# PhD degree in (Medical Biochemistry and Molecular Biology)

## Blueprint of (Biochemistry of proteins and cell signaling – Advanced level) course (PhD)

## Course Code: (BIC604BPCA - BIC609BPCA - BIC610BPCA)

**The total marks of this course are 150, divided as:**

- Workplace-based assessment (30 marks)
- Written exam (120 marks), distributed as follows:

| Course content | Teaching hours | Relative weight to the total marks | Total Marks | MCQ Marks | No of exam Q (MCQ) | Short essay questions Marks | No of exam Q (short essay questions) |
|---|---|---|---|---|---|---|---|
| 1. Proteins: Three-dimensional structure and function:<br>a) Primary, secondary, tertiary and quaternary structure.<br>b) Protein-protein interactions.<br>c) Protein denaturation and renaturation. | **1** | **2.22%** | **3** | 2 | | 1 | |
| 2. Protein folding and stability:<br>a) Definition - processing.<br>b) Quality control system.<br>c) Unfolded protein response in the cytosol and endoplasmic reticulum.<br>d) Degradation of proteins.<br>e) Biochemical aspect of conformational diseases associated with unfolding of various proteins. | **3** | **6.67%** | **8** | 6 | | 2 | |
| 3. Intracellular trafficking and | **3** | **6.67%** | **8** | 6 | | 2 | |

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|---|---|---|---|---|---|---|---|
| sorting of proteins:<br>a) Pathways of protein import into intracellular organelles.<br>b) Transport vesicles.<br>c) Protein sorting.<br>d) Role of small GTPases.<br>e) Biochemical aspect of diseases caused by abnormalities in intracellular transport of specific proteins. | | | | | | | |
| 4. Plasma proteins:<br>a) Enzymes.<br>b) Hormones.<br>c) Transport or binding proteins.<br>d) Proteins involved in immune defense, inflammatory response and blood clotting. | **5** | **11.11%** | **13** | 9 | | 4 | |
| 5. Globular and fibrous proteins:<br>- Types, structure and function. | **1** | **2.22%** | **3** | 2 | | 1 | |
| 6. Proteomics:<br>a) Introduction.<br>b) Types: Expression, structural and functional proteomics.<br>c) Basics of proteomics technologies:<br>❖Conventional techniques:<br>- Chromatography.<br>- Enzyme- linked | **7** | **15.56%** | **19** | 13 | | 6 | |

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|---|---|---|---|---|---|---|---|
| immunosorbent assay (ELISA).<br>- Western blotting.<br>- 2D-gel electrophoresis.<br>❖ Advanced techniques:<br>- Microarrays.<br>- Mass spectrometry (MS).<br>- Amino acid sequencing.<br>- Isotope coded affinity (ICAT).<br>- X-ray crystallography. | | | | | | | |
| 7. Introduction to cell signaling:<br>a) Basic principle of cell signaling.<br>b) Cell-cell & cell-matrix interaction. | **1** | **2.22%** | **3** | 2 | | 1 | |
| 8. Components of cell signaling:<br>a) Ligands or signals.<br>b) Receptors:<br>❖ Intracellular:<br>□ Organelles (nuclear,mitochondrial & endoplasmic reticulum).<br>□ Cytoplasmic<br>❖ Membranous<br>c) Signal transducers<br>d) Second messengers<br>e) Transcription factors | **5** | **11.11%** | **13** | 9 | | 4 | |
| 9. Molecular mechanisms of cell | **8** | **17.78%** | **21** | 15 | | 6 | |

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|---|---|---|---|---|---|---|---|
| signaling pathways:<br>a) Initiation.<br>b) Propagation:<br>□ cAMP / phosphoinositide Ca+2<br>signaling pathways.<br>□ cGMP signaling pathways.<br>□ RAS / MAP kinase signaling pathways.<br>□ PI3K / AKT / mTOR signaling<br>pathways.<br>c) Response:<br>□ Insulin response pathway.<br>□ Damage / stress response.<br>□ Oncogenic (proliferation) response pathway.<br>□ Survival response pathway.<br>□ Inflammatory response pathway.<br>□ Energy response pathway.<br>□ Developmental response pathway.<br>d) Termination. | | | | | | | |
| 10. Regulators of signaling pathways. | **2** | **4.44%** | **5** | 3 | | 2 | |
| 11. Clinical aspect of misfolded proteins e.g. amyloidosis, | **3** | **6.67%** | **8** | 6 | | 2 | |

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|---|---|---|---|---|---|---|---|
| Alzheimer, Parkinson′s diseases, ..etc | | | | | | | |
| 12. Clinical aspect of diseases caused by abnormalities in intracellular transport of specific proteins e.g. cystic fibrosis, hemophilia, familial hypercholesterolemia, α1 antitrypsin deficiency, Von Willbrand, etc | **3** | **6.67%** | **8** | 6 | | 2 | |
| 13. Clinical aspect related to plasma proteins abnormalities. | **3** | **6.67%** | **8** | 6 | | 2 | |
| Total | **45** | **100%** | **120** | 85 | | 35 | |

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