

CURRICULUM TRANSACTIONAL STRATEGY

Course title : Cell Biology

Course Code: ZOO-CC-102

Unit	Topic	Method	Activity	No. of classes needed
I	Introduction & Cell Membrane	Lecture, PPT, Discussion	Library / Lab consultation/ assignment & presentation	15
	Introduction and classification of organisms by cell structure	do	do	03
	Cytosol	do	do	01
	Compartmentalization of Eukaryotic cells	do	do	01
	Cell Fractionation	do	do	01
	Cell Membrane and Permeability	do	do	02
	Organization of Fluid Mosaic Model	do	do	02
	Membrane as a dynamic entity	do	do	01
	Cell Recognition	do	do	02
	Membrane Transport	do	do	02

Learning Outcomes

After going through this unit the students should be able to:

- Classify based on the presence or absence of nuclei?
- Understand the structure of an animal cells.
- Understand the structure and functions of animal cells.
- Define membrane as a dynamic entity.

Points for discussion

- We discussed the difference between prokaryotic and eukaryotic cells, different models of plasma membrane, asked questions how plasma membrane is dynamic. We also discussed the mechanism of membrane transport.

Unit	Topic	Method	Activity	No. of classes needed
II	Endoplasmic reticulum, structure, function including role in protein segregation/Traficking	Lecture, Interaction Discussion with the active involvement of students, power point presentation	Question & Answer Session, Library/presentation	04
	Golgi complex, structure, biogenesis and functions including role in protein secretion	do	do	04
	Brief Idea of vesicular transport	do	do	02
	Endocytosis, Pinocytosis and Phagocytosis	do	do	03
	Lysosomes	do	do	02
	Ribosomes: Structure and function including role in protein synthesis	do	do	04
	Mitochondria: Structure and function, Genomes, biogenesis	do	do	06

Learning Outcomes

After going through this unit you should be able to:

- Describe the structure of Endoplasmic Reticulum and its role in endomembrane system
- Compare the difference between Rough Endoplasmic Reticulum and Smooth Endoplasmic Reticulum
- Describe the structure and compartmentalization of Golgi complex
- Elucidate the biogenesis and function of Golgi Complex
- Role of Golgi complex in secretory pathway, focus on anterograde and retrograde transport
- Explain the different aspects of vesicular transport including constitutive and signal based pathway
- Differentiation between Endocytosis, Pinocytosis and Phagocytosis
- Define lysosomes, explanation of its structure and function
- Explain the structure, function and role of Ribosomes in protein synthesis
- Determine the structural details of Mitochondria and explain its role in oxidative phosphorylation
- Determine the Genomic structure of Mitochondrial DNA and its major roles

Points for discussion

You may like to dwell upon and try to find answers to some of the following points:

- What is the role of Endoplasmic reticulum in protein targeting with emphasis on Signal hypothesis?
- What is the endomembrane system and how different organelles work in integrated manner to complete the secretory pathway?
- What is the difference anterograde and retrograde pathway of protein secretion?
- Explain the theories of Oxidative Phosphorylation? How is Chemiosmotic theory able to explain the efficient synthesis of ATP molecules?
- Explain the role of ribosomes in the protein synthesis?
- Describe the structure of Mitochondrial DNA and its different roles?

References:

1. Gerald Karp (2013) Cell and Molecular Biology: Concepts and Experiments, 7th Edition
2. Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2008) Molecular Biology of the Cell. 5th Edition. Garland Science
3. PS Verma and AK Agarwal (2004) Cell Biology, Genetics, Molecular Biology, Evolution & Ecology S. Chand
4. Power, C.B. (2016), *Cell Biology*, India, Himalayan Publishing House
5. <http://www.mheducation.com/highered/product/M007802420X.html>
6. **Molecular Cell Biology** 4th ed., Lodish, Harvey; Berk, Arnold; Zipursky, S. Lawrence; Matsudaira, Paul; Baltimore, David; Darnell, James E., New York: W. H. Freeman & Co., 1999. The Cell- A Molecular Approach Bookshelf Link
7. **The Cell - A Molecular Approach** 2nd ed., Cooper, Geoffrey M., Sunderland (MA): Sinauer Associates, Inc., 2000. Bookshelf Link
8. Kierszenbaum, Abraham L; Tres, Laura (2015). Histology and Cell Biology: An Introduction to Pathology. Retrieved from <http://www.ebib.com> Histology and Cell Biology: An Introduction to Pathology
9. Pollard, Thomas D.; Earnshaw, William C.; Lippincott-Schwartz, Jennifer (2014). Cell Biology. Retrieved from <http://www.ebib.com>
10. Celis, Julio E.; Carter, Nigel; Simons, Kai; Small, J. Victor; Shotton, David (2005). Cell Biology, Four-Volume Set : A Laboratory Handbook. Retrieved from <http://www.ebib.com> Cell Biology
11. https://cellbiology.med.unsw.edu.au/cellbiology/index.php/2010_Lecture_5
12. https://cellbiology.med.unsw.edu.au/cellbiology/index.php/2010_Lecture

Unit	Topic	Method	Activity	No. of classes needed
III	Structure and function of microtubules, Microfilaments, Intermediate filaments	Lecture, Interaction Discussion with the active involvement of students, power point presentation	Question & Answer Session, Library/presentation	04
	Cell-matrix interactions .	do	do	04
	cell-cell interactions	do	do	02
	Adherence junctions, tight junctions, gap junctions,	do	do	03
	Desmosomes and hemidesmosomes,.	do	do	02
	Focal adhesions and plasmodesmata	do	do	04

Learning Outcomes

After going through this unit Students should be able to:

- Describe the structure of microtubules, Microfilaments, Intermediate filaments
- Compare the difference between microtubules, Microfilaments, Intermediate filaments
- Elucidate function of microtubules, Microfilaments, Intermediate filaments
- Role of microtubules, Microfilaments, Intermediate filaments in providing supporting frame work
- Explain Cell-matrix interactions .
- Describe cell-cell interactions
- Explain Adherence junctions, tight junctions, gap junctions,
- Describe Desmosomes and hemidesmosomes
- Determine the structural Focal adhesions and plasmodesmata .

Points for discussion

You may like to dwell upon and try to find answers to some of the following points:

- What is the role of microtubules, Microfilaments, Intermediate filaments
- What is the cytoskelton and how they support the cell
- What is the difference between microtubules, Microfilaments, Intermediate filaments

- Explain Cell-matrix interactions
- Describe cell-cell interactions
- Explain the role of Desmosomes and hemidesmosomes
- Describe the structure of Focal adhesions and plasmodesmata and its different roles?

References:

- Gerald Karp (2013) *Cell and Molecular Biology: Concepts and Experiments*, 7th Edition
- Alexander Johnson , Julian Lewis , Martin Raff , Keith Roberts , Peter Walter (2008) *Molecular Biology of the Cell*. 5th Edition. Garland Science
- PS Verma and AK Agarwal (2004) *Cell Biology, Genetics, Molecular Biology, Evolution & Ecology* S. Chand
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- The Cell - A Molecular Approach** 2nd ed., Cooper, Geoffrey M., Sunderland (MA): Sinauer Associates, Inc., 2000. Bookshelf Link
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- Pollard, Thomas D.; Earnshaw, William C.; Lippincott-Schwartz, Jennifer (2014). *Cell Biology*. Retrieved from <http://www.ebib.com>

Unit	Topic	Method	Activity	No. of classes needed
IV	Cell Cycle & Signaling	Lecture, PPT, Discussion	Library / Lab consultation/ assignment& presentation	15
	Introduction to Cell Cycle	do	do	02
	Mitosis	do	do	01
	Meiosis	do	do	01
	Regulation of Cell Cycle	do	do	02
	Molecular Mechanism of Action of Hormones	do	do	02

	Autocrine, Paracrine and endocrine signaling	do	do	02
	Receptor and action (GPCR signaling, cAMP, cGMP, IP3, DAG, Ca ²⁺ , NO)	do	do	04
	Receptor Tyrosine Kinase	do	do	01

Learning Outcomes

After going through this unit the students should be able to:

- Define cell cycle, differentiate between mitosis and meiosis.
- Understand the mechanism of hormone actions.
- Define Signal Transduction with examples.
- Define Receptor Tyrosine Kinase.

Points for discussion

- We discussed the difference between mitosis and meiosis, and checkpoint for the regulation of cell cycle. We also discussed in details about the mechanism of hormone action, and signal transduction.

References:

1. Karp, G. 2010. **Cell and Molecular Biology: Concepts and Experiments**. 6th Edition. John Wiley& Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. **Cell and Molecular Biology**. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009. **The Cell: A Molecular Approach**. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 **The World of the Cell**.7th edition. Pearson Benjamin Cummings Publishing, San Francisco.