

PRACTICE PAPER – 6

SOLUTIONS

SECTION - A

1. Explain what will happen to a plant cell if it is kept in a solution having higher water potential.

Ans. When a cell is placed in a higher water potential solution (low concentrated solution) cell swells up due to endosmosis and becomes turgid.

2. Define respiratory climactic. Name the PGR associated with it.

Ans. The rise in the rate of respiration during the ripening of fruits is known as respiratory climactic. It is associated by ethylene.

3. Who proposed 'lock and key hypothesis' and 'Induced fit hypothesis' ?

Ans. Lock and key hypothesis was proposed by Emil Fisher (1884). Induced fit hypothesis was proposed by Daniel E. Koshland (1973).

4. What is the cross between the F_1 Progeny and the Homo-zygous recessive parent called ? How is it useful ?

Ans. **Test cross.** It is used to test whether an Individual is Homozygous (pure) or Heterozygous (**Hybrid**).

5. How can you differentiate between exonucleases and endo nucleases ?

Ans.	Exonucleases	Endonuclease
	1. They remove nucleotides from the ends of the DNA.	1. They make cuts at specific locations with in the DNA.

6. What is E CORI ? How does it function ?

Ans. E CORI is a restriction enzyme obtained from *Escherichia coli*. It specifically recognises GAA sites on the DNA and cuts it between G and A.

7. Why has the Indian Parliament cleared the second amendment of the country's patents bill ?

Ans. It takes some issues into consideration, Including patent terms, Emergency provisions and research and development initiatives.

8. Give one example for each of transgenic plants which are suitable for food processing and those with improved nutritional quality.

Ans. 'Flavr Savr'- tomato, Golden Rice from Taipei is rich in vitamin A and prevent blindness.

9. What is protoplast fusion ?

Ans. Fusion of protoplasts isolated from two different plants which was enhanced by Poly Ethylene Glycol.

10. Name a microbe used for statin production. How do statins lower blood cholesterol level ?

Ans. *Monascus purpureus* statins act by competitively inhibiting the enzyme responsible for the synthesis of cholesterol.

SECTION - B

11. List out the beneficial aspects of transgenic plants.

Ans. Plants with desirable characterd createss through gene transfer methods are called Transgenic plants. Beneficial aspects are :

a) Transgenic crop plants are efficient because they have many beneficial traits like virus resistance, insect resistance and herbicide resistance.

→ Papaya in resistant to papaya ring root virus.

→ Bt. cotton is resistant to insect.

→ Transgenic tomato plants are resistant to bacterial pathogen *pseudomonas*.

→ Transgenic potato plant are resistance of fungus *phytophthora*.

b) Transgenic plants which are suitable for food processing are produced with improved nutritional quality.

E.g. : i) Transgenic tomato 'Flavr Savr' are bruise resistant i.e., suitable for storage and transport due to delayed ripening and offers longer shelf life.

ii) Transgenic Golden Rice 'Taipei' is rich in vitamin A and prevents blindness.

c) Transgenic plants are used for hybrid seed production.

E.g. : Male sterile plants of *Brassica napus* are produced. This will eliminate the problem of manual emasculation and reduce the cost of hybrid seed production.

- d) Transgenic plants have been shown to express the genes of insulin, Interferon, human growth, hormones, Antibiotics, Antibodies etc.
- e) Transgenic plants are used as bio-reactions for obtaining commercially useful produces, specialized medicines and Antibodies on large scale is called molecular farming.
- f) Transgenic plants tolerant to Abiotic stresses caused by chemicals, cold, drought, salt, heat etc.
 - (i) Basmati variety of rice was made resistant against biotic and abiotic stresses.
 - (ii) Round up ready soyabean is herbicide tolerant.

12. Write short notes on restriction enzymes.

Ans. Two enzymes responsible for restricting the growth of Bacteriophage in *Escherichia coli* were isolated in the year 1963. One of these added methyl groups of DNA and the other cut DNA. The latter was called **restriction endonuclease**. The first restriction endonuclease - Hind II which cut DNA molecules at a particular point by recognising a specific sequence of six base pairs, called recognition sequence for **Hind II**. Today, more than 900 restriction enzymes were isolated from over 200 strains of Bacteria, each of which recognises a different recognition sequence.

E CORI is a restriction enzyme in which, the first letter comes from the Genus (**Escherichia**), and the second two letters from the species of the Prokaryotic cell [**coli**], the letter 'R' is derived from the name of strain. Roman number indicate the order in which the enzymes were isolated from that strain of Bacteria. Restriction enzymes belong to a larger class of enzymes called **nucleases**. They are of two types.

- a) Endonucleases which make cuts at specific location with in the DNA.
- b) Exonucleases which remove nucleotides from the ends of the DNA.

13. A plant with red flowers was crossed with one having yellow flowers. If F_1 showed all flowers in orange colour. Explain the inheritance.

Ans. $RR \times rr$
 $\downarrow \quad \downarrow$
 $R \quad r$
 $\diagdown \quad \diagup$
 Rr

	R	r
R	RR	Rr
r	Rr	rr

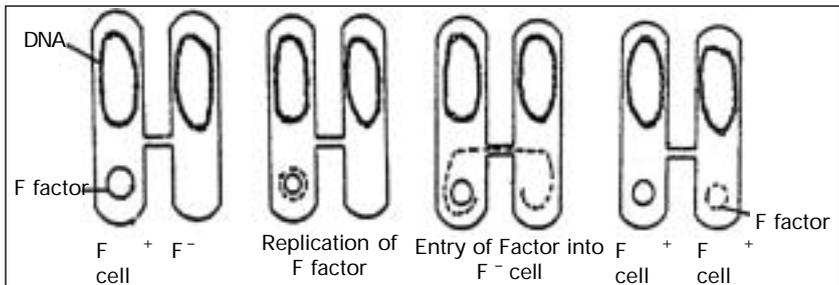
1 = RR (Red) 2 Rr = Orange 1 = rr yellow.

It is called incomplete dominance.

14. Explain the conjugation in bacteria.

Ans. Transfer of Genetic material between two live Bacteria is called conjugation. It was first observed in 1946 by Lederberg and Tatum in *Escherichia coli*.

In *E. coli*, a small circular DNA stand occurs in the cytoplasm in addition to nucleoid called on F plasmid. The cell with F plasmid is called F^+ cell and without F plasmid is called F^- cell. The F^+ cell or donar cell produces the sex pilus that makes contact with the recipient cell or F^- cell. During conjugation, F^+ , and F^- cells bind with each other with the help of sex pilus forms a bridge between them. The F plasmid sepicat and the replicated DNA paeses through bridge to the F^- cell. The F^- cell becomes F^+ cell as it receive the F plasmid. After conjugation, the two cells separate from each other.



15. Why is the respiratory pathway referred to as amphibolic pathway ? Explain.

Ans. Respiration involves the breakdown of substrates so traditionally called catabolic process and the respiratory pathway as a catabolic pathway. In respiration, different substrates enter into respiratory pathway at different points. If fatty acids were respired, they would be degraded to acetyl CoA and enter the pathway. Glycerol would enter the pathway after converted to PGAL. The proteins and the aminoacids would enter the pathway at pyruvate.

Fatty acids would be brokendown to acetyl CoA before entering into respiratory pathway. But when the organism needs to synthesis fatty acids, Acetyl CoA would be withdrawn from the respiratory pathway for it. Hence the respiratory pathway comes into the picture both during the breakdown and the synthesis of fatty acids. In this issue, respiratory pathway is involved in both anabolism and catabolism, it would be better to consider it as amphibolic pathway rather than as a catabolic one.

16. Write briefly about enzyme inhibitors.

Ans. The chemical that can shut off enzyme activity are called inhibitors. They are of 3 types.

1) Competitive inhibitors : Substance which closely resembles the substrate molecules and inhibits the activity of the enzymes are called competitive inhibitors.

Eg : Inhibition of succinic dehydrogenase by malonate which closely resembles the substrate succinate.

Non-competitive inhibitors : The inhibitor which have no structural similarity with the substrate and bind to an enzyme at locations other than the active site, so that the globular structure of the enzyme is changed are called non-competitive inhibitors. **Eg :** Metal ions of Copper, Mercury.

3) Feedback inhibitors : The end product of a chain of enzyme catalysed reactions inhibit the enzyme of the first reaction as a part of homoeostatic control of metabolism are called feed back inhibitors.

Eg : During respiration (Glycolysis) accumulation of Glucose-6 Phosphate occurs, it inhibits the **Hexokinase**.

17. What will happen if a healthy plant is supplied with excess essential elements ? Explain.

Ans. Any material ion concentration in tissues that reduces the dry weight of tissues by about 10 percent is considered toxic. Many a time, excess of an element may inhibit the uptake of another element. For example the **Mn toxicity** is the appearance of brown spots surrounded by chlorotic veins. Mn in excess, competes with iron and Mg for uptake and with Magnesium for binding with enzymes. Manganese also inhibits calcium translocation in the shoot apex. Therefore excess of manganese may in fact, induce deficiencies of iron, magnesium and calcium.

18. Transpiration and photosynthesis - a compromise. Explain.

Ans. Transpiration has more than one purpose; it

- 1) Creates transpiration pull for absorption and transportation in plants.
- 2) Supplies water for photosynthesis.
- 3) Transports minerals from the soil to all parts of the plant.
- 4) Cools leaf surface.
- 5) Maintains the shape and structure of the plants by keeping the cells turgid.

An actively photosynthesising plant has an insatiable need for water. Photosynthesis is limited by available water which can be swiftly depleted by transpiration. C_4 photosynthetic system is one of the strategies for maximising the availability of CO_2 and minimizing water loss. C_4 plants are twice efficient than C_3 plants in fixing carbon and also water loss.

SECTION - C

19. Under what conditions are C_4 plants superior to C_3 ?

Ans.

Conditions	C_4 plants	C_3 plants
1) CO_2 fixation rate under light conditions	High	Low
2) Whether Photorespiration is present at low light intensities	Negligible	High
3) Whether Photorespiration is present at high light intensities	Negligible	High
4) Whether Photorespiration would be present at low CO_2 concentration	Negligible	High
5) Whether Photorespiration would be present at high CO_2 concentration	Negligible	High
6) Optimum Temperature	30–40°C	20–25°C
7) Primary acceptor of CO_2	PEPA	RUBP
8) Primary product	OAA(4C)	PGA(3C)
9) Does the plant have RUBISCO ?	In bundle sheath cells only	Yes
10) Does the plant have PEP case ?	Yes	No

20. Discuss the process of translation in detail.

Ans. It is the process of polymerizing amino acid to form a polypeptide chain. The triplet sequence of base pairs in mRNA defines the order and sequence of amino acids in a polypeptide chain. This process involves 3 steps. a) Initiation b) Elongation c) Termination. During the initiation, tRNA gets charged when the amino acid binds to using ATP. The start codon (AUG) present on mRNA is recognized only by the charged tRNA. The ribosome acts as an actual site for the process of translation and contains two separate sites in a large subunit for the attachment of subsequent amino acid. The small subunit of ribosome binds to mRNA at the initiation codon (AUG) followed by the large

subunit. Then, it initiates the process of translation. During the elongation process, the ribosome moves one codon downstream along with mRNA so as to leave the space for binding of another charged tRNA. The amino acid brought by tRNA gets linked with the previous amino acid through a peptide bond and this process continues resulting in the formation of a polypeptide chain. When the ribosome reaches one or more STOP codon (UAA, UAG and UGA), the process of translation gets terminated. The polypeptide chain is released and ribosomes get detached from mRNA.

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 to 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.

