

PRACTICE PAPER – 4

SOLUTIONS

SECTION – A

1. Does transpiration occur at night ? Give an example.

Ans. Yes. In succulent plants, stomata opens during the night and remain closed during the day time. [Scotoactive stomata]

Eg : Bryophyllum, Cacti.

2. What is meant by bolting ? Which hormone causes bolting ?

Ans. Sudden elongation of internodes prior to flowering is called bolting. It is caused by Gibberellins.

3. What is sex pilus ? What is its function ?

Ans. **Sex pilus** is a conjugation apparatus that pulls two cells together prior to DNA transfer. It help in binding two conjugants and also help in passing **F plasmid** from **F⁺** cell to **F⁻** cell.

4. What are virulent phages ? Give an example.

Ans. T-even phages that attack the bacterium **E.coli** cause lysis of the cells and are called **virulent phages** **Eg : Bacteriophage.**

5. What is the genetic nature of wrinkled phenotype of pea seeds ?

Ans. **rr** is the genetic nature of the phenotypic wrinkled pea seeds.

6. What are molecular scissors ? Where are they obtained from ?

Ans. Molecular scissors are the restriction enzymes which cut the DNA at specific locations usually they are obtained from Bacteria.

7. Name any two artificially restructured plasmids.

Ans. PBR₃₂₂, PUC_{19, 101}.

8. Can a disease be detected before its symptoms appear ? Explain the principle involved.

Ans. Yes. Very low concentration of a bacteria or virus (when the symptoms of the disease are not visible) can be detected by amplification of their nucleic acid through **PCR. rDNA technology, Enzyme Linked Immuno-sorbent Assay** are some of the techniques that serve the purpose of early diagnosis.

9. Name the nematode that infects the roots of tobacco plants. Name the strategy adopted to prevent this infestation.

Ans. *Meloidegryne incognitia*. A novel strategy adopted to prevent this infestation is process of RNA interference [RNA i]

10. What is Emasculation ? Why and when is it done ?

Ans. Removal of anthees from bisexual flower of a female parent is called Emasculation. It is done to prevent self pollination and it is done when the flower is in bud condition.

SECTION - B

11. Stomata are turgor operated valves. Explain.

Ans. The immediate cause of opening or closing of the stomata is a change in the turgidity of the **guard cells**. The inner wall of each guard cell towards the pore is thick and elastic. When turgidity increases with in the two guard cells, the thin outer walls bulge out and force the inner walls into a crescent shape, aided by the microfibrils present in the cell walls of guard cells, making it easier for the stoma to open. When the guard cells loose turgor due to water loss, the elastic inner wall regain their original shape, the guard cells become **flaccid** and the **stomata closes**.

12. 'All elements that are present in a plant need not be essential for its' survival Justify.

Ans. → The elements must be absolutely necessary for supporting normal growth and reproduction.

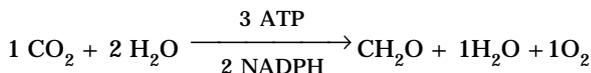
→ The requirement of the element must be specific and not replaceable by another element.

→ These element must be directly involved in the metabolism of plant.

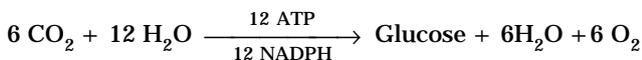
Based on the above criteria, only a few elements are essential for plant growth and metabolism.

13. Six turns of Calvin cycle are required to generate one mole of Glucose. Explain.

Ans. In Calvin cycle, for every CO₂ molecule to be fixed, 3 ATP molecules and 2 NADPH are required which forms 1/6 of the glucose molecule.



To get 1 glucose molecule, 6CO₂ molecules are to be fixed by using 18 ATP and 12 NADPH molecules. So to make one glucose molecule, 6 turns of the canvin cycle are required.



14. Write the physiological responses of Gibberellins in plants.

- Ans.**
- 1) Gibberellins delay senescence. Thus fruits can be left on the tree longer so as to extend the market period.
 - 2) Spraying of Gibberellins on sugarcane crop, increases the length of the stem, thus increasing the yield as much as 20 tonns per acre.
 - 3) GA hastens the maturity period of conifers thus leading to early seed production.
 - 4) GA also promotes bolting in cabbages, beet etc.
 - 5) They also produce parthenocarpic fruits in grapes and tomato.
 - 6) Gibberellins favour the formation of male flowers in cucurbita.

15. Define law of seggregation and law of independent Assortment.

Ans. Law of seggregation : The two alleles of a gene when present together in a heterozygous state, they do not fuse or blend in any way but remain distinct and seggregate during meiosis or in the formation of gametes, so that each meiotic product of gamete will carry only one of them.

Law of Independent Assortment : When two pairs of traits are combined in a hybrid, seggregation of one pair of character is independent of the other pair of characters.

16. What are the different methods of insertion of r – DNA into the host cell ?

Ans. There are several methods of introducing the ligated DNA into recipient cells. Recipient cells after making them competent to receive, take up the DNA present in their surrounding. R-DNA can be forced into such cells by incubating the cells with r-DNA on ice followed by placing them briefly at 42°C (heat shock) and then putting them back on ice. This enables the bacteria to take up the r-DNA.

In Micro-injection method, r-DNA is directly injected into the nucleus of an animal cell.

In Bio listic or **gene gun method** - cells are bombarded with high velocity micro particles of gold or tungsten coated with DNA.

In another method, '**Disarmed pathogen**' vectors are used which when allowed to infect the cell, transfer the r-DNA into the host.

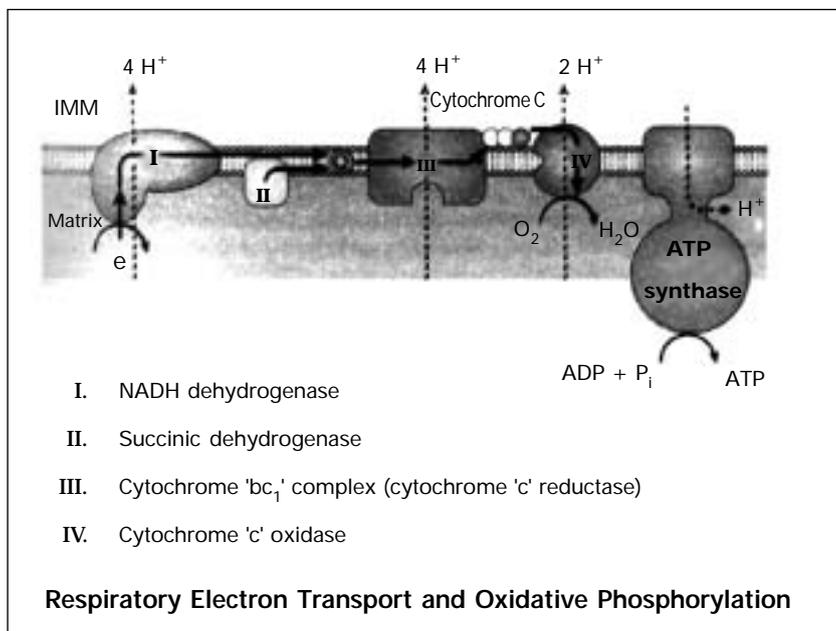
17. Write notes on green revolution and gene revolution.

Ans. Green revolution : Substantial and dramatic increase in agricultural production which was termed as green revolution by **William Gaud**, the director of United States Agency for International development (USAID). **Norman Borlaug** is regarded as father of Green Revolution. **Dr. M.S. Swaminathan** and his team is the success of green revolution in our country. It was possible due to use of improved varieties, chemical fertilizers and pesticides, improved irrigational facilities, adoption of better agricultural management strategies, land reforms etc.,

Gene revolution : It is the application of biotechnology in food production. It is of great potential to farmers as it provides them with disease free planting material and develops plants that resist pests and diseases, reducing use of chemicals that harm the environment and human health. It can provide diagnostic tools and vaccines that help control devastating animal diseases. It can also improve the nutritional quality of staple foods such as rice and create new products for health and industrial uses.

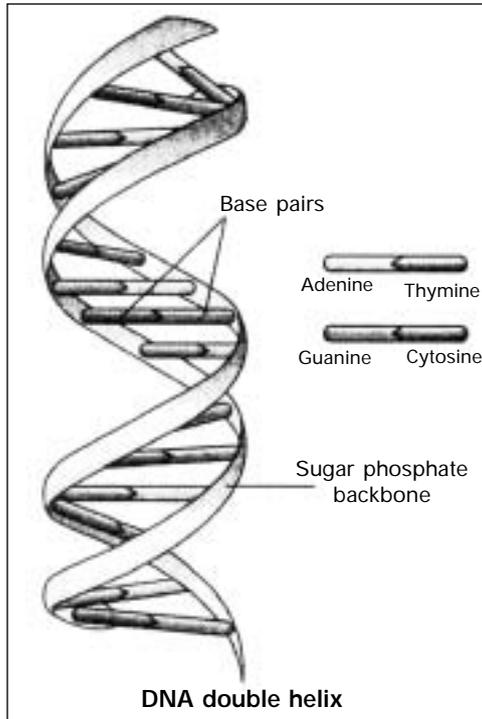
to cytochromes a and a₃, finally reaches ½ O₂ along with 2H⁺, produce 1 H₂O molecule. During this electron flow, 10H⁺ moves from matrix to inner mitochondrial membrane.

[4 H⁺ at complex I, 4H⁺ at complex III, 2 at complex IV]. As a result H⁺ concentration increases towards the inner membrane of mitochondria. So the H⁺ comes back to the matrix side through ATP age [F₀, F₁], involves in the synthesis ATP.



20. Give the salient features of the double helix structure of DNA.

- Ans.**
- 1) It is made up of two polynucleotide chains, when back bone is constituted by sugar - phosphate.
 - 2) The two chains have antiparallel polarity. One chain has 5' → 3' polarity and the other has 3' → 5' polarity.
 - 3) The bases in two strands are paired through hydrogen bonds forming base pairs. Adenine forms two hydrogen bonds with thymine and guanine is bonded with cytosine by three



hydrogen bonds. This generates approximately uniform distance (20 \AA) between the two strands of helix.

- 4) The two chains are coiled in a right handed fashion. The pitch of the helix is 3.4 nm and there are roughly 10bp in each turn. So the distance between two successive base pairs is equal to 0.34 nm.
- 5) The plane of one base pair stacks over the other in a double helix. This confers stability of helical structure.

21. Write a brief essay on Microbes as biocontrol agents.

Ans. Bio control refers to the use of biological methods for controlling plant diseases and pests. Excessive usage of insecticides and pesticides leads toxicity to humans and animals alike and also pollute the environment. Our soil is also polluted due to the use of **weedicides**. If

we use chemicals on diseased plants, both beneficial predatory and harmful insects will die. Thus the use of bio-control agents will greatly reduce our dependence on toxic chemicals and pesticides.

1) The very familiar beetle with red and black markings - lady bird, and dragon flies are useful to get rid of aphids and mosquitoes.

2) Microbial bio-control agent to control butterfly caterpillar is *Bacillus thuringiensis*. These are available in sachets as dried spores which are mixed with water and are sprayed onto vulnerable plants such as brassicas and fruit trees, they are eaten by the insect larvae. The toxin is released in the gut of the larvae, and the larvae gets killed. The bacterial disease will kill the caterpillars but leave other insects unharmed. Through Genetic Engineering method, scientists have introduced *Bacillus thuringiensis* toxin genes into plants. Such plants are resistant to attack by insect pests. Ex : Bt-Cotton, Bt-Brinjal.

3) ***Trichoderma*** species are free living fungi that are very common in the root Ecosystems. They are effective Bio-control agents of several plant pathogens.

4) ***Baculoviruses*** are pathogens that attack insects and other arthropods. They are in the genus, Nucleo Polyhedro virus. These viruses are excellent candidates for species specific, narrow spectrum insecticidal applications.

