1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the **B.Sc Plant Biology And Plant Biotechnology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu with Botany/Biology/Vocational course in Agriculture as one of the papers or any science groups or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree course shall consist of the following

   **a) Part - I**
   Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu. It shall be offered during the first four semesters with one examination at the end of each semester.

   **b) Part – II : English**
   The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester Part II English will be offered as communication skills.

   **c) Foundation Course**
   The Foundation course shall comprise of two stages as follows:
   - Foundation Course A : General Awareness (I & II semesters)
   - Foundation Course B : Environmental Studies (III & IV semesters)

   The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
   - From the printed material supplied by the University - 75%
   - Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsory for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) a candidate will be permitted to appear for the university examinations for any semester if

   i) He/she secures not less than 75% of attendance in the number of working days during the semester.

   ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and

   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).
   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
   a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**
   b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**
      (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**
      (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**

11. **Conferment of the Degree**
    No candidate shall be eligible for conferment of the Degree unless he / she,
i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.

ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.

iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-.

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
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PAPER - I  3 Hrs / Week

PLANT DIVERSITY - I
Algae, Fungi, Lichen, and Plant Pathology

Unit - I
Algae : Classification of Algae - G.M. Smith, Economic importance of algae, Study of the structure, reproduction and life cycle of Spirulina, Navicula and Oedogonium.

Unit - II
Structure, reproduction and life cycle of Dictyota and Polysiphonia

Unit - III
Fungi and Lichen : Classification of fungi (Alexopoulos & Mims 1973) structure and reproduction of Albugo, Saccharomyces and Puccinia.

Unit - IV

Unit - V
Plant Pathology : Study of the following plant diseases with special reference to the symptoms, causal organisms, and disease cycle and control measure of

1. Blast disease of rice
2. Red rot of sugarcane
3. Citrus canker
4. TMV

Practical : Study of the types mentioned in the syllabus.

References :
Algae-S.Sundararajan.,Anmol Publications.,New Delhi.2
Algae&Bryophytes.,A.Ragland., Sararas Publication,.Nagercoi., Tamil Nadu
Phycology, A.Ragland., Sararas Publication,.Nagercoi., Tamil Nadu
Fungi&Plant Pathology., A.Ragland., Sararas Publication,.Nagercoi., Tamil Nadu
Fungi ,Bacteria and Viruses, DubeH.C., Agrobios., Jodhpur
Virology.,S.Sundararajan.,Anmol Publications.,New Delhi.2
Fungi- SKSingh.,Campus Books Int.,NewDelhi.
**PAPER - II**  
4 Hrs / Week

**PLANT DIVERSITY - II**  
Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany

**Unit - I** : Bryophytes  
Classification of Bryophytes (Reimers). Structure and reproduction of Marchantia and Polytrichum.

**Unit - II** : Pteridophytes  

**Unit - III**  
Heterospory and Seed Habit, Structure and Reproduction of Adiantum and Azolla


**Unit - V** : Palaeobotany. Geological time scale, Radio carbon dating, Fossils and kinds of fossils. Study of the following : Lepidodendron (Stem), Lepidocarpon (Fruit) and Calamites (Stem).

**Practicals:** Study of the types mentioned below.  
Bryophytes: Marchantia and Polytrichum.  
Pteridophytes: Selaginella, Equisetum, Adiantum and Azolla.  
Gymnosperms: Cycas and Gnetum.  
Palaeobotany: Lepidodendron Lepidocarpon and Calamites.

**References:**  
An introduction of Embryophyta - Pteridophyta - N.S.Parihar  
An introduction of Palaeobotany - Arnold., Agrobios., Jodhpur,.  
Phytogeography and Paleobotany.,Kumar.,N.C.,Emkay Publication.,Delhi, 51.  
Pteridophytes,Gymnosperms&Palaeobotany, A.Ragland.&V.Kumaresan.,Saras Pub.,Nagercoil,TN  
A text Book of Botany- Pteridohytes., RMJohn et al Scintific Pub., Jodhpur  
Pteridophytes.,SKSingh.,Campus Books Int.,NewDelhi.

**PAPER - III**  
7 Hrs / Week
ANATOMY AND EMBRYOLOGY

Unit - I
Structure and function of Apical Meristems - Root Apex and Shoot Apex - Theories of Meristems. Structure and function of simple and permanent tissues - Parenchyma, Collenchyma, Sclerenchyma, Xylem and Phloem.

Unit - II

Unit - III
Anomalous secondary growth in Dicots - Intraxylary phloem, Successive cambia, cortical vascular bundles and Arborescent monocots (Primary anomalies)

Unit - IV
EMBRYOLOGY :- Structure and development of microsporangium, male gametophyte, megasporangium, female gametophyte (Polygonum type)

Unit - V
Double fertilization, endosperm - Structure, development and types of endosperm. Structure and development of dicot embryo (Capsella).

Practicals :
Anatomy Study of tissues mentioned in the theory
1. Stem - Primary structure - Tridax, Cucurbita, Sorghum
2. Root Primary structure - Ben. Canna. Vanda
3. Leaf - Nerium & Grass
4. Anomalous Secondary thickening - Boerhaavia, Nyctanthes,
Embryology : T.S of anther. 2. Various stages of development of male and female gametophyte, endosperm and embryo sac to be studied from permanent slides. 3. Embryo Mounting - Tridax - Crotalaria.

References :
An introduction to the Embryology of Angiosperms - P.Maheswari
A text book of Plant Anatomy,.E.J.J.Prakash., Emkay Publication.,Delhi,51
Plant anatomy - Pandey, B.P. S.Chand & Co., NewDelhi.
Plant Anatomy &Microtechnique,V.Kumaresan, Saras Publication.,Nagercoil., Tamil Nadu.

PAPER - IV 3 Hrs / Week
CELL BIOLOGY & LAB TECHNIQUES

Unit - I
Cell biology: Structure and function of Cell wall, Plasma membrane (fluid mosaic model only), Endoplasmic reticulum, and Ribosome.

Unit - II
Mitochondria, Chloroplast, Nucleus, Chromosome (Structure and function only)

Unit - III
Mitosis, DNA - Structure, Replication. RNA - types, Protein synthesis

Unit IV
Lab Techniques: Principles, Operation, Techniques and uses of pH meter, Colorimeter, Centrifugation.

Unit - V
Principles and elementary knowledge of Chromotography (paper, T L C & Column), Electrophoresis (Basics).

Practicals: In the next semester (IV)
1. Study of mitosis using Onion roots
2. Study of cell organelles through slides and Photographs
3. Demonstration of pH meter, Colorimeter, Clinical centrifuge and chromatography of leaf pigments - paper only

References:
Cell Biology -C.B. Powar Himalya publishing New Delhi.
Developmental Botany., A.Ragland., Saras Publication.,Nagercoil., Tamil Nadu
Cell Biology, N.Arumugam, Saras Publication.,Nagercoil., Tamil Nadu
Genetics,R.P Meyappan, Saras Publication.,Nagercoil., Tamil Nadu

PAPER - V

3 Hrs / Week
GENETICS, PLANT BREEDING AND BIOSTATISTICS

Unit - I
Monohybrid and Dibybid cross, Test cross, Back cross, Incomplete dominance, Gene Interaction (Complementary, Supplementary, Duplicate and Inhibitory), Polygenic, Inheritance.

Unit - II
Meiosis, Linkages and crossing over Multiples alleles - Blood groups in man, Polyploidy, Sex determination.

Unit - III
Mutation types, physical and Chemical Mutagens, Cytoplasmic inheritance, Nature and function of genetic material (DNA) Gene structure, Genetic code.

Unit - IV
Plant breeding - Objectives, Plant introduction, Selection, Hybridization hybrid vigour, - Achievement in Crop breeding - Sugarcane.

Unit - V
Biostatistics - Collection of data (Sampling, Classification, Tabulation and Graphic representation) Frequence distribution, Standard deviation - Mean (arithemitic Only) Median, Mode & T - test.

Practicals:

1. Study of meiosis
2. Observation of charts for Mendelian ratios, Gene interaction and Linkage - Simple Problems in genetics.

References:
Essential of genetics -Powar
Plant breeding -Singh, B.D. S.Chand & Co., NewDelhi.
Principle and Practice of Plant breeding- Sharma B.D.-
PAPER - VI  
FUNDAMENTALS OF COMPUTER APPLICATIONS

Unit - I: Introduction to computer - components of computer - capabilities of computer - hardware - software-classification of software language-machine language -high level language- compilers, translators-input output storage devices - operating system/DOS/windows.

Unit - II: Introduction to internet-data communication concepts - W W W e-mail-smiley (emotion) - Acronyms, Data correction devices, URL-SHELL FTP INTERNET Service Provider - Internet addressing (Domain IP)-Net Browser, search engines, news groups-intranet -web server-web pages.

Unit - III: Windows - 98, NT,2000, XP & Vista (overall view )

Unit - IV: - Microsoft word - creation of documents - Excel-spread sheet, workbook charts and table.

Unit - V: - Microsoft -Power Point - features - slide presentation MS Access - Creating a database.

Practicals:
1. Creating, editing and printing a document in MS-Word
2. Creating a table in MS-Excel
3. Creating a chart in MS-Excel
4. Creating slide presentation in MS-Power-point
5. Web Browsing
6. E-Mailing

References:
Introduction to Computers. Peter Nortan, Tata Mc Graw-Hill, New Delhi
Teach Yourself Windows in 24hrs Greg Perry, Techmedia Publication, New Delhi
Lean Windows 98 in a week end Michal Meadhra and Faithe Wempen Galotia, New Delhi.
The Internet-Complete Reference, Harley Hahn, Tata Mc Grw-Hill, New Delhi.
TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY

Unit - I
Descriptive terms used in taxonomy. Taxonomy and its significance. Systems of classification - Natural - Bentham & Hooker, Modern Takhtajan (outline only)

Unit - II
Herbarium technique and uses, Nomenclature -ICBN, Priority, Typification, Effective and Valid publication. Author citation. Modern trends in Taxonomy (general)

Unit - III
A detailed study of the following families and the economic importance of types and pollination mechanisms wherever applicable. Annoanaceae, Capparidaceae, Sterculiaceae, Rutaceae, Anacardiaceae, Curcurbitaceae and Apiaceae.

Unit - IV
Rubiaceae, Apocynaceae, Asclepiadaceae, Scrophulariaceae, Acanthaceae and Lamiaceae.

Unit - V
Amaranthaceae, Euphorbiaceae, Orchidaceae, Liliaceae and Poaceae.

Practicals:
1. Taxonomical studies of selected plant species included in the families mentioned in the theory syllabus.
2. Study of economic products of the plants belonging to the families mentioned in the theory syllabus.
3. Students should submit - 20 herbarium sheets of local plants at the time of practical examination.
4. Field trip-for 5 days to study vegetation in Tamil Nadu and neighboring states.
5. Tour report should also be submitted during the practical examination.

References:
Taxonomy, Embryology & Horticulture., A. Ragland., Saras Publication., Nagercoil., Tamil Nadu
Taxonomy of Angiosperms, A. Ragland., Saras Publication., Nagercoil., Tamil Nadu
An Introduction to Systematic Botany. AK Ganguly & NCKumar., Emkay Pub., Delhi

PAPER - VIII
5 Hrs / Week
MEDICINAL BOTANY & HUMAN WELFARE

**Unit - I**: Pharmacognosy - Definition and History. A general account of different survey of Different systems of Medicines - Indian systems of medicine - Siddha Ayurveda and Unani systems. Classification of drugs (elementary). Chemistry of Drugs(Basics).

**Unit - II**: Morphological and Histological studies - Chemical constituents. Therapeutic and other Pharmaceutical uses of Bark - Cinchona, Leaves - Adathoda and Eucalyptus, Flower - Clove.

**Unit - III**: Fruits and seed - Wood apple, Goosberry and Poppy seed, Underground stem - Ginger, Unorganized drugs. Gum - Acacia, Resin - Turpentine, Fixed oil - Castor oil.

**Unit - IV**: A brief account of the following : a) Drugs acting on the Central Nervous system b) Drugs used in the disorders of the Gastro Intestinal tract and c) Cardio Vascular drugs. (Five Plant examples for each mentioned above)


**Practicals**:
1. Morphology and anatomy of medicinal plants mentioned in the syllabus.
2. Identification of medicinal plants and their useful parts in examination.

**References**:
A Hand Book of Medicinal Plants, Prajapathi ND Agrobios .Jodhpur
A Hand Book of Medicinal Herbs.,DeshpandeDJ Agrobios .Jodhpur

**PAPER - IX**

4 Hrs / Week
ECOLOGY AND PHYTOGEOGRAPHY

Unit - I:
Ecology-Principles and approaches, Role of climatic, edaphic and Biotic factors on plants, Biogeochemical cycles (Nitrogen, Carbon)

Unit - II
Autecology and synecology-vegetation-units of vegetation (formation, association, consociation, fasciation and society). Methods of studying vegetation - Quadrat, Belt and Line transect.

Unit - III
Hydrophytes, Mesophytes and Xerophytes - morphological and Anatomical features in relation to their habitats (Adaptation)

Unit - IV
Dispersal and migration, concept of Barriers, Continental drift, endemism, plants and plant communities as indictors.

Unit - V
Plant geography -principles and vegetational types of India - Tropical Rain forest, shoals and deciduous forest - sand dunes and mangroves scrub jungle, phytogeographical regions of India.

Practicals:
1. Study of morphological and anatomical adaptations of hydrophytes, xerophytes, including epiphytes and halophytes and mesophytes using representative samples.
2. Determination of frequency and density constituent of plant species in a terrestrial community through quadrat and trasect (line and belt)
3. Phytogeographical regions of India.

References:
Environment and Pollution,N.Arumugam&V.Kumaresan, Saras Pub., Nagercoil., Tamil Nadu
Plant Ecology, AK Agarwal..Agrobios Jodhpur.
The Geography of Flowering Plants-Ronand Good.,Longman Group Ltd London.

APPLICATION ORIENTED SUBJECT - A 4 Hrs / Week
MICROBIOLOGY

PAPER - I      FUNDAMENTALS OF MICROBIOLOGY

Unit - I :

Unit - II
Soil microbiology - Types of microorganism in soil, microorganisms plant growth, factors affecting microbial growth. Microbiology of air - Role of microorganism in air, methods of purification of air.

Unit - III

Unit - IV

Unit - V
Fermentation, dual and multiple fermentations. Detection and assay of fermentation products. Physical, chemical and biological assays (a general account to be discusses).

References:
Industial Microbiology, L.E.Casida, J.R.Willey Eastern Ltd., ISBN,
Flood, Feed and Fuel from Biomass, Ed. D.S. Chahal, Oxford & IBH, Publishing Ltd., New Delhi,
Microbiology, Paul A Ketchum, John Wiley and Sons., USA
Microbiology, Fundamentals and applications S.S.Purohit, Agrobios Jodhpur.
Microbiology ALBhatia., Avinash Kar Publ., Jodhpur
Fundamentals of Microbiology,., Vijaya Ramesh k. MJ Pub., Chennai.
Applied Microbiology, TrivediPC Agrobios., Jodhpur.

APPLICATION ORIENTED SUBJECT - A

4 Hrs / Week
MICROBIOLOGY

Unit - I
Introduction to applied microbiology. Various applied aspects of microbiology. Fermentation - kinds of fermentors; fermentation media - composition ; sterilization, contamination and screening.

Unit - II
Microbiology of domestic water. Water purification, determination of sanitary quality - chemotherapy and control of microorganisms through antibiotics. Source and mode of action of penicillin. Basic principles of immunology - structure of antigen and antibody and their reaction.

Unit - III
Food microbiology: Milk-physical and chemical composition, pasteurization, diary products (manufacture of cheese) Microbial flora of fresh food, microbial examination of foods-Food poisoning. Botulism.

Unit - IV
Industrial microbiology: Manufacture of alcohol, ethanol, antibiotics - streptomycin, Vitamin-\(B_{12}\), enzyme-cellulase, amino acids, Glutamic, organic acid-citric acid.

Unit - V
Production of microbial biocides-historical background, bacteria, protozoa, fungi, actinomycetes. Microbial Biotechnology and Pollution control.

Practicals:
1. A study of Rhizosphere and mycorrhizae.
2. Preparation of culture media for bacteria, fungi and actinomycetes.
3. Estimation of bacteria, fungi and actinomycetes (plate count) from soil and water by series dilution method.
4. Preparation of agar streak and agar slants, sterilization and inoculation.
5. Identification of gram staining bacteria using milk or curd.
6. Observation of microbes using hanging - drop method.
7. Knowledge on antimicrobial activities using antibiotics.

References:
Industrial Microbiology, L.E.Casida, J.R.Willey Eastern Ltd., ISBN,
Flood, Feed and Fuel from Buiomass, Ed. D.S. Chahal, Oxford & IBH, Publishing Ltd., New Delhi, 1
Experimental Microbial Ecology, RG. Burns and J. Howard Slater, Black Well Scientific Pub,Oxford
Microbiology, Paul A Ketchum, John Wiley and Sons., USA
Microbiology, Fundamentals and applications S.S.Purohit,Agrobios Jodhpur.
Applied Microbiology,TrivediPC Agrobios.,Jodhpur.

PAPER - X

5Hrs / Week
BIOPHYSICS, BIOCHEMISTRY AND PLANT PHYSIOLOGY

Unit - I
Biophysics: Electromagnetic radiation, Absorption and action spectra. Spectrophotometer (Basics) and Laws of thermodynamics (Basics)

Unit - II

Unit - III

Unit - IV

Unit - V
Growth regulators - auxins, gibberellins, Kinetins, ethylene and ABA. Physiology of flowering (Photoperiodism).

Practicals:
1. Rate of respiration in flower buds/germinated seeds using simple respiroscope (Demonstration Only)
2. Separation of leaf pigments by paper chromatography
3. Measurement of the rate of Photosynthesis under varying concentration CO$_2$ concentration
4. Effect of Light intensity on O$_2$ evolution during photosynthesis.
5. Effect of light intensity on transpiration. Determining the rate of transpiration using Ganong's potometer (Demonstration Only)

References:
Plant Physiology-Salisbury and Ross.,Prantices Hall.,New Delhi
Biophysics &Plant Physiology-A.Ragland.,Saras Publication.,Nagercoil., Tamil Nadu
Plant Physiology-Devl.in.,Affiliated East West.,New Delhi.,
Introductory Plant Physiology-Noggle and Fritz., Prantices Hall.,New Delhi
Biostatistics-P.Ramakrishnan., Saras Publication.,Nagercoil., Tamil Nadu
Basics Biophysics for Biologist.,Danial M., Agrobios.Jodhpur
Plant Physiology, A.Ragland et al, Sarar Publication.,Nagercoil., Tamil Nadu
Plant Physiology, S.Sundararajan.,Anmol Publications.,New Delhi.2
Plant Physiology,Kumar&Purohit.,Agrobios, Jodhpur.

PAPER - XI 5Hrs / Week
HORTICULTURE

Unit - I:

Unit - II:
Gardening: Types of gardens, Indoor garden, Kitchen garden and Public garden. Important ornamentals - habit and types - garden components - lawn making, glass house, rockery, water garden and topiary.

Unit - III:
Production technology - Cultivation of vegetables - Brinjal, Tomato and Onion. Cultivation of fruits - Banana, Mango and Apple growth regulators in horticulture. Plant protection measures for horticulture.

Unit - IV:
Commercial horticulture I

Unit - V:
Commercial horticulture II
Extraction of Jasmine concrete and Papain - Bonsai Flower arrangement - Cut flowers - Preservation of fruits and vegetables.

Practicals:
Demonstration of vegetative methods of propagation - Flower arrangement with cut flowers.

References:
An introduction to Horticulture - N. Kumar Narosa Pub., NewDelhi
Vegetables – Choudhury Narosa Pub., NewDelhi
Home Gardening - Trvedi, P. Narosa Pub., NewDelhi
Introduction to Spices Plantation Crops Medicinal and Aromatic Plants
Weed control RC Mandal .., JV Publi.,House.,Jodhpur
Vistas in Horticulture., SK Bhattacharya., Gene Tech Books., New Delhi.2
Commercial Floriculture.,SK Chatopadhya, Gene Tech Books., New Delhi.2
BIOTECHNOLOGY

PAPER – I  CONCEPTS AND TECHNIQUES

Unit - I :
Biotechnology - definition, history and importance - Plant tissue culture, concepts and techniques, constituents of MS and White's media. Sterilization techniques -Callogenesis, regeneration, micropropagation through somatic embryogenesis and suspension culture.

Unit - II
Anther culture, Pollen culture (Androgenic haploids), isolation and culture of protoplast, somaclonal - variations - somatic hybridization, cybrids, synthetic seeds. In vitro establishment of mycorrhizae.

Unit - III
Genetic engineering - Procedure for gene cloning, isolation of specific genes, enzymes used in gene cloning - polymerases, restriction endonucleases, ligases and reverse transcriptase.

Unit - IV
Cloning vectors - Plasmids, phages, cosmids, transposons and YAC. Gene cloning in higher plants - use of CaMV and Agrobacterium Ti - Plasmid as vehicle. Methods of direct gene transfer - electroporation, micro injection and liposomes. Isolation and screening of rDNA.

Unit - V
Application and uses of PCR, RFLP, RAPD and DNA finger printing techniques in biotechnology. Southern, Northern and Western blotting techniques agarosegel - electrophoresis.

References :
Plant Biotechnology,B Nirmala MJ Public.,Chennai.  
Basic Biotechnology, S. Ignacimuthu - Vishvanathan & Co.,Chennai  
Plant Biotechnology, S. Ignacimuthu - Vishvanathan & Co.,Chennai  
Biotechnology, S.S. Purohit and S.K. Mathur - Agrobios.Jodhpur  
Biotechnology.,V. Kumaresan., Saras Publication.,Nagercoil., Tamil Nadu  
Outlines of Biotechnology., Emkay Public., Delhi.,51.
BIOTECHNOLOGY

PAPER - II          APPLIED BIOTECHNOLOGY

Unit - I :
Food Technology - SCP as microbial food for future - mass cultivation and nutritional value or Spirulina, Scenedesmus, Yeast and Methylophilus.
Mushroom Technology - Cultivation techniques and nutritional value of Pleurotus sajor and Agaricus bisporus.

Unit - II
Biofertilizers - Advantages mass cultivation and application technique of Rhizobium, Azospirillum, Blue Green Algae (nitrogen fixers), Phosphobacteria, and VAM.

Unit - III
Application of genetic engineering in agriculture (transgenic plants) medicine and insulin, hormones, vaccines, antibiotics, monoclonal antibodies and hybridoma techniques.

Unit - IV
Biological control of pathogens and weeds through engineered microbes. Bacillus thuringiensis, mycoherbicides and insects, production of secondary metabolites. Bacterial toxins and penicillin.
Enzymes engineering and its uses.

Unit - V

Practical for biotechnology paper I & II :
1. Cultivation of Pleurotus sajor.
2. Preparation of M.S.Medium-sterilization and inoculation of explants - shoot tip culture.
4. Demonstration of biofertilizers - Azospirillum, Agrobacterium and antibiotics - specimens or slides or photographs.
5. Petrochemical Plants - specimens.

References :
Applied Plant Biotechnology,Vishvanathan&Sons.,Chennai.
Basic Biotechnology, S. Ignacimuthu - Vishvanathan&Co.,Chennai
Plant Biotechnology, S. Ignacimuthu - Vishvanathan&Co.,Chennai
Biotechnology, S.S. Purohit and S.K. Mathur - Agrobios.Jodhpur
Biotechnology,.V.Kumaresan., Saras Publication.,Nagercoil., Tamil Nadu
Biotechnology and Biologyof Plants PC Trivedi., Avinash Kar Publi.,Jodhpur
Microbial Biotechnology., PC Trivedi., Avinash Kar Publi.,Jodhpur
Biotechnology,.V.Kumaresan., Saras Publication.,Nagercoil., Tamil Nadu
Outlines of Biotechnology., Emkay Public., Delhi.,51.

B.Sc. Plant Biology & Plant Biotechnology
CORE - PRACTICAL - I
(Papers I, II, & III)
(Algae, Fungi, Lichens & Plant Pathology; Bryophytes, Pteridophytes, Gymnosperms & Paleobotany; Anatomy & Embryology)

Time. Three Hrs. Max.Marks. 100

I. Make suitable micro preparations of A, B, C and D. Draw labeled sketches. Identify giving reasons and submit the slides for valuation.

\[4 \times 8 = 32\]

II. Mount the embryo of the given specimen E and submit the slide for valuation

8

III. Identify any two algal member from the algal mixture

8

IV. Identity, draw diagrams and write notes on G, H, I, J, K, L and M

\[7 \times 5 = 35\]

V. Identity, draw diagrams and write notes on N

7

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90

Record 10

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Total 100

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B.Sc. Plant Biology & Plant Biotechnology
Practical - I - KEY
(Papers I, II, & III)
(Algae, Fungi, Lichens & Plant Pathology; Bryophytes, Pteriodopytes, Gymnosperms & Paleobotany; Anatomy & Embryology)

A - Bryophytes, Identification - 1
B - Pteriodopytes Slide - 3
C - Gymnosperms Sketch - 1
D - Anatomy Reasons - 3 4 X 8 = 32

E - Embryo mounting (Tridax / Crotalari ) 8

F - Algal Mixture 4 X 2 = 8

G - Fungi
H - Lichen Identification - 1
I - Anatomy Sketch - 2
J - Embryology Notes - 2

K - Pteriodopytes 7x5 =35

L - Gymnosperms

M - Paleobotany

N - Plt. Pathology --- Identification - 1
   Symptoms - 2
7
   Causal organism - 1
   Control measures - 2
   Sketch - 1

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90

Record 10

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Total 100

CORE PRACTICAL - II
I. Make a squash of the given specimen A. Draw sketches, Identify any one stage. Submit the slide for valuation. 10

II. Identify B Draw sketches and Write notes 10

III. Work out the given Problem - C 10

IV. Identity D Draw sketches and Write notes 10

V. Identify E, F, G, H, I & J 6 X 5=30

VI. Write Algorithm for K. 10

VII. Write Notes on. L 10

90

Record 10

Total 100

PRACTICAL - II
## KEY

| A - Squash | Identification - 1, Slide - 5, Sketch - 2, Reasons - 2 =10 |
| B - Labtechniques | Identification - 1, Sketch - 5, Reasons - 4 =10 |
| C - Genetics Problem | =10 |
| D - Plant Breeding | Identification - 1, Diagram - 4, Notes - 5 =10 |
| E - Cell biology | Identification - 1 |
| F - Labtechniques | |
| G - Genetics | Sketch --- 1 |
| H - Plant Breeding | Reasons------ 3 |
| I - Biostatistics | |
| J - Computer Devices | (6*5) = 30 |
| K - Algorithm (MS Word/Excel/Access and Power Point. Web Browsing and e-mailing etc) | =10 |
| L - Computer - MS Office, (Input / Out put Devices, Diagrams / Hardware - Key Board, Monitor, CPU) Spread sheet, Table or any web address - (PDB - Swiss Prot, Gen Scan) | (Identification - 1, Notes 5 & Diagram - 4) 10 |

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### CORE PRACTICAL - III
(Papers VII, VIII, IX, X & XI)

Time 3 hrs Max. Marks 75

I. Assign specimen A to its respective family giving reasons. ----------------------------- 6

II. Describe specimen B in technical terms. Draw sketches of floral Parts, Construct floral diagram & write floral formula ----------------------------- 14

III. Write procedure, apparatus required for the experiment C. Give the inference from the inference from the experiment and leave the set up for valuation ----------------------------- 15

IV. Assign specimen D to its respective habitat, giving the morphological and anatomical features ----------------------------- 7

V. Analyse the plant communities present in the constructed Quadrat / Line Tansect / Belt tansect E by Quantitative method. Present the data and give the inference ----------------------------- 7

VI. Cut T.S of F. Draw sketches & write notes ----------------------------- 6

VII. Write the family, binomial and morphology of the useful part in G & H (2*4) 8

VIII. Write notes on I, J, K, L, & M. ----------------------------- (5*4) 20

-------------------------------------------------- 83

HERBARIUM AND TOUR REPORT 5+2 7

---------------------- 90
Record 10
---------------------- 100

PRACTICAL - III
(Papers VII, VIII, IX, X & XI)

**KEY**

A. Taxonomy - Elimination (Identification - 1, Reasons - 5)  

B. Technical Description (Sketches - 3, Floral diagram - 3, Floral Formula - 3, Description - 5)  

C. Physiology (Lot system to be followed) (Apparatus Required, Procedure Set up Inference & Results)  

D. Ecology (Hydrophyte / Xerophyte / Mesophyte)  

E. Quadrat / Line transect / Belt transect - (Identification - 2, Notes - 5)  

F. Medicinal Botany (Bark, Leaves, Flowers, Stem, Fruits)  

G. Economic Botany (Family - 1, Binomial -2, Useful Part - 1)  

H. Economic Botany (Family - 1, Binomial - 2, Useful Par - 1)  

I. Biochemistry / Biophysics  

J. Plant Physiology  

K. Phytogeography  

L. Medicinal Botany  

M. Horticulture  

Herbarium and Tour report  

---5+2-----------------------------  

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AOS PRACTICAL - IV
All AOS Papers
(Microbiology I & II and Biotechnology 1 & II)

Time : 3 hrs 75 Marks

1. Write down the procedure for the gram staining and identify the type of bacteria present in the given sample A 14

2. Write down the procedure for the preparation of media / culture techniques given in B 14

3. Identify the apparatus given in C and D and write the uses in their respective fields 2 X 6 = 12


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90

Record 10

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100

Practical - IV
All AOS Papers
(Microbiology I & II and Biotechnology 1 & II)

KEY

Time : 3 hrs 100 Marks

A. Gram staining 14
B. Preparation of culture media for bacteria/fungi/actinomycetes 14
C. Apparatus used in Microbiology 6
D. Apparatus used in Biotechnology
   (Autoclave, inoculation chamber, inoculation needle, laminar flow/any other
   instruments used) 6

E,F,G,H & I
Microbiology: Pleurotus sajor, Diary products, (cheese/ pasteurized milk)
preparation of agar slant /streak /hang drop method/Knowledge of microbial
activity. 5 X 5 = 25

J, K, L, M & N
Biotechnology (Synthetic seeds, Shoot tip culture, callus, VAM
Nostoc, Azosprillum, Agrobacterium, MS medium,
Transgenic plants, Petrochemical Plants, SCP), etc.
   5 X 5 = 25

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90
Record 10
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Total 100
======
SYLLABUS : COMPULSORY DIPLOMA COURSE
DIPLOMA COURSE : BIODEGRADABLE WASTE MANAGEMENT

PAPER – I (3 Hours / Week)
INTRODUCTION TO ENVIRONMENTAL POLLUTION

UNIT - I Environment – introduction, a brief account of biosphere and hydrosphere.

UNIT – II Environmental pollution – introduction, definition, kinds of pollutants in water, air and soil.
UNIT – III Water pollution – industrial, agricultural and sewage, effects and control of water pollution.
UNIT - V Soil pollution – industrial, domestic and agricultural. Effects and control of soil pollution.

References:
3. Arun Kumar, Environmental problems, protection and control, Anmol Publication Pvt. Ltd.
PAPER – II (3 Hours / Week)
URBAN WASTE AND MANAGEMENT

UNIT - I Solid waste – definition, classification – biodegradable and nonbiodegradable.

UNIT - II Urban waste – types and disposal, effects on biosphere.

UNIT - III Polymers and plastic wastes, problems associated with solid wastes resistance to degradation.

UNIT - IV Persistence of pesticides in environment, bioaccumulation and biomagnification of pesticides.

UNIT - V Vermitechmology – earthworm for vermiculture, principles and management of vermiculture, methods of earthworm production.

References:
PAPER – III (3 Hours / Week)

INDUSTRIAL WASTES AND MANAGEMENT

UNIT – I  Scope and importance of waste management Application – Consolation of Environment

UNIT - II  Industrial waste – classification, sludge treatment processes – thickening, aerobic and anaerobic digestion, conditioning, de-watering


UNIT - IV  Treatment of Industrial effluents – Primary – and. Tertiary – Biological screening.

UNIT - V  Bioremediatior – definition, in-situ bioremediation, bioremediation of hydrocarbons, heavy and xenobiotics.

References :

PAPER – IV  
(4 Hours / Week)
Practical V
(Covering theory papers I, II & III)

1. Determination of Soil $p^H$
2. Effluent analysis (Paper / Distillery) – dissolved oxygen, free carbon dioxide, carbonate and bicarbonate, turbidity, total solids, dissolved solids, hardness, chloride,
*(Eudrilus eugeniae, Eisenia foetida and Lampito mauritii).*

References:

PAPER IV 
Practical V  
(Covering theory papers I, II & III)

Time: 3 hrs  
Max: 75 Marks

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<td>I.</td>
<td>A</td>
<td>Major Experiment</td>
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<td>II.</td>
<td>B</td>
<td>Minor Experiment</td>
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<td>III.</td>
<td>C</td>
<td>Comment on a Setup (from demo. expts)</td>
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<td>IV</td>
<td>Draw labeled sketches and identify giving reasons D, E, F, G &amp; H</td>
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Record 10

Total Marks 100
Key

1. A. Any one of Major experiment (as per syllabus)* 35
2. B. Any one of Minor experiment (as per syllabus)** 20
3. C. Setup of any one experiment (as per syllabus) 15
   (Instrument / material / diagram / models) 4x5 20
   90

Record 10

Total Marks 100

Marks Allotment
Expt.

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<td>Executions / viva voce</td>
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<td>Setup</td>
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<td>Calculation</td>
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<td>Data Presentation</td>
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<td>Results</td>
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TOTAL MARKS 35 20
MODEL QUESTION PAPERS

Answr All Questions - அனுரூபமான தேவைகளை விளக்காது.

Paper : I Plant Diversity I
Algae Fungi, Lichen and Plant Pathology

Section – A

Fill up the blanks :

1. *Spirulina* is a ....................... celled algae.

2. *Navicula* is a .......................

3. *Polysiphonia* is rich in ................. pigment.

4. *Dictyota* is a ................. algae.

5. *Albugo* belongs to ................. class.

Give short Answer :

6. How is the mycelium of *Saccharomyces*?

7. Name the pathogen of Tikka disease disease.

8. Name the fruit body of any Lichen.

9. Name the pathogen for Citrus Canker.

10. Red rot of sugarcane.

Section - B 5 x 6 = 30

11. a) Describe the thallus of *Spirulina* .

Or

b) Write notes on *Nannandrium*.

12. a) Describe the thallus structure of *Dictyota* .

Or

b) Draw a labelled sketch of cystocarp of *Polysiphonia*.

13. a) Describe asexual reproduction in *Albugo* .

Or
b) Describe the uredinal stage of *Puccinia.*

14. Write a short notes on tikka disease.

*(Discontinued in English)*

Or

b) Write a short notes on the frutic body of lichen.

15. a) Give an account on the blast disease of Paddy.

*(Discontinued in English)*

Or

b) Write notes on citrus canker.

Section - C

16. a) Describe the thallus structure and reproduction of *Navicula.*

*(Discontinued in English)*

Or

b) Write the classification of algae by G.M. Smiths.

17. a) Describe the sexual reproduction in *Dictyota.*

*(Discontinued in English)*

Or

b) Describe the sexual reproduction and post fertilization changes in *Polysiphonia.*

18. a) Write about the three different cycles of *Saccharomyces* with suitable examples.

*(Discontinued in English)*

Or

b) Write an essay on pycnidiospores and aecidiospores *Puccinia.*

19. a) Write an essay on the economic importance of fungi.

*(Discontinued in English)*

Or

b) With suitable diagrams, describe morphology and internal structure of Lichen thallus.

20. a) Give a detail account on the casual agent, symptoms and control measures of red rot of sugarcane.

*(Discontinued in English)*

Or

b) Give a detail account on casual agent, symptoms and control measures of TMV disease.

*(Discontinued in English)*
Paper II Plant Diversity II
Bryophytes, pteridophytes, Gymnosperms and Palaeobotany

Section – A
Fill up the blanks:
1. Elaters are seen in ........................................
2. Stelar theory was proposed by ..............................
3. Vegetative propagation of Azolla is by ..............................
4. Vascular bundle in Cycas rachis is present in .............................. shaped manner
5. The famous palaeobotanist in India was ....................

Give short answer:
6. Trabecule
7. Plactostele
8. The angiospermic characters of Gnetum
9. The stele of Adiantum
10. Lepidocarpan

Section - B 5 x 6 = 30
11. a) Draw heat and labelled sketch of T.S. of Marchantia thallus
   Or
   b) Describe the structures of mature antheridium and archegonium of Polytrichum

12. a) Write down the vegetative propagation of Selaginella
    Or
   b) Describe the structure of the strobilus of Equistetum

13. a) Describe the anatomy of Adiantum petiole
    Or
   b) Describe the gametophytic generation of Azolla
14. a) Write a neat labelled sketch describe the L.S. of Cycas ovule
Or

b) Draw and label the L.S. of Gnetum ovule
Or

15. What are fossils? Describe different kinds of them
Or

b) Describe the stem structure of Lepidodendron
Or

16. a) Write the classification of Bryophytes by Reimer
Or

b) With neat and labelled diagram Describe the structure of the mature sporogonium of Polytrichum
Or

17. a) Write an essay on stelar evolution.
Or

b) Describe the life cycle of Equisetum
Or

18. a) Give an account on the heterospory and seed habit in Pteridophytes
Or

b) Describe the reproduction of Azolla. Write the importance of Azolla to agriculture
Or

19. a) Describe the anatomy of the Cycas young stem.
Or

b) Describe the reproduction of Gnetum
Or

20. a) Give an account on the geological time scale
Or

b) Describe the stem structure of Calamites
Or


Section – A

Fill up the blanks : கீழே எழுதிக் கொள்வார்.
1. A quiescent centre is found in .........................

2. Epidermis of the root called .........................

3. Stems are characterized ......................... archxylem.

4. Cortical vascular bundle is seen in .........................

5. Interxyllary phloem is found in .........................

Give short Answer : 

6. Name the tissues that produce primary tissues.

7. From where tapetum is derived in angiosperms?

8. Where you can see anatropous ovules more?

9. Through which the pollen tube enters into the ovule?

10. How many nuclei fuse to form endosperm in the angiosperms?

Section - B  

11. a) What are the differences between the shoot apex and the root apex?

Or

b) What are the different types of collenchyma?

12. a) Draw a diagram of the internal structure of a dicot root and label it 

Or

b) Bring out the differences between the monocot and dicot leaves

13. Write notes on successive cambia.

Or

b) Give a brief account on medullary bundles.

14. a) What is a tapetum? Describe its function.
b) Describe the structure of an ovule.

15. a) Explain obturator.

Or

b) Describe endospem haustoria.

Section - C

5 x 12 = 60

16. a) What are meristems? Explain various theories concerned with meristem.

Or

b) Write an essay on simple permanent tissue.

17. a) With neat labelled sketch, describe the structure of dicot leaf.

Or

b) With neat labelled sketch describe the structure of a dicot stem.

18. a) Give an account on normal secondary growth of a dicot stem.

Or

b) With suitable example, describe anomalous secondary growth in dicot stems.

19. a) Describe the structure and development of an embryosac.

Or

b) Explain double fertilization.

20. a) Describe the development of endospem in angiospam.

Or

b) With neat diagram describe the development of a dicot embryo.

Paper IV : Cell biology & Lab Technique

Section – A

Fill up the blanks:

1. Middle lamella is made up of ........................

Or
2. The division of nucleus into two is called
   replikation of chromosome

3. Thylakoids of adjacent grana are connected by membranous tubules called
   connection

4. Electrophoresis was first developed by
   Fraenkel

5. A device for separating compounds in a suspension by spinning is known as
   ultracentrifuge

Give short answer: DNA is the genetic material

6. Write short notes on torus.
   Torus is a doughnut-shaped structure

7. Define kinetochore
   Centromere

8. RNA Polymerase
   RNA polymerase

9. Define pH
   Hydrogen ion concentration

10. Chromatography
    Chromatography

Section - B 5 x 6 = 30

11. a) Describe the structure and function of the ribosomes.
    Ribosomes are the sites of protein synthesis

Or

b) Give a brief account on the ultra structure and function of Endoplasmic reticulum
   Endoplasmic reticulum is a network of membrane-bound channels

12. a) Describe the structure of chromosome and its chemical composition
    Chromosomes are made up of DNA and proteins

Or

b) Explain in detail the ultra structure of thylakoids and their functions
    Thylakoids are the sites of photosynthesis

13. a) Describe the structure of Watson & Crick model of nucleic acid
    Nucleic acids are composed of four bases

Or

b) Describe the structure and types of RNA
    RNA is a single-stranded nucleic acid

14. a) Give a general account on the uses of laboratory instruments
    Laboratory instruments are used in scientific research
b) Describe the principle and operation techniques of a colorimeter

15. a) Explain the method of separation of molecules using a paper chromatography

Or

b) Explain polyacrylamide gel electrophoresis

Section - C

16. a) Give a detail account on the structure and functions of the cell wall

Or

b) Describe various specialized structures of plasma membrane and their function

17. a) Describe the ultra structure of mitochondria and their function

Or

b) Describe the ultra structure of nucleus and its functions

18. a) Explain in detail DNA replication in prokaryotes

Or

b) What are the various steps involved in protein synthesis?

19. a) Explain the principles, techniques & application of pH meter

Or

b) Discuss the principle and working mechanism types of centrifuge

20. a) Differentiate TLC from column chromatography

Or

b) Give an account on the basic principle of any one type of electrophoresis mentioned in the syllabus

Paper V - Genetics, Plant breeding and Biostatistics

Section – A

Fill up the blank : சொந்தமாக விளக்கம் விளக்கம்.

1. The Law of Segregation was postulated by Mendal using ......................... cross
2. When linked genes are inherited together through two or more generations it is called .................. linkage.

3. The substances which induce mutation is called a s ......................

4. Removal of anthers in the female plant during hybridisation is known as ........................................

5. Data originally collected for an investigation is known as .............. 

6. Dominant gene -

7. Aneuploidly -

8. Cistron -

9. Quarantine law -

10. Tabulation -

Section - B

11. a) Describe incomplete dominance with suitable example

Or

b) Give an account on test cross.

12. a) Give an account on polyploidys.

Or

b) What is linkage? Explain.

13. (a) Give an account on mutagens.

Or

b) Describe the chemical nature of gene.

b) Write notes on plant introduction.

15. a) What are the merits and demerits of median?

Or

b) Give an account on graphic representation.

Section - C

16. a) Describe the dihybrid cross taking an example to prove the law of independent assortment.

Or

b) Explain gene interaction with inhibiting factor as reference.

17 a) Give an account on multiple allelism with reference to human blood group.

Or

b) Write an essay on methods of sex determination in plants.

18. a) What is meant by cytoplasmic inheritance. Explain it with suitable example.

Or

b) Define Genetic code and enlist the essential features of it.

19. a) Define Hybridisation Explain the different techniques involved in it.

Or

b) Explain the different types of selection in plant breeding.

20. a) Give an account on classification of data?

b) Explain standard deviation.
Paper : VI : Fundamentals of Computer Applications

Section – A

Fill up the blank:

1. ................ is the heart of the computer
   .................. कम्प्यूटर का गर्दन है।
2. www stands for ..................
   व्हेब एंडर है।
3. ................ command is used to create a new file.
   .................. नया फाइल बनाने के लिए मात्र कमान्ड है।
4. The combination of row and column is ..................
   क्रोन और स्यूम्बल का संयोजन है।
5. To insert a slide in Power Point ........... option is used.
   स्लाइड इंसर्ट करने के लिए पावर बिड गॉड ऑप्शन है।

Give Short Answer:

6. List out any two input devices for computer.
   कंप्यूटर में से किसी भी दो इनपुट डिवाइस हैं।
7. What is ‘URL’?
   URL क्या है?
8. What is ‘Desktop’
   डेस्कटॉप क्या है?
9. What are the ways to create document in MS-Word?
   MS-गुड फ्रॉम कैसे डूटेक्ट करता है?
10. Define the term Database?
    डेटाबेस क्या है?

Section - B (5x6=30)

11. (a) Explain machine language and high level language.
    मशीन लेञ्जुअर और हाइ लेभल लेन्जुअर क्या है?
    or क्या है?
    (b) Describe various components of a computer.
    कंप्यूटर के विभिन्न अवयवों का विवरण करें।

12. (a) What are the uses of internet?
    इंटरनेट के क्या उपयोग है?
    or क्या है?
    (b) Describe how search engines are useful.
    शिर्कुट कैसे उपयोगी है?

13. (a) Explain the differences between Windows 98 and 2000.
    डिस्कार्ड 98 और 2000 के बीच क्या अंतर है?
    or क्या है?
    (b) Explain the differences between Windows Xp and Vista.
    डिस्कार्ड Xp और विस्टा के बीच क्या अंतर है?

14. (a) How documents are created and changes are made in MS-Word
    MS-गुड क्या करता है?
    or क्या है?
    (b) How will you create a table and insert a new row in it?
    आप इसमें टेबल बनाएंगे और नया र� इंसर्ट करेंगे?
15. (a) Explain the uses of Power Point.
(b) Describe the uses of MS Access

Section - C

(5x12=60)

16. (a) Write an essay on the capabilities of modern computers
(b) Explain in detail about compilers and translators.

17. (a) Explain the creation, sending and replying of an e-mail.
(b) Explain different types of web browsers.

18. (a) Explain the special features of Vista.
(b) Write an essay on the advantages and disadvantages of Windows-98.

19. (a) Write an essay on the creation of a table using MS-Excel and apply chart option:
(b) Describe the different steps involved in mail merge in Ms-Word.

20. (a) How will you create a Database?
(b) What are the steps involved in slide presentation?

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Paper VII : Taxonomy of Angiosperms and Economic Botany

Section – A

Fill in the blanks:

1. Bentham and Hookers’ system is a .................. classification.
2. Naming of a plant scientifically known as .................. .
3. Obdiplostamenous Condition is found in the family ..........................................

4. Bilipped corolla is common in the family ..........................................

5. Cereals are from the family ............................................................

Give Short answer ..........................

6. What is a taxon? ..............................................................................

7. What is ICBN? ..............................................................................

8. Give the botanical name for cocoa? ..............................................

9. Name the type of first in Apocyanaceae ........................................

10. How are the embryos of Amaranthaceae? .....................................

Section - B

11. a) Write short notes on the significance of Taxonomy of Angiosperms ..............................................................

Or ............................

b) Betham & Hookers’ classification has demerits also-Comment. ..........................

12. a) What are the uses of plant Herbalium? ......................................

Or ............................

b) With suitable example explain binomialmomenelature. ..........................

13. a) With botanical terms describe a typical flower of Annonaceae. ..............................................................

Or ............................

b) With botanical terms describe a typical flower of Rutaceae. ..........................

14. a) Write notes on the economic importance of Rutaceae. ..........................

Or ............................

b) Write notes in the economic importance of Lamiaceae. ..........................

15. a) Describe the special type of inflorescence of Euphorbiaceae. ..........................

Or ............................

b) Describe the importance characters of Liliaceae. ..........................


Section - C

16. a) What is a natural system of classification? Name one such system and justify it.

b) What are the important criteria for classification of plants? How they are used in a system studied by you?

17. a) What is a Herbarium? Write an essay on the technique and uses of it.

b) Write an essay on the modern trends in the classification of flowering plants.

18. a) Describe the general characters and economic importance of Rutaceae.

b) Describe the general characters and economic importance of Apiaceae.

19. a) Describe the general characters and economic importance of Asclepiadaceae.

b) Describe the general characters and economic importance of Lamiaceae.

20. a) Describe the general characters and economic importance of Euphorbiaceae.

b) Describe the general characters and economic importance of Poaceae.

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Paper VIII : Medicinal Botany and Human Welfare

Section – A

1. Fill up the blanks: சொல்லவித்தல் சிக்கத்துச் சொல்ல

1. Important herb used in Ayurveda is .........................

2. Clove oil is obtained from .........................

3. Major constituent of ginger is .........................

4. Drug acting on nervous system is .........................

5. The process through which hybrids are produced is .........................

---
Give Short Answers:

6. Define pharmacognosy.
   Pharmacognosy is the study of plant drugs.

7. Write the chemical constituent of Eucalyptus.
   The chemical constituent of Eucalyptus is eucalyptol.

8. Give the botanical name for poppy plant.
   The botanical name for poppy plant is Papaver somniferum.

9. What is fixed oil? Give example.
   Fixed oil is the oily part of a plant. An example is olive oil.

10. What is drug adulteration?
    Drug adulteration involves adding substances to the drug.

Section - B

(5x6=30)

11. (a) How will you study the drug systematically?
    Systematically study the drug by identifying its parts.

   (b) Describe Siddha medicine practiced in Tamilnadu.
    Siddha medicine involves using herbal medicines.

12. (a) Describe the internal structure of cinchona bark.
    The internal structure of cinchona bark involves the bark and inner tissues.

   (b) Describe the anatomy of Adhathoda leaf.
    The anatomy of Adhathoda leaf involves the veins and leaves.

13. (a) Write the medicinal uses of the gum.
    The medicinal uses of the gum include treating infections.

   (b) With the help of a labelled diagram describe the morphology of the giner.
    The morphology of the giner involves its structure and function.

14. (a) Name any five plants and their parts used as cardiovascular drug.
    Examples include giner, cinchona bark, and eucalyptus leaves.

15. (a) How drug adulterations are done?
    Adulterations can involve adding foreign substances.

   (b) Write the methods of drug evaluation?
    Methods include testing for purity and potency.

Section - C

(15x12=60)

16. (a) Give an account of Indian systems of medicine.
    Indian systems of medicine involve Ayurveda and Siddha.

   (b) Write the history of pharmacognosy.
    Pharmacognosy began with the study of plants in ancient times.
17. a) Give an account of morphology, internal structure, chemical constituents and uses of colve.

b) Write an essay about the structure, chemical constituents and uses of Eucalyptus

18. a) Write the binomial, tructure and uses of wood apple

b) What is unorganised drug? Give an example and write about it.

19. a) Describe any three plants yielding drugs for nervous system

b) Give an account of cardiovascular drug

20. a) Give an account on the cultivation of medicinal plants

b) Write an essay on the plant breeding methods for the improvement of medicinal plants.

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**Paper IX: Ecology and Phytogeography**

**Section – A**

**Fill up the blank:**

1. Term Ecology was proposed by............ .

2. The study of an individual to its environment is known is............ .

3. The study of soil is known as ............ .

4. Study of the plant community is known as ............ .

5. *Eichhornia* is an example for ............ .

**Give Short Answer:**

6. Where are sunken stomata seen?

7. How the plant community acting as a measure of environmental condition is referred?
8. How the mass two way movement of an entire population is referred?

9. Name of the branch of the science which deals with the distribution of plants.

10. How the plants adapted to sand environment are called?

Section - B

11. (a) What are the effects of light on Vegetation?

12. a) Discuss the various qualitative characteristics of the plant communities.

13. What are xerophytes?

14. Explain biological indicators of the environment.

15. Write notes on the discontinuous distribution of species.

Section - C

16. a) What are climatic factors? Explain the effect of any two of them on the form and distribution of plants.
b) Discuss the effect of biotic factors on plant life.

Or

17. a) Describe the various classificatory units of plant community.

Or

b) What do you mean by phenology? Discuss briefly the correlation between the phenology and the various environmental changes.

Or

18. What are hydropytes? Describe the morphological and anatomical adaptation of them.

Or

b) What are the various anatomical features of mesophytes?

Or

19. Write notes on i) Continental drift ii) concept of barriers .

Or

b) What are plant indicators? How they indicate the different conditions? Explain with examples.

Or

19. What are basic phytogeographical principles? Discuss in brief the factors which affect distribution of plant species.

Or

b) Write an essay on phytogeographical regions of India

Application Oriented Subject A - Microbiology - I
Fundamentals of Microbiology

Section – A

Fill up the blanks : குறிப்பிட்டு விளக்க விளக்க

1. Germ theory of fermentation was proposed by ................. .

2. Compound microscope has ................. lens near the object

3. ................. is a blue green Algae used as biofertilizer.
4. .......... gas of the atmosphere is fixed biologically by some algae directly.

5. Fimbriae of a bacterium is made up of .........

6. Expand BGLB which is used in coliformis test

7. Define phytophagy

8. Mention the genetic material of TMV

9. Name the microbe commonly employed for alcoholic fermentation

10. What is the use of turbidometric analysis?

Section - B          5 x 5 = 25

11. a) Bring out the highlights of the history of industrial microbiology.

12. a) What is rhizosphere? Name any three microorganisms of this region with their benefits

13. a) Describe the structure and chemical composition of mycoplasma.

14. a) Given an account on satellite virus.

15. Explain the fermentation and its various types.
b) Give a brief account on any three fermentation products and their production.

Section - C

16. a) Write an essay on the scope of microbiology and its application.

b) What are the main groups of microorganisms and how are they classified?

17. a) Write an essay on the role of microorganisms in the air with examples.

b) Describe the methods of purification of air.

18. a) Write the general morphology and ultra structure of bacteria.

b) Describe in detail the sexual reproduction in bacteria.

19. a) Write in detail various modes of virus transmission.

b) Draw & describe the structure and replication of T₂ phages

20. a) Write an essay on multiple fermentation with suitable examples.

b) Describe in detail how fermentation products are assayed and determined by physical methods?
2. In water purification ....................... is used as one of the coagulants.

3. LTLT method is most popular in ....................... technique

4. Blue circle is a product name of ....................... technique

5. The organism used in the production of citric acid is ....................... technique

6. What is meant by biomining?

7. Write short notes on antigen.

8. Define neurotoxin

9. Write short notes on streptomycin

10. Define Phytomediation

Section - B          5 x 5 = 25
11. a) Draw and explain different parts of a fermentor and mention the basic requirements of a good fermenter.

b) What are the methods used for sterilization of fermentation media?

12. a) What are the mechanism of action of antimicrobial drugs?

b) Explain what is innate immunity with suitable examples?

13. a) Write down the physical and chemical composition of milk.

b) Write an account on microbial flora of fresh food.

14. a) Write down the production process of glutamic acid

b) Give an account on growth of Industrial Microbiology.
15. a) With suitable examples give an account on fungal insecticide.

Or

b) Give a brief account on historical background of production of microbial biocide.

Section - C

5 x 8 = 40

16. a) Write an essay on composition of fermentation media.

Or

b) List out various applied aspects of microbiology in detail.

17. a) Bring out the reactions of Antigen and Antibody.

Or

b) Write the steps involved in water purification.

18. a) Describe the steps involved in the production of cheese.

Or

b) Write any three common laboratory tests of dairy products.

19. a) Describe the manufacture of alcohol.

Or

b) Explain the production process of vitamin B12

20. a) With suitable example explain the role of microbial biotechnology in pollution control

Or

b) Define microbial biocide and explain its importance

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Paper X : Biophysics, Biochemistry and Plant Physiology

Section – A

Fill in the blanks :

1. Randomness of molecules is known as ......................
2. pH is the power of active ............... atoms in total.
3. Evaporation of water from plant is called as ................. .
4. Photosystem II Pigments absorb lights at ................. nm.
5. Crystalline auxin was first obtained from ................. .
6. Write is the powerful inhibitor of seed and seed germination?
7. Mention any two form of Carbohydrate.
8. Name the cells that regulate the stomatal openings.
9. How many number of ATPs results as net gain at the end of glycolysis?
10. Which phytohormone increases the flowing and furit ripening?

Section - B
11. a) What is visual light? What parts of it are useful for photosynthetic activity? Explain.
    b) Distinguish enthalpy and entropy.
    b) Write notes on polypeptide.
13. a) What is known as osmotic pressure? How it helps the plants? Explain.
    b) Write breifly the factors that affects the transpiration.
14. a) Write notes on cyclic photophosphorylation.
    b) Write notes on electon transport system.
15. a) What are gibberellins? How they affect the activities of plants?

Or Aaba

b) What notes on ABA.

ABA புரிய திருப்புவர்

Section - C

16. a) Describe the basic construction of a simple spectrophotometer. Write briefly the procedure to use it.

Or Aaba

b) Explain different laws of thermodynamics.

Or Aaba

17. a) Give an account on Carbohydrate.

Or Aaba

b) Give a concise account on beta oxidation of fatty acids.

Or Aaba

18. a) Explain water potential osmotic potential and pressure potential. Add note on their interneleations.

Or Aaba

b) Discuss briefly the theories on ascent of sap.

Or Aaba

19. a) Write an essay on Krebs'cycle .

Or Aaba

b) Give a brief account on Calvin cycle.

Or Aaba

20. a) Write an essay on the plant growth regulator.

Or Aaba

b) Define photoperiodism give an account on florigen concept.

Or Aaba

Paper XI : Horticulture

Section – A

I. Fill up the blanks : கருவற்றுள் முறைமை
1. The study of fruit yielding plants is ................. .
   The carrier based preparations of beneficial micro organisms which improve soil fertility are called as......
   Plants which complete their life cycle within one year or one season are known as......
   Plants are trimmed to get ashape of an animal, bird etc are known as.........
   Damping off disease is caused by................. .
   Give short Answer :
   Name the chemicals commonly called to control mites.
   Which is known as the queen of the spices?
   Mention the disease for which vinblastine, a drug obtained from Vina rosea is used
   What is the art of growing minature trees and shrub es in shallow containers?
   Name the process of application of heat in varying degrees to the food in a closed container.

2. The carrier based preparations of beneficial micro organisms which improve soil fertility are called as......
   Plants which complete their life cycle within one year or one season are known as......
   Plants are trimmed to get ashape of an animal, bird etc are known as.........
   Damping off disease is caused by................. .
   Give short Answer :
   Name the chemicals commonly called to control mites.
   Which is known as the queen of the spices?
   Mention the disease for which vinblastine, a drug obtained from Vina rosea is used
   What is the art of growing minature trees and shrub es in shallow containers?
   Name the process of application of heat in varying degrees to the food in a closed container.

3. Plants which complete their life cycle within one year or one season are known as......
   Plants are trimmed to get ashape of an animal, bird etc are known as.........
   Damping off disease is caused by................. .
   Give short Answer :
   Name the chemicals commonly called to control mites.
   Which is known as the queen of the spices?
   Mention the disease for which vinblastine, a drug obtained from Vina rosea is used
   What is the art of growing minature trees and shrub es in shallow containers?
   Name the process of application of heat in varying degrees to the food in a closed container.

4. Plants are trimmed to get ashape of an animal, bird etc are known as.........
   Damping off disease is caused by................. .
   Give short Answer :
   Name the chemicals commonly called to control mites.
   Which is known as the queen of the spices?
   Mention the disease for which vinblastine, a drug obtained from Vina rosea is used
   What is the art of growing minature trees and shrub es in shallow containers?
   Name the process of application of heat in varying degrees to the food in a closed container.

5. Damping off disease is caused by................. .
   Give short Answer :
   Name the chemicals commonly called to control mites.
   Which is known as the queen of the spices?
   Mention the disease for which vinblastine, a drug obtained from Vina rosea is used
   What is the art of growing minature trees and shrub es in shallow containers?
   Name the process of application of heat in varying degrees to the food in a closed container.

6. Name the chemicals commonly called to control mites.
   Which is known as the queen of the spices?
   Mention the disease for which vinblastine, a drug obtained from Vina rosea is used
   What is the art of growing minature trees and shrub es in shallow containers?
   Name the process of application of heat in varying degrees to the food in a closed container.

Section - B          5 x 6 = 30

11. a) What are the importances of horticulture?
    Or
    b) Briefly explain the different methods of layering.

12. a) How will you layout a kitchen garden?
    Or
    b) Give a brief account on indoor garden.

13. a) Describe the cultivation of tomato.
Or
b) Give a brief account of plant protection measures for horticulture.

14. a) Describe the cultivation methods of orchids.
   மலர் ஆண்டல் மலர் பாதுகாப்பு விளையாட்டு குறிக்க.

   Or
b) Briefly describe the cultivation method of periwinkle.
   மலர் பாதுகாப்பு விளையாட்டு குறிக்க.

15. a) Give an account on bonsai.
   போன்பை விளையாட்டு குறிக்க.

   Or
b) Explain briefly the flower arrangement.
   கூட்டார் விளையாட்டு விளையாட்டு குறிக்க.

Section - C          5 x 12 = 60

16. a) Describe the different methods of grafting with examples.
   பூரினங்கள் பாதுகாப்பு விளையாட்டு விளையாட்டு குறிக்க.

   Or
b) Write an essay on irrigation methods.
   இரிட்டல் பாதுகாப்பு விளையாட்டு விளையாட்டு விளையாட்டு குறிக்க.

17. a) Describe the component of a public garden.
   பூத்தினங்கள் மலர் பாதுகாப்பு விளையாட்டு விளையாட்டு குறிக்க.

   Or
b) Describe the types of the habit of ornamental plant.
   கூட்டார் விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு குறிக்க.

18. a) Explain the cultivation of mango.
   மாஞ்சார் விளையாட்டு விளையாட்டு விளையாட்டு.

   Or
b) Write an essay on the role of growth regulators in horticulture.
   விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு.

19. a) Explain the cultivation of Anthurium.
   அந்தூரியம் விளையாட்டு விளையாட்டு விளையாட்டு.

   Or
b) Describe the cultivation of Cardomorn.
   கார்஦ோமோன் விளையாட்டு விளையாட்டு.

20. a) Explain the procedure for the extraction of Jasmine concrete.
   கூட்டார் விளையாட்டு 'அலிச்சீட்' விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு.

   Or
b) Write an essay on preservation of fruits and vegetables.
   கூட்டார் விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு.

   கூட்டார் விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு விளையாட்டு
Section – A

Fill up the blank:

1. The phenomenon of mature cells reverting into a meristematic state is termed as .................

2. The substance which disintegrates upon heating is called as ......................

3. Fusogen is used for ......................

4. The agent which prevents damage to cells under freezing is ......................

5. ...................... are enzymes introduce or remove super coils from closed circular DNA

Give short answers:

6. Which synthetic, stranded oligonucleotide used to attach sticky ends to a blunt end molecule?

7. Name the DNA sequence that is able to move from place to place within genome?

8. Name the process of transfer of DNA into an eukaryotic cell.

9. Name the thermophilic bacterium from which the heat stable Taq polymerase in isolated.

10. Name the process by which the separation of molecules on the basis of their charge to mass ratio is done

Section – B

5 x 5 = 25

11. a) What is a culture medium? State the basic composition of a general plant tissue culture

Or

b) What do you mean by cell suspension culture? Give an account on suspension culture.

12. a) How haploids are produced in tissue culture? Mention the significance of haploids.
13. Explain the importance of in vitro establishment of mycorrhizae.

14. a) Compare plasmids with cosmids.

b) Write short notes on ligation techniques.

15. a) List out the applications of PCR.

b) Outline the procedure for southern hybridization.

16. Explain the general technique of plant tissue culture. Discuss the possible mechanisms causing it.

b) What is somatic embryogenesis? Discuss the principle and protocol for introducing it.

17. a) What are synthetic seeds? Explain the procedure for preparation and the importance of artificial seed.

b) Give an account of somaclonal variation.

18. a) Explain gene cloning procedure.

b) How can you isolate specific genes from a genome?

19. a) Give an account on direct gene transfer in plants.
b) Explain the techniques of isolation and screening of DNA.
DNA is a large molecule containing genetic information. It is isolated from cells and analyzed for its genetic content.

20. a) What are molecular markers? Explain its types?
Molecular markers are genetic markers that can be used to identify specific DNA sequences. They can be used in various applications such as genetic mapping and disease diagnosis.

Or
b) Write an essay on agarose gel electrophoresis.
Agarose gel electrophoresis is a technique used to separate DNA fragments based on size.

Application Oriented Subject B - Biotechnology II
Applied Biotechnology

Section – A

1. Fill up the blanks :

1. Methylophilus is a SCP.

2. Mushroom seed is called ...

3. The genes encoding for nodulation in a rhizobial genome is ...

4. ................. is a technique of seed dressing with bacteria.

5. Insulin hydrolyses the glucose of the blood is an ...

6. How are the heterogenous antibodies called?

7. Name any two secondary metabolites of the plants.

8. Which are controlled by glyphosate?

9. How is the rate of storage photosynthetic products known?

10. How is the practice of planting trees for fuel generation is known?

Section - B 5 x 5 =25

11. (a) Explain algal production in waste water for SCP.

Or

b) Write notes on yeast biomass.

12. (a) What is bacterization? What types of microorganisms are used as microbial inoculants?
b) Blue green algae are biofertilizers - Discuss

13. (a) Write short notes:
   i) Somatotropin
   ii) Biologically synthesized vaccines

   (b) Discuss

   i) Rhizobium
   ii) Bacillus thuringiensis

Or

14. (a) What are microbial herbicide? How will you control aquatic weeds by using microorganisms?

(b) Give a brief account on bacterical toxins.

15. (a) What are waste? How they can be used as renewable source of energy?

(b) Explain the terms:
   i) Biomass
   ii) Bioconservation
   iii) Menthogens

Section-C

16. (a) Explain the methods for mass cultivation of spirulina SCP and discuss the benefits from it.

   Or

(b) Describe in detail the cultivation of paddy straw mushroom.

17. (a) Give a detailed account on mass cultivation of Rhizobium and its use as biofertilizer.

   Or

(b) Write an essay on mycorrhiza and its benefits to plants.

18. (a) How is genetic engineering helpful in the crop improvement? Discuss with suitable examples

   Or

(b) What do you know about monoclonal antibodies? How are they synthesized?

19. (a) Bacillus thuringiensis a microbial pesticide - discuss in detail

   Or

(b) Give an account on culture, selection methods and fermentation process of penicillin production.
20. a) Explain the process of treatment of paper and distillery effluents.

What are the sources of Hydrogen gas used as gaseous fuel? Discuss its future importance.

Or

What are the sources of Hydrogen gas used as gaseous fuel? Discuss its future importance.