

UNIVERSITY OF JAMMU

NOTIFICATION (10/Aug/ ADP/36)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation to the approval of the Academic Council, has been pleased to authorize adoption of the revised Syllabi and Courses of Study in the subject of Human Genetics M.Sc. I semester of Master's Degree Programme for the examination to be held in the years as under alongwith % age of change:-

Human Genetics

Adoption of the revised Syllabi of M.Sc. I Semester alongwith %age of Change

<u>Class</u>	Semester	For the Examinations to be held in the year	%age of Change
M.Sc	I Semester	Dec. 2011, 2012, 2013	less than 25% change

The alternative question papers are required to be set as per the University regulation given as under:-

- If the change in the Syllabi and Courses of Study is less than 25%, no alternative Question paper will be set.
- ii). if the change is 25% and above but below 50% alternative Question Paper be set for one year.
- iii). If the change is 50% and above on whole scheme is changed, alternative Question Paper are set for two years.

Sd/-(DR. P.S. PATHANIA) REGISTRAR

F.Acd./XXVI/10/5277 - 5306 Dated: 12/8110

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Syllabi of Human Genetics for M.Sc. I^{st} semester for the examination to be held in the years, Dec. 201 ϕ , 201 χ & 2012.

Course No. 101

Credits: 02 Duration of Examination: 2 hrs **Title: - Cell Biology**

Maximum Marks a) Semester Examination: 40 b) Sessional Assessment: 10

CELL BIOLOGY

Objective: The course has been designed to expose the student of Human Genetics to the structure and function of cell and its organelles. Cell – cell interaction, Signal transduction and Programmed cell death are some of the mechanism which will make a student to have better understanding of the cell.

UNIT-I

Cell, Plasma Membrane and Cytoskeleton

- 1.1. Cell: Structure and Organisation
- 1.2. Plasma Membrane
 - 1.2.1. Structure of Plasma Membrane with special emphasis on various models
 - 1.2.1. Functions of Plasma Membrane

1.2.2.1. Transport across membrane

1.2.2.2. Mechanisms of Endocytosis and Exocytosis

1.3. Cytoskeleton

- 1.3.1. Microfilaments: Structural organization, cell motility and cell shape
- 1.3.2. Microtubule: Structural and Functional organization
- 1.3.3. Intermediate filaments

UNIT-II

Structure and Functions of Cell Organelles

- 2.1. Mitochondria
- 2.2. Ribosome
- 2.3. Golgi Complex
- 2.4. Endoplasmic Reticulum
- 2.5. Peroxisomes and Lysosomes
- 2.6. Nucleus

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UNIT-III

Cell Cycle and Cell Signalling

3.1. Cell cycle and its regulation

3.2. Cell-Cell Interaction

3.2.1. Cell adhesion molecules

- 3.2.2. Cellular Junctions
- 3.2.3. Extracellular matrix

3.3. Signal transduction

- 3.3.1. Intracellular receptor and cell surface receptors
- 3.3.2. Signalling via G-protein linked receptors (PKA, PKC, CaM kinase)
- 3.3.3. Enzyme linked receptor signaling (Growth factor receptor signaling; JACK-STAT pathway)
- 3.3.4. Network and cross-talk between different signal mechanisms
- 3.4. Programmed cell death (Apoptosis)

Note : The question paper will contain two question from each unit (total Six question) and the candidates will be require to answer one question from each unit (Total question to be attempted will be Three) i.e. there will be 100% internal choice within each unit

Books Recommended:

- 1. Geoffrey M. Cooper and Robert E. Hausman. 2009. The Cell: A Molecular Approach, Fifth Edition. ASM Press and Sinauer Associates, Inc.
- Gerald Karp, 2009. Cell and Molecular Biology: Concepts and Experiments, 6th Edition John Wiley and Sons.
- 3. Bruce Alberts *et al.*, 2007. Molecular Biology of the Cell, 5th Edition, Taylor & Francis Group.
- 4. Alberts et al, 2002. Molecular Biology of the Cell
- 5. De-Robertis, Cell & Molecular Biology (latest Edition)
- 6. Powar, C.B., Cell Biology (latest Edition)
- 7. Rastogi, S.C., 2007. Cell Biology. Third Edition. New Age International Publishers.

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Syllabi of Human Genetics for M.Sc. Ist Semester for the examination to be held in the years, Dec. 2019, 2013 & 2012.

Course No. 102

Credits: 04 Duration of Examination: 3 hrs Title: - Human Anatomy, Embryology and Endocrinology Maximum Marks a) Semester Examination: 80

b) Sessional Assessment: 20

HUMAN ANATOMY, EMBRYOLOGY AND ENDOCRINOLOGY

Objectives: - Course is designed to apprise the student about the details of different systems of human body and the process from fertilization to implantation of fertilized ovum. This will helps the students to understand the changes caused in different systems and organs due to genetic changes.

UNIT-I

1.1. Muscular & Skeletal system

- 1.1.1. Classification of Bones
- 1.1.2. Ossification and growth of Bones
- 1.1.3. Joints and their types
- 1.1.4. Classification of muscles
- 1.1.5. Structure of smooth, cardiac and skeletal muscles
- 1.1.6. Neuromuscular junction
- 1.1.7. Degenerative disorders of muscles

UNIT-II

2.1. Digestive system

- 2.1.1 An overview of anatomy of different parts of digestive system.
- 2.1.2 Physiology of digestive system.
 - 2.1.2.1. Digestion in Mouth
 - 2.1.2.2. Digestion in stomach
 - 2.1.2.3. Digestion in Intestine

2.2. Circulatory system

- 2.2.1. Blood and its composition
- 2.2.2 Grass anatomy of heart
- 2.2.3. Lymphatic system
- 2.2.4. Arterial & Venous system

2.3. Respiratory system

- 2.3.1. An overview of anatomy of respiratory tract
- 2.3.2 Physiology of Respiration
 - 2.3.2.1. Mechanism of Respiration
 - 2.3.2.2. Gaseous Exchange in lungs
 - 2.3.2.3. Transport of oxygen and carbon dioxide

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UNIT-III

3.1. Nervous system

- Anatomy of Brain & spinal cord 3.1.1.
- 3.1.2. An overview of Autonomic nervous system
- 3.1.3. Senses: Eyes, Ears, Nose, and Touch

3.2. **Urinogenital System**

- Anatomy and Physiology 3.2.1
 - 1. Gross Anatomy
 - 2. Fine Anatomy

UNIT - IV

Anatomy and Physiology of Endocrine System 4.1.

- 4.1.1. Pituitary Gland
- 4.1.2. Thyroid, Parathyroid Gland
- 4.1.3. Adrenal Gland
- Islets of Langerhans 4.1.4.
- 4.1.5. Gonads
- 4.1.6. Pineal gland
- 4.1.7. Thymus gland

UNIT-V

3.1 Embryology

- 3.1.1. Fertilization
- 3.1.2. Conception and development of human embryo upto three germinal layers.
- 3.1.3. Development of embryonic disc, notochord formation & neurulation.
- 3.1.4. Subdivision of intraembryonic mesoderm into somites.
- 3.1.5. Chrionic formation and development of placenta
- 3.1.6. Implantation

Note:-The question paper will contain two question from each unit (total ten question) and the candidates will be require to answer one question from each unit (Total question to be attempted will be five) i.e there will be 100% internal choice within each unit.

Books Recommended:-

- 1. Turner, S.L. (1966). General Endocrinology W.S. Saunders, Tappan Co. Ltd. Tokyo, Japan.
- 2. Guyton and Hall. Text book of Medical Physiology. 12th Edition. Elsevier Saunders publishers.
- 3. J.S.Lewis. The Endocrine System (latest edition).
- 4. J. Matthew Neal, 2001. How the Endocrine System Works, Blackwell Science.
- 5. Roger Lewin. Hormones (latest edition)
- 6. Harper's. 28th Edition, Illustrated Biochemistry. The McGraw-Hill Company.

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Syllabi of Human Genetics for M.Sc. Ist Semester for the examination to be held in the years, Dec. 2010, 2011 & 2012.

Course No. : 103

Credits: 04 Duration of Examination: 2 hrs Title: - Human Molecular Genetics-I

Maximum Marks a) Semester Examination: 80 b) Sessional Assessment: 20

HUMAN MOLECULAR GENETICS-I

Objective: - Human Molecular Genetics is a vast field that provides information of Genetic Material, general principles and applications of cloning and molecular hybridization. It provides comprehensive guide to the structure, function and evolution of human genes and genome.

UNIT-I

1.1. Nucleic Acid: Structure and function

- 1.1.1. Physical and chemical structure of DNA
- 1.1.2. DNA Replication
- 1.1.3. Different types of RNA and their Structure
- 1.1.4. RNA transcription factors and gene expression
- 1.1.5. Post transcriptional RNA processing
- 1.1.6. Post Translational modifications

UNIT-II

2.1. Cell-based DNA cloning

- 2.1.1. Principles of DNA cloning
- 2.1.2. Vector systems for cloning different sizes of DNA fragments
- 2.1.3. Expression cloning

2.2. PCR based DNA cloning and DNA analysis

- 2.2.1. Principles of PCR
- 2.2.2. Applications of PCR

UNIT-III

3.1. Human Genome

- 3.1.1. Basic concepts of Human Genome
- 3.1.2. Organization of the human genes
- 3.1.3. Human gene expression
- 3.1.4. Gene Silencing
- 3.1.5. Repetitive DNA and its types
- 3.1.6. Transposable elements in Eukaryotes.

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UNIT-IV

4.1. DNA hybridization assays

- 4.1.1. Nucleic acid probes
- 4.1.2. Principles of molecular hybridization
- 4.1.3. Methods and applications of molecular hybridization
- 4.1.4. Synthesis and labeling of probes

UNIT-V

5.1 Molecular evolution

- 5.1.1. Evolution of human mitochondrial genome
- 5.1.2. Evolution of human nuclear genome
- 5.1.3. Evolution of human sex chromosomes
- 5.1.4. What makes as human.

Note:-The question paper will contain two question from each unit (total T_{en} question) and the candidates will be require to answer one question from each unit (Total question to be attempted will be *Five*) i.e. there will be 100% internal choice within each unit.

BOOKS RECOMMENDED

- 1. F Vogel A.G. Motulusky. Human Genetics: Problems and Approaches. Third Completely Revised Edition, Springer-Verlag.
- 2. D. Peter Snustad and Michael J.Simmons. 2009. Principles of Human Genetics. Fifth Edition. John Wiley & Sons, Inc.
- 3. Ricki Lewis. 2009. Human Genetics-Concepts and Application. Ninth Edition. McGraw-Hill College Publishers.
- 4. Benjamin Lewin, 2008. Gene IX. Jones and Bartlett Publishers.
- 5. T.A.Brown. 2002. Genome, Second Edition. Bios Scientific Publishers Ltd
- 6. T.A.Brown. 2006. Genome, Third Edition, Garland Science.
- 7. David P. Clark, 2005. Molecular biology. Elsevier Academic Press.

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Syllabi of Human Genetics for M.Sc. Ist Semester for the examination to be held in the years, Dec. 2010, 2011 & 2012.

Course No. 104

Credits: 04 Duration of Examination: 3 hrs Title: - Human Cytogenetics - I

Maximum Marks a) Semester Examination: 80 b) Sessional Assessment: 20

HUMAN CYTOGENETICS-I

Objectives: The course has been designed to provide an introduction to Human Cytogenetics. Different steps and advances that occurred in understanding human chromosomes have been discussed in detail. Structural details and the role of chromosomes in human congenital anomalies & cancers have been discussed so that a student pursuing P.G course in Human Genetics is able to understand the importance of human chromosomes.

UNIT-I

- 1.1 Historical aspects of Human Cytogenetics
- 1.2. Nomenclature of human chromosomes
- 1.3. Human Sex chromosomes: An Introduction
- 1.4. The future of Human Cytogenetics

UNIT-II

- 2.1 Chromosome structure and organization
- 2.2 Types of cell division Mitosis and Meiosis
- 2.3 Techniques for Chromosome study
 - i. G- Banding
 - ii. C-Banding
 - iii. Q-Banding
 - iv. R-Banding
 - v. High Resolution Banding
 - Tissue culture techniques
 - i. Whole Blood Culture
 - ii. Bone Marrow Culture
 - iii. Aminocyte Culture
 - iv. Skin Fibroblast

UNIT-III

- 3.1. Chromosome break and re-arrangements
- 3.2. Telomeres

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- 3.3. Inactivation of the Centromere
- 3.4. Robertsonian translocations
 - 3.4.1. Occurrence
 - 3.4.2. Relative frequency of different types of Robertsonian translocation

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3.4.3. Segregation in carrier of Robertsonian translocations

UNIT-IV

- 4.1. Variability in structure and number of Sex chromosomes and related anomalies in man.
- 4.2. Variability in structure and number of Autosomes and related anomalies in man
- 4.3. Inactivation of Sex chromosomes.
- 4.4. Formation, Detection and Behaviour at meiosis of Ring Chromosomes at meiosis.
- 4.5. Environmental factors that influences human mutations

4.5.1. Physical factors

4.5.2. Chemical factors

UNIT-V

- 5.1 Evolution of Human Chromosomes.
- 5.2 Identification of Human Chromosomes on the basis of their pattern.
- 5.3 Human Y Chromosome.
 - 5.3.1 Structure
 - 5.3.2 Genes on the Y Chromosomes
 - 5.3.3 X&Y Pairing and Pseudoautosomal region
 - 5.3.4 Sex determination in Human beings.

Note : The question paper will contain two question from each unit (total ten question) and the candidates will be require to answer one question from each unit (total question to be attempted will be five) i.e there will be internal choice within each unit .

Books Recommended:

- 1. Emery and Rimoin's, et al., 2007. Principles and Practice of Medical Genetics. Fifth Edition. Volume II, Churchill Livingstone Elsevier.
- 2. Emery and Rimoin's, Principles and Practice of Medical Genetics e-dition: 3-Volume Set, Churchill Livingstone Elsevier
- 3. De Grouchy & Turleau. 1984. Clinical atlas on Human Chromosomes.
- 4. Jankowski & Polak, 1996. Clinical Gene Analysis and Manipulation.
- 5. Robinson and Linden, Clinical Genetics Handbook. (latest edition)
- 6. F Vogel A.G. Motulusky. Human Genetics: Problems and Approaches. Second Completely Revised Edition, Springer-Verlag. (latest edition)
- 7. Golder N. Wilson, M.D., Ph.D.Clinical Genetics-A Short Course. A John Wiley and Sons, Inc., Publication. (latest edition)

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Syllabi of Human Genetics for M.Sc. Ist semester for the examination to be held in the years, Dec. 2010, 2011 & 2012.

Course No.: 105

Credits: 02 Duration of Examination: 2 hrs Title: - Research methodology and instrumentation

Maximum Marks a) Semester Examination: 40 b) Sessional Assessment: 10

RESEARCH METHODOLOGY AND INSTRUMENTATION

Objectives: - Course has been designed to expose the students to various instruments used in Cytogenetics and Molecular Genetics. The students will be fully trained to handle the instruments for their use for research work as well as teaching.

UNIT-I

- 2.1. Microscopy: Basic principles and applications
 - 2.3.1. Light Microscopy
 - 2.3.2. Dark-field Microscopy
 - 2.3.3. Phase-contrast Microscopy
 - 2.3.4. Fluorescence Microscopy
 - 2.3.5. Electron Microscopy
- 2.2. Photometry:
- Basic principle, Types and Applications
- 2.3. Spectroscopy: Basic principle, Types and Applications

UNIT-II

- 1.1. Centrifugation: Basic principle, Types and its applications.
- 1.2. Chromatography:
 - 1.2.1. Principle, types and applications
 - 1.2.2. Paper Chromatography,
 - 1.2.3. Thin layer chromatography;
 - 1.2.4. Column Chromatography:
 - 1.2.1.1. Ion-exchange
 - 1.2.1.2. Gel-filtration
 - 1.2.1.3. HPLC
 - 1.2.1.4. Affinity columns

1.3. Electrophoresis:

Principle, Types and applications.

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UNIT-III

- 3.1. Principles of Immunological Techniques
 - 3.1.1. Immunodiffusion
 - 3.1.2. Immunoelectrophoresis
 - 3.1.3. Immunofluorescence
- 3.2. RIA and ELISA
- 3.3. Western Blotting

Note :The question paper will contain two question from each unit (total Sign question) and the candidates will be require to answer one question from each unit (total question to be attempted will be True i.e. there will be 100% internal choice within each unit.

Books Recommended

- 1. Keith Wilson, John M. Walker, 2010. Principles and techniques of biochemistry and Molecular Biology. Seventh Edition, Cambridge University Press.
- 2. Keith Wilson, John M. Walker, 2005. Principles and techniques of biochemistry and Molecular Biology. Sixth Edition, Cambridge University Press.
- 3. Hafiz Ahmed, 2000. Principles and reactions of protein extraction, purification, and Characterization. CRC Press.
- 4. David Sheehan, 2009. Physical biochemistry: principles and applications, Second edition, John Wiley and Sons.

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5. Janis Kuby, 2007. Immunology, Sixth edition. W.H. Freeman.

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