LIFE SCIENCES

Name & Signature of the Invigilator

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PAPER – II

CODE-04

OMR Answer Sheet No. :

Roll No. :

(in figures as in Hall Ticket)

Roll Number in words : .....

.....

042968

Question Booklet Sl. No.

Time : 2 Hours] **No. of Printed Pages : 24** **[Maximum Marks : 200**

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page.
2. This paper consists of **one hundred (100)** multiple choice type of questions. **All** questions are compulsory.
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 on the OMR Answer Sheet and the OMR Answer 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 oval as indicated below on the correct response against each item.

   Example: (A) ● (C) (D) where (B) is the correct response.
5. Your responses to the items are to be indicated on the OMR Answer Sheet under Paper – II only. If you mark your response at any place other than in the oval in the OMR Answer Sheet, it will not be evaluated.
6. Rough Work is to be done in the end of this booklet.
7. If you write your Name, Roll Number, Phone Number 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, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
8. You have to return the original OMR Answer Sheet to the invigilator at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are however, allowed to carry original question booklet and duplicate copy of OMR Answer Sheet on conclusion of examination.
9. Use only Blue/Black Ball point pen.
10. Use of any calculator or any electronic devices or log table etc., are prohibited.
11. There shall be no negative marking.

પરીક્ષાર્થીઓ માટે સૂચનાઓ

1. આ પાનાની ટોચ પર દર્શાવેલી જગ્યામાં તમારો રોલ નંબર લખો.
2. આ પ્રશ્નપત્રમાં બહુવૈકલ્પિક ઉત્તરો ધરાવતા સો (૧૦૦) પ્રશ્નો આપેલા છે. બધા જ પ્રશ્નો ફરજિયાત છે.
3. પરીક્ષાની શરૂઆતમાં આપને પ્રશ્નપુસ્તિકા આપવામાં આવશે. પ્રથમ પાંચ (૫) મિનિટ દરમ્યાન તમારે પ્રશ્નપુસ્તિકા ખોલી અને ફરજિયાતપણે નીચે મુજબ પરીક્ષણ કરવું :
   (i) પ્રશ્નપુસ્તિકાનો વપરાશ કરવા માટે આ કવર પૃષ્ઠની ધાર પર આપેલ સીલ સ્ટીકર ફાડી નાખો. કોઈપણ સંજોગોમાં સીલ સ્ટીકર વગરની કે ખુલ્લી પ્રશ્નપુસ્તિકા સ્વીકારશો નહીં.
   (ii) કવર પૃષ્ઠ પર છપાયેલ નિર્દેશાનુસાર પ્રશ્નપુસ્તિકાના પ્રશ્નો, પૃષ્ઠો અને સંખ્યાને બરાબર ચકાસી લો. ખામીયુક્ત પ્રશ્નપુસ્તિકા કે જેમાં પ્રશ્નો/ પૃષ્ઠો ઓછાં હોય, બે વાર છપાયા હોય, અનુક્રમમાં અથવા અન્ય કોઈ ફરક હોય અર્થાત કોઈપણ સંજોગોમાં ખામીયુક્ત પ્રશ્નપુસ્તિકા સ્વીકારશો નહીં. અને જો ખામીયુક્ત પ્રશ્નપુસ્તિકા મળી હોય તો નિરીક્ષક પાસેથી તુરંત જ બીજી સારી પ્રશ્નપુસ્તિકા મેળવી લેવી. આ માટે ઉમેદવારને પાંચ (૫) મિનિટનો સમયગાળો આપવામાં આવશે. પછીથી, પ્રશ્નપુસ્તિકા બદલવામાં આવશે નહીં કે કોઈ વધારાનો સમયગાળો આપવામાં આવશે નહીં.
   (iii) આ ચકાસણી સમાપ્ત થાય પછી, પ્રશ્નપુસ્તિકાનો નંબર OMR જવાબ પત્રક પર લખવો અને OMR જવાબ પત્રકનો નંબર પ્રશ્નપુસ્તિકા પર લખવો.
4. પ્રત્યેક પ્રશ્ન માટે ચાર જવાબ વિકલ્પ (A), (B), (C) અને (D) આપવામાં આવેલ છે. તમારે સાચા જવાબના ઓવલ (oval) ને નીચે આપેલ ઉદાહરણ મુજબ પેનથી ભરીને સંપૂર્ણ કાળું કરવાનું રહેશે.
   ઉદાહરણ : (A) ● (C) (D) કે જ્યાં (B) સાચો જવાબ છે.
5. આ પ્રશ્નપુસ્તિકાના પ્રશ્નોના જવાબ અલગથી આપવામાં આવેલ OMR જવાબ પત્રકમાં પેપર-II લખેલ વિભાગમાં જ અંકિત કરવા. જો આપ OMR જવાબ પત્રકમાં આપેલ ઓવલ (oval) સિવાય અન્ય સ્થાને જવાબ અંકિત કરશો તો તે જવાબનું મૂલ્યાંકન કરવામાં આવશે નહીં.
6. કાચું કામ (Rough work) પ્રશ્નપુસ્તિકાના અંતિમ પૃષ્ઠ પર કરવું.
7. જો આપ OMR જવાબ પત્રક નિયત જગ્યા સિવાય અન્ય કોઈપણ સ્થાને, આપનું નામ, રોલ નંબર, ફોન નંબર અથવા એવું કોઈ ચિહ્નક જેનાથી તમારી ઓળખ થઈ શકે, અંકિત કરશો અથવા અભદ્ર ભાષાનો પ્રયોગ કરો, અથવા અન્ય કોઈ અનુચિત સાધનોનો ઉપયોગ કરો, જેમકે અંકિત કરી દીધેલ જવાબ ભૂંસી નાખવો કે સફેદ શાહીનો ઉપયોગ કરી બદલશો તો આપને પરીક્ષા માટે અયોગ્ય જાહેર કરવામાં આવશે.
8. પરીક્ષા સમય પૂરો થઈ ગયા બાદ ઓરીજીનલ OMR જવાબ પત્રક જે તે નિરીક્ષકને ફરજિયાત સોપી દેવું અને કોઈ પણ સંજોગોમાં તે પરીક્ષા ખંડની બહાર લઇ જવું નહીં. પરીક્ષા પૂર્ણ થયા બાદ ઉમેદવાર ઓરીજીનલ પ્રશ્નપુસ્તિકા અને OMR જવાબ પત્રકની ડુપ્લિકેટ કોપી પોતાની સાથે લઈ જઈ શકે છે.
9. માત્ર કાળી / ભૂરી બોલ પોઈન્ટ પેન વાપરવી.
10. કેલ્કયુલેટર,લોગ ટેબલ અને અન્ય ઈલેક્ટ્રોનિક યંત્રોનો ઉપયોગ કરવાની મનાઈ છે.
11. ખોટા જવાબ માટે નકારાત્મક ગુણાંકન પ્રથા નથી.

DO NOT WRITE HERE

LIFE SCIENCES

Paper – II

1. Terminator seeds are produced by seed companies using genetic engineering techniques. In this technology
   (A) Hybrid seeds give a very high yield
   (B) Seeds germinate and produce incompatible gametes
   (C) Hybrid seeds germinate, but do not produce seeds in the next generation
   (D) Seeds develop into fertile plants, which produce non-germinable seeds

2. A seed biologist desired to preserve some medicinal plant seeds by making them dormant. For this he kept the seeds on 10% osmoticum in dark, exposed to FR light and dried. Later he found that they were viable, but dormant. This type of dormancy is known as
   (A) Secondary, innate dormancy
   (B) Secondary, induced dormancy
   (C) Primary, mechanical dormancy
   (D) Primary, enforced dormancy

3. Which one of the following is the CORRECT sequence of events during fertilization in mammals ?
   (A) capacitation --> activation of egg --> acrosomal reaction --> entry of sperm in egg
   (B) capacitation --> acrosomal reaction --> activation of egg --> entry of sperm in egg
   (C) acrosomal reaction --> activation of egg --> capacitation -> entry of sperm in egg
   (D) activation of egg --> acrosomal reaction --> entry of sperm in egg --> capacitation

4. Like most acid-amide bonds, the peptide bond is stabilized by
   (A) π electrons resonance
   (B) Hydrogen bonds
   (C) Peptide bonds
   (D) van der Waal's interaction

5. Which one of the following statements are TRUE about membrane-spanning proteins ?

P. Proteins that span biological membranes are often α-helical.

Q. Amino acids would be hydrophobic in nature.

R. A α-helix is especially suited to cross a membrane because the amide hydrogen atoms and carbonyl oxygen atoms of peptide backbone take part in intrachain hydrogen bonds, thus stabilizing these polar atoms in a hydrophobic environment.

Choose the correct option :

(A) P and Q (B) P and R

(C) P, Q and R (D) R and Q

6. Receptor-mediated endocytosis involves

(A) Clathrin (B) SNARE (C) Arrestin (D) Glycoprotein

7. Which one of the following is NOT a function of rough endoplasmic reticulum ?

(A) N-linked glycosylation of proteins

(B) Folding of polypeptide chains

(C) O-linked glycosylation of proteins

(D) Specific proteolytic cleavage

8. A molecular biologist cloned a novel gene with 3 kb promoter region, 280 bp of 5'UTR and 170 bp of 3' UTR. It also consisted of three exons (1.2 kb, 2 kb and 4 kb) and two introns (1.2 kb, 2.5 kb). What would be the size of the mature mRNA it will produce ?

(A) 14.35 kb (B) 7.65 kb (C) 11.35 kb (D) 7.2 kb

9. Choose the INCORRECT statement about signal recognition particle. It _____.

(A) targets nascent secretory polypeptides to the RER

(B) temporarily arrests translation

(C) contains both RNA and polypeptides

(D) contains a signal peptidase activity

10. Which chaperone follows two stroke engine mechanism ?

(A) Chaperonin (B) Hsp70 (C) Hsp100 (D) Hsp40

11. Which is an essential component of signalling pathway stimulated by receptor tyrosine kinase ?
(A) Adenylate cyclase
(B) Adaptor proteins
(C) Auto phosphorylating receptor
(D) Ras activating protein

12. Isoleucine DOES NOT show preference for adopting α helix, because it has a
(A) Hydrophobic sidechain
(B) Long sidechain
(C) Aliphatic sidechain
(D) β-branched sidechain

13. Which one of the following eukaryotic rRNAs is NOT transcribed from single transcription unit ?
(A) 5.8S (B) 18S (C) 28S (D) 5S

14. Sulfonamides are inhibitors of biosynthesis of
(A) Cyanocobalamine
(B) Tetrahydrofolate
(C) Riboflavin
(D) Niacinamide

15. During eukaryotic DNA replication which of the following proteins bind to newly separated parental strands by activity of helicases ?
(A) MCM (B) RPA (C) ORC (D) FEN 1

16. Choose the correct match sets from the below two columns.

A) – 35 element	1) Pribnow box
B) "rho" factor	2) Consensus sequence (TTGACA)
C) Sigma(σ) factor	3) Termination factor
D) – 10 element (TATAAT)	4) Transcription factor

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

17. The grafting of a second polarizing region into the anterior of a limb bud results in which of the following ?
(A) Formation of second bud at the site of the graft
(B) Formation of extra copies of the anterior most digit
(C) Formation of extra copies of posterior most digit
(D) Second full set of digits form with mirror image orientation to the normal set of digits

18. A female fruit fly (*Drosophila*) has mutation in both copies of the *gurken* gene. In her ovary, cells cannot produce functional *gurken* protein. What phenotype will be expected to be obtained in her progeny ?
(A) The embryo will develop normally
(B) The embryo will be dorsalized
(C) The embryo will be ventralized
(D) Half of the embryo will be normal, and half will be dorsalized

19. In the vertebrate eye development, regulation of the crystalline gene is controlled by
(A) Pax6, Sox2 and L-Maf
(B) Pax3, Sox9 and Mitf
(C) BMP4 and Nogging
(D) Delta and BMP2

20. The covalent modification of histones that is NOT known to play a role in the regulation of gene expression is
(A) ADP-ribosylation
(B) Acetylation
(C) Methylation
(D) Glycosylation

21. Choose the correct matching sets from the below two columns.

A) RNA polymerase-I	1) mRNAs, most snRNA and sno RNAs, miRNAs, telomerase RNAs
B) RNA polymerase-II	2) Larger rRNAs (28S, 18S, 5.8S)
C) RNA polymerase-III	3) Small RNAs, including tRNAs, 5S RNA, U6 snRNA
D) RNA polymerase-IV	4) siRNA in plants

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

22. The diameter of B-DNA, raise per base pair is 3.4 Å and its diameter is approximately 20 Å. If a 10 base pairs long stretch of it has to be fitted in a cylinder what would be the cylinder's volume ?

(A) 10,686 cubic Å
(B) 42,743 cubic Å
(C) 680 cubic Å
(D) 340 cubic Å

23. Adding alcohol to aqueous solution of DNA destabilizes the double stranded structure, because

(A) H-bonding interactions are disturbed
(B) Hydrophobic and van der Waal's interactions are interfered with
(C) Covalent bonds are destabilized
(D) Ionic interactions are destabilized

24. Which one of the following statements is NOT TRUE of the group of signalling molecules called eicosanoids ?

(A) Eicosanoids are derivatives of arachidonic acid.
(B) Eicosanoids include prostaglandins, thromboxanes and leukotrienes.
(C) Eicosanoids are usually autocrine signalling molecules.
(D) Eicosanoids can be synthesized from fatty acids derived from membrane phospholipids.

25. Which one of the following sequences will be correct, if filled in the blank below against 1,2,3,4.

1) The general process by which fluids or particles are transported into cells is called _____.
2) The specific term for engulfing fluid is _____.
3) The specific term for engulfing particles is _____.
4) The engulfed substances are taken into the cell in membrane-enclosed sacs is called _____.

(A) 1-Pinocytosis; 2-endocytosis; 3-phagocytosis; 4-vesicles
(B) 1-Endocytosis; 2-phagocytosis; 3-vesicles; 4-pinocytosis
(C) 1-Endocytosis; 2-pinocytosis; 3-phagocytosis; 4-vesicles
(D) 1-Phagocytosis; 2-endocytosis; 3-vesicles; 4-pinocytosis

26. Which one of the following statements about G-proteins is FALSE ?

(A) They are involved in signal cascades.

(B) They bind to and are regulated by guanine nucleotide.

(C) They become activated when bound to GDP.

(D) They need to be active before the cell can make needed cAMP.

27. Which one of the following applies to intercellular junctions ?

(A) The three major adhesive junctions of animal cells are adherens junctions, desmosomes and hemidesmosomes

(B) Desmosomes and hemidesmosomes connect epithelial cells to their basement membrane and adjacent cells respectively

(C) Gap junctions and plasmodesmata are homologous structures

(D) The junctional complexes of gastrointestinal enterocytes ensure that nutrients are only absorbed through the spaces between the cells, which prevent them from absorbing potentially harmful substances

28. Antiviral glycoproteins released in response to viral attack when induce a viral resistant state to neighbouring cells are called

(A) Natural killer cells

(B) Complement system

(C) Interferons

(D) Phagocytes

29. Which one of the following is NOT a likely reason for the reduction in CD4 T cell numbers characteristic of AIDS ?

(A) Persistent immune overactivation leading to apoptosis

(B) Lysis of infected cells by HIV

(C) Reduced generation of T cells in the thymus

(D) Overproduction of regulatory T cells

30. Choose the correct matching sets from the following two columns :

BLOOD GROUP	ASSOCIATED TERMINAL CARBOHYDRATE
i) O	A. Galactose
ii) A	B. Fucose and galactose
iii) B	C. N-acetyl galactosamine

(A) i – A, ii – B, iii – C

(B) i – B, ii – A, iii – C

(C) i – C, ii – A, iii – B

(D) i – B, ii – C, iii – A

31. Which one of the following is NOT a typical event associated with normal cell signalling ?

(A) activation of G-proteins by exchanging GTP for GDP

(B) release of cytochrome C from the mitochondria

(C) production of the second messenger cAMP and IP3

(D) activation of protein kinases

32. The stage between seed formation and seed germination is called

(A) dormancy (B) quiescence

(C) hibernation (D) aestivation

33. In plants, the formation of seeds without fertilization is called

(A) parthenocarpy (B) apospory

(C) parthenogenesis (D) apomixis

34. If *bicoid* mRNA is injected into the posterior pole of a wild-type *Drosophila* embryo, the expected phenotype is

(A) head structure at both the posterior and anterior poles

(B) head structure at the posterior pole only

(C) head structure at anterior pole only

(D) no head structure form

35. What prevents the cells adjacent to the progenitor vulva cells in *C . elegans* from differentiating into vulva cells ?

(A) These cells are separated from the anchor cell to receive the LIN-3 signal

(B) These cells lack the ability to bind and respond to the LIN-3 signal

(C) These cells receive a signalling compound from a hypodermal cell that deactivates the LIN-3 signal

(D) These cells have condensed their chromatin in the regions responsive to the LIN-3 signal

36. Match the column I with column II and select the correct matching sequence from the options.

I	II
1) Radial cleavage	p) Amphibians
2) Spiral cleavage	q) Mammals, nematodes
3) Bilateral cleavage	r) Tunicates
4) Rotational cleavage	s) Echinoderms, Amphioxus
	t) Annelids, Mollusca

(A) 1 – p, 2 – q, 3 – r, 4 – s

(B) 1 – s, 2 – t, 3 – r, 4 – q

(C) 1 – t, 2 – s, 3 – q, 4 – p

(D) 1 – q, 2 – p, 3 – s, 4 – t

37. Which one of the following is responsible for the cohesive property of water ?

(A) Hydrogen bonds between the oxygen atoms of two adjacent water molecules

(B) Covalent bonds between the hydrogen atom of two adjacent water molecules

(C) Hydrogen bonds between the oxygen atom of one water molecule and hydrogen atom of other water molecule

(D) Covalent bonds between the oxygen atom of one water molecule and hydrogen atom of other water molecule

38. In plants, the leaf primordia are formed by the accumulation of

(A) Gibberellins (B) Auxin (C) Cytokinin (D) ABA

39. Which one of the following element is required for N_2 fixation in higher plants ?

(A) B (B) Si (C) Co (D) P

40. How many ATP molecules are required for the reduction of one N_2 to 2 NH_4^+ during biological N_2 fixation ?

(A) 16 (B) 24 (C) 15 (D) 12

41. Charged molecules like NO_3^- will be transported into the cell by

(A) Diffusion
(B) Transporters
(C) Ion channels
(D) Both Transporters and ion channels

42. Thyroxin releasing hormone receptor belong to _____.

(A) Nuclear receptor family
(B) Receptor tyrosine kinase family
(C) G-protein receptor family
(D) Guanylate cyclase receptor family

43. ATP is used indirectly for which one of the following transport processes ?

(A) Accumulation of Ca^{2+} in the cytoplasm
(B) Transport of Na^+ from the cytoplasm to outside of the cell
(C) Transport of K^+ from outside to inside of the cell
(D) Absorption of glucose from outside to inside of the cell

44. Which statement is INCORRECT in guttation process ?

(A) Guttation takes place through hydathodes
(B) Guttation occurs both during day time and night time
(C) Water loss in guttation is rich with minerals
(D) Water is lost in liquid form

45. If one glucose molecule metabolizes, the output of glycolysis is

(A) 2 Pyruvate, 4 ATP and 2 NADH
(B) 4 Pyruvate, 2 ATP and 2 NADH
(C) 4 Pyruvate, 4 ATP and 2 NADH
(D) 2 Pyruvate, 4 ATP and 4 NADH

46. Match the following and choose the CORRECT option.

1) Requirement of light for germination	(i) Nyctinasty
2) Folding of leaves at night	(ii) Photonasty
3) Opening of leaves at dawn	(iii) Phototropism
4) Directional bending of shoots to light	(iv) Photoblasty

(A) 1 – (iv); 2 – (iii); 3 – (ii); 4 – (i)

(B) 1 – (i); 2 – (iv); 3 – (iii); 4 – (ii)

(C) 1 – (iv); 2 – (i); 3 – (ii); 4 – (iii)

(D) 1 – (ii); 2 – (iii); 3 – (i); 4 – (iv)

47. Which one of the following is NOT TRUE concerning the protein buffer system ?

(A) Albumin is considered the main protein buffer in blood plasma

(B) Albumin is the most abundant buffer in blood plasma and intracellular fluid

(C) The functional components of a protein buffer system are the carboxyl group and the amino group

(D) Protein buffers are the primary buffers of acids in urine

48. Which one of the following statements is CORRECT about chloride shift ?

(A) It takes place from stomach to the blood vascular system of man to produce HCl.

(B) It involves the passage of chloride ions from the plasma to RBC to balance the bicarbonate ions which have passed out from RBC to plasma.

(C) It occurs to balance chloride ions and sodium ions in a muscle cell during muscle contraction.

(D) It is an Hamburger phenomenon occurs from the blood to liver in a fresh fish to maintain its osmotic balance.

49. The sequence of flow of blood in the hepatic portal system of a mammal is

(A) Caudal vein – kidney – liver – posterior vena cava

(B) Intestine – liver – hepatic vein – posterior vena cava

(C) Kidney – liver – intestine – sinus venous

(D) Anterior vena cava – intestine – liver – sinus venous

50. Which one of the following is the most important enzyme involved in homologous recombination in *E. coli* ?

(A) RecE (B) RecF (C) RecA (D) RecBCD

51. Inversion is a type of chromosomal aberration in which two breaks occur in a chromosome and the region between the breaks rotates 180° before rejoining with the two end fragments. Now if the centromere is outside this inversion, then it is known as _____.

(A) Homozygous inversion (B) Paracentric inversion

(C) Heterozygous inversion (D) Pericentric inversion

52. What is the purpose of cis – trans complementation test ?

(A) To map the distance between centromere and gene

(B) To map the distance between two genes

(C) To check if two mutations are allelic

(D) To identify the number of transposons present

53. In the case of "Four O' clock plant", when the red flowered plant is crossed with the white one then pink flowered plant is obtained. This is a classic example of

(A) Dominance (B) Recessive

(C) Epistasis (D) Incomplete dominance

54. Bats visits a plant during the night and sunbirds during the day. Given this information, which one of the following characters best match this plant ?

(A) The plant is an herb with saucer-shaped white flowers

(B) The plant is a shrub with tubular, red, diurnal flowers

(C) The plant is a climber with tubular cream-coloured flowers

(D) The plant is a grass with white-coloured fragrant, spikelets

55. In an electrocardiogram, the QRS complex represents the

(A) Depolarisation of the atria P

(B) Repolarisation of the atria P

(C) Depolarisation of the ventricles QRS

(D) Repolarisation of the ventricles QRS

56. High doses of antibiotics can destroy the bacterial flora of the large intestine. This car result in impaired _____.

(A) absorption of protein
(B) blood coagulation
(C) bone resorption
(D) respiratory control

57. Unlike most bony fishes, sharks maintain body fluids that are isoosmotic to seawater They osmoregulate by

(A) using their gills and kidneys to rid themselves of sea salts
(B) monitoring dehydration at the cellular level with special gated aquaporins
(C) tolerating high urea concentrations that balance internal salt concentrations t seawater osmolarity
(D) possessing a unique adaptation that allows their cells to operate at an unusuall high salt concentration

58. Trypsin differs from pepsin in that :

(A) Trypsin digests protein in an acidic medium, while pepsin does so in an alkaline medium
(B) Trypsin digests protein in an alkaline medium, while pepsin does so in an acidic medium
(C) Trypsin is secreted from the gastric glands, while pepsin is secreted from the pancreas
(D) Peptidergic neurohormones influence trypsin production, while steroids influence pepsin

59. The following statements about the parathyroid hormone are true, EXCEPT :

(A) The parathyroid hormone is a single-chain peptide hormone composed of 84 amino acids.
(B) The parathyroid hormone increases calcium and phosphate absorption in intestine.
(C) The parathyroid hormone increases serum calcium and decreases serum phosphate.
(D) The parathyroid hormone increases calcium excretion and decreases phosphat excretion in the kidneys.

60. Insulin and thyroxine arrive at an organ at the same time. Thyroxine causes an effect on the organ, but insulin does not. Why ?

(A) Thyroxine is a lipid-soluble hormone and insulin is not

(B) The target cells in the organ are upregulated by thyroxin

(C) The organ's cells have receptors for thyroxine but not for insulin

(D) Thyroxine is a local hormone and insulin is a circulating hormone

61. The CORRECT sequence of hormone secretion from the beginning of menstruation is as follows :

(A) FSH – progesterone – estrogen

(B) Estrogen – FSH – progesterone

(C) FSH – estrogen – progesterone

(D) Estrogen – progesterone – FSH

62. Which one of the following statement is CORRECT about human mitochondrial gene ?

(A) Mitochondrial DNA has both introns and exons and long noncoding sequences.

(B) Mitochondrial DNA is inherited paternally.

(C) Mitochondrial DNA have been found to encode only essential mitochondrial proteins.

(D) Mitochondrial DNA has no introns.

63. The glands of Brunner and of Lieberkuhn are characteristic of the mammalian

(A) small intestine

(B) liver

(C) small intestine and liver respectively

(D) hypothalamus and small intestine respectively

64. Match the contents of the following table :

Class of Animals	Character
A. Reptilia	i. Pinnae
B. Mammalia	ii. Scutes
C. Aves	iii. Crop and gizzard
D. Amphibia	iv. Amplexusory Pad

(A) A – ii, B – i, C – iii, D – iv
(B) A – i, B – ii, C – iv, D – iii
(C) A – i, B – ii, C – iii, D – iv
(D) A – ii, B – i, C – iv, D – iii

65. A reproductive developmental biologist identified a seed sterile mutant in *Arabidopsis* while screening a T-DNA insertion seed mutant population. Detailed analysis of this mutant confirmed that the lack of endosperm is the reason for the sterility. Which one of the following seed development processes is defective ?

(A) Gametogenesis
(B) Primary fertilization
(C) Embryogenesis
(D) Secondary fertilization

66. Some key characteristics of the two classes of phylum Mollusca are listed below :

a. They have two lateral (left and right) shells (valves) hinged together dorsally; they do not have distinct head or radula; they disperse from place to place largely as larvae.

b. They generally creep on their foot; the heads of most of this group have a pair of tentacles with eyes at the end; during embryological development, they undergo torsion.

The correct match of the above characteristics with the classes of Mollusca is

(A) a : Bivalvia; b : Gastropoda
(B) a : Gastropoda; b : Cephalopoda
(C) a : Bivalvia; b : Polyplacophora
(D) a : Polyplacophora; b : Gastropoda

67. Following are the characteristics of species that make them prone to extinction :

Rare – a	Common – b
Good dispersal rate – c	Poor dispersal rate – d
Low specialization – e	High specialization – f
High variability – g	Low variability – h
Low trophic status – i	High trophic status – j
Long life span – k	Short life span – l
High reproductive output – m	Low reproductive output – n

Which one of the following is the CORRECT combination of characteristics that makes the species more prone to extinction ?

(A) a d f h j l n
(B) a c f h i k m
(C) b d e g i l n
(D) b c f h j k m

68. Match the Group 1 with Group 2 and select the correct combination from the options given below :

Group 1 : Orders of insecta	**Group 2 : Common name**
i. Hemiptera	a. Butterflies
ii. Lepidoptera	b. Red cotton bug
iii. Odonata	c. Dragonflies
iv. Diptera	d. Mosquitoes

(A) i – a; ii – c; iii –d; iv – b
(B) i – b; ii – d; iii – a; iv – c
(C) i – b; ii –a; iii – c; iv – d
(D) i – c; ii – a; iii – b; iv – d

69. Polyploidy can be achieved by preventing the segregation of chromosomes. This can be achieved by using

(A) DAPI
(B) Colchicine
(C) EMS
(D) Auxin

70. Which one of the following is CORRECT about Type III survivorship curve ?
(A) It is highly convex
(B) Generation time is high
(C) Number of progeny is low
(D) Few reach to reproductive stage

71. Which one of the following is NOT a feature of r-selected species ?
(A) High intrinsic rate of growth
(B) Early reproductive age
(C) Small body size
(D) Good competition ability

72. When large mammals walk in the forest and trample small plants, those plants die. This interspecies relationship is a form of
(A) Amensalism
(B) Mutualism
(C) Commensalism
(D) Parasitism

73. On average, how many fragments would a restriction enzyme that recognizes a specific 4 base sequence in DNA be expected to generate by cleaving a double-stranded bacteriophage DNA with a genome size of 5,000 bp ?
(A) about 4
(B) about 2
(C) about 50
(D) about 20

74. Which one of the following techniques, based on the migration of DNA fragments in a gel in the presence or absence of proteins, is used to identify proteins that bind to DNA ?
(A) DNA foot printing
(B) Nuclease protection
(C) Gel retardation
(D) Nuclear magnetic resonance spectroscopy

75. Which one of the following activities is most closely associated with alkaline phosphatase ?
(A) Preventing vector dimerization
(B) Joining DNA fragments with cohesive ends
(C) Homopolymer tailing
(D) Cutting DNA

76. Which one of the following evolutionary processes best described Red Queen Dynamics ?

(A) Convergent evolution
(B) Co-evolution
(C) Parallel evolution
(D) Divergent evolution

77. A population size increased from 600 to 645 in a month. The birth rate for the population is 0.5, what would be the specific growth rate in the population ?

(A) 0.425
(B) 0.075
(C) 0.450
(D) 0.500

78. A grass species grows around a mine area with patches of heavy metal contaminated soil. Some of the populations of the species grow selectively on soil contaminated with heavy metals. Over a period, though the tolerant and non-tolerant grass populations were continuously distributed and not separated by geographical barriers, they eventually evolved different flowering times and became different species. What kind of speciation would you call this ?

(A) Allopatric speciation
(B) Sympatric speciation
(C) Parapatric speciation
(D) Bottle-neck effect

79. Flufftails in mainland Asia show high variation in tail colour. However, in the far-out Pacific Island, the flufftails show minimal variation in tail colour. This variation in tail colour can be explained by all of the following EXCEPT :

(A) Founder effect
(B) Homologous evolution
(C) Genetic drift
(D) Frequency-dependent selection

80. Which one of the following is NOT a prediction arising from Wilson-MacArthur's theory of Island Biogeography ?

(A) The number of species on an island should increase with size/area.
(B) The number of species should decrease with increasing distance of the island from the source pool.
(C) The turnover of species should be common and frequent.
(D) Species richness on an island should be related to its average distance to the neighbouring islands.

81. The nutrition in Yeast is saprotrophic. They have the power to convert sugar solution into alcohol by secreting an enzyme complex known as

(A) Amylase
(B) Zymase
(C) Invertase
(D) Kinase

82. Yeast is an important source of

(A) Vitamin C
(B) Sugars
(C) Riboflavin
(D) Vitamin A

83. Penicillins and Cephalosporins have been useful in combating bacterial diseases and infections. Their mechanism of action is through

(A) Inhibition of DNA replication
(B) Inhibition of protein synthesis
(C) Killing the stationary cells
(D) Inhibition of transpeptidase reaction

84. Match the common names of spices listed in Column A with their scientific names and the plant parts (commonly used in food preparations) given in Column B and Column C, respectively and choose the RIGHT combination from the options given below.

A **Common Name**	B **Scientific Name**	C **Plant part used**
I. Cloves	a. *Piper nigrum*	i. Seeds
II. Blackpepper	b. *Curcumo longa*	ii. Roots
III. Cardamom	c. *Syzygium aromaticum*	iii. Flower buds
IV. Turmeric	d. *Elettaria cardomomum*	iv. Fruits

(A) I – c,iii; II-a,iv; III – d,i; IV – b,ii

(B) I – c,iv; II – a,i; III – d,iii; IV – b,ii

(C) I – d,iii; II – a,iv; III – c,ii; IV – b,i

(D) I – d,iv; II – a,i; III – c,iii; IV – b,ii

85. Gibberellins are used

(A) for promoting dormancy development in buds and bulbs
(B) for inhibiting plant growth
(C) for breaking dormancy of buds and bulbs
(D) for preventing normal recognition of auxin molecule

86. Two species of barnacles i.e., species 1 and species 2, occupy the upper and lower strata of intertidal rocks, respectively. Only when you removed species 2 from the lower strata, species 1 could occupy both the upper and lower strata. From the choices given below, what would be your inference from these observations ?

(A) Upper strata of the intertidal rock is the realized niche of species 1
(B) Upper strata of the intertidal rock is the fundamental niche of species 1
(C) Species 1 and species 2 exhibit mutualism
(D) Species 1 can compete with species 2

87. A non-poisonous butterfly population has the same colour pattern as some highly poisonous butterflies. Assume that non-poisonous butterflies' population is higher than that of poisonous butterflies. Given this, what will be the impact of this mimicry on the fitness of the population of the poisonous butterflies in the presence of the predator ?

(A) It will lower the fitness, that is, fitness of the mimic is negatively frequency-dependent
(B) It will increase the fitness, that is, fitness of the mimic is positively frequency-dependent
(C) It will not affect the fitness, that is, fitness of the mimic is frequency-independent
(D) It will increase the fitness, that is, fitness of the mimic is negatively frequency-dependent

88. Green fluorescent protein (GFP) cloned from jellyfish has now wide application in biological research. The fluorescence emitted by GFP is due to

(A) presence of two zinc ions in GFP molecule
(B) heme, which serves as a prosthetic group in GFP molecule
(C) three amino acid residues in GFP molecule
(D) whole GFP molecule

89. Shoot organogenesis by culture results in

(A) a bipolar structure that has no vascular connection with the explant
(B) a monopolar structure that has a strong connection with the pre-existing vascular tissue of the explant
(C) a monopolar structure that has no vascular connection with the explant
(D) a bipolar structure that has a strong connection with the pre-existing vascular tissue of the explant

90. The first successful gene therapy was done to correct the defect in which one of the following enzymes ?

(A) Adenylate cyclase
(B) Adenosine decarboxylase
(C) Homogentistic acid oxidase
(D) Adenosine deaminase

91. Two proteins; one a monomer of 90 kDa, while the other, a dimer of 90 kDa each. What would you expect if they are run by classical SDS-PAGE (assuming a good electrophoresis) ?

(A) One band of 90 kDa.
(B) One band of 180 kDa.
(C) Two bands, 90 kDa and 180 kDa.
(D) Smearing of bands within 90 kDa and 180 kDa.

92. Which technique is used to inactivate a gene by altering the DNA encoding it ?

(A) homologous recombination
(B) antisense nucleic acid blocks
(C) antibody microinjection
(D) introduction of dominant inhibitory mutants

93. Virulence genes (*vir* genes) of Ti-plasmid in *Agrobacterium* is activated by

(A) Octopine (B) Nopaline (C) Acetosyringone (D) Auxin

94. Beginning with 600 template DNA molecules, after 25 cycles of PCR, how mar amplicons will be produced ?

(A) 2×10^{10} (B) 2^{25} (C) 600×25 (D) 2×10^{25}

95. Why were the first genetically engineered human insulin genes split into separate A ar B chain sequences and cloned in separate *E. coli* strains ?

(A) *E. coli* cannot fold the resultant peptide with the C chain present
(B) to prevent loss of insulin by secretion
(C) to control the proportions of A and B chains produced
(D) to prevent an *E. coli* strain from producing an active insulin

96. The population of a widely distributed species gets divided into two subpopulations due to the appearance of a mountain barrier. Eventually these subpopulations evolve into two separate species. This is a case of

(A) Sympatric speciation

(B) Peripatric speciation

(C) Parapetric speciation

(D) Allopatric speciation

97. Under normal condition, which of the following helps in concentrating urine ?

(A) length of the loop of Henle

(B) renal portal system

(C) number of Bowman's capsule in the kidney

(D) blood pressure and blood volume

98. Which of the following is the precursor for adrenaline, noradrenaline and dopamine ?

(A) Tyrosine and Tryptophan

(B) Tryptophan and Phenylalanine

(C) Tryptophan

(D) Tyrosine

99. Which one of the following combinations of nutrients follow sedimentary pattern of biogeochemical cycling ?

(A) Carbon and Sulphur

(B) Sulphur and Phosphorus

(C) Phosphorus and Nitrogen

(D) Nitrogen and Carbon

100. CRISPR-Cas9 is a genetic molecular tool which is used in

(A) RNA coding

(B) DNA coding

(C) DNA sequencing

(D) Gene editing

Space for Rough Work