NEET Biology Sample Paper 05

A) Subject: Biology
B) Total Questions: 90 Questions (All Compulsory)
C) Marking Scheme & Rules:

- Correct Answer: +4 marks
- Incorrect Answer: -1 mark (Negative marking)
- Unattempted Question: 0 marks
- Multiple Answers: Treated as incorrect, attracting -1 mark

Botany(Section A)

1. A researcher observes 1024 plants in the F_2 generation of a dihybrid cross involving garden peas. Based on Mendelian principles, calculate how many of these plants are expected to express the dominant phenotype for both studied traits.

(1) 123
(2) 218
(3) 324
(4) 576

2. Analyze the provided pedigree chart carefully. A specific trait is being tracked through three generations. Based on the patterns of inheritance shown (affected males and females in various generations), identify the most likely nature of this trait.

(1) Autosomal recessive
(2) X-linked recessive
(3) Autosomal dominant
(4) Both (1) and (3) are possible

3. In the study of genetics and allelic interactions, the production of a dominant phenotype or trait is typically attributed to the expression of which specific types of alleles?

(1) Unmodified allele only
(2) Modified alleles only
(3) Both unmodified and equivalent modified alleles
(4) Every modified and unmodified allele regardless of function

4. Genes A and B are linked on the same chromosome with a map distance of 24 cM. If a cross is performed between parents with genotypes AAbb and aaBB, determine the expected percentage of 'AB' gametes produced by their offspring.

(1) 38%
(2) 12%
(3) 24%
(4) 26%

5. Evaluate the following statements regarding Mendelian genetics:
Assertion: Looking at the phenotype of a dominant trait does not reveal its genotypic composition.
Reason: Mendel performed reciprocal crosses to determine the genotype of a dominant organism.

(1) Both A and R are true; R is the correct explanation.
(2) Both A and R are true; R is not the correct explanation.
(3) Assertion is true; Reason is false.
(4) Both Assertion and Reason are false.

6. Mendel's groundbreaking work on inheritance remained unrecognized for several decades after its publication in 1865. Which of the following factors contributed to this lack of recognition?
(a) Lack of physical proof for 'factors'
(b) Contemporary rejection of stable, discrete units of inheritance
(c) Mathematics being seen as an outdated tool for biology
(d) Difficulties in communication at the time

(1) (a), (b) & (c)
(2) (c) & (d)
(3) (a), (b) & (d)
(4) Only (a)

7. Given the map distances between four genes: $a - d = 3.5$, $b - c = 1$, $a - b = 6$, $c - d = 1.5$, and $a - c = 5$. Determine the correct linear sequence of these genes on the chromosome.

(1) adcb
(2) acdb
(3) abcd
(4) acbd

8. Match the following genetic disorders with their correct descriptions or characteristics:
(a) Haemophilia (b) Colourblindness (c) Turner syndrome (d) Phenylketonuria
(i) Autosomal recessive (ii) 45 chromosomes (XO) (iii) Absence of clotting factor (iv) Non-functional cone cells

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

9. Consider the following two statements regarding human health:
Statement-I: Sickle cell anaemia and Haemophilia are both inherited as recessive traits.
Statement-II: Sickle cell anaemia and Haemophilia are classified as disorders of the blood.

(1) Both are correct
(2) Both are incorrect
(3) I is correct, II is incorrect
(4) I is incorrect, II is correct

10. Human ABO blood groups provide a classic example of multiple allelism and codominance. Which of the following statements accurately describe the genetics of this system?
(a) Controlled by gene I (b) Three alleles: I^A, I^B, and i (c) I^A and I^B are dominant over i (d) 4 genotypes possible (e) In I^AI^B, only I^A is expressed.

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

11. Review Mendel's experimental design:
Statement-I: Mendel selected 14 true-breeding pea plant varieties as pairs.
Statement-II: Contrasting traits included inflated/constricted pods and green/yellow seeds.

(1) Both incorrect
(2) I correct, II incorrect
(3) I incorrect, II correct
(4) Both correct

12. In the context of artificial hybridization in peas:
Assertion (A): Emasculation is a necessary step for cross-hybridization.
Reason (R): Pea plants naturally possess bisexual flowers.

(1) Both correct; R is not the explanation.
(2) A is correct; R is incorrect.
(3) A is incorrect; R is correct.
(4) Both correct; R is the correct explanation.

13. Identify the set of correct statements regarding Mendelian and Non-Mendelian disorders:
(a) Cystic fibrosis is non-mendelian. (b) Phenylketonuria is mendelian. (c) Colour blindness occurs in 8% of females. (d) Haemophilia is sex-linked. (e) Sickle cell anaemia involves hemoglobin polymerization under low oxygen.

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

14. Match the sex determination types with the correct organisms:
(A) XO type (B) XY type (C) ZW type (D) X-body
(i) Human (ii) Grasshopper (iii) Birds (iv) Henking

(1) A-i, B-ii, C-iii, D-iv
(2) A-ii, B-i, C-iii, D-iv
(3) A-iv, B-iii, C-ii, D-i
(4) A-iii, B-iv, C-i, D-ii

15. Regarding sex chromosomes and determination:
Statement-I: In male grasshoppers, 50% of the sperm produced do not contain a sex chromosome.
Statement-II: In humans, the Y chromosome is significantly shorter than the X chromosome.

(1) Both incorrect
(2) I correct, II incorrect
(3) I incorrect, II correct
(4) Both correct

16. In the ABO blood group genotype table, identify the missing components W, X, Y, and Z for the following:
Genotype I^AI^O gives Blood group A (W); Genotype I^BI^O gives Blood group B (X); Genotype I^AI^B gives Blood group AB (Y); Genotype I^OI^O gives Blood group O (Z).

(1) I^AI^O, I^BI^O, AB, I^OI^O
(2) I^AI^O, I^BI^O, AB, I^OI^O
(3) I^BI^O, I^AI^O, AB, I^OI^O
(4) I^BI^A, I^AI^A, AB, I^OI^O

17. Which of the following statements regarding the phenomenon of incomplete dominance is mathematically or biologically incorrect?

(1) F_1 phenotype does not resemble either parent.
(2) Snapdragon is a classic example.
(3) Crossing two pink flowers results in only red flowers.
(4) F_2 generation shows red, white, and pink flowers.

18. Thomas Hunt Morgan conducted dihybrid crosses in Drosophila. Which observation regarding his results is accurate?

(1) Body and eye colour genes showed 1.3% recombination.
(2) Eye colour and wing size showed 98.7% recombination.
(3) Eye colour and body colour genes were loosely linked.
(4) Eye colour and wing size showed 62.8% recombination.

19. Calculate the probability of colourblindness in the progeny if a colourblind male marries a female whose mother was also colourblind (assuming the father of the female was normal).

(1) 50%
(2) 75%
(3) 25%
(4) 100%

20. Based on the patterns of X-linked inheritance, which of the following represents an impossible pathway for the transfer of the haemophilic gene?

(1) From a haemophilic father directly to his son.
(2) From a haemophilic mother to her son.
(3) From a haemophilic father to his daughter.
(4) From a haemophilic mother to both son and daughter.

21. In Griffith's transformation experiment with Pneumococcus:
Pathway A: S-strain injected into mice. Pathway B: R-strain injected into mice.
Identify the outcomes for A and B.

(1) A: Mice die; B: Mice live
(2) A: Mice die; B: Mice die
(3) A: Mice live; B: Mice die
(4) A: Mice live; B: Mice live

22. Evaluate the structural properties of DNA:
(A) DNA is acidic. (B) Chains have antiparallel polarity. (C) 5-Methyl uracil is Thymine. (D) B-DNA is right-handed.
How many of these are correct?

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

23. Regarding genetic mutations, identify the statement that is scientifically incorrect:

(1) Deletions/insertions cause frame-shifts.
(2) Cancer cells show chromosomal aberrations.
(3) UV and Gamma rays are mutagens.
(4) A single base pair change cannot cause a mutation.

24. Match the organism with its correct number of nucleotides/base pairs:
(i) $\phi \times 174$ (ii) Lambda phage (iii) E. coli (iv) Human (haploid)
(A) 4.6×10^6 bp (B) 3.3×10^9 bp (C) 5386 nucleotides (D) 48502 bp

(1) i-D, ii-C, iii-B, iv-A
(2) i-B, ii-D, iii-A, iv-B
(3) i-A, ii-D, iii-C, iv-B
(4) i-C, ii-D, iii-A, iv-B

25. Regarding the Lac Operon:
Statement A: It represents regulation of enzyme synthesis by substrate.
Statement B: Glucose serves as the primary inducer for the operon.

(1) Only A is correct
(2) Only B is correct
(3) Both are correct
(4) Both are incorrect

26. Determine the correct chronological sequence of events during the process of translation:
(a) Ribosome movement (b) tRNA binding to mRNA (c) Ribosome binding to start codon (d) Release factor binding.

(1) $a \rightarrow c \rightarrow d \rightarrow b$
(2) $c \rightarrow b \rightarrow d \rightarrow a$
(3) $c \rightarrow b \rightarrow a \rightarrow d$
(4) $d \rightarrow c \rightarrow a \rightarrow a$

27. Arrange the steps of DNA fingerprinting in the correct order:
(a) Hybridization (b) Digestion (c) Detection (d) Separation.

(1) $a \rightarrow c \rightarrow d \rightarrow b$
(2) $b \rightarrow d \rightarrow a \rightarrow c$
(3) $b \rightarrow d \rightarrow c \rightarrow a$
(4) $c \rightarrow a \rightarrow b \rightarrow d$

28. If a DNA template strand has the sequence 3'ATGGAACTA 5', what will be the sequence of the mRNA produced?

(1) 3'ATCCGAACU 5'
(2) 5'UACCUUGAU 3'
(3) 5'AUGGAACUA 3'
(4) 3'AUAAGGCUA 5'

29. If the Meselson-Stahl experiment is continued for four generations in bacteria, what will be the ratio of $^{15}N/^{15}N$:^{15} $N/^{14}N$:^{14} $N/^{14}N$ DNA?

(1) 1:1:0
(2) 1:4:1
(3) 0:1:3
(4) 0:1:7

30. Which of the following facts about E. coli is incorrect?

(1) It has 4.6×10^6 bp.
(2) Replication completes in 18 minutes.
(3) Polymerization rate is 2000 bp/minute.
(4) DNA replication is semiconservative.

31. In the Lac Operon system:
Statement-I: The 'i' gene codes for the repressor protein.
Statement-II: Lac z, y, and a are the structural genes.

(1) Both correct
(2) Both incorrect
(3) I correct, II incorrect
(4) I incorrect, II correct

32. Complete the eukaryotic regulation flowchart: DNA → (A) → hnRNA → (B) → mRNA → (C) → (D) → Protein.

(1) A-Transcription, B-Processing, C-Transport, D-Translation
(2) A-Replication, B-Transcription, C-Translation, D-Processing
(3) A-Transcription, B-Processing, C-Translation, D-Transport
(4) A-Replication, B-Transport, C-Processing, D-Translation

33. A deletion at the terminal end of an mRNA causes it to code for 99 amino acids instead of 100. How many nucleotides must have been deleted to lose exactly one amino acid?

(1) 1
(2) 2
(3) 3
(4) Any of the above

34. If one strand of DNA has an $(A+T)/(G+C)$ ratio of 0.8, what is the ratio for the complementary strand?

(1) 0.2
(2) 0.02
(3) 5
(4) 0.8

35. Which statement regarding the process of transcription is correct?

(1) Only one DNA strand is copied into RNA.
(2) Single DNA polymerase handles all steps.
(3) Primary transcripts in eukaryotes contain only exons.
(4) Initiation starts when rho-factor reaches the promoter.

36. Identify the incorrect statements regarding DNA replication:
(A) dNTPs serve dual purpose. (B) Replication is continuous on the $5' \rightarrow 3'$ template. (C) Polymerase works with low accuracy. (D) Mistakes cause mutations.

(1) A and C
(2) B and C
(3) A and B
(4) B and D

37. Regarding transcription and translation:
Statement-I: RNA polymerase catalyzes polymerization in a template-independent manner.
Statement-II: In prokaryotes, translation can begin before mRNA is fully transcribed.

(1) Both incorrect
(2) I correct, II incorrect
(3) I incorrect, II correct
(4) Both correct

38. Match the gene types with their occurrences:
(A) Monocistronic (B) Polycistronic (C) Exons (D) Introns
(I) Coding sequence (II) Intervening sequence (III) Mostly prokaryotes (IV) Mostly eukaryotes

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

39. In the lac operon diagram labeled 'p i p o z y a', identify the correct sequence of products for i, z, y, and a.

(1) Repressor, β-galactosidase, Permease, Transacetylase
(2) Inducer, Transacetylase, β-galactosidase, Permease
(3) Repressor, Permease, Transacetylase, β-galactosidase
(4) Inducer, Transacetylase, Permease, β-galactosidase

40. How is population density mathematically expressed?

(1) $P.D. = N/S$ (Number/Space)

(2) $P.D. = S/N$ (Space/Number)
(3) $P.D. = S/W$ (Size/Weight)
(4) $P.D. = W/S$ (Weight/Size)

41. In the logistic growth equation $dN/dt = rN(K - N)/K$, what biological parameter does 'K' represent?

(1) Biotic potential
(2) Environmental Resistance
(3) Carrying capacity
(4) Initial population size

42. An age pyramid where pre-reproductive individuals significantly outnumber reproductive individuals indicates a population that is:

(1) Declining and urn-shaped
(2) Expanding and triangular
(3) Stable and bell-shaped
(4) Expanding and bell-shaped

43. The specific "occupational address" or functional role of a species within its environment is defined as its:

(1) Biome
(2) Niche
(3) Habitat
(4) Ecosystem

44. Which of the following plants is categorized as an epiphyte?

(1) Orchid
(2) Liana
(3) Santalum
(4) Mango

45. Which of the following are considered functional components of an ecosystem?
(a) Productivity (b) Decomposition (c) Nutrient cycling (d) Energy flow (e) Succession (f) Stratification.

(1) a, b, c
(2) a, b, c, d
(3) a, b, c, d, e
(4) a, b, c, d, f

46. During the process of spermatogenesis, which of the following sequences and descriptions is considered incorrect?

(1) The process is initiated only upon reaching the stage of puberty.
(2) It is regulated by LH and FSH hormones produced by the anterior pituitary gland.
(3) The culmination of the process results in the production of diploid gametes.
(4) The final differentiation of gametes takes place after the meiotic divisions are finished.

47. A clinician is studying the hormonal profile of a pregnant woman. Which of the following sets of hormones are uniquely secreted by both the ovary and the placenta?

(1) H.C.G., Estrogen, Progesterone
(2) H.P.L, H.C.G, Relaxin
(3) H.C.G, H.P.L, Progesterone
(4) Relaxin, Estrogen, Progesterone

48. In the context of human reproductive events, identify the statement that provides an inaccurate description of the process or site:

(1) Fertilization is defined as the fusion of a male and a female gamete.
(2) Insemination involves the transfer of semen into the female vaginal tract.
(3) The primary site for successful fertilization is the uterine cavity.
(4) The biological sex of the offspring is determined by the genetic contribution of the Father.

49. During the physiological process of parturition (childbirth), from which specific location is the hormone oxytocin released to trigger uterine contractions?

(1) Foetal-Pituitary
(2) Maternal-Pituitary
(3) Maternal-Hypothalamus
(4) Placenta

50. In the male reproductive system, after the process of (A), sperm heads become embedded in Sertoli cells and are eventually released from the seminiferous tubules by process (B). Identify A and B:

(1) A: Spermiation, B: Insemination
(2) A: Spermiogenesis, B: Insemination
(3) A: Spermiogenesis, B: Spermiation
(4) A: Spermiogenesis, B: Capacitation

51. Which of the following reproductive processes is unique because it is initiated during the embryonic development stage of the individual?

(1) Spermatogenesis
(2) Formation of polar body
(3) Oogenesis
(4) Spermiogenesis

52. In Assisted Reproductive Technology (ART), an early embryo resulting from in vitro fertilization that contains up to 8 blastomeres is typically transferred into:

(1) Fimbriae
(2) Cervix
(3) Uterus

(4) Fallopian tube

53. Referencing a standard diagram of the male reproductive system, which of the following functional matches is correct?

(1) Vas deferens - transport of sperm
(2) Prostate - maturation of sperm
(3) Seminal vesicle - storage of sperm
(4) Testes - contains only 3-4 testicular lobules

54. A woman uses a commercial pregnancy test kit to confirm her status. These kits are designed to detect the presence of which specific hormone in the urine?

(1) hCG
(2) hPL
(3) Progesterone
(4) LH

55. In the human menstrual cycle, which of the following physiological observations is scientifically correct?

(1) Estrogen levels show an increase after the event of ovulation.
(2) Graafian follicles reach full maturity during the luteal phase.
(3) The maximum level of progesterone occurs between the 11th and 13th day.
(4) Estrogen is the primary hormone responsible for the maintenance of pregnancy.

56. What is generally considered the first clinical sign that a foetus is growing healthily within the womb that can be detected by a medical professional?

(1) Sudden movement of the fetus felt by the mother.
(2) The appearance of fine hair on the head of the fetus.
(3) Listening to the heart sound carefully through a stethoscope.
(4) The visible formation of limbs during an ultrasound.

57. Assertion (A): During the proliferative phase, the endometrium of the uterus regenerates through proliferation. Reason (R): During this phase, primary follicles grow into mature follicles and secrete estrogen.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(3) (A) is correct but (R) is incorrect.
(4) Both (A) and (R) are incorrect.

58. Match the ovarian structures with their characteristics: (a) Secondary follicle, (b) Tertiary follicle, (c) Corpus luteum with (i) Antrum, (ii) Progesterone, (iii) Theca layers.

(1) (a)-(iii), (b)-(ii), (c)-(i)
(2) (a)-(iii), (b)-(i), (c)-(ii)
(3) (a)-(ii), (b)-(iii), (c)-(i)
(4) (a)-(ii), (b)-(i), (c)-(iii)

59. Which of the following is a correct statement regarding modern contraceptive methods mentioned in reproductive health literature?

(1) Saheli was developed by the National Institute of Drugs in Pune.
(2) Saheli is a non-steroidal "once a week" pill.
(3) Progestasert is an IUD that primarily releases estrogen.

(4) Injections of estrogen alone are the most effective form of contraception.

60. If a female patient has blocked fallopian tubes but a functional uterus, which of the following ART procedures would be most appropriate?

(1) ZIFT (Zygote Intra Fallopian Transfer)
(2) IUT (Intra Uterine Transfer)
(3) GIFT (Gamete Intra Fallopian Transfer)
(4) Artificial Insemination

61. Categorize the following Intra-Uterine Devices (IUDs) correctly: Progestasert and Multiload 375.

(1) Copper releasing and hormone releasing
(2) Non-mediated and copper releasing
(3) Hormone releasing and copper releasing
(4) Gossypol and hormone releasing

62. Most Sexually Transmitted Diseases (STDs) are curable if detected early. However, which of the following is completely curable?

(1) HIV infection
(2) Genital herpes
(3) Chlamydiosis
(4) Hepatitis-B

63. Lactational amenorrhoea is a natural method of contraception based on the absence of menstruation. It is considered effective only up to:

(1) Three months after parturition
(2) Six months after parturition
(3) One year after parturition
(4) Two years after parturition

64. When HIV enters the human body, it specifically replicates within a certain cell type to produce progeny viruses. Identify this cell "A":

(1) T-Killer Cell
(2) Natural killer cell
(3) T-Helper cell
(4) B-Lymphocyte

65. Which of the following pairs represents drugs that are derived exclusively from the plant Cannabis sativa?

(1) Charas and Heroin
(2) Ganja and Cocaine
(3) Hashish and Marijuana
(4) Atropa and Datura

66. Autoimmune diseases occur when the body attacks its own cells. Which of the following options represents a pair of autoimmune diseases?

(1) Malaria and AIDS
(2) Dengue and Chicken pox
(3) Rheumatoid Arthritis and Myasthenia gravis
(4) Alzheimer's disease and Tuberculosis

67. An anamnestic response in acquired immunity is characterized by which of the following?

(1) A low-intensity primary response.
(2) A highly intensified response upon a subsequent encounter with the same pathogen.
(3) A non-specific response to any foreign invader.
(4) The body's inability to distinguish between self and non-self.

68. During the life cycle of the malarial parasite Plasmodium, in which human organ or cell type do the initial stages of multiplication occur?

(1) Red Blood Cells (RBCs)
(2) White Blood Cells (WBCs)
(3) Liver
(4) Heart

69. Phagocytic cells, which are part of the cellular barriers of innate immunity, destroy harmful bacteria primarily through the process of:

(1) Endocytosis (Phagocytosis)
(2) Antibody production
(3) Interferon secretion
(4) Perforin release

70. Acquired immunity is distinct from innate immunity. Which of the following is a fundamental characteristic of how acquired immunity functions?

(1) T-lymphocytes directly produce circulating antibodies.
(2) B-lymphocytes produce specific antibodies to neutralize pathogens.
(3) It relies solely on the basic pH of the stomach.
(4) It is present from birth and is non-specific.

71. In the study of drug abuse, which of the following correctly matches a drug with its source or derivative?

(1) Heroin is obtained by the acetylation of morphine.
(2) Ganja is obtained from the roots of the Cannabis plant.
(3) Cocaine is derived from the coffee plant.
(4) Morphine is extracted from the leaves of the poppy plant.

72. Statement I: Ionizing radiations like X-rays and non-ionizing radiations like UV cause DNA damage. Statement II: The transformation of normal cells into cancerous cells is induced by carcinogens.

(1) Both statement-I and II are true.
(2) Both statement-I and II are false.
(3) Only statement-I is true.
(4) Only statement-II is true.

73. According to the Hardy-Weinberg principle, which of the following factors can disturb the genetic equilibrium and affect gene frequency in a population?

(1) Natural selection
(2) Gene migration and Mutation
(3) Genetic drift and Recombination
(4) All of the above

74. In evolutionary biology, identify the option that correctly pairs structures representing convergent evolution (analogous structures):

(1) Sweet potato and potato
(2) Thorn of Bougainvillea and tendril of Cucurbita
(3) Vertebrate hearts and brains
(4) Forelimbs of whale, cheetah, and man

75. Hugo de Vries proposed that mutations are the cause of evolution. According to his theory, mutations are:
(1) Random and directional
(2) Small and directionless
(3) Random and directionless
(4) Small and directional

76. The Theory of Panspermia, once a popular idea among astronomers, suggests that:
(1) Life originated from inorganic molecules in a primordial soup.
(2) Units of life called spores were transferred to different planets, including Earth.
(3) Life arose spontaneously from decaying matter like straw.
(4) Evolution occurs through the inheritance of acquired characteristics.

77. Darwin's theory of evolution by natural selection was based on two key concepts. What are they?
(1) Branching descent and Natural selection
(2) Reproductive isolation and Mutation
(3) Use and disuse of organs and Adaptation
(4) Saltation and Genetic drift

78. Which of the following statements regarding the rate of evolution and fitness is correct?
(1) The rate of appearance of new forms is not linked to the life cycle.
(2) Fitness is the end result of the ability to adapt and get selected by nature.
(3) Branching descent is the key concept of Lamarckism.
(4) Evolution is driven solely by the use and disuse of organs.

79. In Animal Diversity, which of the following groups contains animals that all belong to the same taxonomic class?
(1) Chameleon, Cobra, Ophiura
(2) Bufo, Hyla, Salamander, Ichthyophis
(3) Corvus, Neophron, Pteropus
(4) Delphinus, Macropus, Betta

80. Match the phylum with its representative organisms: (a) Echinodermata, (b) Annelida, (c) Amphibia.
(1) (a) Asterias, (b) Hirudinaria, (c) Hyla
(2) (a) Echinus, (b) Sabella, (c) Betta
(3) (a) Cucumaria, (b) Nereis, (c) Chelone
(4) (a) Aphrodite, (b) Lumbricus, (c) Salamandra

81. Regarding the Class Reptilia, identify the statement that is scientifically accurate:
(1) Chelone has skin covered by scales and possesses an external ear opening.
(2) All reptiles, including Vipers, possess a four-chambered heart.
(3) Crocodiles exhibit external fertilization and are oviparous.

(4) Testudo has bony scutes, a tympanum representing the ear, and a three-chambered heart (incomplete 4).

82. Match List-I (Special Features) with List-II (Organisms): (A) Metagenesis, (B) Radula, (C) Bioluminescence, (D) Proboscis gland.

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

83. Which of the following statements regarding animal phyla is correct?

(1) Flatworms (Platyhelminthes) are pseudocoelomate animals.
(2) Annelids are diploblastic and lack true segmentation.
(3) Arthropods are mostly dioecious with usually internal fertilization.
(4) Aschelminthes exhibit external fertilization and are hermaphroditic.

84. Birds (Aves) have several unique adaptations for flight. Which of the following is a characteristic feature of this class?

(1) Presence of feathers and hollow (pneumatic) bones.
(2) Moist skin with numerous glands to reduce friction.
(3) Presence of mammary glands and pinna.
(4) Skin is rough and covered with hair.

85. Assertion (A): Cartilaginous fishes must swim constantly to avoid sinking. Reason (R): They lack an air bladder (swim bladder) which provides buoyancy.

(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(3) (A) is correct but (R) is incorrect.
(4) (A) is incorrect but (R) is correct.

86. The water vascular system is a distinctive feature of which of the following groups of animals?

(1) Asterias, Echinus, Antedon
(2) Sycon, Spongilla, Euspongia
(3) Pila, Octopus, Aplysia
(4) Balanoglossus, Saccoglossus

87. In taxonomic classification, which of the following is an incorrect match between the organism and its category?

(1) Ascidia - Urochordata
(2) Scoliodon - Amphibia
(3) Catla - Pisces
(4) Lamprey - Agnatha

88. Match the common names with their scientific names: (a) Star fish, (b) Devil fish, (c) King crab, (d) Brittle star.

(1) (a)-III, (b)-IV, (c)-I, (d)-II
(2) (a)-I, (b)-II, (c)-III, (d)-IV
(3) (a)-IV, (b)-III, (c)-II, (d)-I
(4) (a)-III, (b)-II, (c)-IV, (d)-I

89. Which of the following is considered a "living fossil" because it has remained virtually unchanged for millions of years?

(1) Spongilla
(2) Obelia
(3) Limulus
(4) Aplysia

90. Assertion (A): All vertebrates are chordates, but not all chordates are vertebrates. Reason (R): The notochord is replaced by a vertebral column in adult vertebrates.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A).
(2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
(3) (A) is true but (R) is false.
(4) (A) is false but (R) is true.

Answer Key & Detailed Explanations

1. **(4) 576**: In a dihybrid cross (F_2), the ratio for double dominant phenotype is 9/16. Calculation: $1024 \times (9/16) = 576$.
2. **(4) Both (1) and (3)**: The pedigree shows affected individuals in every generation and both sexes, which matches both patterns.
3. **(3) Both unmodified/equivalent**: Dominance is caused by unmodified alleles or functionally equivalent modified ones.
4. **(2) 12%**: Map distance 24 cM = 24% recombinants. AB and ab are recombinants (12% each).
5. **(3) Assertion true, Reason false**: Mendel used *test crosses* (with homozygous recessive) to determine genotype.
6. **(3) (a), (b) & (d)**: Lack of proof, discrete units rejection, and slow communication were the primary factors.
7. **(1) adcb**: Based on mapping: $a \xrightarrow{3.5} d \xrightarrow{1.5} c \xrightarrow{1} b$. Total $a - b = 6$.
8. **(2) a-iii, b-iv, c-ii, d-i**: Standard genetic disorder characteristics.
9. **(1) Both are correct**: Both are recessive blood disorders affecting hemoglobin/clotting.
10. **(2) a, b, and c**: ABO system has 6 genotypes and $I^A I^B$ shows codominance.
11. **(4) Both correct**: Mendel utilized 14 true-breeding varieties with distinct pairs of contrasting traits.
12. **(4) Both correct; R explanation**: Emasculation prevents selfing in naturally bisexual pea flowers.
13. **(1) (b) and (e)**: PKU is Mendelian; Hb polymerizes in sickle cell under low oxygen tension.
14. **(2) A-ii, B-i, C-iii, D-iv**: Organism-specific sex determination types.
15. **(4) Both correct**: Male grasshoppers are XO; the human Y chromosome is much smaller than X.
16. **(2) Correct sequence**: W-Group A, X-Group B, Y-Group AB, Z-Group O.
17. **(3) Incorrect statement**: Pink × pink results in a 1:2:1 ratio (Red:Pink:White).
18. **(1) 1.3% recombination**: Body and eye color genes in Drosophila are very tightly linked.
19. **(1) 50%**: Carrier female (X^cX) × colorblind male (X^cY) gives 50% affected offspring.
20. **(1) Father directly to son**: X-linked genes cannot pass from father to son as the son receives the Y chromosome.
21. **(1) A-die; B-live**: S-strain is virulent; R-strain is non-virulent.
22. **(1) 4**: All listed DNA structural properties are correct.
23. **(4) Incorrect statement**: A single base pair change (Point mutation) causes Sickle cell anaemia.
24. **(4) i-C, ii-D, iii-A, iv-B**: Specific genome sizes and nucleotide counts.
25. **(3) Both correct**: The Lac operon is regulated by substrate (Lactose).
26. **(3) c-b-a-d**: Ribosome bind → tRNA bind → Ribosome movement → Release.
27. **(2) b-d-a-c**: Digestion → Separation → Hybridization → Detection.

28. **(3) 5' AUGGAACUA 3'**: mRNA is 5'-3' and complementary to the 3'-5' template.
29. **(4) 0:1:7**: After 4 generations, heavy DNA disappears and light DNA predominates.
30. **(3) 2000 bp/minute**: Incorrect. E. coli polymerizes at 2000 bp per *second*.
31. **(1) Both correct**: Inhibitor gene 'i' codes for repressor; z, y, a are structural.
32. **(1) Flowchart**: Transcription → Processing → Transport → Translation.
33. **(4) 3 nucleotides**: 3 nucleotides (one triplet) code for one specific amino acid.
34. **(4) 0.8**: Base ratios are identical on complementary strands.
35. **(1) Only one strand**: Only the template strand is transcribed into RNA.
36. **(2) B and C**: Replication is continuous on $3' \rightarrow 5'$ template with high accuracy.
37. **(3) I incorrect, II correct**: Polymerase is template-dependent.
38. **(1) A-IV, B-III, C-I, D-II**: Correct cistron and sequence classifications.
39. **(1) Correct sequence**: Repressor (i), β-gal (z), Permease (y), Transacetylase (a).
40. **(1) N/S**: Number of individuals per unit Space.
41. **(3) Carrying capacity**: K represents the limit of the environment.
42. **(2) Expanding**: A large pre-reproductive base indicates a growing population.
43. **(2) Niche**: The functional role or "profession" of a species.
44. **(1) Orchid**: A classic example of an epiphyte.
45. **(2) a, b, c, d**: Functionals: Productivity, Decomposition, Nutrient cycling, Energy flow.
46. **(3) Diploid gametes**: Incorrect. Spermatogenesis produces haploid gametes.
47. **(4) Relaxin/Est/Prog**: These are shared by both the ovary and the placenta.
48. **(3) Uterine cavity**: Inaccurate. The site of fertilization is the Fallopian tube.
49. **(2) Maternal Pituitary**: Oxytocin for labor is released from the posterior pituitary.
50. **(3) Spermiogenesis/Spermiation**: Formation of sperm → Release from tubules.
51. **(3) Oogenesis**: This process is unique because it starts during fetal life.
52. **(4) Fallopian tube**: ZIFT is the transfer into the tube.
53. **(1) Vas deferens**: Transports sperm. Testes have 250 lobules.
54. **(1) hCG**: The primary hormone detected by pregnancy tests.
55. **(1) Estrogen rise**: Estrogen increases post-ovulation to repair the endometrium.
56. **(3) Heart sound**: First sign heard via stethoscope at ~1 month.
57. **(1) Both correct/Explanation**: Estrogen from follicles drives regeneration.
58. **(2) a-iii, b-i, c-ii**: Secondary (Theca), Tertiary (Antrum), Corpus Luteum (Progesterone).
59. **(2) Saheli**: Developed at Lucknow, it is non-steroidal and taken weekly.
60. **(2) IUT**: Used for embryos beyond 8 cells (transferred to uterus).
61. **(3) Hormone/Copper**: Progestasert (Hormone) and Multiload (Copper).
62. **(3) Chlamydiosis**: Bacterial and curable. Viral ones are incurable.
63. **(2) Six months**: Temporary limit for lactational amenorrhoea.

64. **(3) Helper T**: HIV targets CD4+ T-helper cells.
65. **(3) Hashish/Marijuana**: Derived from *Cannabis sativa*.
66. **(3) RA and Myasthenia**: Both are autoimmune conditions.
67. **(2) Highly intensified**: Result of immune memory.
68. **(3) Liver**: Initial multiplication of Plasmodium occurs in liver cells.
69. **(1) Phagocytosis**: Process of cellular ingestion and destruction.
70. **(2) B-lymphocytes**: Responsible for producing antibodies.
71. **(1) Acetylation**: Morphine $\xrightarrow{Acetylation}$ Heroin.
72. **(1) Both true**: Science of oncology and DNA damage.
73. **(4) All**: These factors all disturb equilibrium.
74. **(1) Sweet potato/potato**: Analogous structures (Convergent evolution).
75. **(3) Random and directionless**: Hugo de Vries' Mutation Theory.
76. **(2) Spores**: Panspermia involves extraterrestrial seeding.
77. **(1) Key concepts**: Branching descent and natural selection.
78. **(2) Fitness**: Result of ability to adapt and survive.
79. **(2) Amphibians**: All listed are classic amphibians.
80. **(1) Phylum-Genus**: Correct representative matches.
81. **(3) Crocodiles**: Unique 4-chambered heart but remain oviparous.
82. **(1) Matches**: Metagenesis-Obelia, Radula-Mollusc, Bioluminescence-Ctenophores.
83. **(3) Arthropods**: Characteristics of the largest phylum.
84. **(1) Adaptations**: Features required for flight.
85. **(1) Air bladder absent**: Cartilaginous fish must move to stay buoyant.
86. **(1) Echinoderms**: Asterias etc. use this for movement/feeding.
87. **(2) Scoliodon**: Incorrect. It is a fish, not an amphibian.
88. **(1) Common names**: Starfish (Asterias), Devil fish (Octopus), King crab (Limulus).
89. **(3) Limulus**: The King Crab is a living fossil.
90. **(1) Both true/Explanation**: All vertebrates have chordate traits, but notochord is replaced.