



Sample Paper-01

Class 12<sup>th</sup> NEET (2024)

**BOTANY**

**ANSWER KEY**

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

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



## HINTS AND SOLUTION

1. (4)  
In Vallisneria, the female flower reach the surface of water by the long stalk and the male flowers or pollen grains are released on to the surface of water. They are carried passively by water currents, some of them eventually reach the female flowers and the stigma.
2. (2)  
Single ovule in the ovary and flowers packed into inflorescence are characteristics of wind pollinated flowers.
3. (3)  
In an ovule, the micropyle is meant for entry of pollen tube in the embryo sac, whereas in a seed it is meant for the entry of water into the seed for seed germination.
4. (4)  
In insect pollinated flowers, the exine of the pollen grain is covered with a yellowish, viscous and sticky substance called pollen kit. This is the protective envelope which also sticks to the body of the insects and thus helps in pollination. It is chiefly made up of lipids and carotenoids.
5. (3)  
Nectar and pollen grains are usual floral rewards to pollinating animals. There are some other awards also like safe place to lay eggs etc.
6. (2)  
Perisperm is persistent nucellus. Endosperm formation is accompanied by degeneration of nucellus.
7. (2)  
A dominant allele is the one which can express its effect both in homozygous (YY-yellow) and heterozygous (Yy-yellow) conditions.
8. (2)  
Mendel crossed a pure white-flowered recessive pea plant with a dominant pure red-flowered plant. The first generation of hybrids from the cross should show all red-flowered plants. This is in accordance with the law of dominance.
9. (3)  
Linkage is an exception to the law of independent assortment.
10. (4)  
The homologous chromosomes are assorted during anaphase I of meiotic division.
11. (1)  
Marriages between close relatives are called consanguineous marriages. They should be avoided because it includes more recessive alleles to come together, e.g., a cross between Aa and Aa may have 25% chances of producing aa type progeny.
12. (3)  
If one parent belongs to A blood group and the other to O blood group, two possibilities arise:
- Possibility-1
- |           |                  |      |
|-----------|------------------|------|
| Parents   | $I^A I^A$        | $ii$ |
| Offspring | $I^A i$ and $ii$ |      |
- Possibility-2
- |           |                  |      |
|-----------|------------------|------|
| Parents   | $I^A i$          | $ii$ |
| Offspring | $I^A i$ and $ii$ |      |
- Hence, offsprings may have A and O groups only.
13. (3)
- |                                     |                      |
|-------------------------------------|----------------------|
| Mr. Sandival = $I^B I^B$ or $I^B i$ | Mrs. Sandival = $ii$ |
| Children = $I^B i$ and $ii$         |                      |
- Hence, the children will have type B and type O blood groups only. So, Om is an adopted child.
14. (1)  
Length of DNA in *E. coli* = 1.36 mm =  $1.36 \times 10^3$  m  
 $m = 1.36 \times 10^3$  m  
Number of base pairs = Length of DNA /  $3.4 \text{ \AA}$  =  $1.36 \times 10^3 \text{ m} / 3.4 \times 10^{-10} \text{ m}$  =  $0.4 \times 10^3 \times 10^{10} = 0.4 \times 10^{13}$ .
15. (2)  
Base ratio =  $(A + T) / (G + C)$   
As, cytosine = 22%, therefore guanine = 22%  
Then, adenine and thymine each will be =  $100 - (22 + 22) / 2 = 28\%$ . So, Base ratio =  $(28 + 28) / (22 + 22) = 56/44 = 1.27$



16. (1)  
If cytosine = 46, then guanine = 46  
Then, adenine and thymine each will be  
=  $200 - (46 + 46)/2 = 54$   
Number of hydrogen bonds:  
46G  $\equiv$  46C: Hydrogen Bonds =  $46 \times 3 = 138$   
54A = 54T: Hydrogen bonds =  $54 \times 2 = 108$   
Hence, total hydrogen bonds =  $138 + 108 = 246$ .
17. (3)  
The first charged tRNA (always charged with methionine amino acid) attaches itself to P site of ribosome in translation. Rest all other charged tRNAs always attach to the A site.
18. (1)  
Peptidyl transferase reaction does not consume a high energy phosphate bond. Peptidyl transferase is a type of catalytic RNA (ribozyme). It is 23S rRNA in prokaryotes and 28S rRNA in eukaryotes.
19. (3)  
If an error occurred during DNA replication in a cell, so that where there is supposed to be an A in one of the genes there is a C instead. Then a mutation will occur which is known as Point or substitution mutation. By this type of a mutation only an amino acid can be changed maximally in the complete polypeptide.
20. (1)  
A gene mutation normally alters the information conveyed by a gene. After the mutation, the protein structure may be changed.
21. (3)  
The RNA primers are removed from the 5' by the action of 5'  $\rightarrow$  3' exonuclease activity of DNA polymerase I.
22. (1)  
Genes are the units of inheritance and contain the information that is required to express a particular trait in an organism. Alternating forms of a single gene which code for a pair of contrasting traits are known as alleles. For example, two alleles determine the height of pea plant (tall and dwarf).
23. (4)  
Genetic map is a linear graphic representation of the sequence and relative distance of various genes present in a chromosome. 1% crossing over between two linked genes is known as 1 map unit or centimorgan (cm).
24. (1)  
1 map unit or centimorgan is equivalent to 1% recombination between two genes. Percentage of crossing over between a and b is 20% so they are 20 map distance apart and b and c are 28 map distance apart. So, the correct sequence of genes on chromosome is b, a, c.
25. (1)  
Artificial selection and domestication from ancestral wild cows, we have well known Indian breeds e.g. sahiwal cow in Punjab.
26. (3)  
In human beings, 45 chromosomes/single X/XO abnormality causes Turner's syndrome. Individuals having a single X chromosome 2A + XO (45) have female sexual differentiation, but ovaries are rudimentary. Other associated phenotypes of this condition are short stature, webbed neck, broad chest, lack of secondary sexual characteristics and sterility. Thus, any unbalance in the copies of the sex chromosomes may disrupt the genetic information necessary for normal sexual development.
27. (1)  
Both husband and wife have normal vision through their fathers were colour blind, the probability of their daughter becoming colour blind is 0%. The chances of daughter becoming colour blind arises only when the father is also colour blind.
28. (2)  
The genetic material of prokaryotes is circular and single stranded DNA. It has no association of histones. The eukaryotic genetic material is linear and double stranded DNA. It is associated with histone proteins to form nucleosome unit.
29. (2)  
The transforming principle of *Pneumococcus* as found out by Avery, MacLeod and McCarty was DNA.  
In 1944, Avery, MacLeod and McCarty repeated Griffith's experiment successfully. They separated the proteins, carbohydrates and DNA of S III strains and separately mixed them in the pure cultures of R II. Only DNA could bring about transformation of R II type into S III and not the proteins or the carbohydrates.



30. (1)  
Deoxyribonucleic acid and ribonucleic acid as the name suggests are made up of several nucleotide monomers. Each nucleotide consists of pentose sugar, phosphate group and nitrogenous bases. DNA has deoxyribose sugar whereas RNA has ribose sugar. The bases in DNA molecule are A, T, G and C whereas in RNA, thymine is absent and instead uracil is found.
31. (1)  
Dough which is used for making foods such as dosa and idli is fermented by Yeast (*Saccharomyces cerevisiae*). Large holes in Swiss cheese are due to production of large amount of CO<sub>2</sub> by *Propionibacterium shermanii*.
32. (2)  
Once the BOD of sewage or waste water is reduced significantly, the effluent is then passed into a settling tank where the bacterial flocs are allowed to sediment. This sediment is called activated sludge. A small part of the activated sludge is pumped back into the aeration tank to serve as the inoculum. The remaining major part of the sludge is pumped into large tanks called anaerobic sludge digesters. This stage of treatment is called secondary or biological treatment.
33. (2)  
The Mediterranean orchid *Ophrys* employs sexual deceit to get pollination done by a species of bee. One petal of its flower bears an uncanny resemblance to the female of the bee in size, colour and markings. The male bee is attracted to what it perceives as a female and pseudocopulates with the flower, and during that process is dusted with pollen from the flower. When this same bee pseudocopulates with another flower, it transfers pollen to it and thus, pollinates the flower.
34. (2)  
The species which establishes an essential link with other species to help the latter in some vital activity is called link species, e.g., Mycorrhizal fungi, many insect species which works as pollinators of flowers. The species which have great influence on the community's characteristics relative to their low abundance or biomass are called key-stone species. The activities of key-stone species determine the structure of the community, e.g., lion in forest, kangaroo rat in desert.
35. (3)  
Statins are products of fermentation activity of yeast *Monascus purpureus* which resemble mevalonate and are competitive inhibitors of b-hydroxy-b-methylglutaryl or HMG CoA reductase. This inhibits cholesterol synthesis. Statins are, therefore, used in lowering blood cholesterol.
36. (3)  
A population has more young individuals compared to the other individuals. It means that the population is expanding.
37. (3)  
The economists are trying to quantify the dollar value of ecosystem services as this allows them to justify the cost of preservation.
38. (4)  
Pyramids of energy represents amount of energy at different trophic levels, energy pyramids are always upright or erect because there is a gradual decrease in energy at successive trophic levels. According to the 10% law of Lindemans, the 90% parts of obtained energy of each organism is utilised in their various metabolic activities and heat and only 10% energy is transferred to the next trophic level. So, 90% energy is lost at each trophic level, therefore top consumers like lion etc., are ecologically weakest but physically they are strong. The pyramid of energy is always upright for any ecosystem. This situation indicates the fact that herbivores have better energy conversion efficiency than carnivores.
39. (1)  
Species composition and stratification are the two main structural features of an ecosystem whereas energy flow and decomposition are the functional features of an ecosystem.
40. (1)  
Most productive agroecosystem is of sugarcane with productivity of 3–4 kg m<sup>-2</sup> yr<sup>-1</sup>. Sugarcane is a renewable, natural agricultural resource because it provides sugar, besides biofuel, fibre, fertiliser and myriad of byproducts with ecological sustainability.
41. (2)  
When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive, and cause decline or extinction of indigenous species. When a species goes extinct in one area, it is often desirable to reintroduce the species from other populations. A major problem with this approach is that populations are often adapted to local conditions and may not survive when moved to a different location.



42. (3)  
Anthropogenic extinction means the extinction of species from surface of Earth that is due to human activities.  
The Holocene extinction, otherwise referred to as the Sixth extinction or Anthropocene extinction, is a name for the ongoing extinction event of species during the present Holocene epoch (since around 10,000 BCE) mainly due to human activity.
43. (2)  
Animals achieved greater diversification due to their movement to diverse habitats which resulted in more evolutionary changes.
44. (1)  
According to the concept of species-area relations, the number of species in an area increases with the size of the area. Within a region, species richness increases with increasing explored area, but only up to a limit.
45. (4)  
There are three reasons for greater biological diversity of tropics than temperate regions:  
(a) Speciation is generally a function of time, unlike temperate regions subjected to frequent glaciations in the past, tropical latitudes have remained relatively undisturbed for millions of years and thus, had a long evolutionary time for species diversification.  
(b) Tropical environments, unlike temperate ones, are less seasonal, relatively more constant and predictable. Such constant environments promote niche specialisation and lead to a greater species diversity.  
(c) There is more solar energy available in the tropics, which contributes to higher productivity; this in turn might contribute indirectly to greater diversity.
46. (4)  
A threatened species is that whose population is likely to become endangered. An endangered species has population numbers so low that it is likely to become extinct.
47. (2)  
The type of gases produced by microbial activity depend upon the microbes and the organic substrates they utilise. Certain bacteria, called methanogens, grow anaerobically on cellulosic material and produce large amount of methane along with carbon dioxide. These bacteria are commonly found in the anaerobic sludge during sewage treatment. Other anaerobic bacteria, involved in the process of anaerobic digestion produce other gases like ammonia and hydrogen sulphide.
48. (1)  
*Cuscuta* is a total stem parasite which is a good example of ectoparasitism. It is commonly found growing on hedge plants.
49. (1)  
In a population where the number of prereproductive individuals or the younger individual is larger than the reproductive individuals, the population will increase.
50. (2)  
Standing crop is the total amount of living material in a specified population at a particular time, expressed as biomass (standing biomass) or its equivalent in terms of energy. The standing crop may vary at different times of the year, for example, in a population of deciduous trees between summer and winter.

