GUJARAT VIDYAPEETH : AHMEDABAD

M.D. Gramseva Mahavidyalaya, Sadra,
Dist: Gandhinagar

Department of Microbiology

Semester-III
(In Force from June-2011)

GUJARAT VIDYAPEETH : AHMEDABAD
M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar
Department of Microbiology
Semester-III
(In Force from June-2011)
MIC-301: Microbial World
(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

UNIT-1		**Evolution of life**	**06 Hours**
		i) Evolution of life	**02 Hours**
		(ii) Origin of microorganisms	**02 Hours**
		(iii) Introduction to microbial diversity	**02 Hours**
UNIT-II		**The place of microorganisms in the living world.**	**06 Hours**
	(1)	Earlier Linnaeus classification scheme	**01 Hour**
	(2)	The protista : The third kingdom	**01 Hour**
	(3)	Whittaker's five-kingdom concept	**01 Hour**
	(4)	Woeses- 3 kingdom systems	**01 Hour**
	(5)	Kingdom Procaryotae after Bergey's manual on systematic bacteriology	**01 Hour**
	(6)	Taxonomic status of viruses	**01 Hour**
UNIT-III		**Introduction to prokaryotes and acellular forms - virus**	**09 Hours**
	(1)	Bacteria- General characteristics, structures, economic importance and reproduction	**05 Hours**
	(2)	Virus - General characteristics, structures, economic importance	**04 Hours**
UNIT-IV		**Introduction to eukaryotes**	**09 Hours**
	(1)	Fungi- General characteristics, economic importance	**03 Hours**
	(2)	Algae- General characteristics, structures, economic importance and reproduction	**03 Hours**
	(3)	Protozooa-General characteristics, structures, economic importance and reproduction	**03 Hours**

* **Reference books**

(1) Elementary Microbiology (Vol-I and Vol-II) Fundamentals of microbiology), Dr. H.A.Modi; (Aug 1995) AKTA Prakashan, Nadiyad-387001

(2) Textbook of microbiology (8th edition), Ananthanarayan and paniker (2009), University Press (India) Pvt. Ltd. Hydrabad

(3) Microbiology,
Michael J.PelczarJR., E.C.S.Chan;
Noel R.Krieeg (5th edition-1993
Tata McGraw-Hill edition 1993

(4) Biology of microorganisms
Brock
Michael T.Modigan
Prentice Hall International

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Department of Microbiology
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(In Force from June-2011)

MIC-301: Microbial World

(Syllabus of PRACTICAL portion) (In force from June, 2010)
Total Mark: 25= External Evaluation: 20 Marks +
Internal Evaluation: 05Marks)
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1 Preparation of N-broth and N-agar
2 pH adjustment of media by Lovibond, pH meter
3 Cultivation of bacteria; broth, slant, stab

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(In Force from June-2011)
MIC-302: Morphology and cytology of microorganisms
(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

UNIT-1		**Advanced technique for studying ultra structure of microorganisms**	**10 Hours**
	(i)	Microtome	
	(ii)	Ultra centrifuge	
	(iii)	Electron microscope	
	(iv)	Biostatistics and computer applications in microbiology	
UNIT-II		**Prokaryotic cells: structure and functions**	**12 Hours**
	(a)	Typical prokaryotic cellular organization	**01 Hour**
		Size, shape and arrangement of bacteria	
		Introduction to Archaeobacteria and Eubacteria	**01 Hour**
	(b)	Surface appendages of bacteria	**02 Hours**
		Flagella - general characters, arrangements, ultra structure, role of flagella in movement. Tactic behaviour of flagellated bacteria.	
		General characters and significance of pili, prosthecae and stalks.	
	(c)	Surface layers of bacteria.	**01 Hour**
		General nature, chemistry and significance of capsual and slime layer.	
		Cell walls : general nature and composition of cell walls of Gram positive and Gram negative bacteria, their significance to bacteria, protoplast and spheroplasts.	**02 Hours**
	(d)	Internal cell structures.	
		Cell membrance : general nature, composition and functions	**02 Hours**
		Mesosomes and other internal membrance structures: their general nature and significance.	
		Cytoplasm, ribosomes, cytoplasmic inclusions, vacuoles, nuclear material.	**01 Hour**
	(e)	Bacterial endospores : general structure and composition sporulation process cytological and	**02 Hours**

biochemical changes during sporulation process, parasporal bodies, spore germination-activation,germination and outgrowth.

UNIT-III **Viruses and Algae** **04 Hours**

(1) Capsid and envelop:capsid, envelop,spikes, nonenveloped. **03 Hours**

(2) General Morphology :helical, polyhedral, (Icosahadral) enveloped, complex viruses, viral envelopes & enzymes viral genomes **01 Hour**

General characteristics and economic importance of algae **01 Hour**

UNIT-IV **Fungi and Protozoa** **04 Hours**

General characteristics, reproduction and economic importance of fungi **03 Hours**

(1) Structure : somatic and ultra structure

(2) Structural modification : Reproduction & hyphal modification

(3) Reproduction

(4) Economic importance

Structure of Protoza **01 Hour**

*** Reference books**

(1) Elementary Microbiology (Vol-I & Vol-II Fundamentals of microbiology)
Dr. H.A.Modi; (Aug 1995)
AKTA Prakashan, Nadiyad-387001

(2) Microbiology
Michael J.PelczarJR., E.C.S.Chan;
Noel R.Krieg (5th edition-1993
Tata McGraw-Hill edition 1993

(3) Introductry Mycology
C.J.Alexopoulos
C.W.Mims
M.Blackwell

(4) Microbiology : An introduction, Tortora ,Funke, and Case, 8th edition (2004. Pearson education pvt. Ltd. Singapore

(5) General Microbiology; Stanier, Ingraham, Wheetis and Pamter, 5th edition (1987), Macmullan press ltd. London

(6) Microbiology, Prescott, Harley and Klein, 7th edition (2008) , Mcgraw hill, New York.

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M.D. Gramseva Mahavidyalaya, Sadra, Dist: Gandhinagar
Department of Microbiology
Semester-III
(In Force from June-2011)
MIC-302: Morphology and cytology of microorganisms
(Syllabus of PRACTICAL portion)
Total Mark: 25= External Evaluation: 20 Marks +
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1 Isolation of bacteria by streak plate, pour plate, spread plate technique
2 Structural stain; endospore, cellwall, capsule, granule staining

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(In Force from JUNE-2011)
MIC-303: *INTRODUCTION TO MICROBIAL PHYSIOLOGY*
(Syllabus of theoretical portion)
Total Mark: 50= External Evaluation: 40 Marks +
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(Total Teaching Hours=30, Credit=02)

UNIT:1. PRINCIPLES OF MICROBIAL NUTRITION: (1) (06 HOURS)

(a) Basic nutritional requirements of Microorganisms: macro and micronutrents, Chemical , physical and Gaseous requirements **(02 lectures)**

(b) Significance of nutrients for the procurement of energy **(01 lectures)**

(c) Nutritional categories**:** Introduction to diversities in microbial nutrition, Nutritional classification of bacteria on the basis of :Sources of carbon, energy, electron donor, oxygen requirements, Temperature requirements.
Miscellaneous parameters:viz. PH, Osmotic pressure , salt requirements and hydrostatic pressure. **(03 lectures)**

UNIT:2. PRINCIPLES OF MICROBIAL NUTRITION: (2) (05 HOURS)

(a) Culture media**:** Principles of media of each ,Construction and Media Ingredients, Types of media (1) Natural (2) Synthetic (3) Complex (4) Solid (5)Semisolid (6) Broth (7) Routine and specialized (8) Selective , Differential , EnriChed, Enrichment , Enumeration , Assay and Maintainance media. **(03 lectures)**

(b) Modes of nutritional uptake: entry of nutrients in the cell, passive Diffusion, Facilitated diffusion and active transport, Utilization of Nutrients that cannot enter cell (extra cellular digestion) **(02 lectures)**

UNIT:3. MICROBIAL GROWTH: (10 HOURS)

(a) Reproduction methods, New cell formation **(01 lecture)**
(b) GROWTH: Definition, growth rate and generation time, Kinetics of growth and growth equation. **(02 lectures)**
(c) Measurement of Growth: Cell mass and cell number. **(02 lectures)**
(d) Normal growth curve of Bacteria **(01 lecture)**
(e) Diauxic growth, Continuous growth, Synchronous growth **(02 lect.)**
(f) Efficiency of growth, Growth yield, Maintainance energy **(01 lecture)**

(g) Effect of environment on the growth: temp.,pH, water activity, magnetisum, nutrients, radiation, redox potential, solutes, salt tolerance, Osmotic and hydrostatic pressure. **(03 lectures)**

UNIT:4. ENZYMOLOGY ***(09 HOURS)***

(1) Biocatalyst: General characters of enzymes, Physico-Chemical Properties of enzymes, localization of enzymes: extracellular and intracellular, Nomenclature and classification of enzymes. **(03 lectures)**

(2) Mechanism of enzyme action: Role of active sites, factors affecting enzyme activity: substrate conc., enzyme concentration, pH, temperature, enzyme inhibition: competitive and non competitive **(02 lectures)**

(3) Enzyme kinetics **(02 lectures)**

Michalis Menton equation, Lineweaver Burk plot, Significance of Km and Vmax.

(4) Regulation of enzyme activity **(02 lectures)**

a. Significance of metabolic regulation

b. Types of regulatory mechanisms: Feedback inhibition and their types. Energy linked control, Precursor activation and zymogen activation.

c. Allosteric enzymes and their role as regulatory enzymes

d. Mechanism of allosteric transitions and types of regulatory effectors.

<u>REFERANCE BOOKS</u>

1. Microbiology, Pelczar, M.J.; Chan, E.C.S.; Kreig N.R.: Mc Graw Hill Book Company

2. General Microbiology, Stainer R.Y., Ingraham Wheelis, M.L.Painter, P.R. Mac Millan India.

3. Introduction to Microbiology by J.L. Ingraham and C.A. Ingraham, 2000

4. Microbiology by J. G. Black, 2002

5. Elementary Microbiology by H.A. modi (vol-I)
Akta Prakashan, Nadiad

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(In Force from December-2011)
MIC-303: *INTRODUCTION TO MICROBIAL PHYSIOLOGY*
(Syllabus of PRACTICAL portion)
Total Mark: 25= External Evaluation: 20 Marks +
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1 Effect of pH, Temperature, pressure on growth on bacteria
2 Study of extra-cellular enzyme activity; amylase and geletinase

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(In Force from JUNE -2011)

CHEM-301: Organic Chemistry-I

(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

Unit-1(A): Stereochemistry

(10 Marks) (08 Hours)

1(A).1 Definition of stereochemistry and stereoisomerism **(0.5 hour)**

1(A).2 Configurational isomers: cis-trans isomers (for acyclic and cyclic compounds) **(0.5hour)**

1(A).3 E-Z nomenclature **(1hour)**

1(A).4 Chirality **(1hour)**

1(A).5 Configurational isomers: isomers with one and more than one chiral centre (Lactic acid, Tartaric acid, 2,3-dibromopentane, 3-chloro-2-butanol) –enantiomers, diastereomers, mesocompounds **(2hours)**

1(A).6 R-S nomenclature (one and more than one chiral centre) **(2hours)**

1(A).7 Conformational analysis of ethane and n-butane only **(1hour)**

References

1. Organic Chemistry (sixth edition), Robert Thornton Morrison and Robert Neilson Boyd, Prentice-Hall of India Pvt. Ltd., New Delhi,(1999)
2. Organic Chemistry (second edition), Paula Yurkanis Bruice, Prentice-Hall, Inc., New Jersey (1998)

(B): Electrophilic aromatic substitution reaction (10 Marks) (07Hours)

1 (B).1 Electrophilic reagent / electrophilic substitution reaction **(0.5hour)**

1(B).2 Mechanism of nitration, sulphonation, halogenation, friedal craft alkylation, friedal craft acylation **(2hours)**

1(B).3 Classification of substituents groups **(0.5hour)**

1(B).4 Theory of orientation of second group in monosubstituted benzene **(2hours)**

[first substituent is activating / deactivating group]

1(B).5 Orientation of third group in disubstituted benzenes **(0.5hour)**

1(B).6 Conversion [reactions form] based on above topics **(1.5hours)**

References

1 .Organic Chemistry (sixth edition), Robert Thornton Morrison and Robert Neilson Boyd, Prentice-Hall of India Pvt. Ltd., New Delhi (1999)

Unit-2: Carbohydrates-I

(20 Marks)
(15 Hours)

2.1 Definition and classification **(1hour)**
2.2 Nomenclature **(0.5hour)**
2.3 D and L notation **(0.5hour)**
2.4 Configuration of aldose and ketose containing three through six carbon atoms **(2hours)**
2.5 General properties of monosaccharide (Glucose and Fructose): colour, taste, physical state, solubility **(0.5hour)**
2.6 Chemical properties of monosaccharide (Glucose and Fructose): acetylation, oxidation, reduction, cynohydrin formation, oxime formation, osazone formation **(2.5hours)**
2.7 Epimers, epimers of D-glucose, conversion of an aldohexose into its C-2 epimer (mannose) **(1hour)**
2.8 Methods of interconversion of sugars **(2hours)**
- Lengthening the carbon chain of aldoses (The Kiliani Fischer synthesis: aldohexose from aldopentose)
- Shortening the carbon chain of aldoses (The Ruff degradation: aldopentose from aldohexose)

2.9 Configuation of (+) glucose: The Fischer proof **(2hours)**
2.10 Cyclic structure of glucose **(2hours)**
2.11 Biological significance of carbohydrates **(1hour)**

References

1. Organic Chemistry (sixth edition), Robert Thornton Morrison and Robert Neilson Boyd, Prentice-Hall of India Pvt. Ltd., New Delhi,(1999)
2. Principles of Microbiology (second edition), Ronald M. Atlas, Wm.C. Brown Publisher, Iowa, pp.1159-1185 (1997)

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Semester-III

(In Force from June-2010)

CHEM-301: Organic Chemistry-I

(Syllabus of PRACTICAL portion) (In force from June, 2010)

Total Mark: 25= External Evaluation: 20 Marks +

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(Total Teaching Hours=45, Credit=02)

Qualitative analysis of organic compounds (45 hours)

Candidates are expected to perform the following tests for the organic compounds

(1) Nature of compound: acidic, basic, phenolic, neutral based on solubility tests
(2) Presence of elements: Lassaigne's test (C, H, N,S,X)
(3) Identification of functional groups:

-COOH	>C=O
-OH (alcoholic)	$-NH_2$
-OH (phenolic)	$-NO_2$
-CHO	$-CONH_2$
-CH	-X

(4) B.P. / M.P.
(5)Identification of compound

List of organic compounds for qualitative analysis

Compounds	Acidic	Basic	Phenolic	Neutral
C, H, O elements	Tartaric acid Citric acid Phthalic acid Benzoic acid Oxalic acid Succinic acid	xxxxxxxxx	Phenol α-Naphthol β-Naphthol Resorcinol	Methanol Ethanol Benzaldehyde Acetone Acetophenone Benzene Toluene Naphthalene
C, H, O, N elements	Anthranilic acid p-Nitrobenzoic acid	Aniline o-Nitroaniline m-Nitroaniline	o-Nitrophenol p-	Acetamide Benzamide Nitrobenzene

		p-Nitroaniline α-Naphthylamine	Nitrophenol	Urea
C, H, O, N, S elements	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	Thiourea
C, H, O, X elements	xxxxxxxxx	xxxxxxxxx	xxxxxxxxx	Chloroform Carbontetrachloride Chlorobenzene Bromobenzene

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CHEM-302: Analytical Chemistry-I

(Syllabus of theoretical portion) (In force from June, 2010)

Total Mark: 50= External Evaluation: 40 Marks +

Internal Evaluation: 10Marks)

(Total Teaching Hours=30, Credit=02)

Unit-1(A): Introduction of analytical chemistry **(10 Marks) (7 Hours)**

1(A).1 Role of analytical chemistry **(1hour)**
1(A).2 Classification of analytical methods: chemical and instrumental methods **(1hour)**
1(A).3 Advantages and limitations of chemical and instrumental methods **(3hours)**
1(A).4 Literatures of analytical chemistry **(1hour)**
1(A).5 Safety in analytical / chemistry laboratory **(1hour)**

References

1. Fundamental of Analytical Chemistry (seventh edition), Douglas A.Skoog, Donald M.West and F.James Holler, Saunders college publishing, New York, pp. 1-10,81(1996)
2. Anatytical Chemistry(sixth edition), Gray D.Christain, John Wiley and Sons,Inc., Singapore, pp.1-14(2003)

Unit-1(B): Complexometric titrations **(10 Marks) (8Hours)**

1(B).1 Introduction **(0.5hour)**
1(B).2Classification of ligands **(0.5hour)**
1(B).3 Structure and acidic properties of EDTA **(0.5hour)**
1(B).4 Complexes and formation constant: How stable are complexes? **(1hour)**
1(B).5 Effect of pH on EDTA equilibria **(1hour)**
1(B).6 Types of EDTA titrations: direct titration, back titration, substitution titration **(1 hour)**
1(B).7 Indicators for EDTA titrations / metal ion indicators **(2 hours)**
- working mechanism
- Preliminary information of metal ion indicators- Murexide, Eriochrome black T, xylenol orange

1(B).8 Masking and demasking agents **(1.5 hours)**

References

1. Anatytical Chemistry (sixth edition), Gray D.Christain, John Wiley and Sons,Inc., Singapore, pp.294-312(2003)
2. Fundamental of Analytical Chemistry (seventh edition), Douglas A.Skoog, Donald M.West and F.James Holler, Saunders college publishing, New York, pp. 278-302(1996)
3. Vogel's Text Book of Quantitative Chemical Analysis (fifth edition), Longman Scientific and Technical Publish Group, England, pp. 309-323 (1991)

Unit-2: Acid-base titrations

(20 Marks)
(15 Hours)

2.1 Introduction **(1hour)**
2.2 Neutralization of strong acid with a strong base by pH metry **(2hours)**
2.3 Neutralization of weak acid with a strong base by pH metry **(2hours)**
2.4 Neutralization of weak base with a strong acid by pH metry **(2hours)**
2.5 Titration of mixture of strong acid and weak acid / base by pH metry **(1hour)**
2.6 Comparative study of different nature of curves for 2.2 to 2.5 **(1hour)**
2.7 Acid-base indicators: definition, theory and Henderson-Hasselbach equation **(2hours)**
2.8 Application of acid-base titrations **(2hours)**
-Reagents for neutralization titrations: preparation and standardization of acids / bases
-The determination of inorganic substances (ammonium salts, nitrates and nitrites, carbonates and carbonate mixtures)
-The determination of organic functional groups (carboxylic and sulphonic acid groups, amine groups, ester groups, hydroxyl groups (Phenolic), carbonyl groups)
2.9 Numerical based on 2.2 to 2.4, 2.7 **(2hours)**

References

1. Anatytical Chemistry (sixth edition), Gray D.Christain, John Wiley and Sons,Inc., Singapore, pp.266-286(2003)
2. Fundamental of Analytical Chemistry (seventh edition), Douglas A.Skoog, Donald M.West and F.James Holler, Saunders college publishing, New York, pp. 248-265 (1996)

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(In Force from June-2010)

CHEM-302: Analytical Chemistry-I

(Syllabus of PRACTICAL portion) (In force from June, 2010)

Total Mark: 25= External Evaluation: 20 Marks +

Internal Evaluation: 05Marks)

(Total Teaching Hours=45, Credit=02)

(A) Solution preparation and standardization (30 Hours)

(1) Preparation and standardization of potassium permanganate solutions (approximately 0.05N) **(3 hours)**

(2) To determine normality of given ferrous ammonium sulphate / ferrous sulphate solution using standard potassium permanganate solutions **(3 hours)**

(3) Preparation and standardization of potassium dichromate solutions (approximately 0.05N) **(3 hours)**

(4)To determine normality of given ferrous ammonium sulphate / ferrous sulphate solution using standard potassium dichromate solutions **(3 hours)**

(5) Preparation and standardization of sodium thiosulphate solutions (approximately 0.1N) **(3 hours)**

(6)To determine normality of given iodine solution using standard sodium thiosulphate solutions **(3 hours)**

(7)Preparation and standardization of EDTA solutions (approximately 0.01N) **(3 hours)**

(8)To determine normality of given $MgCl_2$ solution using standard EDTA solutions **(3 hours)**

(9)Preparation and standardization of silver nitrate solutions (approximately 0.02N) **(3 hours)**

(10)To determine normality of given KCl solution using standard silver nitrate solutions **(3 hours)**

(B) Acid-base titrations by pH metrically and conductometrically (15 Hours)

(1) HCl $\longrightarrow$ NaOH **(6 hours)**

(2) $CH_3COOH \longrightarrow$ NaOH **(6 hours)**

(3) HCl + $CH_3COOH \longrightarrow$ NaOH (by pH metrically only) **(3 hours)**

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Semester-III
(In force from June-2011)

Paper No:- ENG -301
Paper Name:- English
(Syllabus of theoretical portion)
Total Marks: 50 (External evaluation : 40 marks)
(Internal evaluation : 10 marks)
Credit :- 2
Time duration:- 30 hours/Paper/Semester

Unit-1 Text (35%)
Developing English Skills by P.K.Thaker, S.D.Desai, T.J. Purani, Published by Oxford University Press, 200e impression.
Lessons:

1) A difficult customer
2) Lover's Reunion
3) What I …… No Books !
4) Quicksand
5) Blood, Toil, Sweat and Tears.

Unit-2 : Vocabulary (25%) (from the lessons taught)

1) Match the words with their correct meanings.
2) Make meaningful sentences by using the words
3) Use idiomatic phrase/expression in your sentence.

Unit-3 : Grammar (25%)

1) Tenses
2) Prepositions
3) Modals
4) Adjectives and Adverbs.

Unit-4 : (15%)

1) Paragraph writing
2) Application
3) Translation : Eng. To Gujarati (Sentence)

Unit-5 Composition (10%)
In unseen paragraph.

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EC-301: *SCIENTIFIC WRITING*

(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

1	Basic rules of writing
2	Comments on scientific language
3	Drafting the manuscript
4	Choosing a journal
5	Preparing a graph
6	Drawings
7	Figure legends
8	How to design tables
9	Title
10	Authors
11	Abstracts
12	Introduction
13	Methods
14	Results
15	Discussion
16	Acknowledgements
17	Reference
18	Numbers
19	abbreviations
20	How to presents statistical results
21	Typing
22	Correcting proofs

Reference:
(1) Gustavii, B. 2008

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EC-302: SCIENTIFIC ILLUSTRATION SKILLS
(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

Objective: To develop proper and methodological approach of illustration, design needed in scientific publications.

1	Introduction to Scientific Illustration
2	Drawing and diagrams
3	Photographs
4	Charts and tables
5	Molecular graphics
6	Graphs and software
7	The journal, Figures
8	Slides
9	Posters
10	Using an illustrator
11	Using of computer
12	Drawing by hand

Reference:

Briscoe, M. H, 1995. Preparing Scientific illustrations; A guide to better poster, presentations, springllur, II edition

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EC-303: *INTELLECTUAL PROPERTY RIGHTS*
(Syllabus of theoretical portion) (In force from June, 2010)
Total Mark: 50= External Evaluation: 40 Marks +
Internal Evaluation: 10Marks)
(Total Teaching Hours=30, Credit=02)

Objective: The paper intends to give and introductory idea regarding intellectual property legislation and their impact especially in biological research

1 Intellectual Property Rights; conceptualization
2 Protection of inventions; A bird view of patent laws in India
3 Patenting and inventions of biotechnology; new trends in patent law
4 Protection of plant varieties and farmers rights under intellectual regime in India
5 Protection copyrights; an apraisan of copyright law in India
6 Impact of TRIPs on IPR laws in India; a post TRIPs scenario
7 IPR in corporate world; a case study of bioinformatics
8 Patenting of necessary; pros and cons; a case study of product patenting of food/agricultural products and pharmaceutical industries
9 Patenting genetically modified life forms; patenting of life

Reference:

Srinivasulu. N. S. 2007 IPR. Reagal Publication