SILVER OAK UNIVERSITY

EDUCATION TO INNOVATION

(Established under Gujarat Private Universities Act, 2009)

**SEMESTER – II**

Genetics, Tissue Culture and General Biology
Introduction to Major group of Microorganisms
Growth and structure of bacteria
General Chemistry- II

-

SILVER OAK UNIVERSITY
EDUCATION TO INNOVATION
(Established under Gujarat Private Universities Act, 2009)

| **Subject: -** Genetics, Tissue Culture and General Biology | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Program: B.Sc.** | | | | **Subject Code:** | | | **Semester: II** | |
| | | | | | | | | |
| **Teaching Scheme** | | | | **Examination Evaluation Scheme** | | | | |
| **Lecture** | **Tutorial** | **Practical** | **Credits** | **University Theory Examination** | **University Practical Examination** | **Continuous Internal Evaluation (CIE)- Theory** | **Continuous Internal Evaluation (CIE)- Practical** | **Total** |
| 04 | - | 4 | 6 | 24/60 | 20/50 | 16/40 | - | 150 |

# THEORY

**Unit 1: Principles of Inheritance and Variation**

- Heredity and Variation
- Important terms used in inheritance studies
- Brief history of Mendel
- Mendel's Experiments-Monohybrid cross, Dihybrid cross, Test cross, backcross and reciprocal cross
- Mendel's laws of Inheritance-Law of dominance, Law of segregation, Law of Independent assortment
- Interaction of genes-(1) Inter-allelic interaction-(i) Incomplete dominance (1:2:1 ratio) ii- Co dominance (1:2:1ratio) (2) Inter- genic gene interaction-Epistasis-Dominant epistasis (12:3:1 ratio), Recessive epistasis (9:3:4 ratio), Supplementary genes, Complementary genes (9:7 ratio)
- Multiple allelism: characteristics, examples, Blood groups in man, types of blood groups-ABO, M-N), significance, Rh factor
- Sex determination (chromosomal mechanism) humans
- Environmental effect on sex determination
- Hormonal effect on sex determination
- Chromosomal variation – Euploidy (monoploidy and polyploidy) and Anuploidy (hypoploidy and hypoploidy)
- Genetic disorders (Brief account) – Haemophilia, Thalassemia, Albinism, Colour blindness

**UNIT – II Tissue Culture**

- Historical perspective
- Composition of media, Nutrient and hormone requirements (role of vitamins and hormones)
- Important terms: Totipotency, Nutrient medium, Explants, Callus, Organogenesis, Embryogenesis, Stem cells, Pluripotent, Micro propagation
- Basic requirement for Tissue culture laboratory
- Basic steps in tissue culturing (General process)
- Production of transgenic plants and transgenic animals and their significance Tissue culture applications

**UNIT-III Plant morphology and taxonomy**

- **Leaf Morphology** - Parts of simple leaf
- Compound leaf and its types - Pinnate compound and Palmate compound
- Phyllotaxy and its types : Alternate, Opposite and Whorled
- **Inflorenscence :** Racemose, Cymose, Special types
- Racemose - Raceme, Spike, Catkin, Spadix, Corymb, Umbel, Capitulum
- Cymose: Monochasial, Dichasial and Polychasial
- Special types: Verticillaster, Hypanthodium, Cyathium
- Solitary: Terminal and Axillary
- **Flower** : Four Whorls of Flower, Types of flower based on position of ovary
- Angiosperms : General Characters
- Outline classification of Bentham and Hooker's system
- **General characters of Families** : Malvaceae, Solanaceae, Cucurbitaceae
- Plant of economic importance of .
- Malvaceae : Jasud (*Hibiscus rosa-sinensis*), Bhoy Kanski(*Abutilon indicum*), Bhindi *(Abelmoschus esculentus*), Cotton(*Gossypium arboretum*)
- Solanaceae : Brinjal (*Solanum melongena*), Ashwagandha (*Withania somnifera*) Tobacco (*Nicotiana tabacum*), Chilli(*Capsicum annum*) Cucurbitaceae: Galka (*Luffa cylindrical*), Pumpkin(*Cucurbita maxima*) Kakdi (*Cucumis sativus*), Karela(*Momordica charantia*)

**UNIT-IV General Account of Chordates:**

- General characteristics and outline classification of Phylum Chordata
- Type of scales in fishes- Placoid, Cycloid, Ganoid and Ctenoid with examples
- Migration of Fishes with examples
- Parental care in fishes
- Parental care in amphibians
- Neoteny, Paedogenesis and economic importance of Amphibians
- Identification of poisonous and non-poisonous snakes

- Migration of Birds – types, causes and significance
- Flight adaptations in birds
- Type of feathers
- Origin and evolution of man

## PRACTICAL

1. Mendel's laws through ratios- Laboratory exercises in probability and chisquare.
2. Numerical based on Mendelism
3. Chromosome mapping using point test cross data
4. Pedigree analysis for dominant and recessive autosomal and sex-linked traits
5. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes through photographs.
6. Protocol for callus culture (Different stages with photographs)

### Reference


- Cellbiology,Genetics,Molecular Biology,Evolution and Ecology-P.S.Verma and V.K.agarwal
- College Botany Vol 1: Gangulee , Das and Dutta
- Taxonomy of angiosperms: B. P. Pandey
- A text book of Angiospems-Singh,Pande and Jain
- Atext book of botany-A.C.Dutta
- Elements of Biotechnology-P.K.Gupta
- GENETICS –P.K.GUPTA
- Modern textbook of zoology (Vertebrates) – R. L. Kotpal
- Bhojwani, S.S. and Razdan, M.K., - Plant Tissue Culture: Theory and Practice
- Cell Biology-P. S. Verma

SILVER OAK UNIVERSITY
EDUCATION TO INNOVATION
(Established under Gujarat Private Universities Act, 2009)

| Subject: - Introduction to Major group of Microorganisms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Program: B.Sc.** | | | | **Subject Code:** | | | **Semester: II** | |
| | | | | | | | | |
| **Teaching Scheme** | | | | **Examination Evaluation Scheme** | | | | |
| **Lecture** | **Tutorial** | **Practical** | **Credits** | **University Theory Examination** | **University Practical Examination** | **Continuous Internal Evaluation (CIE)- Theory** | **Continuous Internal Evaluation (CIE)- Practical** | **Total** |
| 04 | - | 4 | 6 | 24/60 | 20/50 | 16/40 | - | 150 |

**THEORY**

**Unit: 1 Introduction to Bacteria**

a. General classification
b. Morphology: Cell size and significance of smallness
c. Mode of reproduction

**UNIT:2 Fungi: The Multicellular and Unicellular Microorganisms**

**a.** Yeast and Mold
**b.** Occurrence and General classification
**c.** Morphology
**d.** Mode of Reproduction
**e.** Economic Importance

**UNIT:3 Algae, Protozoa and Helminths**

a. Occurrence and General classification
b. Morphology
c. Mode of Reproduction
d. Economic Importance

**UNIT:4 Virology**

a. Occurrence and General classification of virus
b. Morphology
c. Mode of Reproduction
d. Economic Importance

SILVER OAK UNIVERSITY
EDUCATION TO INNOVATION
(Established under Gujarat Private Universities Act, 2009)

## PRACTICAL

1. Micrometry Measurement
2. Observation of Bacterial growth with nutrient agar
3. Grow and observe growth of yeast on Glucose Yeast Extract Agar
4. Staining of yeast and observation of budding cells
5. Grow and observe growth of fungi growth on Rose Bengal Agar
6. Mounting of fungi (*Aspergillus*, Mucor) and demonstration of sporangium and conidium
7. Identification of economical important fungi. (9 genera) (*Aspergillus, Penicillium, Mucor, Rhizopus, Curvularia, Helminthosporium, Cunninghaemela, Fusarium*, *Alternaria*)
8. Study of permanent slides of algae (*Volvox, Spirogyra*, Diatoms), Cyanobacteria
9. (*Nostoc, Anabena*) and Protozoa (*Amoeba, Paramoecium, Euglena*).

**References:**


- **Microbiology**: Pelczar M J, Chan E C S and Kreig N R Tata Mc Grow Hill
- **Basic Practical Microbiology: A Manual:** Society for General Microbiology, 2006.
- **General Microbiology**: Stanier R Y, Ingraham J L, Wheelis M L, Painter P R. Mac Millan Press Inc.
- **Microbiology: An introduction**: Tortora G J, Funke B R and Case C L. Pearson Education Inc
- **Microbiology: Principles and Explorations:** Black J G. John Wiley & Sons, Inc.
- **Microbiology:** Willey J M, Sherwood L M, Woolverton C J. Mac Millan Press Inc.
- **Elementary Microbiology:** H. A. Modi, Akta Prakashan.
- **Principles of Microbiology:** Atlas R M. Wm. C. Brown Publishers

SILVER OAK UNIVERSITY
EDUCATION TO INNOVATION
(Established under Gujarat Private Universities Act, 2009)

| Subject: - Growth and structure of bacteria | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Program: B.Sc. | | | | Subject Code: | | | Semester: II | |
| | | | | | | | | |
| Teaching Scheme | | | | Examination Evaluation Scheme | | | | |
| Lecture | Tutorial | Practical | Credits | University Theory Examination | University Practical Examination | Continuous Internal Evaluation (CIE)- Theory | Continuous Internal Evaluation (CIE)- Practical | Total |
| 04 | - | 4 | 6 | 24/60 | 20/50 | 16/40 | - | 150 |

## THEORY

**Unit: 1 Bacterial Nutrition**

a. Nutritional requirements of bacteria (Energy, electron, carbon, nitrogen, oxygen, sulfur, phosphorus, trace element, vitamins, water)
b. Nutritional types of bacteria (Phototrophs, Chemotrophs, Autotrophs & heterotrophs, Obligate parasites
c. Bacteriological media: Types of media, Preparation of media
d. Physical condition required for growth
   (i) Temperature: Psychrophiles, Mesophiles, Thermophiles
   (ii) Gaseous requirements: Aerobic, Anaerobic, Facultative, Microaerophilic, Oxygen toxicity
   (iii) pH (Hydrogen Ion Concentration)
   (iv) Miscellaneous physical requirements: Osmotic pressure

**Unit:2 Bacterial Growth**

a. Bacterial and Archaeal reproduction by binary fission
b. Bacterial cell cycle
c. Bacterial Growth curve
**d.** Chemostat and turbidostatic for Continuous culture

**Unit: 3 Determination of growth**

**a.** Total count: Direct microscopic count, Electronic enumeration of cell numbers (Electronic particle counter), Determination of cell dry weight, Turbidimetric method
**b.** Viable count: Plate count method (SPC), Membrane filter count, MPN
**c.** Cell activity: Determination of nitrogen content, Substrate utilization, Product formation, Cell Components

**Unit: 4 Structure of Bacterial cell**

a. Nature, arrangement, structure and role of flagella

b. Nature and significance of pili, prosthecae and stalks
c. Nature and significance of capsule, bacterial cell wall, Cell membrane and Mesosomes
d. Bacterial cytoplasm and cell organelles: Cytoplasm, cytoplasmic inclusions, nuclear Material
**e.** Bacterial endospore: Spore structure, sporulation and spore germination

## PRACTICAL

1. Endospore staining (Dorner's method)
2. Capsule Staining (Hiss's method)
3. Cell wall staining – Dyar's method
4. Influence of oxygen on growth of bacteria and Cultivation of Anaerobic bacteria (Thioglycollate medium).
5. Determination of bacterial growth at different pH
6. Determination of bacterial growth at different temperature
7. Determination of bacterial growth at different NaCl concentration

**References:**


- **Prescott's Microbiology** Willey J.M., Sherwood L.M. and Woolverton C.J., (2017), 10th Edition, McGraw - Hill Education, **(**ISBN: 978-981-3151-26-0)
- **Prescott, Harley and Klein's Microbiology**., Willey J.M., Sherwood L.M. and Woolverton C.J., (2008) , 7th Edition, McGraw - Hill Education, (ISBN: 978-007- 126727-4)
- **Microbiology**: Pelczar M J, Chan E C S and Kreig N R. Tata McGrow- Hill Edition.
- **General Microbiology**: Stanier R Y, Ingraham J L, Wheelis M L, Painter P R. Mac Millan Press Inc.
- **Microbiology: An introduction**: Tortora G J, Funke B R and Case C L. Pearson Education Inc
- **Microbiology: Principles and Explorations:** Black J G. John Wiley & Sons, Inc.
- **Microbiology:** Willey J M, Sherwood L M, Woolverton C J. Mac Millan Press Inc.
- **Elementary Microbiology:** H. A. Modi, Akta Prakashan.
- **Principles of Microbiology:** Atlas R M. Wm. C. Brown Publishers

SILVER OAK UNIVERSITY
EDUCATION TO INNOVATION
(Established under Gujarat Private Universities Act, 2009)

| **Subject: -** General Chemistry- II | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Program: B.Sc.** | | | | **Subject Code:** | | | **Semester: II** | |
| | | | | | | | | |
| **Teaching Scheme** | | | | **Examination Evaluation Scheme** | | | | |
| **Lecture** | **Tutorial** | **Practical** | **Credits** | **University Theory Examination** | **University Practical Examination** | **Continuous Internal Evaluation (CIE)- Theory** | **Continuous Internal Evaluation (CIE)- Practical** | **Total** |
| 03 | - | - | 3 | 24/60 | - | 16/40 | - | 100 |

### UNIT-I ALKYL AND ARYL HALIDES

Homolytic and Heterolytic chemistry, Classificaiton, Preparation, Reaction: Nucleophilic aliphatic substitution, SN2 Reaction: Mechanism & kinetics, Reactivity & steric hindrance, SN1 Reaction: Mechanism & kinetics, Carbocation, Structure of carbocation, Relative stability of carbocations, Stability of carbocation: polar effect, Rearrangement of carbocation, Reaction, Low reactivity of aryl and vinyl halides, Structure of aryl and vinyl halids, Nucleophilic aromatic substitution, Bimolecular displacement for nucleophilic aromatic substitution, Reactivity in nucleophilic aromatic substitution, Orientation in nucleophilic aromatic substitution, Electron withdrawal by resonance, Elimination-Addition mechanism, Benzynes, Problems.

### Unit – II CHEMICAL BONDING

The Lewis Theory, Sidgwick-powell Theory, Valance shell Electron pair Repulsion Theory (VSEPR), Effect of Lone Pair, Effect of electron negativity, Isoelectronic Principle, Some examples using VSEPR Theory like BF3 and the $[BF_4]$- ion, Ammonia $NH_3$, Water $H_2O$, Phosphorus pentachloride $PCl_5$, Chloride trifluoride $ClF_3$, Sulphur tetrsfluoride $SF_6$, The triiodode ion $I_3$-, Sulphur tetrafluoride $SF_4$, Iodine heptafluoride $IF_7$.

LCAO method, s-s combination of orbitals, s-p combination of orbitals, p-p combination of orbitals, Rules of linear combination of atomic orbitals, Examples of molecular orbital Treatment for Homo Nuclear Diatomic Molecules ($H_2$+ , $H_2$, $He_2$+, $He_2$, $C_2$, $O_2$, $B_2$, $F_2$**).**

SILVER OAK UNIVERSITY
EDUCATION TO INNOVATION
(Established under Gujarat Private Universities Act, 2009)

## UNIT-III

### A] CHEMISTRY OF D-BLOCK ELEMENTS

Position of d-block elements in the periodic table, Electronic configuration and definition, Classification of d-block elements in 3d, 4d, 5d and 6d series.

### [B] FUNDAMENTAL CONCEPT OF COORDINATION CHEMISTRY

Definition of some terms, Classification of ligands, Chelate, chelating ligand and Chelation, Classification of chelates, Uses of Chelates, Co-ordination number and Stereochemistry of complexes, Nomenclature of co-ordination compounds.

## UNIT-IV

### CHEMICAL KINETICS

Introduction, Reaction rate constant, Concentration Effects, Differential Rate Law, Integrated Rate Law (including first order, second order with one reactant and two reactant and zero order, half lifetime of a reaction, Methods of determining Order of reaction, Mechanism and rate law, reaction rates and equilibria, temperature effect, Numerical Problems based on above topics.

### Reference


- Barrow, G. M., Physical chemistry (6th Edition).
- Bahl, B.S., Tuli J. D., and Bahl, A, Essentials of Physical Chemistry.
- Prakash S., Tuli, G. D.,Basu, S. K., Madan R. D., Advance inorganic chemistry (Vol. - II).
- Mahan, B.H. University Chemistry, 3rd Ed. Narosa.
- Morrison, R. T. & Boyd, R. N., Organic chemistry (6th edition).


SILVER OAK UNIVERSITY
ज्ञानं परमं भूषणम्
SILVER OAK
UNIVERSITY
EDUCATION TO INNOVATION
(Established under Gujarat Private Universities Act, 2009)