Year 2025 NEET Biology Solved Paper

1. The complex II of mitochondrial electron transport chain is also known as

a. Cytochrome bc_1 b. Succinate dehydrogenase

c. Cytochrome c oxidase d. NADH dehydrogenase

2. Polymerase chain reaction (PCR) amplifies DNA following the equation.

a. N^2 b. 2^n

c. $2n + 1$ d. $2N^2$

3. What are the potential drawbacks in adoption of the IVF method?

A. High fatality risk to mother

B. Expensive instruments and reagents

C. Husband/wife necessary for being donors

D. Less adoption of orphans

E. Not available in India

F. Possibility that the early embryo does not survive

Choose the correct answer from the options given below:

a. B, D, F only b. A, C, D, F only

c. A, B, C, D only d. A, B, C, E, F only

4. What is the name of the blood vessel that carries deoxygenated blood from the body to the heart in a frog?

a. Aorta b. Pulmonary artery

c. Pulmonary vein d. Vena cava

5. Which one of the following statements refers to Reductionist Biology?

a. Physico-chemical approach to study and understand living organisms.

b. Physiological approach to study and understand living organisms.

c. Chemical approach to study and understand living organisms.

d. Behavioural approach to study and understand living organisms.

6. Given below are two statements:

Statement I: In the RNA world, RNA is considered the first genetic material evolved to carry out essential life processes. RNA acts as a genetic material and also as a catalyst for some important biochemical reactions in living systems. Being reactive, RNA is unstable.

Statement II: DNA evolved from RNA and is a more stable genetic material. Its double helical strands being complementary, resist changes by evolving repairing mechanism.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

a. Both Statement I and Statement II are correct

b. Both Statement I and Statement II are incorrect

c. Statement I is correct but Statement II is incorrect

d. Statement I is incorrect but Statement II is correct

7. Epiphytes that are growing on a mango branch is an example of which of the following?

a. Commensalism b. Mutualism

c. Predation d. Amensalism

8. From the statements given below choose the **correct** option:

A. The eukaryotic ribosomes are 80S and prokaryotic ribosomes are 70S.

B. Each ribosome has two sub-units.

C. The two sub-units of 80S ribosome are 60S and 40S while that of 70S are 50S and 30S.

D. The two sub-units of 80S ribosome are 60S and 20S and that of 70S are 50S and 20S.

E. The two sub-units of 80S are 60S and 30S and that of 70S are 50S and 30S.

a. A, B, C are true b. A, B, D are true

c. A, B, E are true d. B, D, E are true

9. Which one of the following is an example of ex-situ conservation?

a. National Park

b. Wildlife Sanctuary

c. Zoos and botanical gardens

d. Protected areas

10. Given below are two statements:

Statement I: The primary source of energy in an ecosystem is solar energy.

Statement II: The rate of production of organic matter during photosynthesis in an ecosystem is called net primary productivity (NPP).

In the light of the above statements, choose the **most appropriate** answer from the options given below:

a. Both Statement I and Statement II are correct

b. Both Statement I and Statement II are incorrect

c. Statement I is correct but Statement II is incorrect

d. Statement I is incorrect but Statement II is correct

11. Match **List-I** with **List-II**:

	List-I		List-II
A.	Emphysema	I.	Rapid spasms in muscle due to low Ca^{++} in body fluid
B.	Angina Pectoris	II.	Damaged alveolar walls and decreased respiratory surface
C.	Glomerulonephritis	III.	Acute chest pain when not enough oxygen is reaching to heart muscle
D.	Tetany	IV.	Inflammation of glomeruli of kidney

Choose the **correct** answer from the options given below:

a. A-III, B-I, C-IV, D-II
b. A-III, B-I, C-II, D-IV
c. A-II, B-IV, C-III, D-I
d. A-II, B-III, C-IV, D-I

12. Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Both wind and water pollinated flowers are not very colourful and do not produce nectar.

Reason (R): The flowers produce enormous amount of pollen grains in wind and water pollinated flowers.

In the light of the above statements, choose the **correct** answer from the options given below:

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

13. Which of the following is an example of non-distilled alcoholic beverage produced by yeast?

a. Whisky
b. Brandy
c. Beer
d. Rum

14. Given below are two statements:

Statement I: In a floral formula ⊕ stands for zygomorphic nature of the flower, and G stands for inferior ovary.

Statement II: In a floral formula ⊕ stands for actinomorphic nature of the flower and G stands for superior ovary.

In the light of the above statements, choose the **correct** answer from the options given below:

a. Both Statement I and Statement II are correct
b. Both Statement I and Statement II are incorrect
c. Statement I is correct but Statement II is incorrect
d. Statement I is incorrect but Statement II is correct

15. Streptokinase produced by *bacterium Streptococcus* is used for

a. Curd production
b. Ethanol production
c. Liver disease treatment
d. Removing clots from blood vessels

16. Which chromosome in the human genome has the highest number of genes?

a. Chromosome X
b. Chromosome Y
c. Chromosome 1
d. Chromosome 10

17. Which of the following statement is **correct** about location of the male frog copulatory pad?

a. First and second digit of fore limb
b. First digit of hind limb
c. Second digit of fore limb
d. First digit of the fore limb

18. Which one of the following phytohormones promotes nutrient mobilization which helps in the delay of leaf senescence in plants?

a. Ethylene
b. Abscisic acid
c. Gibberellin
d. Cytokinin

19. While trying to find out the characteristic of a newly found animal, a researcher did the histology of adult animal and observed a cavity with presence of mesodermal tissue towards the body wall but no mesodermal tissue was observed towards the alimentary canal. What could be the possible coelome of that animal?

a. Acoelomate
b. Pseudocoelomate
c. Schizocoelomate
d. Spongocoelomate

20. Match **List-I** with **List-II**.

	List-I		List-II
A.	Head	(I)	Enzymes
B.	Middle piece	(II)	Sperm motility
C.	Acrosome	(III)	Energy
D.	Tail	(IV)	Genetic material

Choose the **correct** answer from the options given below:

a. A-IV, B-III, C-I, D-II
b. A-IV, B-III, C-II, D-I
c. A-III, B-IV, C-II, D-I
d. A-III, B-II, C-I, D-IV

21. Given below are the stages in the life cycle of pteridophytes. Arrange the following stages in the correct sequence.

A. Prothallus stage
B. Meiosis in spore mother cells
C. Fertilisation
D. Formation of archegonia and antheridia in gametophyte
E. Transfer of antherozoids to the archegonia in presence of water

Choose the **correct** answer from the options given below:

a. B, A, D, E, C
b. B, A, E, C, D
c. D, E, C, A, B
d. E, D, C, B, A

22. Cardiac activities of the heart are regulated by:

A. Nodal tissue
B. A special neural centre in the medulla oblongata
C. Adrenal medullary hormones
D. Adrenal cortical hormones

Choose the **correct** answer from the options given below:

a. A, B and C Only
b. A, B, C and D
c. A, C and D Only
d. A, B and D Only

23. Which of following organisms *cannot* fix nitrogen?

A. *Azotobacter* B. *Oscillatoria* C. *Anabaena*
D. *Volvox* E. *Nostoc*

Choose the ***correct*** answer from the options given below:

a. A only b. D only c. B only d. E only

24. Given below are two statements:

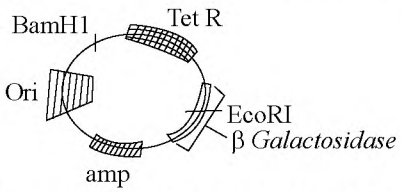
Statement I: Transfer RNAs and ribosomal RNA do not interact with mRNA.

Statement II: RNA interference (RNAi) takes place in all eukaryotic organisms as a method of cellular defence.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

a. Both Statement I and Statement II are correct
b. Both Statement I and Statement II are incorrect
c. Statement I is correct but Statement II is incorrect
d. Statement I is incorrect but Statement II is correct

25.



In the above represented plasmid an alien piece of DNA is inserted at EcoRI site. Which of the following strategies will be chosen to select the recombinant colonies?

a. Using ampicillin & tetracyclin containing medium plate
b. Blue color colonies will be selected
c. White color colonies will be selected
d. Blue color colonies grown on ampicillin plates can be selected

26. Which of the following genetically engineered organisms was used by Eli Lilly to prepare human insulin?

a. Bacterium b. Yeast c. Virus d. Phage

27. Name the class of enzyme that usually catalyze the following reaction:

$S - G + S^{\#} \rightarrow S + S^{\#} - G$

Where, G → a group other than hydrogen

S → a substrate

$S^{\#}$ → another substrate

a. Hydrolase b. Lyase
c. Transferase d. Ligase

28. Find the statement that is **NOT** correct with regard to the structure of monocot stem.

a. Hypodermis is parenchymatous.
b. Vascular bundles are scattered.
c. Vascular bundles are conjoint and closed.
d. Phloem parenchyma is absent.

29. The correct sequence of events in the life cycle of bryophytes is:

A. Fusion of antherozoid with egg.
B. Attachment of gametophyte to substratum.
C. Reduction division to produce haploid spores.
D. Formation of sporophyte.
E. Release of antherozoids into water.

Choose the **correct** answer from the options given below:

a. D, E, A, C, B b. B, E, A, C, D
c. B, E, A, D, C d. D, E, A, B, C

30. Which are correct:

A. Computed tomography and magnetic resonance imaging detect cancers of internal organs.
B. Chemotherapeutics drugs are used to kill non-cancerous cells.
C. α-interferon activates the cancer patients' immune system and helps in destroying the tumour.
D. Chemotherapeutic drugs are biological response modifiers.
E. In the case of leukaemia, blood cell counts are decreased.

Choose the **correct** answer from the options given below:

a. B and D only b. D and E only
c. C and D only d. A and C only

31. Match **List-I** with **List-II**.

	List-I		List-II
A.	Centromere	I.	Mitochondrion
B.	Cilium	II.	Cell division
C.	Cristae	III.	Cell movement
D.	Cell membrane	IV.	Phospholipid Bilayer

Choose the **correct** answer from the options given below:

a. A-I, B-II, C-III, D-IV b. A-II, B-I, C-IV, D-III
c. A-IV, B-II, C-III, D-I d. A-II, B-III, C-I, D-IV

32. Match **List-I** with **List-II**:

	List-I		List-II
A.	Chlorophyll a	I.	Yellow-green
B.	Chlorophyll b	II.	Yellow
C.	Xanthophylls	III.	Blue-green
D.	Carotenoids	IV.	Yellow to Yellow-orange

Choose the option with all **correct** matches:

a. A-III, B-IV, C-II, D-I b. A-III, B-I, C-II, D-IV
c. A-I, B-II, C-IV, D-III d. A-I, B-IV, C-III, D-II

33. Find the correct statements:

A. In human pregnancy, the major organ systems are formed at the end of 12 weeks.
B. In human pregnancy, the major organ systems are formed at the end of 8 weeks.
C. In human pregnancy heart is formed after one month of gestation.
D. In human pregnancy, limbs and digits develop by the end of second month.
E. In human pregnancy the appearance of hair is usually observed in the fifth month.

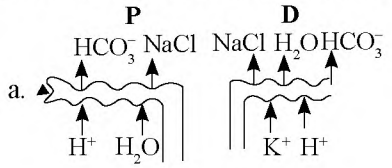
Choose the **correct** answer from the options given below:

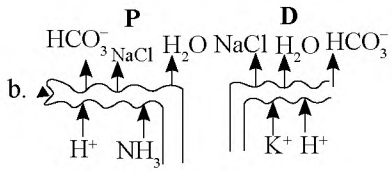
a. A and E Only b. B and C Only
c. B, C, D and E Only d. A, C, D and E Only

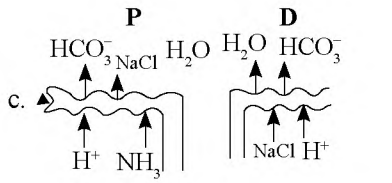
34. In the seeds of cereals, the outer covering of endosperm separates the embryo by a protein-rich layer called:

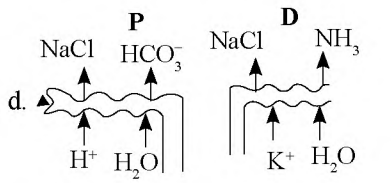
a. Coleoptile b. Coleorhiza
c. Integument d. Aleurone layer

35. Which of the following diagrams is correct with regard to the proximal **(P)** and distal **(D)** tubule of the Nephron.

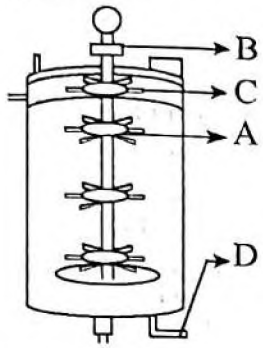
a. 

b. 

c. 

d. 

36. Identify the part of a bio-reactor which is used as a foam braker from the given figure.



a. A b. B c. D d. C

37. Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): A typical unfertilised, angiosperm embryo sac at maturity is 8 nucleate and 7-celled.

Reason (R): The egg apparatus has 2 polar nuclei.

In the light of the above statements, choose the correct answer from the options given below:

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

38. A specialised membranous structure in a prokaryotic cell which helps in cell wall formation, DNA replication and respiration is:

a. Mesosome b. Chromatophores
c. Cristae d. Endoplasmic Reticulum

39. Which of the following are the post-transcriptional events in an eukaryotic cell?

A. Transport of pre-mRNA to cytoplasm prior to splicing.
B. Removal of introns and joining of exons.
C. Addition of methyl group at 5' end of hnRNA.
D. Addition of adenine residues at 3' end of hnRNA.
E. Base pairing of two complementary RNAs.

Choose the **correct** answer from the options given below:

a. A, B, C only b. B, C, D only
c. B, C, E only d. C, D, E only

40. What is the pattern of inheritance for polygenic trait?

a. Mendelian inheritance pattern
b. Non-mendelian inheritance pattern
c. Autosomal dominant pattern
d. X-linked recessive inheritance pattern

41. Which one of the following enzymes contains 'Haem' as the prosthetic group?

a. RuBisCO
b. Carbonic anhydrase
c. Succinate dehydrogenase
d. Catalase

42. Each of the following characteristics represent a Kingdom proposed by Whittaker. Arrange the following in increasing order of complexity of body organization.

A. Multicellular heterotrophs with cell wall made of chitin.
B. Heterotrophs with tissue/organ/organ system level of body organization.
C. Prokaryotes with cell wall made of polysaccharides and amino acids.
D. Eukaryotic autotrophs with tissue/organ level of body organization.
E. Eukaryotes with cellular body organization.

Choose the **correct** answer from the options given below:

a. A, C, E, B, D b. C, E, A, D, B
c. A, C, E, D, B d. C, E, A, B, D

43. Who is known as the father of Ecology in India?

a. S. R. Kashyap b. Ramdeo Misra
c. Ram Udar d. Birbal Sahni

44. Match **List-I** with **List-II**:

	List-I		**List-II**
A.	Alfred Hershey and Martha Chase	I.	*Streptococcus pneumoniae*
B.	Euchromatin	II.	Densely packed and dark-stained
C.	Frederick Griffith	III.	Loosely packed and light-stained
D.	Heterochromatin	IV.	DNA as genetic material confirmation

Choose the **correct** answer from the options given below:

a. A-II, B-IV, C-I, D-III b. A-IV, B-II, C-I, D-III
c. A-IV, B-III, C-I, D-II d. A-III, B-II, C-IV, D-I

45. Neoplastic characteristics of cells refer to:

A. A mass of proliferating cell

B. Rapid growth of cells

C. Invasion and damage to the surrounding tissue

D. Those confined to original location

Choose the **correct** answer from the options given below:

a. A, B only b. A, B, C only

c. A, B, D only d. B, C, D only

46. Given below are two statements:

Statement I: The DNA fragments extracted from gel electrophoresis can be used in construction of recombinant DNA.

Statement II: Smaller size DNA fragments are observed near anode while larger fragments are found near the wells in an agarose gel.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

a. Both statement I and statement II are correct

b. Both statement I and statement II are incorrect

c. Statement I is correct but statement II is incorrect

d. Statement I is incorrect but statement II is correct

47. Match **List-I** with **List-II**:

	List-I		List-II
A.	Adenosine	I.	Nitrogen base
B.	Adenylic acid	II.	Nucleotide
C.	Adenine	III.	Nucleoside
D.	Alanine	IV.	Amino acid

Choose the option with all **correct** matches:

a. A-III, B-IV, C-II, D-I b. A-III, B-II, C-IV, D-I

c. A-III, B-II, C-I, D-IV d. A-II, B-III, C-I, D-IV

48. Consider the following:

A. The reductive division for the human female gametogenesis starts earlier than that of the male gametogenesis.

B. The gap between the first meiotic division and the second meiotic division is much shorter for males compared to females.

C. The first polar body is associated with the formation of the primary oocyte.

D. Luteinizing Hormone (LH) surge leads to disintegration of the endometrium and onset of menstrual bleeding.

Choose the **correct** answer from the options given below:

a. A and B are true b. A and C are true

c. B and D are true d. B and C are true

49. All living members of the class Cyclostomata are:

a. Free living b. Endoparasite

c. Symbiotic d. Ectoparasite

50. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): The primary function of the Golgi apparatus is to package the materials made by the endoplasmic reticulum and deliver it to intracellular targets and outside the cell.

Reason (R): Vesicles containing materials made by the endoplasmic reticulum fuse with the cis face of the Golgi apparatus, and they are modified and released from the trans face of the Golgi apparatus.

In the light of the above statements, choose the **correct** answer from the options given below:

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

51. Match **List I** with **List II**:

	List I		List II
A.	Scutellum	I.	Persistent nucellus
B.	Non-albuminous seed	II.	Cotyledon of monocot seed
C.	Epiblast	III.	Groundnut
D.	Perisperm	IV.	Rudimentary cotyledon

Choose the option with **all correct** matches:

a. A-II, B-III, C-IV, D-I

b. A-IV, B-III, C-II, D-I

c. A-IV, B-III, C-I, D-II

d. A-II, B-IV, C-III, D-I

52. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): All vertebrates are chordates but all chordates are not vertebrate.

Reason (R): The members of subphylum vertebrata possess notochord during the embryonic period, the notochord is replaced by a cartilaginous or bony vertebral column in adults.

In the light of the above statements, choose the **correct** answer from the options given below:

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. Identify the statement that is **NOT** correct.

a. Each antibody has two light and two heavy chains.

b. The heavy and light chains are held together by disulfide bonds.

c. Antigen binding site is located at C-terminal region of antibody molecules.

d. Constant region of heavy and light chains are located at C-terminus of antibody molecules.

54. Silencing of specific mRNA is possible *via* RNAi because of –

a. Complementary dsRNA b. Inhibitory ssRNA

c. Complementary tRNA d. Non-complementary ssRNA

55. Genes R and Y follow independent assortment. If RRYY produce round yellow seeds and rryy produce wrinkled green seeds, what will be the phenotypic ratio of the F_2 generation?

a. Phenotypic ratio – 1 : 2 : 1
b. Phenotypic ratio – 3 : 1
c. Phenotypic ratio – 9 : 3 : 3 : 1
d. Phenotypic ratio – 9 : 7

56. Histones are enriched with –

a. Lysine & Arginine
b. Leucine & Lysine
c. Phenylalanine & Leucine
d. Phenylalanine & Arginine

57. The first menstruation is called:

a. Menopause b. Menarche
c. Diapause d. Ovulation

58. Match **List-I** with **List-II**.

	List-I		List-II
A.	Heart	I.	Erythropoietin
B.	Kidney	II.	Aldosterone
C.	Gastro-intestinal tract	III.	Atrial natriuretic factor
D.	Adrenal Cortex	IV.	Secretin

Choose the **correct** answer from the options given below:

a. A-II, B-I, C-III, D-IV b. A-IV, B-III, C-II, D-I
c. A-I, B-III, C-IV, D-II d. A-III, B-I, C-IV, D-II

59. The protein portion of an enzyme is called:

a. Cofactor b. Coenzyme
c. Apoenzyme d. Prosthetic group

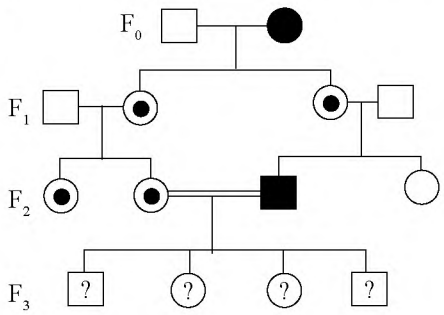
60. Which of the following is the unit of productivity of an Ecosystem?

a. gm^{-2} b. KCal m^{-2}
c. KCal m^{-3} d. (KCal m^{-2}) yr^{-1}

61. Sweet potato and potato represent a certain type of evolution. Select the correct combination of terms to explain the evolution.

a. Analogy, convergent b. Homology, divergent
c. Homology, convergent d. Analogy, divergent

62. With the help of given pedigree, find out the probability for the birth of a child having no disease and being a carrier (has the disease mutation in one allele of the gene) in F_3 generation.



Unaffected male
Affected male
Carrier female
Unaffected female
Affected female

a. 1/4 b. 1/2 c. 1/8 d. Zero

63. Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Cells of the tapetum possess dense cytoplasm and generally have more than one nucleus.

Reason (R): Presence of more than one nucleus in the tapetum increases the efficiency of nourishing the developing microspore mother cells.

In light of the above statements, choose the **most appropriate** answer from the options given below:

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

64. How many meiotic and mitotic divisions need to occur for the development of a mature female gametophyte from the megaspore mother cell in an angiosperm plant?

a. 2 Meiosis and 3 Mitosis b. 1 Meiosis and 2 Mitosis
c. 1 Meiosis and 3 Mitosis d. No Meiosis and 2 Mitosis

65. Which of the following is an example of a zygomorphic flower?

a. *Petunia* b. *Datura* c. Pea d. Chilli

66. After maturation, in primary lymphoid organs, the lymphocytes migrate for interaction with antigens to secondary lymphoid organ(s) / tissue(s) like:

A. Thymus B. Bone marrow
C. Spleen D. Lymph nodes
E. Peyer's patches

Choose the *correct* answer from the options given below:

a. B, C, D only b. A, B, C only
c. E, A, B only d. C, D, E only

67. Given below are two statements:

Statement I: Fig fruit is a non-vegetarian fruit as it has enclosed fig wasps in it.

Statement II: Fig wasp and fig tree exhibit mutual relationship as fig wasp completes its life cycle in fig fruit and fig fruit gets pollinated by fig wasp.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

a. Both statement I and statement II are correct
b. Both statement I and statement II are incorrect
c. Statement I is correct but statement II is incorrect
d. Statement I is incorrect but statement II is correct

68. What is the main function of the spindle fibers during mitosis?

a. To separate the chromosomes
b. To synthesize new DNA
c. To repair damaged DNA
d. To regulate cell growth

69. Which one of the following is the characteristic feature of gymnosperms?

a. Seeds are enclosed in fruits.
b. Seeds are naked.
c. Seeds are absent.
d. Gymnosperms have flowers for reproduction.

70. Consider the following statements regarding function of adrenal medullary hormones:

A. It causes pupilary constriction
B. It is a hyperglycemic hormone
C. It causes piloerection
D. It increases strength of heart contraction

Choose the **correct** answer from the options given below:

a. C and D Only
b. B, C and D Only
c. A, C and D Only
d. D Only

71. Why can't insulin be given orally to diabetic patients?

a. Human body will elicit strong immune response
b. It will be digested in Gastro-Intestinal (GI) tract
c. Because of structural variation
d. Its bioavailability will be increased

72. Match **List-I** with **List-II**.

	List-I		List-II
A.	Pteridophyte	I.	*Salvia*
B.	Bryophyte	II.	*Ginkgo*
C.	Angiosperm	III.	*Polytrichum*
D.	Gymnosperm	IV.	*Salvinia*

Choose the option with all **correct** matches:

a. A-III, B-IV, C-II, D-I
b. A-IV, B-III, C-I, D-II
c. A-III, B-IV, C-I, D-II
d. A-IV, B-III, C-II, D-I

73. Who proposed that the genetic code for amino acids should be made up of three nucleotides?

a. George Gamow
b. Francis Crick
c. Jacque Monod
d. Franklin Stahl

74. Match **List-I** with **List-II**:

	List-I		List-II
A.	The Evil Quartet	I.	Cryopreservation
B.	*Ex situ* conservation	II.	Alien species invasion
C.	*Lantana camara*	III.	Causes of biodiversity losses
D.	Dodo	IV.	Extinction

Choose the option with all correct matches:

a. A-III, B-II, C-I, D-IV
b. A-III, B-I, C-II, D-IV
c. A-III, B-IV, C-II, D-I
d. A-III, B-II, C-IV, D-I

75. Which of the following hormones released from the pituitary is actually synthesized in the hypothalamus?

a. Luteinizing hormone (LH)
b. Anti-diuretic hormone (ADH)
c. Follicle-stimulating hormone (FSH)
d. Adrenocorticotrophic hormone (ACTH)

76. Role of the water vascular system in Echinoderms is:

A. Respiration and Locomotion
B. Excretion and Locomotion
C. Capture and transport of food
D. Digestion and Respiration
E. Digestion and Excretion

Choose the **correct** answer from the options given below:

a. A and B only
b. A and C only
c. B and C only
d. B, D and E only

77. Which of the following type of immunity is present at the time of birth and is a non-specific type of defence in the human body?

a. Acquired Immunity
b. Innate Immunity
c. Cell-mediated Immunity
d. Humoral Immunity

78. In bryophytes, the gemmae help in which one of the following?

a. Sexual reproduction
b. Asexual reproduction
c. Nutrient absorption
d. Gaseous exchange

79. In frog, the Renal portal system is a special venous connection that acts to link:

a. Liver and intestine
b. Liver and kidney
c. Kidney and intestine
d. Kidney and lower part of body

80. Given below are two statements:

Statement I: In ecosystem, there is unidirectional flow of energy of sun from producers to consumers.

Statement II: Ecosystems are exempted from 2nd law of thermodynamics.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

a. Both statement I and statement II are correct
b. Both statement I and statement II are incorrect
c. Statement I is correct but statement II is incorrect
d. Statement I is incorrect but statement II is correct

81. Which of the following statements about RuBisCO is true?

a. It is active only in the dark.
b. It has higher affinity for oxygen than carbon dioxide.
c. It is an enzyme involved in the photolysis of water.
d. It catalyzes the carboxylation of RuBP.

82. Which of the following enzyme(s) are **NOT** essential for gene cloning?

A. Restriction enzymes
B. DNA ligase
C. DNA mutase
D. DNA recombinase
E. DNA polymerase

Choose the **correct** answer from the options given below:

a. C and D only
b. A and B only
c. D and E only
d. B and C only

83. Read the following statements on plant growth and development.

A. Parthenocarpy can be induced by auxins.

B. Plant growth regulators can be involved in promotion as well as inhibition of growth.

C. Dedifferentiation is a pre-requisite for re-differentiation.

D. Abscisic acid is a plant growth promoter.

E. Apical dominance promotes the growth of lateral buds.

Choose the option with all correct statements:

a. A, B, C only
b. A, C, E only
c. A, D, E only
d. B, D, E only

84. Which factor is important for termination of transcription?

a. α (alpha)
b. σ (sigma)
c. ρ (rho)
d. γ (gamma)

85. Frogs respire in water by skin and buccal cavity and on land by skin, buccal cavity and lungs.

Choose the **correct** answer from the following:

a. The statement is true for water but false for land
b. The statement is true for both the environment
c. The statement is false for water but true for land
d. The statement is false for both the environment

86. Twins are born to a family that lives next door to you. The twins are a boy and a girl. Which of the following must be true?

a. They are monozygotic twins.
b. They are fraternal twins.
c. They were conceived through in vitro fertilization.
d. They have 75% identical genetic content.

87. Which of the following microbes is **NOT** involved in the preparation of household products?

A. *Aspergillus niger*

B. *Lactobacillus*

C. *Trichoderma polysporum*

D. *Saccharomyces cerevisiae*

E. *Propionibacterium sharmanii*

Choose the **correct** answer from the options given below:

a. A and B only
b. A and C only
c. C and D only
d. C and E only

88. Match **List-I** with **List-II**:

	List-I		List-II
A.	Progesterone	I.	Pars intermedia
B.	Relaxin	II.	Ovary
C.	Melanocyte stimulating hormone	III.	Adrenal Medulla
D.	Catecholamines	IV.	Corpus luteum

Choose the **correct** answer from the options given below:

a. A-IV, B-II, C-I, D-III
b. A-IV, B-II, C-III, D-I
c. A-II, B-IV, C-I, D-III
d. A-III, B-II, C-IV, D-I

89. The blue and white selectable markers have been developed which differentiate recombinant colonies from non-recombinant colonies on the basis of their ability to produce colour in the presence of a chromogenic substrate.

Given below are two statements about this method:

Statement I: The blue coloured colonies have DNA insert in the plasmid and they are identified as recombinant colonies.

Statement II: The colonies without blue colour have DNA insert in the plasmid and are identified as recombinant colonies.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

a. Both Statement I and Statement II are correct
b. Both Statement I and Statement II are incorrect
c. Statement I is correct but Statement II is incorrect
d. Statement I is incorrect but Statement II is correct

90. Which one of the following equations represents the Verhulst-Pearl Logistic Growth of population?

a. $\frac{dN}{dt} = r\left(\frac{K-N}{K}\right)$
b. $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$
c. $\frac{dN}{dt} = rN\left(\frac{N-K}{N}\right)$
d. $\frac{dN}{dt} = N\left(\frac{r-K}{K}\right)$

Answer Key

1. (b)	**2.** (b)	**3.** (a)	**4.** (d)	**5.** (a)	**6.** (a)	**7.** (a)	**8.** (a)	**9.** (c)	**10.** (c)
11. (d)	**12.** (b)	**13.** (c)	**14.** (d)	**15.** (d)	**16.** (c)	**17.** (d)	**18.** (d)	**19.** (b)	**20.** (a)
21. (a)	**22.** (a)	**23.** (b)	**24.** (d)	**25.** (c)	**26.** (a)	**27.** (c)	**28.** (a)	**29.** (c)	**30.** (d)
31. (d)	**32.** (b)	**33.** (d)	**34.** (d)	**35.** (b)	**36.** (d)	**37.** (c)	**38.** (a)	**39.** (b)	**40.** (b)
41. (d)	**42.** (b)	**43.** (b)	**44.** (c)	**45.** (b)	**46.** (a)	**47.** (c)	**48.** (a)	**49.** (d)	**50.** (b)
51. (a)	**52.** (a)	**53.** (c)	**54.** (a)	**55.** (c)	**56.** (a)	**57.** (b)	**58.** (d)	**59.** (c)	**60.** (d)
61. (a)	**62.** (a)	**63.** (a)	**64.** (c)	**65.** (c)	**66.** (d)	**67.** (b)	**68.** (a)	**69.** (b)	**70.** (b)
71. (b)	**72.** (b)	**73.** (a)	**74.** (b)	**75.** (b)	**76.** (b)	**77.** (b)	**78.** (b)	**79.** (d)	**80.** (c)
81. (d)	**82.** (a)	**83.** (a)	**84.** (c)	**85.** (c)	**86.** (b)	**87.** (a)	**88.** (a)	**89.** (d)	**90.** (b)

Explanations

1. **(b) NCERT XI, Ch-Respiration in Plants, Page-160**

   Complex II of the mitochondrial electron transport chain is also known as succinate dehydrogenase. It catalyzes the oxidation of succinate to fumarate, generating $FADH_2$, which then donates electrons to ubiquinone, contributing to the formation of reduced ubiquinol. This process links the citric acid cycle and the electron transport chain.

2. **(b) NCERT XII, Ch-Biotechnology: Principles and Processes, Page-172**

   Polymerase Chain Reaction (PCR) amplifies DNA exponentially. In each cycle, the number of DNA molecule doubles, so after n cycles, the number of DNA copies is 2^n times the initial amount.

3. **(a) NCERT XII, Ch-Reproductive Health, Page-48**

   The main drawbacks of adoption of IVF methods include high costs due to expensive instruments and reagents (B), reduced rates of orphan adoption (D), and a significant possibility that the early embryo may not survive (F), reducing the success rates.

   IVF has a relatively low fatality risk with modern techniques.

   Donor sperm/eggs can be used; husband/ wife are not always necessary.

   IVF is available in India at various public and private centres.

4. **(d) NCERT XI, Ch-Structural Organisation in Animals, Page-82**

   In frogs, the vena cava is the blood vessel that brings deoxygenated blood from various parts of the body to the heart, specifically into the right atrium.

   Aorta carries oxygenated blood away from the heart.

   Pulmonary artery carries deoxygenated blood from the heart to the lungs.

   Pulmonary vein carries oxygenated blood from lungs to the heart.

5. **(a) NCERT XI, Unit-Cell: Structure and Functions, Page-85**

   Reductionist biology refers to the approach of studying living organisms and their processes by breaking them down into their smaller, more fundamental components, like cells, molecules, and genes and analyzing their physical and chemical properties. This approach has led to significant advances in fields like molecular biology and biochemistry, enabling a deeper understanding of biological processes.

6. **(a) NCERT XII, Ch-Molecular Basis of Inheritance, Page-88**

   Statement I is correct :

   In the RNA world hypothesis, RNA is considered the first genetic material that evolved to carry out essential life processes. RNA acts as both genetic material and a catalyst for biochemical reactions in living systems. Also, RNA being reactive and unstable is widely accepted in the context of its role in early life forms.

   Statement II is correct:

   DNA evolved from RNA, providing a more stable and secure means of storing genetic information. Its double-helical strands are complementary and resistant to changes due to the evolving repair mechanisms.

7. **(a) NCERT XII, Ch-Organisms and Populations, Page-201**

   Epiphytes growing on a mango branch exhibit commensalism. In this relationship, the epiphytes benefit by gaining physical support and access to sunlight while the mango tree is neither harmed nor benefited.

   Mutualism: Both organisms benefit from each other.

   Predation: One organism benefits at the expense of another.

   Amensalism: One organism is harmed, while the other remains unaffected.

8. **(a) NCERT XI, Ch-Cell: The Unit of Life, Page-98**

   Statement A is correct: Eukaryotic ribosomes are 80S, and prokaryotic ribosomes are 70S.

   Statement B is correct: Each ribosome consists of two subunits (larger and smaller).

   Statement C is correct: The subunits of 80S ribosomes are 60S and 40S, while that of 70S ribosomes are 50S and 30S.

9. **(c) NCERT XII, Ch-Biodiversity and Conservation, Page-225**

   Zoos and botanical gardens are examples of *ex-situ* conservation, where threatened species are taken out from their natural habitat and placed in special settings where they can be protected and given special care.

   National parks, wildlife sanctuary and protected areas are examples of *in-situ* conservation, where species are protected within their natural habitat.

10. **(c) NCERT XII, Ch-Ecosystem, Page-207**

    Statement I is correct: Solar energy is the primary source of energy in an ecosystem, as it is the fundamental energy source for photosynthesis.

    Statement II is incorrect: The rate of production of organic matter during photosynthesis is often referred to as gross primary productivity (GPP) of an ecosystem, not net primary productivity (NPP). NPP is the available biomass for the consumption to heterotrophs.

11. **(d) NCERT XI, Ch-Breathing and Exchange of Gases, Body Fluids and Circulation, Excretory Products and their Elimination, Locomotion and Movement, Page-190, 203, 214, 227**

    (A-II) Emphysema: It is a chronic respiratory disorder involving damaged alveolar walls and decreased respiratory surface.

    (B-III) Angina Pectoris: This condition involves acute chest pain when not enough oxygen is reaching the heart muscle.

    (C-IV) Glomerulonephritis: This condition is the inflammation of glomeruli of the kidney.

    (D-I) Tetany: This condition is characterized by rapid spasms (wild contractions) in muscle due to low Ca^{2+} in body fluid.

12. **(b) NCERT XII, Ch-Sexual Reproduction in Flowering Plants, Page-13**

    Assertion (A) is true: Both wind and water pollinated flowers are not very colourful and do not produce nectar.

    Reason (R) is also true: Both wind and water pollinated flowers produce large quantities of pollen to increase the chances of successful pollination.

    However, reason does not explain the assertion. Wind and water pollinated flowers are not very colourful and do not produce nectar because these flowers do not need to attract pollinators.

13. **(c) NCERT XII, Ch-Microbes in Human Welfare, Page-152**

    Beer is a non-distilled alcoholic beverage produced by fermentation with the help of yeast *Saccharomyces cerevisiae*.

    Whisky, Brandy, and Rum are distilled alcoholic beverages. After fermentation, these drinks undergo a distillation process to increase alcohol content.

14. (d) NCERT XI, Ch-Morphology of Flowering Plants, Page-67, 68

Statement I is incorrect : In a floral formula, % stands for zygomorphic (bilateral symmetry) nature of flower, and $\overline{G}$ stands for an inferior ovary.

Statement II is correct : In a floral formula, ⊕ stands for actinomorphic (radial symmetry) nature of flower, and $\underline{G}$ stands for superior ovary.

15. (d) NCERT XII, Ch-Microbes in Human Welfare, Page-153

Streptokinase is an enzyme produced by bacterium *Streptococcus* and modified by genetic engineering. It is used as a 'clot buster' for removing clots from the blood vessels, particularly in patients who have undergone myocardial infarction (heart attack).

16. (c) NCERT XII, Ch-Molecular Basis of Inheritance, Page-104

The human chromosome with the highest number of genes is Chromosome 1. It contains approximately 2968 genes (as per NCERT).

17. (d) NCERT XI, Ch-Structural Organisation in Animals, Page-81

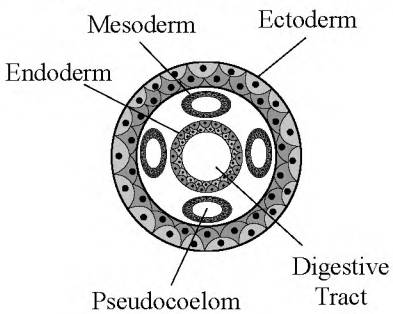
The copulatory pad in male frogs is located on the first digit of the forelimb. It helps the male hold onto the female during mating. It is absent in female frogs.

18. (d) NCERT XI, Ch-Plant Growth and Development, Page-177

Cytokinins promote nutrient mobilization in plants, which helps delay leaf senescence by promoting cell division and growth.

19. (b) NCERT XI, Ch-Animal Kingdom, Page-39

A pseudocoelomate is an animal that has a body cavity not lined by mesoderm, instead it is present as scattered pouches between the ectoderm and endoderm. In the case described, the presence of mesodermal tissue towards the body wall but not towards the alimentary canal indicates the animal has a pseudocoel, a feature characteristic of aschelminthes.



20. (a) NCERT XII, Ch-Human Reproduction, Page-32

(A-IV) The sperm head contains the haploid nucleus, which holds the genetic material.

(B-III) The middle piece of the sperm contains numerous mitochondria, which produce the energy required for sperm motility.

(C-I) The anterior portion of the sperm is covered by the acrosome, which is filled with enzymes that help fertilize the ovum.

(D-II) The tail facilitates the movement of the sperm, which is essential for fertilization.

21. (a) NCERT XI, Ch-Plant Kingdom, Page-30-32

Meiosis in spore mother cells (B) forms haploid spores, which grow into a gametophyte called prothallus (A). It develops antheridia and archegonia (D). Antherozoids swim through water to reach archegonia (E), enabling fertilisation (C). The zygote then develops into a sporophyte.

22. (a) NCERT XI, Ch-Body Fluids and Circulation, Page-202

The heart is myogenic, meaning it is auto-regulated by nodal tissue (A). A neural centre in the medulla oblongata (B) regulates heart rate through the autonomic nervous system. Adrenal medullary hormones (C) also increase cardiac output. However, adrenal cortical hormones (D) regulate metabolism and water-electrolyte balance, not heart activity—so (D) is incorrect.

23. (b) NCERT XII, Ch-Microbes in Human Welfare, Page-158

Anabaena, *Nostoc*, and *Oscillatoria* are cyanobacteria that can fix atmospheric nitrogen. *Azotobacter* is a free-living nitrogen-fixing bacterium. However, *Volvox* is a colonial green alga and cannot fix nitrogen.

24. (d) NCERT XII, Ch-Molecular Basis of Inheritance, Biotechnology and its Applications, Page-93, 180

Statement I is incorrect because tRNA reads the mRNA codons and brings amino acids, while rRNA forms the core of ribosomes and catalyzes protein synthesis. Both interact directly with mRNA during translation.

Statement II is correct—RNA interference (RNAi) is a conserved defence mechanism in all eukaryotes that silences specific mRNAs using complementary RNA, preventing harmful gene expression.

25. (c) NCERT XII, Ch-Biotechnology: Principles and Processes, Page-170

Insertion of foreign DNA at the *Eco*RI site disrupts the β-galactosidase gene, causing insertional inactivation. This enzyme normally cleaves a chromogenic substrate to give blue colonies. When inactivated, the recombinant colonies appear white due to the loss of enzyme activity. Hence, white colonies indicate successful recombinants, while blue colonies are non-recombinants

26. (a) NCERT XII, Ch-Biotechnology and its applications, Page -182

Eli Lilly used bacteria (*Escherichia coli*) to produce human insulin. Separate DNA sequences for insulin A and B chains were prepared and inserted into plasmid of *E. coli*, which produced the polypeptides. These were then purified and chemically joined to form functional human insulin. Yeast, virus, and phage were not used in this process.

27. (c) NCERT XI, Ch-Biomolecules, Page -117

The given reaction involves the transfer of a functional group (G) from one substrate (S–G) to another ($S^{\#}$), forming S and $S^{\#}$–G. This type of reaction is catalysed by transferase enzymes, which is due to their ability to transfer a group other than hydrogen between two substrates.

Hydrolases catalyse hydrolysis of ester, ether bonds etc., lyases catalyse removal of groups from substrates by mechanism other than hydrolysis leaving double bonds, and ligases join two molecules by forming bonds between them

28. (a) NCERT XI, Ch-Anatomy of flowering plants, Page -76

In monocot stems, the hypodermis is sclerenchymatous, not parenchymatous, providing mechanical support.

29. (c) NCERT XI, Ch-Plant kingdom, Page -29

In bryophytes, the haploid gametophyte first attaches to the substratum (B). Then, antherozoids are released into water (E) and swim toward the egg. Fertilisation occurs (A) when an antherozoid fuses with the egg, forming a zygote. This develops into a sporophyte (D), which remains attached to the gametophyte. Finally, reduction division *i.e.,* meiosis (C) takes place in the sporophyte to form haploid spores, which germinate into new gametophytes.

30. (d) NCERT XII, Ch-Human health and disease, Page -141, 142

Statement B is incorrect as chemotherapeutic drugs are specifically designed to kill cancerous cells, not non-cancerous ones.

Statement D is incorrect because it is not chemotherapy drugs but substances like α-interferon that are categorized as biological response modifiers to activate the cancer patients' immune system and destroy the tumor.

Statement E is incorrect because leukaemia is characterised by an abnormally high increase in blood cell count, not a decrease.

31. (d) NCERT XI, Ch-Cell: The unit of life, Page -93, 97, 99, 101

A–II, B–III, C–I, D–IV

A. Centromere → II. Cell division: The centromere is essential during cell division as it holds chromatids together and provides attachment for spindle fibers via the kinetochore.

B. Cilium → III. Cell movement: Cilia are hair-like structures that cause movement either of the cell or surrounding fluid.

C. Cristae → I. Mitochondrion: Cristae are infoldings of the inner mitochondrial membrane.

D. Cell membrane → IV. Phospholipid bilayer: The cell membrane is majorly composed of a phospholipid bilayer.

32. (b) NCERT XI, Ch-Photosynthesis in higher plants , Page -137

(A-III) Chlorophyll a – Blue-green

(B-I) Chlorophyll b – Yellow-green

(C-II) Xanthophylls – Yellow

(D- IV) Carotenoids – Yellow to yellow-orange

33. (d) NCERT XII, Ch-Human reproduction, Page-38

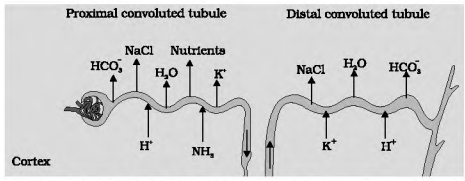
Only statement B is incorrect as the major organ systems are formed by the end of 12 weeks, not 8 weeks.

34. (d) NCERT XI, Ch-Morphology of flowering plants, Page-67

In the seeds of cereals, the aleurone layer is a protein-rich layer that lies between the outer covering of endosperm and the embryo. The other options — coleoptile, coleorhiza, and integument — serve different protective or structural functions but are not protein-rich layers separating the embryo from endosperm.

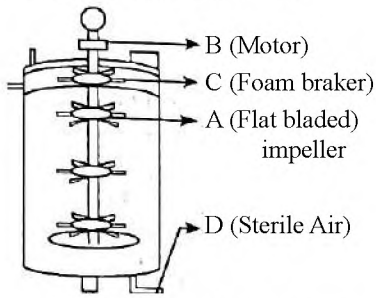
35. (b) NCERT XI, Ch-Excretory products and their elimination, Page-210

The proximal convoluted tubule (PCT) reabsorbs NaCl, HCO_3^-, H_2O and secretes H^+ and NH_3, maintaining pH and electrolyte balance. The distal convoluted tubule (DCT) reabsorbs NaCl, HCO_3^-, H_2O and secretes K^+ and H^+.



36. (d) NCERT XII, Ch-Biotechnology: Principles and Processes, Page-174

In the bioreactor diagram, C represents the foam braker, which is crucial for reduce or prevent the formation of foam that forms in bioreactor vessel.



37. (c) NCERT XII, Ch-Sexual reproduction in flowering plants, Page-11

Assertion (A) is true: A typical unfertilised angiosperm embryo sac at maturity is 8-nucleate and 7-celled with 3 cells in the egg apparatus, 3 antipodal cells, and 1 central cell with 2 nuclei.

Reason (R) is false: The egg apparatus contains 1 egg cell and 2 synergids, not 2 polar nuclei. The 2 polar nuclei are located in the large central cell.

38. (a) NCERT XI, Ch-Cell: The unit of life, Page-90-91

Mesosomes are specialised membranous structures found in prokaryotic cells, formed by the infoldings of the plasma membrane into the cytoplasm as vesicles, tubules, and lamellae. They perform multiple essential functions such as helping in cell wall formation, DNA replication, and respiration.

Unlike mesosomes, chromatophores are involved in photosynthesis in cyanobacteria, while cristae and endoplasmic reticulum are structures exclusive to eukaryotic cells and absent in prokaryotes.

39. (b) NCERT XII, Ch-Molecular basis of inheritance, Page-95

Post-transcriptional modifications in eukaryotic cells include splicing (B), where introns are removed and exons are joined in a defined order, capping (C) with methyl guanosine triphosphate at the 5′ end of hnRNA, and tailing (D), where 200–300 adenylate residues are added at the 3′ end in a template independent manner. These modifications convert the hnRNA into functional mRNA, which is then transported out of the nucleus for translation.

Options A and E are incorrect because functional mRNA is transported out of nucleus to cytoplams after processing , not pre-mRNA (hnRNA) and RNA-RNA base pairing is not part of standard post-transcriptional processing

40. (b) NCERT XII, Ch-Principles of inheritance and variation, Page-69

Polygenic traits are governed by multiple genes (usually three or more) and show continuous variation in a population, such as skin colour in humans. Unlike Mendelian traits, which are controlled by single or two genes with discrete alternate forms, polygenic traits do not follow clear dominant–recessive relationships and instead exhibit additive effects of alleles. This pattern, which also allows environmental influence, is therefore classified as non-Mendelian inheritance.

41. (d) NCERT XI, Ch-Biomolecules, Page-118

Catalase is an enzyme that contains haem as its prosthetic group. The haem group in catalase is a part of active site of the enzyme where hydrogen peroxide is converted into water and oxygen, which is crucial for protecting cells from oxidative damage.

42. (b) NCERT XI, Ch-Biological classification, Page-11

The increasing order of body organization complexity for the kingdoms proposed by Whittaker is as follows:

C. Prokaryotes with cell wall made of polysaccharides and amino acids → Monera (simplest, unicellular prokaryotes)

E. Eukaryotes with cellular body organization → Protista (unicellular eukaryotes)

A. Multicellular heterotrophs with cell wall made of chitin → Fungi

D. Eukaryotic autotrophs with tissue/organ level of body organization → Plantae

B. Heterotrophs with tissue/organ/organ system level of body organization → Animalia (most complex)

43. (b) NCERT XII, Unit-Ecology, Page-189

Ramdeo Misra, known as the Father of Ecology in India, introduced the country's first postgraduate course in ecology and guided over 50 researchers. His work helped us understand tropical communities and their succession, environmental responses of plant populations, and productivity and nutrient cycling in tropical forest and grassland ecosystems.

44. (c) NCERT XII, Ch-Molecular basis of inheritance, Page-84, 85

A – IV: Alfred Hershey and Martha Chase confirmed DNA as the genetic material using bacteriophage.

B – III: Euchromatin is loosely packed and light-stained.

C – I: Frederick Griffith worked with *Streptococcus pneumoniae* in his transformation experiment.

D – II: Heterochromatin is densely packed and dark-stained.

45. (b) NCERT XII, Ch-Human health and disease, Page-141

Neoplastic characteristics of cells include the formation of a mass of proliferating cells, which we commonly refer to as a tumor. These cells show rapid and uncontrolled growth, a hallmark of neoplasia. In cases of malignant tumors, there is also invasion and damage to the surrounding tissues. However, not all neoplastic cells remain confined to their original location—this feature is specific to benign tumors and does not apply to neoplastic growth as a whole.

46. (a) NCERT XII, Ch-Biotechnology: Principles and Processes, Page-168

Statement I is correct. DNA fragments obtained after cutting with restriction enzymes can be separated using gel electrophoresis and then extracted for making recombinant DNA.

Statement II is correct. During gel electrophoresis, DNA (which is negatively charged) moves towards the anode (positive end). The smaller fragments travel farther through the agarose gel, while larger fragments remain near the wells (negative end). This is due to the sieving effect of the gel.

47. (c) NCERT XI, Ch-Biomolecules, Page-106

A. Adenosine → (III)Nucleoside

(Adenine + Ribose sugar = Adenosine → nucleoside)

B. Adenylic acid → (II)Nucleotide

(Adenine + Ribose + Phosphate = Adenylic acid → nucleotide)

C. Adenine → (I)Nitrogen base

(Adenine is one of the 4 nitrogenous bases in DNA/RNA)

D. Alanine → (IV)Amino acid

(Alanine is an amino acid used in protein synthesis)

48. (a) NCERT XII, Ch-Human reproduction, Page-31, 32, 33, 35

In females, the reductive division (meiosis I) begins before birth, during fetal development.In males, meiosis starts at puberty, so female gametogenesis starts earlier.

In males, meiosis I and II occur continuously and rapidly once spermatogenesis begins.In females, there is a long gap — meiosis I starts in fetal life and pauses until puberty, while meiosis II completes only after fertilization.

The first polar body forms from primary oocyte division, producing a secondary oocyte; it's not linked to primary oocyte formation.

Luteinizing Hormone (LH) causes ovulation, not endometrial disintegration.

The disintegration of the endometrium is caused by falling progesterone levels when LH drops, not by the LH surge.

49. (d) NCERT XI, Ch- Animal kingdom, Page-47

All living members of the class Cyclostomata are ectoparasites, meaning they attach to the outer body of other fish and suck blood/body fluids.They have a sucker-like mouth to latch onto their host.

50. (b) NCERT XI, Ch-Cell:The unit of life, Page-96

The Golgi apparatus packages materials received from the endoplasmic reticulum and delivers them to specific intracellular targets or secretes them outside the cell. Vesicles from the ER fuse with the cis face of the Golgi, where the materials are modified in the cisternae and released from the trans face. However, reason does not correctly explains why the Golgi apparatus packages and delivers materials. The Reason describes the process only the transport mechanism of materials through the Golgi.

51. (a) NCERT XII, Ch-Sexual Reproduction in flowering Plants, Page-19-20

A. Scutellum → II. Cotyledon of monocot seed

(Scutellum is the single cotyledon in monocot seeds like maize.)

B. Non-albuminous seed → III. Groundnut

(Groundnut stores food in the cotyledons, not the endosperm.)

C. Epiblast → IV. Rudimentary cotyledon

(Epiblast is a small outgrowth of rudimentary cotyledon near scutellum)

D. Perisperm → I. Persistent nucellus

(Perisperm is the leftover nucellus that persists in some seeds.)

52. (a) NCERT XI, Ch-Animal kingdom, Page-46

The members of subphylum Vertebrata possess notochord during the embryonic period. The notochord is replaced by a cartilaginous or bony vertebral column in the adult. Thus all vertebrates are chordates but all chordates are not vertebrates.

53. (c) NCERT XII, Ch-Human Health and Disease, Page-135

The antigen-binding site is located at the variable (V) region, which is at the N-terminal, not the C-terminal.

54. (a) NCERT XII, Ch-Biotechnology and its Applications, Page-180

RNA interference (RNAi) is a biological process in which complementary double-stranded RNA (dsRNA) binds to the target mRNA, leading to its degradation or blocking its translation, thereby resulting in gene silencing.

55. (c) NCERT XII, Ch-Principles of Inheritance and Variation, Page-63

Genes R and Y follow independent assortment.

R = Round, r = Wrinkled

Y = Yellow, y = Green

Parents:

- RRYY (Round Yellow) × rryy (Wrinkled Green)

→ F_1: All RrYy (Round Yellow)

Now, $F_1 \times F_1$ cross (RrYy × RrYy) → Dihybrid cross

Phenotypic Ratio in F_2 Generation = 9 : 3 : 3 : 1

- 9 Round Yellow
- 3 Round Green
- 3 Wrinkled Yellow
- 1 Wrinkled Green

56. (a) NCERT XII, Ch-Molecular Basis of Inheritance, Page-83

Histones are basic proteins rich in positively charged amino acids like lysine and arginine.

These help them bind strongly to the negatively charged DNA, allowing tight packaging into nucleosomes.

57. (b) NCERT XII, Ch-Human Reproduction, Page-35

Menarche is the term for a girl's first menstrual bleeding, marking the onset of puberty and reproductive capability.

Menopause is the end of menstruation.

Diapause is a period of suspended growth/ development in response to adverse conditions seen in some animals.

Ovulation is the release of an egg from the ovary.

58. (d) NCERT XI, Ch-Chemical Coordination and Integration, Page-245, 247

A. Heart → III. Atrial natriuretic factor (ANF)

(Heart produces ANF to regulate blood pressure)

B. Kidney → I. Erythropoietin

(Kidney releases erythropoietin to stimulate RBC production)

C. Gastro-intestinal tract → IV. Secretin

(Secretin is a hormone from the intestinal mucosa)

D. Adrenal Cortex → II. Aldosterone

(Adrenal cortex secretes aldosterone to regulate salt balance)

59. (c) NCERT XI, Ch-Biomolecules, Page-117-118

An enzyme may consist of a protein part (apoenzyme) and a non-protein part (cofactor or coenzyme).

The apoenzyme is inactive on its own and becomes active only when the non-protein component binds to it.

60. (d) NCERT XII, Ch-Ecosystem, Page-207

Productivity refers to the rate of biomass production.

It is expressed in terms of $gm^{-2}\ yr^{-1}$ or $(kcal\ m^{-2})\ yr^{-1}$

61. (a) NCERT XII, Ch-Evolution, Page-115

Sweet potato (a root modification) and potato (a stem modification) perform the same function—storage of food—but arise from different structures and origins. This is a classic example of analogy, where structures are functionally similar but anatomically different, and convergent evolution, where unrelated species evolve similar traits due to similar environmental pressures

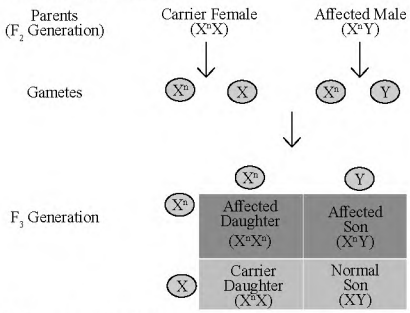
62. (a) NCERT XII, Ch-Principles of Inheritance and Variation, Page-73

From the pedigree chart, this is a classic case of an X-linked recessive disorder.

In the F_2 generation, a carrier female (X^nX) marries a affected male (X^nY). *(Here "n" superscript represent recessive allele for the disease)*.

Their F_3 offspring have the following possibilities:

- Sons: 50% normal (XY), 50% affected (X^nY)
- Daughters: 50% normal (XX), 50% carriers (X^nX)



We are asked the probability of a child having no disease but being a carrier, i.e., X^nX female.

Out of 4 possible combinations, only 1 is a carrier female, hence the probability = 1/2 among females or 1/4 among all children.

63. (a) NCERT XII, Ch-Sexual Reproduction in Flowering Plants, Page-5

The tapetum is the innermost layer of the microsporangium and plays a key role in nourishing developing pollen grains. Tapetal cells possess dense cytoplasm and are often multinucleate to support high metabolic activity. The presence of more than one nucleus enhances their efficiency in nourishing microspore mother cells

64. (c) NCERT XII, Ch-Sexual Reproduction in Flowering Plants, Page-9-11

The megaspore mother cell (MMC) undergoes 1 meiotic division to produce four megaspores. Out of these, only one is functional, and this functional megaspore undergoes 3 mitotic divisions (initially free nuclear, then cell walls laid down) to form the 8-nucleate, 7-celled female gametophyte or embryo sac.

65. (c) NCERT XI, Ch-Morphology of Flowering Plants, Page-62

Zygomorphic (bilateral symmetry) flowers can be divided into two equal halves only in one particular vertical plane. Pea flowers are zygomorphic.

According to NCERT, *Petunia* belongs to the family Solanaceae having actinomorphic flowers.

Datura and Chilli flowers are actinomorphic flowers. They can be divided into two equal radial halves in any radial plane passing through the centre.

66. (d) NCERT XII, Ch-Human Health and Disease, Page-137, 138

After maturation in primary lymphoid organs (bone marrow and thymus), lymphocytes migrate to secondary lymphoid organs such as spleen (C), lymph nodes (D), and Peyer's patches (E) where lymphocytes encounter antigens and proliferate to become effector cells.

67. (b) NCERT XII, Ch-Organisms and Populations, Page-202

Statement I is incorrect: Figs are generally considered vegetarian because they are fruits and not derived from animals. While some fig varieties require pollination by wasps, which can result in the death of the wasp within the fruit, these wasps are broken down and absorbed into the fruit.

Statement II is incorrect because the fig wasp pollinates the fig inflorescence, not the fruit, while searching for suitable egg-laying sites.

68. (a) NCERT XI, Ch-Cell Cycle and Cell Division, Page-123

During mitosis, spindle fibers attach to the kinetochores of chromosomes and help pull the sister chromatids apart toward opposite poles of the cell, ensuring equal chromosome distribution in daughter cells.

69. (b) NCERT XI, Ch-Plant Kingdom, Page-32

Gymnosperms (*gymnos*: naked, *sperma*: seed) have ovules that are not enclosed by any ovary wall. After fertilisation, seeds develop exposed, without any fruit covering — hence, they are called "naked seeds."

70. (b) NCERT XI, Ch-Chemical Coordination and Integration, Page-244

Adrenal medullary hormones (adrenaline/epinephrine and noradrenaline/norepinephrine.) are hyperglycemic (increase blood sugar level by glycogen breakdown), cause piloerection (simply, goosebumps), pupilary dilation (widening of pupils), and increase the strength of heart contraction. These are emergency hormones that prepare the body for "fight or flight".

71. (b) NCERT XII, Ch-Biotechnology and its Applications, Page-181

Insulin is a protein hormone. If taken orally, it gets broken down by digestive enzymes in the stomach and intestine, making it ineffective before it can enter the bloodstream.

72. (b) NCERT XI, Ch-Plant Kingdom, Page-30, 31, 33

A. Pteridophyte – IV. *Salvinia* (aquatic fern, a pteridophyte)

B. Bryophyte – III. *Polytrichum* (a moss, classified under bryophytes)

C. Angiosperm – I. *Salvia* (a flowering plant, typical angiosperm)

D. Gymnosperm – II. *Ginkgo* (a classic gymnosperm example)

73. (a) NCERT XII, Ch-Molecular Basis of Inheritance, Page-95

- George Gamow, a physicist, proposed that the genetic code should consist of three nucleotides to code for one amino acid.
- Francis Crick (with James Watson) is associated with the Double Helix model of DNA.
- Jacque Monod (with Francois Jacob) elucidated *lac* operon.
- Franklin Stahl (with Matthew Meselson) demonstrated semi-conservative nature of DNA replication through the famous Meselson-Stahl experiment.

74. (b) NCERT XII, Ch-Biodiversity and Conservation, Page-221-223, 225

A. The Evil Quartet – III. Causes of biodiversity losses (habitat loss and fragmentation, over-exploitation, alien species invasion, and co-extinctions)

B. *Ex situ* conservation – I. Cryopreservation (a method under *ex situ* conservation like gene banks)

C. *Lantana camara* – II. Alien species invasion (an invasive alien species in India)

D. Dodo – IV. Extinction (a classic example of human-induced extinction)

75. (b) NCERT XI, Ch-Chemical Coordination and Integration, Page-241

Anti-diuretic hormone (ADH, also called vasopressin) and oxytocin are synthesized in the hypothalamus and transported to the posterior pituitary (neurohypophysis), from where it is released into the blood.

76. (b) NCERT XI, Ch-Animal Kingdom, Page-45

The water vascular system in echinoderms plays a key role in locomotion, respiration, and capture and transport of food.

77. (b) NCERT XII, Ch-Human Health and Disease, Page-134

Innate immunity is the non-specific type of defense present in the human body since birth. It includes physical barriers, phagocytic cells, physiological responses, cytokine barriers that act against all pathogens.

78. (b) NCERT XI, Ch-Plant Kingdom, Page-29

In bryophytes like liverworts, gemmae are green, multicellular buds that develop in gemma cups. They detach from the parent plant and germinate independently, forming new individuals asexually.

79. (d) NCERT XI, Ch-Structural Organisation in Animals, Page-82

Frogs possess special venous connections: one between the liver and intestine, known as the hepatic portal system, and another between the kidney and lower body parts, called the renal portal system.

80. (c) NCERT XII, Ch-Ecosystem, Page-209

Statement I is correct: In an ecosystem, energy flow is unidirectional—from the Sun to producers and then to various levels of consumers.

Statement II is incorrect: Ecosystems follow the second law of thermodynamics—as energy flows, some of it is lost as heat, increasing entropy.

81. (d) NCERT XI, Ch-Photosynthesis in Higher Plants, Page-143

RuBisCO (Ribulose-1,5-bisphosphate carboxylase/oxygenase) is the enzyme that catalyzes the first step of the Calvin cycle, i.e., the carboxylation of RuBP using CO_2.

Though it can also bind oxygen, its primary role is in carbon fixation.

82. (a) NCERT XII, Ch-Biotechnology: Principles and Processes, Page-165

The enzymes DNA mutase and DNA recombinase are not essential for gene cloning. While restriction enzymes, DNA ligase, and DNA polymerase play crucial roles in cutting, joining, and amplifying DNA, DNA mutase is involved in mutation, and DNA recombinase functions in recombination, making them unnecessary for basic gene cloning procedures.

83. (a) NCERT XI, Ch-Plant Growth and Development, Page-172, 175-177

Auxins can induce parthenocarpy, i.e., fruit development without fertilization.

Plant growth regulators can be involved in both the promotion and inhibition of growth. For example, auxins promote growth, while abscisic acid inhibits it.

Dedifferentiation is a prerequisite for re-differentiation, as dedifferentiated cells regain the ability to divide and can re-differentiate.

Abscisic acid is a plant growth inhibitor.

Apical dominance suppresses the growth of lateral buds due to auxins produced at the shoot tip.

84. (c) NCERT XII, Ch-Molecular Basis of Inheritance, Page-94

The termination of transcription in prokaryotes requires a specific protein factor called rho (ρ) factor.

85. (c) NCERT XI, Ch-Structural Organisation in Animals, Page-82

Frogs respire in water through their skin (cutaneous respiration) by diffusion of dissolved oxygen. On land, they use skin, buccal cavity, and lungs (pulmonary respiration).

86. (b) NCERT XII, Ch-Human Reproduction

Fraternal twins are produced when two separate eggs are fertilized by two separate sperm cells, resulting in two genetically distinct offspring. Since the twins are a boy and a girl, they must be fraternal twins, as monozygotic (identical) twins arise from a single fertilized egg that splits into two embryos, making them genetically identical and of the same gender.

In vitro fertilization (IVF) is not a guaranteed condition for the birth of twins of different sexes.

Fraternal twins, on average, share 50% of their genetic material.

87. (a) NCERT XII, Ch-Microbes in human welfare, Page-151, 153

A. Fungus *Aspergillus niger* is involved in the production of citric acid.

B. Bacterium *Lactobacillus* is used in the preparation of dairy products like curd.

C. Fungus *Trichoderma polysporum* produces cyclosporin A that is used as an immunosuppressive agent in organ-transplant patients.

D. Yeast *Saccharomyces cerevisiae* is involved in making bread by fermentation.

E. Bacterium *Propionibacterium sharmanii* is used in the production of Swiss cheese.

Thus, A (*Aspergillus niger*) and C (*Trichoderma polysporum*) are not involved in household products.

88. (a) NCERT XI, Ch-Chemical coordination and integration, Page-241, 244, 246

NCERT XII, Ch-Human reproduction, Page-37

(A-IV) Progesterone is secreted by the corpus luteum, which forms when the ruptured follicle transforms after ovulation.

(B-II) Relaxin is secreted by the ovary in the later phase of pregnancy.

(C-I) Melanocyte stimulating hormone is produced in the pars intermedia of the pituitary gland.

(D-III) Catecholamines(epinephrine and nor-epinephrine) are secreted by the adrenal medulla.

89. (d) NCERT XII, Ch-Biotechnology: Principles and processes, Page-170

Statement I is incorrect: The blue-colored colonies typically do not have a foreign DNA insert in the plasmid and are identified as non-recombinant.

Statement II is correct: The colonies without the blue color have the DNA insert in the plasmid and are identified as recombinant colonies. This happens because the insertion of foreign DNA results in insertional inactivation of β- galactosidase gene, preventing the blue color formation.

90. (b) NCERT XII, Ch-Organisms and populations, Page-195

The Verhulst-Pearl Logistic Growth equation describes population growth where the growth rate decreases as the population size approaches the carrying capacity (K). The equation is:

$$dN/dt = rN\left(\frac{K-N}{K}\right)$$

Where:

- N = Population density at time t
- r = Intrinsic rate of natural increase
- K = Carrying capacity