



KSEAB PYQ K (2022)

Kannada

BOTANY

1. Define Polyembryony.
2. Mention the organic resistant material present in the exine of pollen grains.
3. Give one example for Pleiotropy.
4. Write one symptom of Turner's syndrome.
5. Write the use of Nucleopolyhedrovirus.
6. What are Biofertilisers?
7. Write the function of statins.
8. What do you mean by endemism?
9. Define the following terms:
 - a) Staminate flower
 - b) Pistillate flower
10. Differentiate between albuminous and non-albuminous seeds.
11. Give a brief account on female heterogamety in the sex determination.
12. Differentiate between linkage and recombination.
13. Mention any two causes for the biodiversity losses.
14. Cleistogamous flowers are invariably autogamous. Justify the statement.
15. Mention the stages of sexual reproduction.
16. Write two symptoms of Down's syndrome and write the chromosome number in Down's syndrome.
17. With reference to transcription in eukaryotes, explain the following terms:
 - a) Splicing
 - b) Capping
 - c) Tailing
18. Give the scheme of a simplified model of phosphorus cycling in the terrestrial ecosystem.
19. Give the graphic representation of Biome distribution with respect to annual temperature and precipitation.
20. Define Megasporogenesis. Describe the internal structure of a mature embryo sac of an angiosperm flower.
21. Write the schematic representation of one gene inheritance in the *Pisum sativum* plant.
22. Write any five salient features of genetic code.
23. Describe the Hershey-Chase experiment to prove that the DNA is genetic material.
24. Describe the secondary treatment process of sewage treatment.
25. Write a note on the Decomposition process.
26. With a neat labelled diagram, explain the process of removal of air pollutants by using an electrostatic precipitator.
27. Define the following terms:
 - a) Adaptations
 - b) Natality
 - c) Mortality
 - d) Immigration
 - e) Emigration



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Hint & Solution

1. ()
Occurrence of more than one embryo in a seed is called polyembryony.
Example: Citrus.

2. ()
Sporopollenin.

3. ()
Phenylketonuria.
A single gene affects multiple characters.

4. ()
Sterile female with rudimentary ovaries.
Other acceptable points: short stature, poorly developed secondary sexual characters.

5. ()
Nucleopolyhedrovirus is used as a biocontrol agent against insect pests.

6. ()
Biofertilisers are organisms that enrich the nutrient quality of soil.

7. ()
Statins are used as blood cholesterol-lowering agents.

8. ()
Endemism is the condition in which a species is confined to a particular geographical region and is not found elsewhere.

9. ()

a) A unisexual flower having only stamens is called a staminate flower. It represents the male flower.

b) A unisexual flower having only pistil/carpel is called a pistillate flower. It represents the female flower.

10. ()

Albuminous seeds	Non-albuminous seeds
Endosperm persists in the mature seed.	Endosperm is completely consumed during embryo development.
Food is stored in the endosperm.	Food is usually stored in cotyledons.
Example: Wheat, maize, castor.	Example: Pea, groundnut, bean.

11. ()

In some organisms, the female produces two different types of gametes. This condition is called female heterogamety. In birds, the female has ZW sex chromosomes and the male has ZZ sex chromosomes. The female produces two types of ova, one carrying Z and the other carrying W. The sex of the offspring depends on the type of ovum fertilised by the sperm.

12. ()

Linkage	Recombination
Tendency of genes on the same chromosome	Formation of new gene combinations.



to be inherited together.	
It reduces variation.	It increases variation.
Linked genes show less crossing over.	Recombination occurs due to crossing over.

13. ()

Any two:

1. Habitat loss and fragmentation.
2. Over-exploitation.
3. Alien species invasion.
4. Co-extinctions.

14. ()

Cleistogamous flowers do not open at all. Since the anthers and stigma remain enclosed inside the closed flower, pollen grains come in contact with the stigma of the same flower. Therefore, only self-pollination occurs. As there is no chance for cross-pollination, cleistogamous flowers are invariably autogamous and assure seed formation even in the absence of pollinators.

15. ()

The stages of sexual reproduction are:

1. Pre-fertilisation events – gamete formation and gamete transfer.
2. Fertilisation – fusion of male and female gametes to form a zygote.
3. Post-fertilisation events – zygote development, embryogenesis and formation of new individual.

16. ()

Down's syndrome is caused by trisomy of chromosome 21. The affected individual has 47 chromosomes.

Symptoms:

1. Short-statured body with small round head.
2. Furrowed tongue and partially open mouth.
3. Broad palm with characteristic palm crease.

4. Physical, psychomotor and mental development may be delayed.

Any two symptoms + chromosome number are sufficient.

17. ()

a) Splicing

Splicing is the process in which non-coding introns are removed from the primary transcript and coding exons are joined together.

b) Capping

Capping is the addition of methyl guanosine triphosphate to the 5' end of hnRNA.

c) Tailing

Tailing is the addition of adenylate residues at the 3' end of hnRNA. These modifications help in processing hnRNA into functional mRNA.

18. ()

A simplified phosphorus cycle can be represented as:

Rocks

↓ weathering

Soil phosphate

↓ absorption

Plants

↓ food chain

Animals

↓ death and excretion

Detritus

↓ decomposition

Soil phosphate

↓

Sedimentation → Rocks

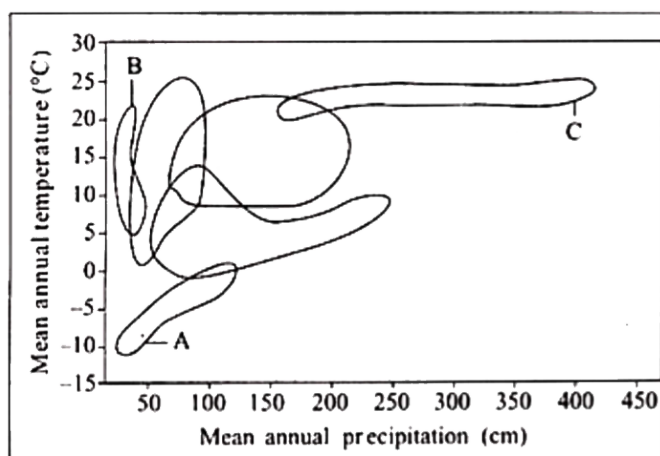
Phosphorus enters the soil by weathering of rocks. Plants absorb phosphate from soil. Animals obtain it through food chains. After death and excretion, decomposers return phosphate to the soil.

19. ()



Biome distribution depends mainly on annual temperature and precipitation. Deserts occur in regions with low rainfall. Grasslands occur with moderate rainfall. Forests occur where rainfall is higher. Tundra occurs at very low temperatures, while tropical forests occur at high temperature and high precipitation.

For a diagram, draw a graph with annual precipitation on X-axis and annual temperature on Y-axis. Mark tundra, desert, grassland, temperate forest and tropical forest in their respective climatic regions.



20. ()

Megasporogenesis is the process of formation of megaspores from the megaspore mother cell by meiosis.

In the ovule, a diploid megaspore mother cell undergoes meiosis to form four haploid megaspores. Usually, three megaspores degenerate and one functional megaspore develops into the embryo sac. The functional megaspore undergoes three mitotic divisions to form eight nuclei. These nuclei are arranged into a mature embryo sac.

A mature embryo sac is 7-celled and 8-nucleate. At the micropylar end, there is an egg apparatus consisting of one egg cell and two synergids. The synergids have special cellular thickenings called filiform apparatus, which guide the pollen tube. At the chalazal end, three antipodal cells are

present. In the centre, a large central cell contains two polar nuclei. Thus, the mature embryo sac consists of one egg cell, two synergids, three antipodals and one central cell with two polar nuclei.

21. ()

Example: Inheritance of plant height in pea.

Parents:	Tall plant	×	Dwarf plant
Genotype:	TT	×	tt
Gametes	T		t
F1 generation:		Tt	
Phenotype:		Tall	
F1 × F1:	Tt	×	Tt
Gametes:	T, t		T, t
Punnett square:			
Tt × Tt			
	T	t	

T	TT	Tt	
t	Tt	tt	

F₂ genotypic ratio: 1 TT : 2 Tt : 1 tt

F₂ phenotypic ratio: 3 Tall : 1 Dwarf

This shows that the tall character is dominant and dwarf character is recessive. The recessive character remains hidden in F₁ but reappears in F₂.

22. ()

Any five:

1. The genetic code is triplet; three bases form one codon.
2. One codon codes for only one amino acid, so it is unambiguous.
3. Some amino acids are coded by more than one codon, so the code is degenerate.
4. The codon is read in a continuous manner without punctuation, so it is commaless.
5. The genetic code is nearly universal.
6. AUG acts as the start codon and codes for methionine.



7. UAA, UAG and UGA are stop codons and do not code for any amino acid.

23. ()

Hershey and Chase worked with bacteriophages that infect bacteria. They used radioactive isotopes to label DNA and protein separately. DNA contains phosphorus but not sulphur, so viral DNA was labelled with radioactive phosphorus, ^{32}P . Protein contains sulphur but not phosphorus, so viral protein coat was labelled with radioactive sulphur, ^{35}S .

The labelled bacteriophages were allowed to infect *E. coli* bacteria. After infection, the mixture was agitated in a blender to separate the viral coats from bacterial cells. Then the mixture was centrifuged. The bacterial cells formed the pellet, while the viral protein coats remained in the supernatant.

In the experiment with ^{32}P -labelled DNA, radioactivity was found inside the bacterial cells. In the experiment with ^{35}S -labelled protein, radioactivity remained in the supernatant. This showed that DNA entered the bacterial cells and directed viral multiplication, while protein did not enter. Therefore, DNA was proved to be the genetic material.

24. ()

Secondary treatment of sewage is also called biological treatment. In this process, the primary effluent is passed into large aeration tanks. In these tanks, air is pumped mechanically and the liquid is constantly agitated. This allows the growth of useful aerobic microbes into flocs.

Flocs are masses of bacteria associated with fungal filaments. These microbes consume the major part of organic matter present in sewage. As a result, the biochemical oxygen demand of the effluent is reduced.

After aeration, the effluent is passed into a settling tank. Here, the bacterial flocs settle down as activated sludge. A small part of activated sludge

is pumped back into the aeration tank to serve as inoculum. The remaining major part is sent to anaerobic sludge digesters.

In the digesters, anaerobic bacteria digest the sludge and produce gases such as methane, hydrogen sulphide and carbon dioxide. These gases form biogas. After secondary treatment, the effluent is usually released into natural water bodies.

25. ()

Decomposition is the process by which complex organic matter is broken down into simpler inorganic substances like carbon dioxide, water and nutrients. It is carried out mainly by decomposers such as bacteria and fungi.

Dead plant remains such as leaves, bark, flowers and dead remains of animals, including faecal matter, form detritus. Decomposition involves five important steps: fragmentation, leaching, catabolism, humification and mineralisation.

In fragmentation, detritivores break detritus into smaller particles. In leaching, water-soluble inorganic nutrients move down into the soil. In catabolism, bacterial and fungal enzymes degrade detritus into simpler substances. Humification leads to formation of humus, a dark-coloured amorphous substance resistant to microbial action. Mineralisation releases inorganic nutrients into the soil.

Decomposition is affected by chemical composition of detritus and climatic factors. Warm and moist conditions favour decomposition, while low temperature and anaerobic conditions slow it down.

26. ()

An electrostatic precipitator removes particulate matter from exhaust gases. It is commonly used in thermal power plants.

The device has electrode wires maintained at very high voltage. These wires produce a corona that releases electrons. The electrons attach to dust

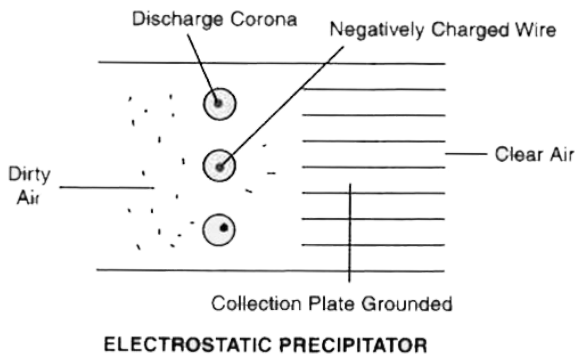


particles present in the gas and give them a negative charge. The charged dust particles then move towards collecting plates, which are positively charged or grounded.

The dust particles settle on the collecting plates. The plates are periodically cleaned by mechanical rapping, and the collected dust falls into a hopper. The clean gas is released through the outlet.

A good electrostatic precipitator can remove most of the particulate matter from exhaust gas.

While drawing the diagram, label dirty gas inlet, discharge electrodes, collecting plates, dust particles, clean gas outlet and dust hopper.



27. ()

a) Adaptations

Adaptations are morphological, physiological or behavioural features that help an organism survive and reproduce in its habitat.

b) Natality

Natality is the number of births in a population during a given period.

c) Mortality

Mortality is the number of deaths in a population during a given period.

d) Immigration

Immigration is the entry of individuals of the same species into a population from outside.

e) Emigration

Emigration is the movement of individuals out of a population to another area.