Sadguru Gadage Maharaj College, Karad

(An Autonomous College)

Reaccredited by NAAC with 'A+' Grade

Syllabus
For

M.Sc. II Zoology
(Semester Pattern)
M.Sc. Sem. III and Sem. IV

Under
Choice Based Credit System
(CBCS)

Syllabus to be implemented
from
June, 2023 onwards

M.Sc. II Zoology
(Semester Pattern)
M.Sc. Sem. III and Sem. IV

	Semester III
Paper IX	**Z22-301 Genetics**
Paper X	**Z22-302 Enzymology**
Paper XI	**Z22-303 Animal Physiology**
Paper XII	**Z22-304 Applied Physiology**
Practical V	**ZP22-305 Practical based on paper – IX & X**
Practical VI	**ZP22-306 Practical based on paper – XI & XII**

	Semester IV
Paper XIII	**Z22-401 Animal Cells in Biotechnology**
Paper XIV	**Z22-402 Toxicology and Immunology**
Paper XV	**Z22-403 Physiology of Health**
Paper XVI	**Z22-404 Clinical Physiology**
Practical VII	**ZP22-405 Practical based on paper – XIII & XIV**
Practical VIII	**ZP22-406 Practical based on paper –XV & XVI**

Rayat Shikshan Sanstha's

Sadguru Gadage Maharaj College, Karad

(An Autonomous College)

I) Title: Zoology
II) Year of Implementation: 2023-2024
III) Structure of Course:
1. Structure of Syllabus:

M.Sc. – II Semester –III

Sr. No.	Course Title	Theory			Practical		
		Paper No.& Paper Code	No. of lectures Per week	Credits	Course Title	No. of lectures per week	Credits
1	Zoology	Paper-IX: Z22-301	04	04	Practical V Paper –IX & X: ZP22 305	04	04
		Paper-X: Z22- 302	04	04			
		Paper-XI: Z22-303	04	04	Practical VI Paper XI & XII: ZP22 306	04	04
		Paper-XII: Z22 -304	04	04			

M.Sc. – II Semester –IV

Sr. No.	Course Title	Theory			Practical		
		Paper No.& Paper Code	No. of lectures Per week	Credits	Course Title	No. of lectures per week	Credits
1	Zoology	Paper-XIII: Z22 -401	04	04	Practical VII Paper – XIII&XIV: ZP22- 405	04	04
		Paper-XIV: Z22 -402	04	04			
		Paper-XV: Z22 -403	04	04	Practical VIII Paper – XV & X VI :ZP22 406	04	04
		Paper-XVI: Z22 -404	04	04			

M.Sc. Part-II Semester III
Credits- 24

M.Sc. course has semester pattern and choice Based Credit System (CBCS). The following table shows the details about structure, marks system of Internal, theory and practical examination.

Subject Code	Paper	Title of paper / Practical	Hours / Week	CIE marks	Exam Marks	Total Marks	Credits
Z22-301	Paper–IX	Genetics	4	20	80	100	4
Z22-302	Paper–X	Enzymology	4	20	80	100	4
Z22-303	Paper–XI	Animal Physiology	4	20	80	100	4
Z22-304	Paper–XII	Applied Physiology	4	20	80	100	4
ZP22-305	Practical-V	Practical based on paper – IX & X	4	-	100	100	4
ZP22-306	Practical-VI	Practical based on paper – XI & XII	4	-	100	100	4

M.Sc. Part-II Semester IV

Credits- 24

M.Sc. course has semester pattern and choice Based Credit System (CBCS). The following table shows the details about structure, marks system of Internal, theory and practical examination.

Subject Code	Paper	Title of paper / Practical	Hours / Week	CIE marks	Exam Marks	Total Marks	Credits
Z22-401	Paper–XIII	Animal Cells in Biotechnology	4	20	80	100	4
Z22-402	Paper–XIV	Toxicology and Immunology	4	20	80	100	4
Z22-403	Paper–XV	Physiology of Health	4	20	80	100	4
Z22-404	Paper–XVI	Clinical Physiology	4	20	80	100	4
ZP22-405	Practical-VII	Practical based on paper – XIII & XIV	4	00	100	100	4
ZP22-406	Practical-VIII	Practical based on paper – XV & XVI	4	00	100	100	4

M. Sc. II Semester III Evaluation Pattern

Course/Subject	TH/PR	CCE		SEE		Total
		Max	Min	Max	Min	
Paper IX Z22-301 **Genetics**	TH	20	08	80	32	100
Paper X Z22-302 **Enzymology**	TH	20	08	80	32	100
Paper XI Z22- 303 **Animal Physiology**	TH	20	08	80	32	100
Paper XII Z22- 304 **Applied Physiology**	TH	20	08	80	32	100
Z22P-305 and 306 Practical V (Paper No. IX and X) & Practical VI (Paper No. XI and XII)	PR	---	---	200	80	200

M. Sc. II Semester IV Evaluation Pattern

Course/Subject	TH/PR	CCE		SEE		Total
		Max	Min	Max	Min	
Paper XIII Z22-401 **Animal Cells in Biotechnology**	TH	20	08	80	32	100
Paper XIV Z22-402 **Toxicology and Immunology**	TH	20	08	80	32	100
Paper XV Z22-403 **Physiology of Health**	TH	20	08	80	32	100
Paper XVI Z22-404 **Clinical Physiology**	TH	20	08	80	32	100
ZP22-405 and 406 Practical VII (Paper No. XIII and XIV) & Practical VIII (Paper No. XV and XVI)	PR	---	---	200	80	200

M.Sc. Zoology
M. Sc. II – Sem. III

Paper IX Z22 301: Genetics

Credit:–04

Unit- I Human Cytogenetics **(15 Hrs)**

• Techniques in human chromosome analysis
• Human karyotype - banding, nomenclature
• Genetics basis of sex determination in human beings
Y linked genes, X linked genes, Dosage compensation, and testicular feminization Syndrome.
• Numerical abnormalities of human chromosomes and related syndrome
Nondisjunction, Aneuploidy, Patau syndrome, Edward syndrome, Down syndrome, Turner syndrome and Klinefelter syndrome
• Structural abnormalities of human chromosomes and related syndromes
Robertsonian Translocation

Unit- II- Microbial Genetics and Population Genetics **(15 Hrs)**

• Bacterial transformation, transduction and conjugation
• Genetic variation in natural population, phenotypic variation
• Hardy- Weinberg principle, Genetic drift, Genetic pool
• Molecular analysis of quantitative traits
• Inbreeding depression and heterosis.

Unit- III- Mutations **(15 Hrs)**

• Introduction to the mutation, mutation and environment, Spontaneous versus induced mutation.
• Phenotypic effects of mutations.
• Somatic and germinal mutation.
• Pleiotropy, back mutation and suppressor mutation
• Molecular basis of genetic mutation
• Radiation induced mutation- Ionizing and non- ionizing
• Chemical induced mutation
• Mutation and DNA repair mechanism
• Mutation frequency
• Practical application of genetic mutations
• Mutagenicity and carcinogenicity.
• Mutations and human welfare

Unit- IV- Basis of genetic counseling **(15 Hrs)**

• Introduction to genetic counseling
• Karyotypic analysis- normal and abnormal chrosomes
• Ethical and psychological approach of genetic counseling
• Family pedigree, Genetic inheritance and investigations
• Inheritance and acquired genetic defects
• Easy treatments in genetic counseling.
• Prenatal genetic counseling and diagnosis.
• Avoidance of risk factor with genetic diseases

Reference Books:

Concepts of Genetics By Klug and Cummings
Principles of Genetics By Tamarind
Genetics By Strickberger
Facts of Genetics By Robert Edger
Introduction to biochemical genetics By Mather and Jinks
Molecular Genetics By Gunther Stint
Principles of Genetics By Peter, Snustad and Michael
Genetics of population by Philip Hedrick
Principles of Population Genetics By Hartl and Clark
Gene Clones By Ernst Winnacker

M.Sc. Zoology
M. Sc. II – Sem. III
Paper X Z22 302 - Enzymology
Credit:–04

Unit- I: **(15 Hrs)**

Classification and Nomenclature of Enzymes, Isoenzymes, Multienzyme Complexes
Cofactors
Inorganic
Organic: Pyridoxyl Phosphate, Biotin, Lipoic acid, Thiamine diphosphate, Flavin nucleotides, Nicotinamide

Unit- II: **(15 Hrs)**

Purification of Enzymes
Objectives and strategies
Methods of separation: Centrifugation, Dialysis, Gel-filtration, Ion Exchange chromatography,
Electrophoresis, Isoelectric focusing, Affinity chromatography.
Structure of Enzymes
23Primary, Secondary, tertiary and quaternary
Active sites and Allosteric sites
Structure of chymotrypsin

Unit- III: **(15 Hrs)**

Enzyme Kinetics
Relationship between initial velocity and substrate concentration
Michaelis Menten equation
Briggs Haldane Hypothesis
The Line Weaver Burk Plot
The Halden relationship for reversible reaction
Effect of Modifiers on enzyme Kinetics
Effect of temperate
Thermal denaturation
Effect of pH
Enzyme Actions of
Chymotrypsin
Fructose bisphosphate aldolase

Unit- IV: **(15 Hrs)**

The control of Enzyme Activities by Non Genetic Mechanism
Enzymes in Organised System
RNA nucleotidyl transferase
The Pyruvate dehydrogenase
Enzyme Technology
Use of isolated enzymes in industrial processes
Immobilized enzymes

Suggested Reading Material:

Fundamentals of Enzymology : Price N.C. and L. Stevens e.. Oxford, New York.
Dixon, M., Webb, E.C; et al. (3rd Ed.) Longman, London.
Methods in Enzymology all volumes.
Scopes, R.K. Protein Purification, Principles and Practice.
Ferdinand, W. (1976) fundamentals of enzyme kinetics, Butterworths, London.
Enzyme by Palmer.
Niggins, I.J. Best D.J. and Jones, J. Biotechnology – Principles and applications, Black well, scientific oxford (1985).
Bulock, J. and Kristiansen, B- (1987) Basic biotechnology.

M.Sc. Zoology
M.Sc.-II Sem.- III
Paper XI Z22 303 – Animal Physiology
Credit: 04

Unit I: Membrane physiology and Muscle **(15 hrs)**

• Transport of ions and molecules through cell membrane
• Membrane potential and action potentential
• Physiologic anatomy of skeletal and smooth muscle
• Excitation of skeletal muscle
• Neuromuscular transmission
• Excitation –contraction coupling
• Contraction and Excitation of smooth muscle

Unit II: Physiology of sense organs **(15 hrs)**

2.1 Anatomy and physiology of eye
• Optics of eye
• Receptor and neuronal functions of retina.
2.2 Sense of hearing
2.3 Chemical sense –Taste and smell
2.4 Aging and sense organs

Unit III: Physiology of Reproduction: **(15 hrs)**

3.1 Male Reproductive system
3.2 Female Reproductive system
3.3 Contraceptives and birth control
3.4 IVF and Embryo Transfer
3.5 Aging and the reproductive system

Unit IV: Mammalian developmental Physiology **(15 hrs)**

4.1 Maturation of germ cells and fertilization
4.2 Physiology of Cell and Tissue culture
4.3 Embryonic development
4.4 Prenatal diagnostic tests
4.5 Physiological regulation in embryogenesis.
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References:

Human Physiology – by A.C. Guyton. Saunders Company Londan, Toronto.
Shepherd G.M. Neuro Biology, New York Oxford University Press 1987.
Hurst J.W et al (eds) The Heart7th ed. New York McGraw- Hill Book Co. 1990.
Hand Book of Physiology Vols. Circulation. Renkin, E.M. & Micbel, C.C. (eds) Americal Physiological Society, 1984.

Gayton A.C. et al. Circulation Overall regulation Annu Re. Physiol. 34: 13 1972.
Guyton A.C. 1980 Arterial pressure & Hypertension Philadelphia, W.B. Saunders Co- Cartiar output
& its regulation 1973.
Kaplan N.M. et al 1989- The Kidney in Hypertension (Perspectives in hypertension vol.2) New
York. Raven Press.
Guyton A.C. et al 1975 Dy namics & Control of the Body flerids
Philadelphia, W.B. Saunders, Co., 1975.
Brenner B.M. & Rector, F.C. (Jr) 1986. The kidney 3rd ed. Philadelphia, W.B. Saunders Co., 1986.
Brooks V.B. 1986. The neural Basis of motor control New York, Oxford University Press.
Johnson L.R. et al Physiology of the gastrointestind tract 1987 New York Raven press.
Thampson J.C. et al (eds) Gastrointestinal Endocrinology. New York McGraw Hill book co., 1987.
Setchell K.D.R. et al eds 1988. The Bile Acids New York Plenum Pub. Corp.
Guthrie H.A. 1988. Introductory Hutrition 7th ed. St.Lonis C.V. Mosby Co.,
Felig P et al (eds) 1987. Endocrinology & Metabolism New Your MacGraw- Hill Book Co.,
DeGroot L.J. et al 1989. Endocrinology 2nd ed. Philadelphia, W.B. saunders Co. 1989.
Kannan, C.R. 1988. The adrenal gland New York Plenum Pub. Corp.

M.Sc. Zoology
M. Sc. II – Sem. III
Paper XII Z22 304 - Applied Physiology
Credit: 04

Unit I- Environmental physiology **(15 hrs)**

1.1. Physiology of high altitude.
1.2. Physiology of deep sea diving.
1.3. Temperature, light and life.
1.4. Space Physiologya)
Physiological requirement of space travel
b) Adaptations due to space travel

Unit II- Exercise physiology **(15 hrs)**

2.1. Fundamental of physical exercise
2.2. Energy for exercise, Enhancement of energy- Aerobic and Anaerobic power
2.3. Exercise physiology- Muscles in exercise, Respiratory exercise, Cardiovascular system exercise, Nervous system exercise, Body heat in exercise
2.4. Biochemical changes in exercise
2.5. Recovery from exercise.

Unit III- Ergonomics and Industrial physiology **(15 hrs)**

3.1. Man- machine and environment
3.2. Physiology of man and women at work
3.3. Physical fitness and efficiency
3.4. Aging and occupational disease/ hazards
3.5. Problems of Child labour in India.

Unit II- Occupational Physiology **(15 hrs)**

4.1. Work place environment
4.2. Occupational health.
4.3. Occupational stresses
4.4. Occupational hazards and diseases
4.5. Management of Occupation hazards and diseases

References:

Human Physiology – by A.C. Guyton. Saunders Company Londan, Toronto.
Shepherd G.M. Neuro Biology, New York Oxford University Press 1987.
Hurst J.W et al (eds) The Heart7th ed. New York McGraw- Hill Book Co. 1990.
Hand Book of Physiology Vols. Circulation. Renkin, E.M. & Micbel, C.C. (eds) Americal Physiological Society, 1984.
Gayton A.C. et al. Circulation Overall regulation Annu Re. Physiol. 34: 13 1972.

Guyton A.C. 1980 Arterial pressure & Hypertension Philadelphia, W.B. Saunders Co- Cartiar output
& its regulation 1973.
Kaplan N.M. et al 1989- The Kidney in Hypertension (Perspectives in hypertension vol.2) New
York. Raven Press.
Guyton A.C. et al 1975 Dy namics & Control of the Body flerids
Philadelphia, W.B. Saunders, Co., 1975.
Brenner B.M. & Rector, F.C. (Jr) 1986. The kidney 3rd ed. Philadelphia, W.B. Saunders Co., 1986.
Brooks V.B. 1986. The neural Basis of motor control New York, Oxford University Press.
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Thampson J.C. et al (eds) Gastrointestinal Endocrinology. New York McGraw Hill book co., 1987.
Setchell K.D.R. et al eds 1988. The Bile Acids New York Plenum Pub. Corp.
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Felig P et al (eds) 1987. Endocrinology & Metabolism New Your MacGraw- Hill Book Co.,
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Kannan, C.R. 1988. The adrenal gland New York Plenum Pub. Corp.

M. Sc. Zoology
M.Sc.-II Sem.-III
ZP22 305 Practical V
Based on paper
Paper IX Z22 301: Genetics
&
Paper X Z22 302: Enzymology

1 Human lymphocyte culture.
2. Preparation of metaphasic chromosomes from human lymphocyte culture.
3. Study of human chromosomes explaining aspects of chromosome structure.
4. Study of human normal karyotype.
5. Manual preparation of human karyotype from metaphasic chromosomes.
6. Assessing quality and quantity of metaphases.
7. Harvesting of mitotic chromosomes from rat bone marrow.
8. Estimation of mitotic index.
9. Study of X chromosome heterochromatinization by Barr body staining .
10. G banding of rat chromosomes/Human chromosomes.
11. Preparation of chromosome ideogram.
12. Karyotype identification with reference to Patau syndrome, Edward Syndrome, Down syndrome, Klinefelter syndrome and Turner syndrome (from photographs).
13. Identification of cases of Patau syndrome, Edward Syndrome, Down syndrome, Klinefelter syndrome and Turner syndrome from photographs by morphological/ symptomatic features
14. Principle of Fluorescence In Situ Hybridization, Interpretation of results FISH for Patau syndrome, Edward Syndrome, Down syndrome, Klinefelter syndrome and Turner syndrome (from photographs).
15. Drosophila culture
16. Sexual dimorphism in Drosophila
17. Study of heritable characters in Drosophila
18. Examples based on Hardy-Weinberg Equilibrium
19. Symbols used in Pedigree analysis
20. Studies of Human pedigrees concerned with autosomal recessive disorders, autosomal dominant disorders, X linked dominant disorders and X linked recessive disorders.
21. Clinical test for Phenylketonuria by Guthrie test /Ferric chloride test
22. Study of bacterial transformation
23. Study of bacterial transduction
24. Estimation of proteins.
25. Estimation of Amylase / any other suitable enzyme.
26. Effect of pH on Amylase activity / any other suitable enzyme.
27. Effect of temperature on Amylase activity / any other suitable enzyme.
28. Michaelis – Menten constant determination for Amylase / any other suitable enzyme.
29. Effect of modifiers on enzyme activity / Thermolability of enzyme.
30. Isolation of Amylase or any other enzyme.
31. Any other practical set by the Department.

AT LEAST 12 EXPERIMENTS TO BE COVERED IN THE SEMISTER FROM GENETICS.

M.Sc. Zoology
M.Sc.-II Sem.-III
ZP22 306: Practical VI
Based on paper
Paper XI Z22 303: Animal Physiology
&
Paper XII Z22 304: Applied Physiology

- Study of histology and histochemistry of reproductive organs.
- Vaginal smear technique.
- Study of Uterine muscles.
- Study of sperm count.
- Capacitation and motility of sperm.
- Study of placental type.
- Contraceptive devices.
- Gonadectomy in white rat
- Estimation of lactate content of rat blood.
- Estimation of calcium content of rat blood.
- Determination of PEFR.
- Study of physical fitness by Step Test method
- Determination of Grip strength.
- To study effect of work load on finger muscle by Finger Ergometery.
- Absorption spectra of blood pigments.
- Estimation of Chloride content in rat blood.
- Visit to the industrial area to study man- machine environment.
- Demonstration of principal of dialysis.
- Demonstration of IVF procedure (Lab. visit).
- Project work/ Review articles.
- Any other practical set by concern teacher.

M.Sc. Zoology
M.Sc.-II Sem.IV
Paper XIII Z22-401: Animal Cells in Biotechnology
Credit: 04

Unit I: Laboratory design and introduction of cells: (15 hrs)

• Design of Tissue Culture Laboratory
• Equipments : Laminar Flow Hoods, CO2 incubator, Microscopes, centrifuge, Refrigerators and Freezers, pipetting aids, Miscellaneous Equipments.
• Glass wares/plastic wares and filters for tissue culture.
• Basic Aseptic Techniques
• Cryopreservation for Storage and shipment
• Primary cell culture, Established cell line, transformed cell line

Unit II: Growth media (15 hrs)

• Physical requirements and Nutritional Requirements of Cells
• Natural media
• Basal salt solution (BSS)-Various types
• Minimum Essential Medium(MEM)
• Antibiotics in media
• Serum dependent defined media
• Serum independent defined media – Cell specific media

Basic Techniques of mammalian cell culture

• Open and closed cell cultures
• Primary Cell culture – Isolation and separation of cells, viable cell count, maintenance of cell culture, maintenance of stock culture, Antibiotic free stock cultures
• Types of cell cultures – Monolayer, Suspension, Clonal culture, Mass culture-micro carrier culture (monolayer), Stem cell cultures (ESC)

Unit III: Biology and Characterization of cultured cells (15 hrs)

• Karyotyping
• Contamination Testing of Culture
• Viability measurement and cytotoxicity
• Measurement of growth parameters
• Cell cycle analysis and Synchronization of cultures

Uses of Animal Cells in Culture

• Evaluation of Chemical carcinogenicity, Cell malignancy Testing
• Uses of Embryonic stem cells and Pluripotent stem cells

Unit IV: Cell surgery and Cell Fusion Methods (15 hrs)

• Surgical manipulation of *in vitro* fertilization
• Cell fusion by Sendai virus and Polyethylene glycol
• Hybridoma cell preparations and their properties

Tissue Engineering

• Capillary culture Units
• Techniques for culturing differentiated cells: Use of Reconstituted basement membrane rafts

and use of feeder layers.

Reference:

1. Morgan, S.I. Animal Cell culture 1993 Bio. Scientific Publishers Ltd Oxford.
2. Freshney, R.I. Culture of Animal Cells: A manual of Basic Technique, 1994, John Wiley &
44
Sons Inc. Pub. USA.
3. Butler, M. Mammalian Cell Biotechnology.: A practical Approach 1991 IRL Press Oxford.
4. Jenni P. Mather & David Barnes Eds: Animal Cell culture Methods. Methods in Cell Biology
Vol. 57 Academic press.
5. Cell Culture: Methods in Enzymology, vol. 58 1979/recent volume. Academic Press.
6. Kuchler, R.J. Biochemical Methods in Cell culture & vivology 1977. Dowden, Huchinson &
Ross, Inc. Strausberg, USA.

M.Sc. Zoology
M. Sc. II Sem. IV
Paper XIV Z22 402 – Toxicology and Immunology
Credit: 04

Unit- I **(15 hrs)**

• **Concept and Scope of Toxicology**: Definition, History, Recent development, Disciplines of
toxicology. Classification of toxicants, toxic effects, principle aspects and importance of toxicology.

• **Toxicity Tests:** Types of toxicity tests, acute, sub acute and chronic toxicity tests and their objectives, experimental design, route of administration, doses and number. Bioassays i.e determination LD50 or LC 50 value using fish/mollusk/ insects graphical and statistical methods.

Unit- II **(15 hrs)**

• **Insecticides and metals toxicity**- Synthetic organic insecticides, their classification, prospectus effects, symptoms mechanism of toxic action of Organochlorine, Organophosphate, Carbamate and synthetic Pyrcthroid insecticides, toxic metals- Arsenic, Lead, Mercury and Cadmium, their toxic effects on animals and toxicokinetics.

• **Bio-accumulation and bio magnification toxicants**- Oranochlorine insecticides and heavy metal mercury.

Bio-transformation of toxicant- Organochlorine and Organophosphate insecticides i. e Metabolism of insecticides- DDT, BHC, Parathion and Malathion- Mechanism Phase I and Phase II reaction.

• **Food Toxicants-** Food addictives, Contaminants, adulterants , food poisoning due to bacterial fungal and algal toxins.

Immunology

Unit –III: **(15 hrs)**

Antigens: Antigenicity and immunogenicity, Factors influenceing immunogenicity, Epitopes,Antibody:Basic structure of antibodies, obstacles to antibody sequencing, Immunoglobulin
fine structure, Antibody classes and biological activities. MHC molecules: Genomic map of MHC
genes, Cellular distribution of MHC molecules, Regulation of MHC expression, MHC and immune
responsiveness

Unit –IV: **(15 hrs)**

Innate immunity:Anatomy, physiologic, phagocytic and inflammatory, Adaptive immunity: Antigenic specificity, diversity, immunologic memory, self and non self recognition, Hypersensitive
reactions, IgE mediated (Type I) hypersensitivity, Antibody mediated cytotoxic (Type II)

hypersensitivity, Immune complex mediated (Type III) hypersensitivity, Delayed type (Type IV)
hypersensitivity

Reference Books:

Chris Kent (2001) : Basics of Toxicology
Devid J.K. and Kit A.K. (2006): Toxicological testing handbook 2nd Ed.
Gupta P.K. and Salunkhe D.K. (1985): Modern toxicology (Vol. I,II &III)
Pandey, Shukla and Trevedi (2004): Fundamentals of Toxicology.
Thomas J.H. and William O.B. (1987): Handbook of Toxicology.
Kuby Immunology, WH Freeman, USA.
W Paul Fundamentals of Immunology.
I.M. Roitt, Essential Immunology, ELBS edition.
Roiff, I Brosfott, J and Male D – Immunology.
Sharma, J.M. : Avian Cellular Immunology.
Karger and Basel: The year of Immunology 1988.
Zapata A.G. and Co oper, E.L. The immune system.
Smialo wicz R.J. and Holsapple Michael. Experimental Immunology toxicology.
Laurie Hoffman – Goetz : Exercise and immune function.
Cooper E.L and Brazier M.A.B : Developmental Immunology.
Clark W.R.. Experimental functions of Modern Immunology.
Immunobiology - Charles A. Janeway and oyhers – 2001.
Pandey Kamleshwar., Shuklar J. P. and Trivedi S. P. (2005): Fundamental of Toxicology. New
Central book agency PVT. LTD. Kolkata.
Chris Kent (2001) : Basics of Toxicology
Devid J.K. and Kit A.K. (2006): Toxicological testing handbook 2nd Ed.
Gupta P.K. and Salunkhe D.K. (1985): Modern toxicology (Vol. I,II & III)Pandey, Shukla and
Trevedi (2004): Fundamentalsof Toxicology.
Thomas J.H. and William O.B. (1987): Handbook of Toxicology.
Kuby Immunology, WH Freeman, USA.
W Paul Fundamentals of Immunology.
I.M. Roitt, Essential Immunology, ELBS edition.

M.Sc. Zoology
M.Sc.-II Sem.-IV
Paper XV Z22 403 – Physiology of Health
Credit: 04

Unit I- Physiology of gastrointestinal disorders and Diseases (physiological basis, , histopathology, biochemistry) (15 hrs)

• Digestive glands
• Swallowing and oesophagus
47
1.3. Stomach
1.4. Small intestine
1.5. Rectum
1.6. Large intestine- constipation, diarrhea, and defecations.
1.7. Aging and general disorders of digestive tract.
1.8. Appendix

Unit II- Disorders and Diseases of respiratory and circulatory systems (physiological basis, histopathology, biochemistry) (15 hrs)

2.1. Respiratory insufficiency- Chronic pulmonary Emphysema, Pneumonia, Atelectasis, Aathama, Tuberculosis.
2.2. Hypoxia, Hypercapnia, Hypocapnia.
2.3. Haemolysis and clotting defects
2.4. Congenital and Ischemic heart diseases,
2.5. Hypertension, cardiac arrest and heart failure.
2.6. ECG-defect, Angiogram and Angioplasty.

Unit III- Renal Disorders and Diseases (physiological basis, histopathology, biochemistry) (15 hrs)

3.1. Acute renal failure- Peripheral internal and post renal failure.
3.2. Chronic renal failure – injury to glomeruli and interstitium
3.3. Hypertensions and kidney diseases.
3.4. Uremic toxicity, dialysis and artificial kidney.
3.5. Kidney transplantation

Unit IV- Disorders and Diseases of Nervous and muscular system (physiological basis, histopathology, biochemistry) (15 hrs)

4.1. Disorders of Cerebrospinal fluid (CSF)
a) Psychosis b) Epilepsy c)Alzimers diseases
4.2. Inherited neurological disorders.
4.3. Clinical physiology of muscular system.
4.4 Muscular atrophy and dystrophy

References:

Human Physiology – by A.C. Guyton. Saunders Company Londan, Toronto.
Shepherd G.M. Neuro Biology, New York Oxford University Press 1987.
Hurst J.W et al (eds) The Heart7th ed. New York McGraw- Hill Book Co. 1990.
Hand Book of Physiology Vols. Circulation. Renkin, E.M. & Micbel, C.C. (eds) Americal Physiological Society, 1984.
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Guyton A.C. 1980 Arterial pressure & Hypertension Philadelphia, W.B. Saunders Co- Cartiar output
& its regulation 1973.
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Guthrie H.A. 1988. Introductory Hutrition 7th ed. St.Lonis C.V. Mosby Co.,
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Kannan, C.R. 1988. The adrenal gland New York Plenum Pub. Corp.
Wozney J.M. et al 1988. Novel regulators of bone formation: Molecular clones & cultivates science
242: 1528.
Martin R.B. & Burr D.B. 1989. Structure, function & adaptation of compact Bone New York, Raven
Press 1989.
Knobil E. et al (eds) The physiology of Reproduction New York, Raven Press 1988.
Leung P.C.K. et al (eds) Endocrinology & Physiology of reproduction New York Plenum Pub. Corp.
1987.

M.Sc. Zoology
M.Sc. II Sem IV
Paper XVI Z22 404 – Clinical Physiology
Credit: 04

Unit I- Disorders and diseases of Endocrine glands (physiological basis, histopathology and biochemistry) (15 hrs)

- Pitutory glands
- Thyroid glands
- Parathyroid glands
- Endocrine pancreases.
- Adrenal gland and Kidney
- Disorders of Testis, Overies

Unit II- Disorders and diseases of Special senses ((physiological basis, histopathology and biochemistry) (15 hrs)

2.1. Hearing defects
2.2. Occular defects
2.3. Hyperthermia and Hypothermia.
2.4. Defects in Chemoreception.
2.5. Aging and defects in special sense.
2.6. Disorders of Organs: Liver, Lungs and Brain.

Unit III - Disorders of Blood and immunity ((physiological basis, histopathology and biochemistry) (15 hrs)

3.1. Different causes of Anemia.
3.2. Genetic blood disorders
3.3. Polycythemia and Leukemia
3.4. Types of immunity and its mechanisms
3.5. Hypo and Hypersensitivity mechanism

Unit VI – Physiology of Carcinoma ((physiological basis, histopathology and biochemistry) (15 hrs)

4.1. Introduction and mechanism of different types of carcinoma
4.2. Carcinoma of digestive tract and associated glands
4.3. Brain tumor
4.4. Brest cancer
4.5. Malignancy of Gonadal cells
4.6. Altered biomechanics in cancer cells.
4.7. Skin cancer

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M.Sc. Zoology
M.Sc.-II Sem.-IV
ZP22 405 Practical VII
Based on paper
Paper XIII Z22 401: Animal Cells in Biotechnology
&
Paper XIV Z22 402: Toxicology and Immunology

1. Preparation of glassware for cell culture. Preparation of cells that do not need enzyme digestion (RBC, Spleen lymph nodes, B.M.)
2. Isolation of cells by enzyme digestion
3. Separation of cells by suitable methods
4. Viable cell count (Tyypan Blue)
5. Primary cell culture and its maintenance
6. Measurements of growth parameters- DNA
7. Cell cycle analysis – mitotic cells.
8. Karyotype studies- Bone marrow peritoneal macrophages.
9. Evaluation of acute toxicity by using static renewal bioassay test (In fish / Insect).
10. Determination of LC50 of toxicant in fish / stored grain pest by employing probit analysis.
11. Effect of toxicant (sublethal dose) on fish gill and alimentarytract in fish and in insect on alimentary canal haemolymph (Mulberry silkworm)
12. Detection of heavy metal from animal issue by AAS (Lead/cadmium/chbromium).
13. Detection of pesticide by TLC method from water sample (organochlorine/ organophosphate).
14. Paw edema test.
15. Granulometa – Quantification by weight and differential cell count.
16. Spleenectomy.
17. Study of spleen replica for germinal centers.
18. Separation of immunoglobulin by Electrophoresis.
19. Immuno diffusion technique of agar gel diffusion.
21. RBC rosette technique.
22. Harem agglutination inhibition test.
23. Blood group analysis.
24. Histology of lymphoid organs spleen, thymus, lymph node & Bone marrow.
25. Any other practical / experiments set by the Department.

M.Sc. Zoology
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ZP22 406 Practical VIII
Based on paper
Paper XV Z22 403: Physiology of Health
&
Paper XVI Z22 404: Clinical Physiology

1) Study of blood indices.
2)Effect of toxicant / drug to the digestive/ reproductive cell/ glands (Histology and Histochemistry).
3) Qualitative test of Carbohydrate, Protein and fatty acids.
4)Determination of Oxygen Consumption in fish.
5) Effect of pH on Amylase activity.
6) Study of Electrocardiogram (ECG).
7) Study of Arterial blood pressure (BP).
8) Effect of Insulin on blood sugar level.
9) Effect of Adrenalin on blood sugar level.
10) Study of colour index from blood sample by using haemocytometer.
11) To study effect of temperature on enzyme activity
12) Effect of temperature on heart beat.
13) Demonstration of role of brain hormones in developmental stage.
14) Determination of Calcium in given sample of blood plasma.
15) Separation of serum proteins by Electrophoresis.
16) Estimation of blood Cholesterol.
17) Tracheacotomy in rat
18) Pancreactomy in rat
19) To study pathophysiology of muscle fiber – smooth, skeletal and cardiac muscle (Histology and Histochemistry).
20) Detection of reducing substances in urine using Chromatography.
21) Histochemical detection of uric acid crystals by using $AgNO_3$ Formalin method.
22) Study of Endocrine disorders
23) Any other practical set by concern teacher.