

CERTIFICATE COURSE IN PLANT TISSUE CULTURE

SYLLABUS

THEORY

Unit I. Plant breeding-

General idea- introduction to plant breeding, objectives of plant breeding, genetic variability And its role in plant breeding, methods of reproduction and breeding- in self pollinated, cross pollinated, vegetative propagated plants, heterocyst and inbreeding depression, genetic, physiological and biochemical basis of heterocyst. Organogenesis, factors affecting organogenesis, differentiation.

Unit II. Somatic embryogenesis

Embryogenesis - induction, development and maturation, factors, applications and synthetic seeds, molecular biology of somatic embryogenesis – induction, development, synchronizing somatic embryo development, hormonal regulation, late embryogenesis abundant (LEA).

Unit III. Exploits

Anther, pollen and ovary culture for production of haploid plants and homozygous lines, triploid production- methods and applications.

In vitro pollination and fertilization – methods, factors affecting seed setting after in vitro pollinations, applications, embryo culture, embryo rescue.

Risks and ethics of biotechnology

Unit IV. Gene expression –

Genes isolated from somatic embryos, expression of ‘non-embryonic’ genes during somatic embryogenesis, somatic embryo as a genetic system.

Unit V. Introduction to cell culture-

Totipotency, tissue culture technique to produce novel plants and hybrids, preparation and composition of tissue culture media. Callus initiation and maintenacnce, suspension culture: single cell clones. Cytodifferentiation.

Unit VI. Variation

Somaclonal and gametoclonal variations origin of somaclonal variations, mechanism underlying genetic variations, assessment of somaclonal variations, isolation of variants – disease resistant lines, herbicide resistant lines, stress tolerant lines.

Protoplast isolation – culture and fusion, selection of hybrid cells and regeneration of hybrid plants, symmetric and asymmetric hybrids, cybrids.

Unit VII. Cryopreservation-

Slow growth and DNA bank for germplasm conservation.

Unit VIII. Plant Transformation –

Plant Transformation applications for productivity and performance, production of transgenic plants resistant to herbicides, pathogens (Virus, fungi and bacteria), insect pests (Bt. Toxin gene) and abiotic stresses (drought, salt, chilling).

Unit IX. Genetic manipulation

Genetic manipulations in plants- Flower pigments, the time of flowering, production of male sterile plants. Antisense strategy,

PRACTICALS

1. Sterilization and preparation of media.
2. Isolation of explants, establishment and maintenance of culture.
Subculture of callus, organogenesis and transfer of plants to soil.
3. Micropropagation by proliferation of axillary bud.
4. Micropropagation by adventitious shoot proliferation.
5. Initiation and establishment of cell suspension cultures.
6. Microspore/ anther culture for haploid production.
7. Protoplast isolation and culture.
8. Embryogenesis and embryo culture, synthetic seeds.
9. In vitro pollination and culture of ovary/ ovule.
10. Density gradient centrifugation for isolation of chloroplast and mitochondria.
11. Isolation of DNA from chloroplast.
12. Isolation of total RNA from plant.
13. Demonstration of southern hybridization to check the plant transformation.
14. Isolation of DNA from plant.

Reference Books –

1. Plant tissue culture by K.K.Dey.
2. Methods in plant tissue culture by Razdan.
3. Plant tissue culture by Jha & Ghosh.
4. Trends in plant tissue culture by pareek.
5. Plant cell, Organ & tissue culture by Norasa.
6. Plant cell & tissue culture by S.Narayaswami.

Scheme of the Examination:

Scheme of the examination the examination will be carried out as guidelines given by Solapur University, Solapur.

The proposed scheme is as follows.

Sr.No	Heads	Marks
1	THEORY	100
2	PRACTICAL	100
	Total	200

Nasture of Theory Question Paper

Total Marks 100

SECTION – 1

Objectives	10 Marks
Short Notes (Any Four)	20 Marks
Short Answer Question	05 Marks
Short Answer Question	05 Marks
Long Answer Question	10 Marks

SECTION – II

Objectives	10 Marks
Short Notes (Any Four)	20 Marks
Short Answer Question	05 Marks
Short Answer Question	05 Marks
Long Answer Question	10 Marks

Nature of Practical Question Paper

Total Marks 100

Short Experiments 2 (15 marks each)	2 * 15 =30 Marks
Long Experiments 3 (20 Marks each)	3 * 20=60 Marks

Practical Record

=10 Marks

Passing Criteria : as per guidelines of University-

The proposed passing criteria is as follows:

The candidates obtaining minimum of 40 marks each in theory examination & practical examination will be declared as pass. Certificates will be issued for such candidates.

a) soma clone b) cybrid c) protoplast d) hybrid

7) Reversal of organized structures into an undifferentiated state is called as -----

a) dedifferentiation b) dedifferentiation c) cytogenesis d) embryogenesis

8) Asexual or vegetative propagation of plants in vitro is called as-----

a) embryo culture b) micro propagation c) somaclonal variation d) organogenesis

9) Aseptic culture of organized structures of plant is called as-----

a) cell culture b) micro propagation c) organ culture d) organogenesis

10) Single cells with their walls stripped off are called -----

a) callus b) organ c) protoplast d) suspension

11) Heritable differences observed among plants propagated through tissue culture of a single mother plant is known as -----

a) embryo culture b) micro propagation c) somaclonal variation d) organogenesis

12) Potentiality or property of a cell to produce a whole organism is called as -----

a) plueripotency b) growth c) tot potency d) culture

13)-----is an auxine?

a) 2,4-D b) kinetin c) BAP d) Zeatin

14) ----- is a vitamin incorporated in PTC media.

a) ascorbic acid b) glutamine c) casein d) peptone

Q.2 Answer the following (any 10)

20 Marks

1. Mention any two surface sterilizing agents used for PTC.

2. What is an explants

3. Enlist any 4 instruments used in PTC laboratory.

4. Enlist any 2 cytokines used for preparation of PTC media.

5. How can Air inside laboratory be sterilized?

6. Define micro propagation.

7. Mention any 2 applications of PTC.

8. Define cryopreservation.
9. Define axenic culture.
10. Write any 2 differences between somatic embryogenesis and somatic hybridization.
11. Enlist the enzymes used for protoplast isolation by enzymatic method.
12. Define plant tissue culture.

Q.3 Answer the following (any 5)

25 Marks

1. Draw a neat, well labeled diagram that explains protoplast isolation method.
2. Embryo culture
3. Explain in brief – somaclonal variation.
4. Sterilization techniques used in PTC laboratory
5. Culture media for PTC
6. Discuss in brief – Growth regulators used in PTC media

Q.4 Answer the following (any 3)

21 Marks

1. Root culture
2. Suspension culture
3. Callus culture
4. Artificial seeds

Q.5 Answer the following (any 2)

20 Marks

1. Organogenesis
2. General plant Tissue Culture Laboratory design & equipment for PTC
3. Haploid production – Anther and pollen culture

Faculty of Science

Examination : Certificate course in Plant Tissue Culture

March/April 2016

Subject: Certificate Course in Plant Tissue Culture

Title of the Paper: Theory Paper for Certificate Course in Plant Tissue Culture

Time : 3.00 hours

Max. Marks: 100

Scheme of marking and model answer

Q.1 Rewrite the following sentences by using correct alternative. 14 Marks

Each correct answer carries one full mark.

Q.2 Answer the following (any 10) 20 Marks

Each correct definition, or names, or examples, or meaning, or differences carries two full marks.

Q.3 Answer the following (any 5) 25 Marks

1. A complete, neat well labeled, correct diagram carries 5 full marks.

2. Definition, Principle with diagram – 5 Marks

3. Terminology, explanation – 3 marks and example of somaclonal variation -2 marks

4. Any 5 Sterilization techniques used in PTC laboratory -5 full marks

5. Description of media preparation, mention components

6. All growth regulators and their roles with examples -5 full marks

Q.4 Answer the following (any 3) 21 Marks

1. Root culture- definition-2 marks, principle (with diagram)-3 marks, application-2 marks

2. Suspension culture- definition- 2 marks, principle (with diagram)-3 marks, applications-2 marks

3. Callus culture- definition- 2 marks, principle (with diagram)-3 marks, applications-2 marks

4. Artificial seeds – concept -2 marks, preparation/principle-3, applications-2 marks

Q.5 Answer the following (any 2) 20 Marks

1. Organogenesis- introduction, definition-2 marks, principle (with diagram)-6 marks, applications -2 marks

2. Detailed description with diagram -10 full marks

3. Haploid production- Anther and pollen culture – introduction, definition – 2 marks, principle (with diagram) – 5 marks, applications – 3 marks