

CELL MODULE

1st Year MBBS 2014

DURATION	10 days (TEACHING + ASSESSMENT)
CONTACT HOURS	Lectures 31 hrs + Practicals 10 hrs + PBL Session 2 hrs + Tutorial 1hr = 44 hrs
CREDIT HOURS	2. 25
TEACHING METHODOLOGIES	Lectures/ Practicals/ Tutorials / Small group discussions / Problem based learning

OBJECTIVES

This course is designed primarily for 1st year medical students and will cover fundamental aspects of biochemistry and cell biology. By the end of the course the students should be able to

1. Describe structure of macromolecules and function of cell as basic unit of life.
2. Discuss in detail the structure and functions of cellular organelles in biological processes including energy production, protein degradation and protein trafficking
3. Have fundamental knowledge of principles of enzyme kinetics and regulation
4. Explain the fundamentals of genetics including the basic structure of genes, gene expression and regulation, patterns of inheritance,
5. Describe the Structure of DNA its functions and means of replication
6. Describe the processes of transcription and translation
7. Polymerase chain reaction and DNA sequencing as practical applications of DNA replication
8. Describe the Cell signaling pathways
9. Enumerate Cells of immune system and discuss their functions
10. Define inflammation and describe Basic principles of inflammation and response of cell to inflammation and injury
11. Genetics of cancer

		WEEK 1			DEPARTMENT/ Facilitator	DURAT ION
TIME		COURSE CONTENT	PLACE	LEARNING OUTCOME	Recommended books	
DAY 1 (24-11-2014 Monday)						
Understanding important organic						
8 --- 9	1	Structure Of Macromolecules	Old Auditorium/Physiology Lecture Theater	molecules that make up the building block (cell), known as carbohydrates, lipids, proteins, and nucleic acids Understanding of the cells structure and	Life :- The Science Of Biology 7 th ed.	Molecular Biology Dr. Mehmood 1hr
9--- 10	2	Cells: The Basic Units Of Life	Old Auditorium/Physiology Lecture Theater	organization of organelles and their function, Role of different organelles and their coordination	Life :- The Science Of Biology 7 th ed.	Molecular Biology Prof. Dr. Fridoon 1 hr
BREAK 10 ---10:30						
Student should be able to describe						
10 :30 - -- 11:30	3	Cell Membrane 1 Structure And Composition	Old Auditorium/Physiology Lecture Theater	i) The chemical composition of cell membrane ii) Fluid mosaic model	Biochemistry by Harper 28 th ed. Medical biochemistry by Mushtaq.	Biochemistry Dr. Ismat Bibi 1hr
Student should be able to						
11--- 30 – 1:30	4	Practical Fixation and processing of tissues for staining of macromolecules	1-Histology Lab 2-physiology lab 3- pharmacology lab.	Enumerate the various steps in preparation of tissues Describe the underlying principles and have knowledge of Molecular basis of routine H & E Staining		Anatomy A- Dr. Mahjabeen B. Dr. Sohail C. Dr. Lubna Shah 2 hrs
DAY 2 (25-11-2014 Tuesday)						
Student should be able to enumerate						
8 --- 9	5	Cell Membrane 2 Functions of various components of cell membrane and their importance	Old Auditorium/Physiology Lecture Theater	i) Functions of Lipid Bilayer ii) Functions of integral and peripheral cell membrane proteins iii) Glycocalyx, Its Functions & Importance iv) The student should be able to describe Transport across Cell	i) Guyton & Hall Text Book of Physiology 12 th ed. ii) Ganongs review of medical physiology 23 rd ed.	Physiology Dr. Imrana Ihsan 1hr

				Membrane Diffusion simple and facilitated Active transport Primary & secondary.			
9--- 10	6	Cell Architecture; Structure & Functions of Cytoskeletal Framework 1	Old Auditorium/Physiology Lecture Theater	The student should know about the i) Components of cytoskeletal framework ii) Structure and properties of microtubule iii) Briefly about the centrioles, basal body MTOC, Motor proteins iv) Function of microtubules and their role in intercellular transport, Cell division & Movement of cilia	Basic histology by Junqueira 12 th ed Histology a Text And Atlas by Michael H. Ross 6 th edition	Anatomy Dr. Mahjabeen	1hr
BREAK 10 ---10:30							
10 :30 - -- 11:30	7	Cell Architecture; Structure & Functions of Cytoskeletal Framework 2	Old Auditorium/Physiology Lecture Theater	Should be able to describe i) Different types of intermediate filaments their component proteins and commonly associated diseases. ii) Actin filament their structure, properties iii) Role of actin filament in intercellular junctions, microvilli & Locomotion	Basic histology by Junqueira 12 th ed Histology a Text And Atlas by Michael H. Ross 6 th edition	Anatomy Dr. Mahjabeen	1 hr
11--- 30 – 12:30	9	Energy , Enzymes & Metabolism	Old Auditorium/Physiology Lecture Theater	Explain the logic of living state. Role of enzymes in chemical interconversions responsible for life	Life :- The Science Of Biology 7 th ed	Molecular biology Prof. Dr. Fridoon	1 hr
BREAK 12:30 –1pm							
1-2	8	Integration Of Cells Into Tissues: The Role Of ECM & Intercellular	Old Auditorium/Physiology Lecture Theater	How cells attach to neighboring cells, role of ECM in cell signaling and inter cellular communication, molecules that make up	Life :- The Science Of Biology 7 th ed	Molecular biology Dr. Mahmood	1 hr
DAY 3 (26-11-2014 Wednesday)							
8 --- 9	10	Basement membrane	Old Auditorium/Physiology Lecture Theater	The student should be able to i) Describe structure and composition of basement membrane	Basic histology by Junqueira 12 th ed. Wheaters functional	Anatomy Prof. Dr. Raafea Tafweez	1 hr

				ii) Differentiate between basal and reticular and external lamina, iii) Identify types and enumerate functions of collagen fibers, proteins and glycoproteins present in the basement membrane iv) Role of basement membrane in various disease processes such as diabetes mellitus, cancer, genetic & auto immune diseases	histology a text and colour atlas. 5 th ed		
9--- 10	11	TUTORIALS Clinical conditions associated with changes in basement membrane	Physiology Dept.	Student should be able to apply their knowledge of basement membrane to understand the functions and be familiar with conditions associated with thickening and thinning of basement membrane	Students are directed to come prepared with the topic	Physiology Dr. Shahid Saeed (R# 1 – 80) Dr. Mubasir Abbas (R# 81 – 160) Dr. Rana Khurram (R# 161 – 240) Dr. Sheena Tariq (R# 241 onward)	1 hr
BREAK 10 ---10:30							
10 :30 - -- 11:30	12	Mitochondria, Structure, Glycolysis, Krebs Cycle, ATP Generation & Proton Pump	Old Auditorium/Physiology Lecture Theater	At the end of this lecture the student will be able to correlate structure of mitochondrion with its function such as utilization of body fuels like glucose and fats	Biochemistry by Harper 28 th ed. Medical biochemistry by Mushtaq.	Biochemistry Dr. Shakil Ahmad	1 hr
11:30 - -- 1:30	13	Practical Identification of basement membrane & collagen fibers under light microscope	1-Histology Lab 2-physiology lab 3-pharmacology lab.	Student should be able to identify <ul style="list-style-type: none"> • Basement membrane with routine H & E stain under L/M • Basement membrane with PAS stain • Collagen fibers in routine H& E stain and special stain 		Anatomy A. Dr. Mahjabeen B. Dr. Sohail C. Dr. Lubna Shah	2 hr
DAY 4 (27-11-2014 Thursday)							
8 --- 9	14	Structure of Nucleus & nucleolus	Old Auditorium/Physiology Lecture Theater	Student should Know about <ul style="list-style-type: none"> • Various components of the 	Basic histology by Junquiera 12 th ed.	Anatomy Dr. Mahjabeen	1 hr

				<ul style="list-style-type: none"> nucleus • Chromatin Hetro & euchromatic nuclei • Structure of nuclear envelope and nuclear pores • Nuclear lamina and its importance in cell division • Nucleolus its role in transcription of ribosomal RNA & ribosomal assembly 	Wheaters functional histology a text and colour atlas. 5 th ed		
9--- 10	15	Chromosomes, Cell cycle and Cell division	Old Auditorium/Physiology Lecture Theater	How structural elements (chromosomes) that carry genetic information are transferred to daughter cells (Mitosis, Meiosis and their regulation)	Life :- The Science Of Biology 7 th ed	Molecular biology Dr. Mahmood	1hr
BREAK 10 ---10:30							
10 :30 - -- 11:30	16	Lysosomes, Functional system of cell-endocytosis and Exocytosis	Old Auditorium/Physiology Lecture Theater	To deliver knowledge to the students about transport across the cells by different mechanism specially endocytosis and exocytosis along with biochemical importance of lysosomes	Biochemistry by Harper 28 th ed. Medical biochemistry by Mushtaq.	Biochemistry Dr. Abdul Hameed	1 hr
11:30 - -- 1:30	17	PRACTICAL Identification of nuclei in cells	1-Histology Lab 2-physiology lab 3-pharmacology lab.	Student should be able to identify <ul style="list-style-type: none"> • Nucleus under the light microscope • Uni, binucleated and multinucleated cells • Shape of cell because of position and shape of nucleus 		Anatomy A. Dr. Mahjabeen B. Dr. Sohail C. Dr. Lubna Shah	2hrs
DAY 5 (28-11-2014 Friday)							
8 --- 9	18	Protein Synthesizing Machinery Of Cell	Old Auditorium/Physiology Lecture Theater	Rough Endoplasmic Reticulum & Ribosomes, their Role In Protein Synthesis. Agranular Endoplasmic Reticulum & Its Functions	i) Guyton & Hall Text Book of Physiology 12 th ed. ii) Ganongs review of medical physiology 23 rd ed	Physiology Dr. Imrana Ihsan	1 hr

9-10	19	Hormone Production & storage	Old Auditorium/Physiology Lecture Theater	The student should be able to i) Define endocrine system and name endocrine organs ii) Enumerate major classes of hormones		Physiology Dr. Amna Tahir	1 hr
9--- 10	19						

				in modification packing & Labeling of proteins	Book of Physiology 12 th ed. ii) Ganongs review of medical physiology 23 rd edSS	Dr. Imrana Ihsan	
			BREAK 10 ---10:30				
10 :30 - -- 12:30 pm	20	PBL Session Lysosomal Storage Diseases	Physiology & Biochemistry			Physiology & Biochemistry Dr. Shahid Saeed Dr. Mubasir Abbas Dr. Rana Khurram Dr. Sheena Tariq	2 hr
DAY 6 (29-11-2014 Saturday)							
8 --- 9	21	Modification in cells in relation to function	Old Auditorium/Physiology Lecture Theater	The student should be able to apply their knowledge of cellular organelles to understand the structure and functions of <ul style="list-style-type: none"> • Secretory cells • Ion transporting cells/ absorptive cell • Steroid hormone producing cells • Identify locations where these cells may be found 	Basic histology by Junquiera 12 th ed. Wheaters functional histology a text and colour atlas. 5 th ed	Anatomy Dr. Mahjabeen	1 hr
9--- 10	22	Role of DNA in Heredity	Old Auditorium/Physiology Lecture Theater	DNA as genetic material, sequence of nucleotides as carrier of genetic information. How the genetic information is faithfully transferred from one generation to the next.	Life :- The Science Of Biology 7 th ed	Molecular Biology Dr. Mahmood	1 hr
			BREAK 10--- 10:30				
10 :30 - -- 11:30	23	Theory of PCR and its applications	Old Auditorium	Understanding theory of Polymerase Chain Reaction and how this technique is applied in medicine and diagnostics	Life :- The Science Of Biology 7 th ed	Molecular Biology Prof. Dr. Fridoon	1 hr

				iii) Interaction of hormones with receptors to alter biological activity of cells iv) Positive & negative feedback controls v) Their role in maintaining homeostasis			
11:30 - -- 1:30	24	Practical Identification of cellular shapes and appearance in routine H& E staining under the light microscope	1-Histology Lab 2-physiology lab 3-pharmacology lab.	Student should be able to <ul style="list-style-type: none"> • identify & draw different cells with H & E staining and correlate their appearance with the function • Discuss Underlying principles for their appearance with routine H& E staining e.g Secretory cells Thyroid gland, Serous & Mucous cells • Absorptive cells Intestinal cells, Cells of proximal Convoluted tubules • Squamous cells • Alveolar epith,, Bowman capsule • Fat cells • Yellow adipose • Steroid producing cells Zona fasciculata of adrenal gland 		Anatomy Dr.Mahjabeen B. Dr. Sohail C. Dr. Lubna Shah	2 hrs
WEEK 2 DAY 1 (01-12-2014 Monday)							
8 – 9	25	Golgi complex	Old auditorium	in modification packing & Labeling of proteins	Book of Physiology 12 th ed. ii) Ganongs review	Dr. Imrana Ihsan	in mod
9 ---	26	From DNA-> RNA Transcription	Old	How the Genetic information is transferred	Life :- The Science	Molecular Biology	1hr

10		Phenotype	Auditorium	from the language of nucleotides to the language of aminoacids via mRNA synthesis and other components such as rRna, Ribosomes, adapter molecules (tRNA)	Of Biology 7 th ed	Dr. Mahmood	
BREAK 10 ---10:30							
10:30 - --11:30	27	From RNA->Protein Translation	Old Auditorium	How certain genes are switched on and off in different tissue and at different times during development and their role in cellular differentiation and morphogenesis	Life :- The Science Of Biology 7 th ed	Molecular Biology Dr. Mahmood	1 hr
11:30 - --12:30	28	Cellular adaptation to stress, cell injury & death Definition Hypertrophy with example Hyperplasia with examples Atrophy with example Metaplasia with example, Dysplasia with example Definition of reversible & irreversible cell injury Cellular changes in reversible and irreversible cell injury with diagrammatic presentation Brief account of cellular swelling and fatty changes with example Example of necrosis & apoptosis BREAK 10 ---10:30 Cell aging	Old Auditorium	Student should i) Be able to define different cellular adaptive changes to stress ii) Be able to differentiate between reversible and irreversible cell injury	Robins Pathology	Pathology Dr. Humera Rafique	1 hr
BREAK 12.30 ---- 1 pm							
1—2 pm	29	Gene Expression	Old Auditorium	Principles of cell signaling and overview of signaling systems	Life :- The Science Of Biology 7 th ed	Molecular Biology Prof. Dr. Fridoon	1 hr
DAY 2 (02-12-2014 Tuesday)							
8—9	30	Specialized signaling pathway part I	Old Auditorium	G-Protein coupled receptor pathway, Receptor Tyrosine Kinase Pathway	Life :- The Science Of Biology 7 th ed	Molecular Biology Prof. Dr. Fridoon	1 hr
9 --- 10	31	Immune System	Old	Student should have an understanding of	Robins Pathology	Pathology	1 hr

		Cells of immune system, Blymphocytes, T- lymphocytes, NK cells, Antigen presenting cells Differentiation from stem cell (T& B lymphocyte NK cells & APC), Introduction to cytokines Functions of T& B lymphocyte NK cells & APC	Auditorium	i) Differentiation of different cells of immune system with their antigenic expression ii) Be able to identify different cells of immune system		Dr. Aliya Muzaffar	
			BREAK 10 --- 10:30				
10:30 - --11:30	32	Specialized signaling pathways part II	Old Auditorium	Sonic hedgehog signaling pathway, Wnt signaling pathway, Toll like receptor pathway	Life :- The Science Of Biology 7 th ed	Molecular Biology Prof. Dr. Fridoon	1 hr
11:30 - --12:30	33	Molecular & Genetic Basic of Development	Old Auditorium	Regulation of cell division, cell differentiation and morphogenesis during embryonic development	Life :- The Science Of Biology 7 th ed	Molecular Biology Prof. Dr. Fridoon	1 hr
			BREAK 12:30 --- 1 pm				
1---2 pm	34	Apoptosis	Old Auditorium	Overview of apoptosis and its role in development. Role of different molecules that regulate apoptosis. Relevance of apoptosis in cancer biology	Life :- The Science Of Biology 7 th ed	Molecular Biology Prof. Dr. Fridoon	1hr
DAY 3 (03-12-2014 Wednesday)							
8 ---9 am	35	Inflammation Definition Cardinal sign Vascular changes:- Vasodilatation, Increased permeability Cellular events: - Brief account of margination, rolling, adhesion, transmigration, chemotaxis, phagocytosis & killing. Cells of acute & chronic inflammation Brief concept of mediators of inflammation	Old Auditorium	Student should i) Be able to identify different cells of acute & chronic inflammation ii) Have an understanding vascular and cellular events of inflammation and mediators released during inflammation	Rob Life :- The Science Of Biology 7 th ed ins pathology	Pathology Dr. Javeria Aijaz	1 hr

		Cell & plasma derived mediators Feature of chronic inflammation					
9 --- 10	36	Molecular & Genetic Basic of Neoplastic transformations	Old Auditorium	Molecular basis of Conversion of tissue with normal growth pattern into malignant tumor, protooncogenes and tumor suppressor genes in neoplastic transformations	Life :- The Science Of Biology 7 th ed	Molecular Biology Prof. Dr. Fridoon	1 hr
			BREAK 10 --- 10:30				
10:30 - 11:30	37	Stem cells and personalized medicine	Old Auditorium	Current challenges in tissue regeneration and comtemporany cell based approaches in regenerative medicine, different types of stem cells, their ability to regenerate tissue	Life :- The Science Of Biology 7 th ed	Molecular Biology Prof. Dr. Fridoon	1 hr
11:30 - 01:30	38	Practical Identification of necrotic and inflammatory cells	1-Histology Lab 2-physiology lab 3-pharmacology lab.	Gross specimen & Microscopic slides of Acute appendicitis Chronic cholecystitis Gangrene		Pathology Dr. Sara (A) Dr. Qamar (B) Dr. Asad Shabbir © Dr. Javeria Masood	2 hrs

ASSESSMENT DAY 4

Lecture distribution

Molecular biology	16
Anatomy	5
Physiology	4
Biochemistry	3
Pathology	3

Practical

Anatomy	4
Pathology	1

PBL Session 1 of 2hr duration

Tutorial Session 1 of 1 hr duration