



Sample Paper- 02

Class 12th NEET (2024)

BOTANY

ANSWER KEY

1. (4)
2. (1)
3. (4)
4. (2)
5. (2)
6. (3)
7. (3)
8. (3)
9. (1)
10. (4)
11. (4)
12. (4)
13. (3)
14. (1)
15. (1)
16. (2)
17. (2)
18. (3)
19. (3)
20. (1)
21. (4)
22. (1)
23. (2)
24. (3)
25. (4)

26. (1)
27. (1)
28. (3)
29. (3)
30. (1)
31. (3)
32. (3)
33. (3)
34. (1)
35. (4)
36. (4)
37. (2)
38. (4)
39. (3)
40. (1)
41. (2)
42. (4)
43. (1)
44. (3)
45. (4)
46. (1)
47. (1)
48. (4)
49. (1)
50. (4)



HINTS AND SOLUTION

1. (4)
In some members of Rosaceae, Solanaceae, Leguminosae pollen maintain viability for months. In some cereals like rice and wheat belonging to Poaceae family to pollen lose viability within 30 minutes of their release.

2. (1)
Tassels in the corn cob represent stigma and style which wave in the wind to trap pollen grains.

3. (4)
Pollen grains are highly nutritious. Pollen tablets are available in the market for supplementing food. They are banned for athletes and players.

4. (2)
(a) Autogamy: It is a kind of pollination in which the pollen from the anthers of a flower are transferred to the stigma of the same flower.
(b) Geitonogamy: It is a kind of pollination in which the pollens from the anthers of one flower are transferred to the stigma of another flower borne on the same plant. It usually occurs in plants which show monoecious condition (unisexual, male and female flowers are borne on the same plant). Geitonogamy involves two flowers but these belong to the same parent plant.

5. (2)
Dichogamy - the maturation of male and female parts of a flower at different times, preventing automatic self-pollination. In this case, anther and stigma mature at different times.

6. (3)
Maximum height of the plant (with genotype AABB) = 60 cm
Contribution of each dominant allele = $60/4 = 15$ cm
Minimum height of the plant (with genotype aabb) = 20 cm
Contribution of each recessive allele = $20/4 = 5$ cm
Hence, height of the plant with genotype AaBb = $15 + 5 + 15 + 5 = 40$ cm

7. (3)
Phenotypic ratio of trihybrid test cross = 1:1:1:1:1:1:1:1 (8 types)
Genotypic ratio of trihybrid test cross = 1:1:1:1:1:1:1:1 (8 types)
So, Sum = $8 + 8 = 16$ types

8. (3)
In the cross $ABcDE \times AbcdE$,
The product will be = $AABbccDdEE$
Hence, Number of gametes = 2^n (where, n = heterozygous pairs).
 $2^n = 2^2 = 4$

9. (1)
When both husband and wife are with blood group of O type, they can bear offspring of O type only.

10. (4)
If the kernel colour of wheat is determined by two polygenes, then the number of phenotypes possible is 5. Their phenotypic ratio is 1:4:6:4:1.

11. (4)
Exalbuminous (non-endospermic) seeds usually store reserve food material in cotyledons. In these seeds, the endosperm is used up and not present in mature seeds, e.g., bean, gram and pea.

12. (4)
If father is with blood group A and son is with blood group O. Then mother can have $I^A i$, $I^B i$ and $I^A I^A$. But she can never be $I^A I^B$.

13. (3)
A man with blood group A marries a woman having blood group AB.

Parents	$I^A I^A$	$I^A I^B$
Offspring	$I^A I^A$, $I^A I^A$, $I^A I^B$ and $I^A I^B$ (Children are with A and AB blood groups)	
Parents	$I^A i$	$I^A I^B$
Offspring	$I^A I^A$, $I^A i$, $I^A I^B$ and $I^B i$ (Children are with A, AB and B blood groups)	

Progeny with blood group B would show that the man is heterozygous.

14. (1)
DNA was responsible for the transformation because when DNA was treated with DNase (which degraded DNA), transformation was not possible.



15. (1)
HIV is a retrovirus. It does not follow the central dogma of molecular biology. But it follows reverse central dogma because it does not have its own cellular machinery. It enters inside a living cell and undergoes reverse transcription.
16. (2)
Length of DNA sample = $240 \text{ bp} \times 3.4 \text{ \AA} = 816 \text{ \AA}$.
17. (2)
After three duplications, there will be eight DNA molecules, out of which two will be having hybrid densities (radioactive- non-radioactive) and remaining six will be having light densities (non-radioactive-non-radioactive).
18. (3)
If an adenosine residue is inserted after 12th nucleotide, the resultant mRNA sequence will be 5' CCCUCAUAGUCAAUAC-3'.
Here, the third codon is UAG which is a STOP codon. Hence, it will code for just two amino acids.
19. (3)
After four generations, total sixteen DNA molecules will be obtained in the following ratio:
 $^{15}\text{N}/^{15}\text{N}=0$, $^{15}\text{N}/^{14}\text{N}=2$ and $^{14}\text{N}/^{14}\text{N}=14$.
20. (1)
E.coli divides after every 20 minutes. Hence in 60 minutes it will divided thrice. Hence, 2 hybrid : 6 light DNA molecules will be produced.
21. (4)
First, DNA helix unwind by the enzyme helicase which use the energy if ATP and replication of DNA begin at a specific point, called initiation point or origin where replication fork begins, Topoisomerase helps in unwinding of DNA, Single stranded binding proteins (SSBP) help in keeping DNA in single stranded position and also known as helix destabilizing proteins (HDP).
22. (1)
Double fertilization is the simultaneous occurrence of syngamy and triple fusion. Syngamy involves fusion of one male gamete with egg cell to form zygote. The result of syngamy is zygote (2n) which ultimately develops into embryo.
The second male gamete fuses with 2 polar nuclei or secondary nucleus to form triploid primary endosperm nucleus and this is called triple fusion. This primary endosperm nucleus (3n) ultimately develops into a nutritive tissue for developing embryo called endosperm.
23. (2)
Based on the destination of pollen grains, two types of pollination are recognised. When pollen grains are transferred from an anther to the stigma of the same flower the process is a type of self pollination called autogamy. Cross-pollination is further classified depending on whether the pollination has occurred between two flowers on the same plant (geitonogamy) or between the flowers on different plants (xenogamy).
24. (3)
A pleiotropic gene regulates multiple traits (characteristics) in an individual.
25. (4)
The relationship between the sequence of amino acids in a polypeptide and nucleotide sequence of DNA or mRNA is called genetic code. The genetic code is a triplet. One codon codes for only one amino acid, hence it is unambiguous and specific. Some amino acids are coded by more than one codon, hence the code is degenerate.
26. (1)
The gene for starch synthesis in pea seeds can produce more than one effect which implies it is a pleiotropic gene.
27. (1)
Pedigree analysis is a system of analysis by following the movement and distribution of certain genetic traits in many generations of a family. Pedigree analysis cannot confirm that DNA is the carrier of genetic information because it is an analysis system. For DNA based experiments, molecular biology techniques are used.



28. (3)
In prokaryotes, the negatively charged DNA is held with some positively charged proteins in a region termed as nucleoid.
In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome.
29. (3)
Genetic code is non ambiguous. There is no ambiguity for a particular codon. A particular codon will always code for the same amino acid, where ever it is found.
30. (1)
Jacob and Monod proposed the lac operon of E. coli. The lac operon contains a promoter, an operator, and three structural genes called z, y, and a, coding for the enzyme, β galactosidase, permease and transacetylase respectively. The lac regulator gene, designated as i gene, codes for repressor. In the absence of the inducer, the repressor binds to the lac operator, preventing RNA polymerase from binding to the promoter and thus transcribing the structural gene.
31. (3)
Alcohol is the result of yeast fermentation, which is the incomplete oxidation of complex organic compounds with the help of enzymes produced by yeast (invertase and zymase)
$$\text{C}_{12}\text{H}_{22}\text{O}_{11} + \text{H}_2\text{O} \xrightarrow[\text{Invertase}]{\text{Yeast}} \text{C}_6\text{H}_{12}\text{O}_6 + \text{C}_6\text{H}_{12}\text{O}_6$$

(Sucrose) (Glucose) (Fructose)
$$\text{C}_6\text{H}_{12}\text{O}_6 \xrightarrow[\text{Invertase}]{\text{Yeast}} 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$$
32. (3)
Different varieties of cheese are known by their characteristic texture, flavour and taste, the specificity coming from the microbes used. For example, the large holes in Swiss cheese are due to production of a large holes in Swiss cheese are due to production of a large amount of CO_2 by a bacterium named *Propionibacterium shermanii*. The Roquefort cheese are ripened by growing a specific fungi on them, which gives them a particular flavour.
33. (3)
In a cross between $\text{AABB} \times \text{aabb}$, the ratio of F2 genotypes between AABB , AaBB , Aabb and aabb would be 1 : 2 : 2 : 1.
34. (1)
Carrying capacity of an environment is the maximum number of individuals of a population which can be provided with all the necessary resources for their healthy living. A population grows rapidly at first and then levels off as carrying capacity of it is limited by density dependent factors.
35. (4)
Transfer RNA (tRNA) are types of RNA responsible for the transfer of specific amino acids to the growing end of a polypeptide chain during translation.
R.Holly in 1965 gave clover leaf model of tRNA for yeast alanyl tRNA.
It has four major sites - AA binding site, anticodon site, TYC loop and DHU loop.
The chain is having unpaired base sequence CCA at 3' end and G at 5' end.
36. (4)
Population size in any given habitat is also known as population density.
$$\text{Population density (D)} = \frac{\text{No. of individuals (N)}}{\text{Space(s)}}$$

Space is indicated in two dimensions (m^2) for land organisms, and in three dimensions (m^3) for aquatic organisms and for the organisms suspended in space.
37. (2)
Cyclosporin A used as an immuno-suppressive agent in organ-transplant patients, is produced by the fungus *Trichoderma polysporum*.
38. (4)
Secondary treatment is a biological treatment process of wastewater (or sewage) to remove the dissolved and suspended organic compounds by using aerobic microbes to degrade the organic content in the water.



39. (3)

In the pyramids of number, the number of individual organism in various trophic levels is shown in the form of figure. These pyramids are mostly upright, because number of producers (T_1) is maximum and number of herbivores and carnivores decrease towards apex or at successive trophic levels, such as grassland ecosystem and aquatic ecosystem. But in a tree ecosystem the pyramid of numbers is inverted. This is called parasitic ecosystem because small birds (herbivores) depends on the trees (producers) and predator birds (consumers) depend on small birds, therefore with increase in the number of trophic levels, the number of the organism increases sequentially.

40. (1)

Less than 1% of the solar energy that falls on the leaves of a plant is converted to chemical energy by photosynthesis. Of the incident solar radiation less than 50 per cent of it is photosynthetically active radiation (PAR). Plants capture only 2–10 percent of the PAR and this small amount of energy sustains the entire living worlds.

41. (2)

Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks.

42. (4)

During the long period (> 3 billion years) since the origin and diversification of life on earth there were five episodes of mass extinction of species.

43. (1)

Fishes constitute the oldest group of vertebrates. There are 24,600 species of fishes on earth. Amphibians descended from fishes and have 5800 species. Reptiles which evolved from amphibian ancestors have approximately 6300 species of reptiles. Birds are thought to have arisen from reptilian ancestors have approximately 9100 species.

44. (3)

On a logarithmic scale, the species-area relationship is a straight line described by the equation:

$$\log S = \log C + Z \log A$$

where, S = species richness; A = Area; Z = slope of the line (regression coefficient); C = Y–intercept
Ecologists have discovered that the value of Z lies in the range of 0.1 to 0.2. But, if you analyse the species–area relationships among very large areas like the entire continents, you will find that the slope of the line to be much steeper (Z values in the range of 0.6 to 1.2).

For example, for frugivorous (fruit-eating) birds and mammals in the tropical forests of different continents, the slope is found to be 1.15.

45. (4)

Loss of biodiversity in a region may lead to :

- (a) Decline in plant production.
- (b) Lowered resistance to environmental perturbations such as drought.
- (c) Increase variability in certain ecosystem processes such as plant productivity, water use and disease cycles.

46. (1)

Two or more species with closely similar niche requirements cannot exist indefinitely in the same area as sooner or later they come into competition for possession of it.

This is called as Gause's principle of competitive exclusion, which states that an ecological niche cannot be simultaneously and completely occupied by established populations of more than one species. Two species can live in same habitat but not in the same niche. More similar the two niches are, severe the competition is.

47. (1)

Decomposition is the process of breaking down organic matter into simple inorganic matter. The rate of decomposition is controlled by chemical and climatic factors. If detritus is rich in lignin and chitin, the decomposition rate is slow. If detritus is rich in nitrogen, the decomposition rate is relatively high. Warm and moist environment favour decomposition whereas low temperature and anaerobiosis inhibit decomposition .

48. (4)

Introduction of the African catfish *Clarias gariepinus* for aquaculture purposes has become a threat to indigenous catfishes in our rivers. *Clarias gariepinus* is an alien species for the communities in Yamuna..



49. (1)
Stability can be defined as the power of a system to be in their state against unfavourable factors and resilience is the capability of regaining its original shape or position after being deformed.

50. (4)
Azolla plays a very important role in rice production. Azolla and its nitrogen-fixing partner, Anabaena, have been used as green manure to fertilise rice paddies and increase production.



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