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**Biology**

**12**

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- ➡ Comprehensive explanation of each sub-topic
- ➡ Large pool of very short, short and long answer type questions



**Highlights** important information which must be remembered

Includes **HOTS** and **Value Based** questions

**Based on the latest syllabus and textbook(s) issued by CBSE/NCERT**



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**V.K. Khosla  
Kanta Khosla**

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# SYLLABUS

## BIOLOGY

### CLASS–XII

#### (THEORY)

Time: 3 Hours

70 Marks

Units No.	Title	No. of Periods	Marks
VI	Reproduction	30	14
VII	Genetics and Evolution	40	18
VIII	Biology and Human Welfare	30	14
IX	Biotechnology and its Applications	30	10
X	Ecology and Environment	30	14
	<b>Total</b>	<b>160</b>	<b>70</b>

#### Unit VI : Reproduction

30 Periods

- Chapter 1. Reproduction in Organisms:** Reproduction, a characteristic feature of all organisms for continuation of species; modes of reproduction - asexual and sexual reproduction; asexual reproduction - binary fission, sporulation, budding, gemmule formation, fragmentation; vegetative propagation in plants.
- Chapter 2. Sexual Reproduction in Flowering Plants:** Flower structure; development of male and female gametophytes; pollination - types, agencies and examples; outbreeding devices; pollen-pistil interaction; double fertilization; post fertilization events - development of endosperm and embryo, development of seed and formation of fruit; special modes-apomixis, parthenocarpy, polyembryony; Significance of seed dispersal and fruit formation.
- Chapter 3. Human Reproduction:** Male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis - spermatogenesis and oogenesis; menstrual cycle; fertilisation, embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea).
- Chapter 4. Reproductive Health:** Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs); birth control - need and methods, contraception and medical termination of pregnancy (MTP); amniocentesis; infertility and assisted reproductive technologies - IVF, ZIFT, GIFT (elementary idea for general awareness).

#### Unit VII : Genetics and Evolution

40 Periods

- Chapter 5. Principles of Inheritance and Variation**
- Heredity and variation:** Mendelian inheritance; deviations from Mendelism - incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination - in humans, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorders in humans - thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.
- Chapter 6. Molecular Basis of Inheritance:** Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; transcription, genetic code, translation; gene expression and regulation - lac operon; genome and human and rice genome projects; DNA fingerprinting.



**Chapter 7. Evolution:** Origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences); Darwin's contribution, modern synthetic theory of evolution; mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy - Weinberg's principle; adaptive radiation; human evolution.

**Unit VIII : Biology and Human Welfare**

**30 Periods**

**Chapter 8. Human Health and Diseases:** Pathogens; parasites causing human diseases (malaria, dengue, chickengunia, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence- drug and alcohol abuse.

**Chapter 9. Strategies for Enhancement in Food Production**

**Improvement in food production:** Plant breeding, tissue culture, single cell protein, Biofortification, Apiculture and Animal husbandry.

**Chapter 10. Microbes in Human Welfare:** In household food processing, industrial production, sewage treatment, energy generation and microbes as biocontrol agents and biofertilizers. Antibiotics; production and judicious use.

**Unit IX : Biotechnology and its Applications**

**30 Periods**

**Chapter 11. Biotechnology – Principles and processes:** Genetic Engineering (Recombinant DNA Technology).

**Chapter 12. Biotechnology and its Application**

**Application of biotechnology in health and agriculture:** Human insulin and vaccine production, stem cell technology, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues, bio piracy and patents.

**Unit X: Ecology and Environment**

**30 Periods**

**Chapter 13. Organisms and Populations**

**Organisms and environment:** Habitat and niche, population and ecological adaptations; population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution.

**Chapter 14. Ecosystem**

**Ecosystems:** Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy; nutrient cycles (carbon and phosphorous); ecological succession; ecological services - carbon fixation, pollination, seed dispersal, oxygen release (in brief).

**Chapter 15. Biodiversity and its Conservation:** Concept of biodiversity; patterns of biodiversity; importance of biodiversity; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, national parks, sanctuaries and Ramsar sites.

**Chapter 16. Environmental Issues:** Air pollution and its control; water pollution and its control; agrochemicals and their effects; solid waste management; radioactive waste management; greenhouse effect and climate change; ozone layer depletion; deforestation; any one case study as success story addressing environmental issue(s).



**BIOLOGY (CODE NO. 044)**  
**QUESTIONS PAPER DESIGNS**  
**CLASS-XII**

Time-3 Hours

Marks:70

S. No.	Typology of Questions	Very Short Answer (VSA) (1 Mark)	Short Answer -I (SA-I) (2 Marks)	Short Answer -II (SA-II) (3 Marks)	Value Based Question (VBQ) (4 Marks)	Long Answer (LA) (5 Marks)	Total Marks	% Weightage
1.	<b>Remembering—Knowledge based</b> Simple recall questions, to know specific facts, terms, concepts, principles, or theories; Identify, define, or recite, information)	2	1	1	–	–	7	10%
2.	<b>Understanding Comprehension</b> —to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, information).	–	2	4	–	1	21	30%
3.	<b>Application</b> (Use abstract information in concrete situation, to apply knowledge to new situations, Use given content to interpret a situation, provide an example, or solve a problem)	–	2	4	–	1	21	30%
4.	<b>Higher Order Thinking Skills (Analysis &amp; Synthesis</b> —Classify, compare, contrast, or differentiate between different pieces of information; Organize and/ or integrate unique pieces of information from a variety of sources)	2	–	1	–	1	10	14%
5.	<b>Evaluation</b> —(Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	1	–	2	1	–	11	16%
	<b>TOTAL</b>	<b>5×1=5</b>	<b>5×2=10</b>	<b>12×3=36</b>	<b>1×4=4</b>	<b>3×5=15</b>	<b>70(26)</b>	<b>100%</b>

### QUESTION WISE BREAK UP

Type of Question	Marks per Question	Total No. of Questions	Total Marks
VSA	1	5	05
SA-I	2	5	10
SA-II	3	12	36
VBQ	4	1	04
LA	5	3	15
<b>Total</b>		<b>26</b>	<b>70</b>

1. Internal Choice: There is no overall choice in the paper. However, there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and all the three questions of 5 marks weightage.
2. The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.

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# Super Refresher

All chapters as per **CBSE** Syllabus and NCERT Textbooks

Every chapter divided into **Sub-topics**

**NCERT Textbook** Questions with answers

**NCERT Exemplar Problems** with answers

**Additional Important & Boards' Questions** with answers

# Biology

Variety of Value Based Questions

HOTS questions with answers in every chapter

**Reproduction in Organisms**

**VBQs**

**Q. 1.** A group of students went on excursion in a park. It had small ponds, a few birds in a cage in one corner. They were surprised to observe small fish like tadpoles of the frog swimming in the pond; young chicks hatching out of the eggs and the female dog giving birth to four or five puppies.

(a) Name the process and the product, formed by the fusion of male and female gametes.


(b) Name the term for animals which lay eggs. What is the special feature of the eggs? Are the eggs released in fertilised or unfertilised state?

(c) Name the group of animals which give birth to young ones? What is the source of nutrition for the developing embryo.

**Ans.** (a) Process—Fertilization  
Product—Zygote  
(b) (i) Oviparous animals  
(ii) These eggs are either shelled or covered by protective coverings.  
(iii) In frog (amphibians) unfertilised eggs are released. In reptiles and birds, fertilized eggs are released.  
(c) (i) Viviparous animals.  
(ii) Developing embryo draws nutrition from mother through placenta.

**FIGURES/DATA BASED QUESTIONS (SOLVED)**

**Q. 1.** (i) Identify the figure 1.18.  
(ii) Label the parts (A) and (B).




**Ans.** (i) Conidiophore of *Penicillium* bearing conidia.  
(ii) A. Conidia  
B. Conidiophore of *Penicillium*.

**Q. 2.** Identify each part and write whether it is haploid (n) or diploid (2n) in flowering.

Structure	Ploidy	Structure	Ploidy
Ovary	a	Pollen	d
Anther	b	Male gamete	e
Egg	c	Zygote	f

**Ans.** (a) Ovary—Diploid (2n)  
(b) Anther—Diploid (2n)  
(c) Egg—Haploid (n)  
(d) Pollen—Haploid (n)  
(e) Male gamete—Haploid (n)  
(f) Zygote—Diploid (2n).

**Q. 3.** Give the term for kinds of gametes in the given figures (A) and (B). In a figure (B) give the specific terms for (i) and (ii).



**Ans.** (a) Ovary—Diploid (2n)  
(b) Anther—Diploid (2n)  
(c) Egg—Haploid (n)  
(d) Pollen—Haploid (n)  
(e) Male gamete—Haploid (n)  
(f) Zygote—Diploid (2n).

**Q. 4.** Mention two inherent characteristics of Amoeba and Yeast that enable them to reproduce asexually.

**Ans.** (i) They are unicellular organisms.  
(ii) They have a very simple body structure.

**Q. 5.** Why do we refer to offspring, formed by asexual method of reproduction as clones?

**Ans.** Offspring formed by asexual reproduction referred to as clones because they are morphologically and genetically similar to the parent.

**Q. 6.** Although potato tuber is an underground stem, it is considered as a stem. Give two reasons.

**Ans.** (i) It has nodes, internodes, axils and a perennial shorter juvenile phase.  
(ii) It has a shorter juvenile phase than to be completed in one year phase is shorter.

Figure Based Questions

Model Question Papers for Practice

## MODEL QUESTION PAPER—3

BIOLOGY  
CLASS—XII

Time Allowed : 3 Hours]

[Max. Marks : 70

General Instructions : Same as in Model Question Paper-1.

### SECTION-A

- A bilobed, ditheous anther has 100 microspore mother cell per microsporangium. How many male gametophytes this anther can produce?
- Mention two functions of the codon AUG.
- Name the scientist who disproved spontaneous generation theory?
- What is it that prevents a child to suffer from a disease he/she is vaccinated against? Give one reason.
- Why is the enzyme cellulase used for isolating genetic material from plant cells but not from animal cells?

### SECTION-B

- A moss plant produces always number of antherozoids but relatively only a few egg cells. Why?
- Mention the reasons for difference in ploidy of zygote and primary endosperm nucleus in an angiosperm.
- How does an electrostatic precipitator work to remove particulate pollutants released from the thermal power plants.
- Name the type of food chains responsible for the flow of large fraction of energy in an aquatic and a terrestrial ecosystem respectively. Mention one difference between the two food chains.
- Honey collection improves when beehives are kept in crop-fields during flowering season. Explain.

Or

How does addition of a small amount of curd to fresh milk help formation of curd? Mention a nutritional quality that gets added to the curd.

### SECTION-C

- How does a test cross help in identifying the genotype of the organism? Explain.

- Name the host and the site where the following occur in the life cycle of a malarial parasite.
  - Formation of gametocytes
  - Fusion of gametocytes
- Why is the introduction of genetically engineered lymphocytes into a ADA deficiency patient, not a permanent cure? Suggest a possible permanent cure.
- How does the floral pattern of Mediterranean orchid ophrys guarantee cross pollination?
- Describe the initiation process of transcription in bacteria.
- Draw a longitudinal section of a post-pollinated pistil showing entry of pollen tube into a mature embryo sac. Label filiform apparatus, chalazal end, hilum, antipodals, male gametes and secondary nucleus.

Or

Draw a labelled sectional view of seminiferous tubule of a human male.

- During his studies on genes in *Drosophila* that were sex linked T.H. Morgan found  $F_2$  population phenotypic ratios deviated from expected 9 : 3 : 3 : 1. Explain the conclusion he arrived at.
- Explain convergent and divergent evolution with the help of one example of each.
- Name the type of human cell HIV attacks on its entry into the body. Explain the events that occur in the cell which further lead to cause immunodeficiency syndrome.
- Explain the efforts which must be put in to improve health/hygiene and milk yield of cattle in a dairy farm.
- Identify a, b, c, d, e, and f in the table given below.

	Organism	Bioactive molecule	Use
1.	<i>Monascus purpureus</i> (yeast)	a	b
2.	c	d	antibiotic A
3.	e	cyclosporin	A





# UNIT-I

## REPRODUCTION

**This unit includes the study of the following :**

- ✓ Reproduction in Organisms
- ✓ Sexual Reproduction in Flowering Plants
- ✓ Human Reproduction
- ✓ Reproductive Health





# 1

## Reproduction in Organisms

### CONCEPTS

- 1.1 Reproduction, a characteristic feature of all organisms for continuation of species.
  - 1.1.1 • Life spans of organisms
    - Reproduction and its types
  - Asexual reproduction. Asexual reproductive structures.
  - 1.1.2 Natural vegetative propagation.
  - 1.1.3 Artificial vegetative propagation.
- 1.2 Sexual Reproduction
  - Juvenile/vegetative phase, Reproductive phase, senescence/old age
  - 1.2.1 Pre-fertilisation events. (i) Gametogenesis and (ii) Gamete transfer.
  - 1.2.2 Fertilisation-process called syngamy.
    - External fertilization and internal fertilization, significance
  - 1.2.3 Post-fertilisation events, Embryogenesis.

### BASICS & BASIS

#### 1.1 Reproduction

- **Reproduction** is the ability of an organism to produce young ones of its own kind.
- Reproduction enables a species to live generation after generation. Thus ensures continuity of species.
- Reproduction helps in production of variations in sexually reproducing organism.
- The common basic features of reproduction are :
  1. Replication of DNA.
  2. Cell division
  3. Formation of reproductive bodies
  4. Development into young one.

- Mostly lower organisms reproduce by simple cell division.

#### Life span

- The period from the birth/hatching to the natural death of organism is called **life span**.
- **Life span** of organisms ranges between a few hours, a day or a few days to thousands of years.
- Reproduction may be asexual or sexual reproduction.
- **Asexual Reproduction.** It involves the formation of offspring identical to one another and exact copies (clones) of a single parent, with or without the formation and fusion of gametes.

#### Life Span of a few plants and animals.

May fly	—	1 day ;	Wheat	—	5 months ;
Monkey	—	26 years ;	Dog	—	20 to 30 years ;
					(Recorded 29 years 5 months)
Cat	—	35 to 40 years ;	Horse	—	60 years ;
Elephant	—	65 years ;	Eagle	—	90 years ;
Man	—	100 years ;	Parrot	—	140 years ;
Tortoise	—	200 years ;	Banyan tree	—	200 years ;
			Sequoia tree	—	3000 — 4000 years.

- Life spans of organisms are not correlated with size of organism.
- Oldest living tree is the bristle cone of pine

named *Methuselah* at height of 10,000 ft on calif side of white mountains, with a confined age of 4600 years.





### TEST YOUR UNDERSTANDING

**1 What is reproduction ?**

**Ans.** It is a biological process in which an organism gives rise to young ones (offspring) similar to itself.

**2 Write the utility of reproduction.**

**Ans.** Reproduction enables the continuity of species, generation after generation.

**3 List two factors which determine the type of reproduction.**

**Ans.** Organisms habitat and internal physiology.

**4 Define life span.**

**Ans.** The period from birth to natural death of an organism represents its life span.

**5 What is the ultimate phase of life.**

**Ans.** Natural death.

**6 How do lower organisms reproduce ?**

**Ans.** Simple cell division or budding.

#### 1.1.1 Asexual reproductive structures

Asexual reproduction is with or without formation of gametes.

Generally microorganisms reproduce by **asexual methods**. It involves only **mitotic divisions**, hence **genetically**, newly formed individuals are similar to parent.

##### Basic features of asexual reproduction

1. Only one parent is involved.
2. All the cell divisions are mitotic.
3. All the offsprings are genetically similar to the parents.
4. The reproductive unit is a fragment or specialised part of the parent called **blastema**.

##### Advantages of asexual reproduction

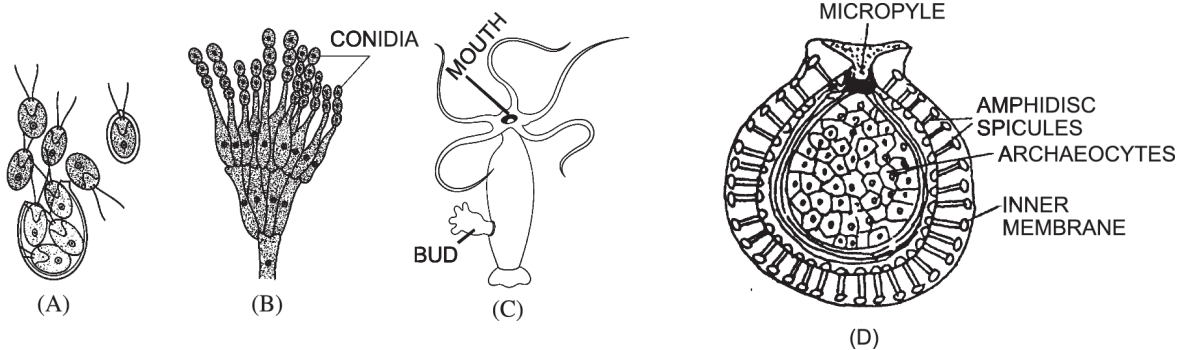
1. It involves simple mitotic division in single parent and it may produce large number of young ones.
2. Young ones produced by asexual methods are genetically similar to parent.
3. It helps in the dispersal of offsprings to far off places.

##### Disadvantages of asexual reproduction

1. The young ones thus produced do not possess much capacity to adapt rapidly with the environment changes taking place in quick succession.
2. No genetic recombination occurs thus no variation occurs.

The common methods of asexual reproduction are fission, budding, spore formation and vegetative propagation.

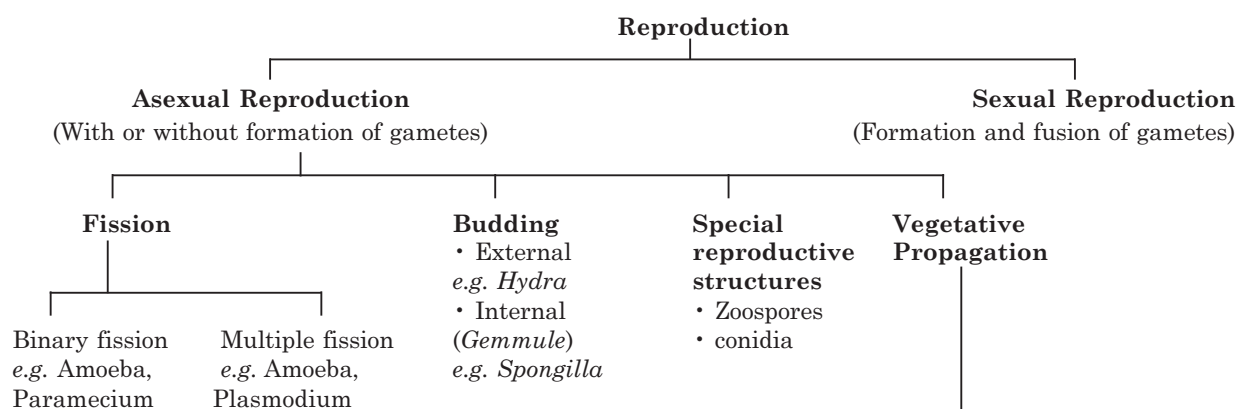
#### Asexual reproductive structures



- A. Zoosporangium producing motile zoospores.  
B. Conidiophore of *Penicillium* bearing conidia;

- C. Buds in Hydra  
D. Gemmules in sponges.

▲ Fig. 1.1. Different kinds of asexual structures.



### Vegetative reproduction

A multicellular portion or fragment of the plant body detaches from the body and serves as reproductive structure e.g., roots, stems (eye of potato), leaves (Bryophyllum) etc.

As no specialised structures are formed hence it is also termed as **vegetative propagation/vegetative multiplication/vegetative cloning** instead of reproduction.

- Vegetative propagation can occur **naturally** or **artificially** by man.

#### 1.1.2 Natural Vegetative propagation

#### 1.1.2 Artificial Vegetative propagation

##### By stems

- Underground stems as suckers, rhizomes, corms, bulbs etc. possess buds that give rise to new plants.
- Creeping stems (**runners, offsets** (water hyacinth etc.) give rise to new plants at intervals.
- Aerial stems like segments of Opuntia stem give rise to new plants when fall on the soil.

##### By roots

- Roots of some plants like Murraya, root tuber of sweet potato etc. develop adventitious buds that form new plants.

##### By leaves

- Leaves of some plants like *Bryophyllum* Kalanchoe etc possess adventitious buds in leaf notches that give rise to new plants on detachments from parent plant.
- *Bryophyllum* leaf develops new plants when still attached to the parents plants. etc. By bulbils and turions.
- Bulbils and turions are fleshy buds meant for propagation in land plants. e.g. Adaveand aquatic-plants from plant tic plants e.g. Utricularia respectively.

##### Cutting

- Small pieces or cuttings of stems (sugarcane, banana, ginger, tea,) leaves (sanservieria), roots (blackberry, raspberry), are buried in soil for propagation.

##### Layering

- A branch of plant is lowered and some of its part is buried into soil. The buried part develops roots and is detached to grow as new plant e.g. jasmine, grape vine etc.
- Layering can be of many types e.g., mound layering, air layering, drop layering etc.

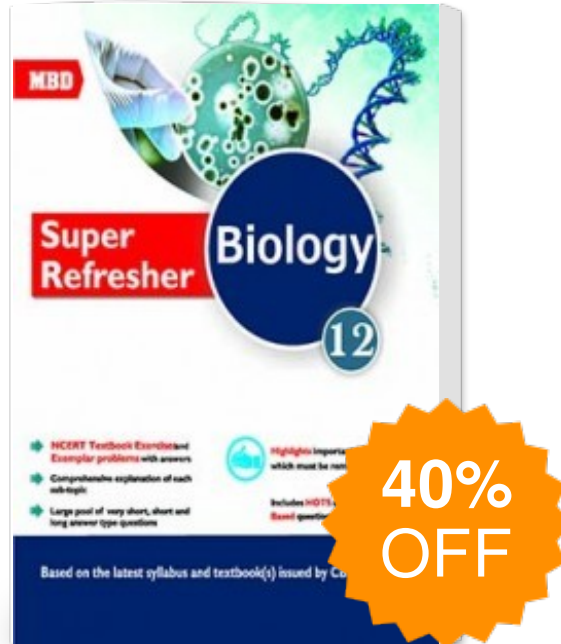
##### Grafting

- A part of one plant (Scion) is transplanted onto another plant (stock) to form a composite plants with root system of stock and shoot system of scion e.g. mango, apple, pear etc.
- It can be done by several methods such as tongue grafting, bud grafting, wedge grafting etc.

##### Micropropagation

- Micropropagation (Tissue culture technique) is the rapid raising of new plants from plant tissues with the help of tissue culture technique e.g. Carnation, Gladiolus etc.

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