Biophysics semifinal exam, topic list for the starting of talk 2020/21 I. semester (Pharmacy)(EP)

1. The basis of geometrical optics. What phenomena can be explained by it?
2. Basis of wave optics. What phenomena can be explained by it?
3. Resolution limit of the light microscope, Abbe's principle, special light microscopes.
4. How can you apply the wave-particle duality for light?
5. What quantities and laws can be used to describe radiations?
6. Summary of the important experiments about the atomic structure. (Thomson, Rutherford, Franck-Hertz)
7. Summary of the atomic models with their critiques. (Thomson, Rutherford, Bohr)
8. Basis of quantum physics (state function). Bound and free states of the electron.
9. Interpretation of bounds and interactions between atoms.
10. The Boltzmann-distribution and its applications.
11. Light scattering and absorption (macro- and microscopic laws) Interaction of light and matter.
12. Thermal radiation, laws, principles, spectra in different representations.
13. Luminescence, discrimination of its types, practical applications, spectra.
14. Light amplification, properties and generation of laser radiation.
15. Laws for the description of gases (macro- and microscopic). Real and ideal gases.
16. Spatial and energetic structure of crystalline materials. relation to optical and electric properties.
17. Defects in crystals, effects of doping.
18. Structure and properties of liquid crystals, applications.
19. Fluids. Physical properties of water and their explanation. (surface tension)
20. Production of X-ray radiation, comparison of bremsstrahlung and characteristic radiation by spectra and generation.
21. Absorption of X-ray and γ-radiation, interaction of high energy photons with matter.
22. Interaction of high energy photons with atoms and molecules.
23. Radioactive decay types, interactions of nuclear radiations with matter.
24. Radioactive decay law. Properties and applications of radioactive isotopes.

1. Image formation (lens, mirrors), microscope.
2. Concentration determination with the refractometer.
3. Optics of the eye, image formation in the eye.
4. Special microscopy methods.
5. Force measurement with a spring/cantilever; resonance.
6. Light emission and its laboratory applications
7. Material identification and concentration determination by polarimetry.
8. Light absorption and its laboratory applications.
9. Basis of nuclear measurement techniques.
10. Analysis of the amplifier, signal processing.
11. Dosimetry, dose(rate) measuring devices.
12. Absorption of gamma radiation, basis of radiation protection.