the forest ecosystem
IV. Community interdependence	4. Aquatic community

	I	II	III	IV
(A)	1	4	3	2
(B)	1	3	4	2
(C)	4	2	3	1
(D)	2	4	1	3

98. Which of the following are not related to community ?

(A) Dominance

(B) Stratification

(C) Stable

(D) Autecology

99. Thermal stratification among community is found in

(A) Gut microflora

(B) Teak forest

(C) Grassland

(D) Aquatic ecosystem

100. **Assertion (A) :** Grassland ecosystem is made up of grasses, other plants, animals and microbes mainly.

Reason (R) : Dominant flora decides the name of an ecosystem.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true, but (R) is not the correct explanation of A

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

Space for Rough Work