Final Exam Questions in Medical Biology For the Students of Pharmaceutical Faculty

1. The universal features of cells (having - DNA, mRNA, Proteins, enzymes-catalysts, free energy consumption, plasma membrane);

2. Genetic information of prokaryotic cells;

3. Evolving of eukaryotic cells;

4. Genetic information of eukaryotic cells;

5. The tree of life;

6. Four major families of small organic molecules: sugars, fatty acids, amino acids, nucleotides);

7. Oxidation of organic molecules and ATP synthetic reactions (glycolysis, fermentations, citric acid cycle, electron transport reactions, oxidative phosphorylation);

8. DNA and chromosomes (the structure of eukaryotic chromosomes);

9. DNA replication and repair;

10. From DNA to RNA;

11. From RNA to Proteins;

12. Genes and genome, mobile genetic elements and viruses;

13. Membrane structure (the lipid bilayer: phospholipids, sphingolipids, cholesterol, lipid rafts, glycolipids);

14. Membrane proteins (transmembrane, peripheral, integral);

15. Carbohydrate layer of plasma membrane, lectins;

16. Membrane transport (passive transport, active transport, coupled transport, channel proteins, carrier proteins, uniporters, symporters, antiporters, Na+ - driven carrier proteins, ATP-driven pumps, Na+ - K + pump);

17. Structure of the nucleus (nuclear envelope, nuclear pore complexes, nuclear lamina proteins, chromatin, nucleolus, nucleoplasm); Functions of the nucleus;

18. Gated transport: Nuclear import and export mechanisms (protein with nuclear localization signal, nuclear import receptor, protein with nuclear export signal, nuclear export receptor, Ran-GTP, Ran-GDP);

19. Structure of mitochondrion (mitochondrial membranes, mitochondrial matrix, mitochondrial DNA); Functions of mitochondria;

20. Transmembrane transport: The import of proteins into mitochondria (mitochondrial precursor proteins, protein translocators: TOM, TIM, OXA complexes, chaperone proteins);

21. Structure of peroxisomes (peroxisomal membrane, peroxisomal enzymes), Functions of peroxisomes;

22. Transmembrane transport:The import of proteins into peroxisomes (peroxisomal import signal, import receptor, peroxins, ATP);

23. A model for new peroxisomes formation;

24. Structure of the endoplasmic reticulum (ER membranes, ER lumen), Functions of ER;

25. Co-translation transport: The import of proteins into the Endoplasmic reticulum (ER signal sequence, SRP, SRP-R, protein translocator);

26. Protein glycosylation in the rough Endoplasmic reticulum (lipid molecule-dolichol, lipidlinked oligosaccharide, oligosaccharyl transferase, N-linked oligosaccharides, O-linked oligosaccharides);

27. Vesicular transport (COPI,COPII, klathrin, adaptin, dynamin, Rab-GTP, Rab-GTP effector, SNAREs);
28. Structure of the Golgi apparatus (cis and trans faces, cis network, trans network, Golgi vesicles, secretory vesicles); The functional compartmentalization of the Golgi apparatus;

29. Processing of Oligosaccharide chains in the Golgi apparatus; assembling of proteoglycans in the Golgi apparatus;

30. Transport from the ER through the Golgi apparatus (COPII-coated vesicles, SNARE proteins, ER resident proteins);

31. The retrieval pathway of proteins to the ER using sorting signals (KDEL sequence, KDEL receptor, COPI-coated transport vesicles);

32. Structure of lysosomes (lysosomal membrane characteristics, acid hydrolases); Functions of lysosomes;

33. The transport of newly synthesized lysosomal hydrolases to lysosomes (lysosomal hydrolase precursor, M6P, M6P-receptor, clathrin-coat, late endosome, mature lysosomal hydrolase);

34. Pathways to degradation in lysosomes (endocytosis, early endosomes, late endosomes, autophagy, autophagosome, phagocytosis, phagosome);

35. Specialized lysosomes of melanocytes and their exocytosis;

36. Phagocytosis (professional phagocytes, phagosomes, actin filaments, Fc receptors);

37. Pinocytosis (clathrin-coated pits, caveolae);

38. Receptor-mediated endocytosis (LDL, transferrin);

39. Transcytosis (receptor-antibody complexes, recycling endosome);

40. Constitutive secretory pathway;

41. Regulated secretory pathway.

42. Cytoskeleton (microtubules, actin filaments, motor-proteins);

43. Mitochondrial diseases, Peroxisomal diseases, Lisosomal diseases;

44. Cystic fibrosis, Familial hypercholesterolemia;

45. The phases of cell cycle;

46. The M phase of the cell cycle;

47. Chromatin condensation;

48. Breakdown of the nuclear envelope;

49. The assembly and function of the mitotic spindle;

50. Chromosomes movement to the middle of the cell;

51. The separation of sister chromatids to opposite poles;

52. Cytokinesis;

53. Cell cycle control system (checkponts, cyclins, cdks, inhibitor proteins, tumorsuppressive proteins p53,Rb);

54. Apoptosis (caspases, signaling pathways to activate caspase cascade);

55. Characteristics and benefits of sexual reproduction;

56. Characteristics of I division of meiosis (homologs pairing, crossing over, assembling and disassembling of synaptonemal complex, homologs segregation);

57. Characteristics of II division of meiosis;