Biophysics final exam, part II., topic list for the labs (2020, EP)

The form of the exam is an online zoom-meeting. After the successful completion of part I. you will be required to talk about two topics (one from the C-list, and one from the D-list). In each topic you will get three sub-questions (altogether six questions). A perfect answer is worth 3 points for each sub-question. The final grade will be given based on the total amount of points from both parts.

C/1	The basis of geometrical optics. What phenomena can be explained by it?
C/2	Absorption of X-ray and γ-radiation, interaction of high energy photons with matter.
C/3	Basis of wave optics. What phenomena can be explained by it?
C/4	Physical properties of water and their explanation.
C/5	Resolution limit of the light microscope, Abbe's principle, special light microscopes.
C/6	Radioactive decay law. Properties and applications of radioactive isotopes.
C/7	How can you apply the wave-particle duality for light?
C/8	Production of X-ray radiation, comparison of bremsstrahlung and characteristic radiation by spectra and generation.
C/9	What quantities and laws can be used to describe radiations?
C/10	Summary of the properties of proteins and nucleic acids based on the bond strengths.
C/11	Summary of the important experiments about the atomic structure. (Thomson, Rutherford)
C/12	Laws for the description of gases (macro- and microscopic). Real and ideal gases.
C/13	Summary of the Thomson- , Bohr- and Rutherford atomic models with their critiques.
C/14	Spatial and energetic structure of crystalline materials. relation to optical and electric properties.
C/15	Basis of quantum physics (state function). Bound and free states of the electron.
C/16	Luminescence, discrimination of its types, practical applications, spectra.
C/17	Interpretation of bounds and interactions between atoms, AFM.
C/18	Structure and properties of liquid crystals, applications.
C/19	The Boltzmann-distribution and its applications.
C/20	Light amplification, properties and generation of laser radiation.
C/21	The Franck-Hertz experiment and its conclusions.
C/22	Defects in crystals, effects of doping.
C/23	Thermal radiation, laws, principles, spectra in different representations.
C/24	Radioactive decay types, interactions of nuclear radiations with matter.
C/25	Light scattering and absorption (macro- and microscopic laws) Interaction of light and matter.
C/26	Particle accelerators, their role in medicine and in the generation of ionizing radiation.
D/1	Flow of fluids (liquids and gases), laws.
D/2	Fluids with internal friction: laws and applications for the blood flow.
D/3	Laws and applications of diffusion in biology.
D/4	Basis of thermodynamics, quantities and concepts used for the description of systems.
D/5	Unified description of transport processes ; The Laws of Thermodynamics.
D/6	Thermodynamic potential functions and their applications.
D/7	Generation of the resting state membrane potential by transport mechanisms.
D/8	Electric potential changes in biological membranes.
D/9	Basis of sensory function, psychophysical laws, connection between stimulus and sensation.
D/10	Basis of sedimentation and electrophoretic methods; application examples.
D/11	Methods based on the absorption of UV and VIS radiation.
D/12	Summary of the nuclear magnetic resonance technique and its applications.
D/13	Structure determination methods based on luminescence.
D/14	Basis of electrical circuits, examples.
D/15	Basis and steps of signal processing methods.
D/16	Detection of ECG signals on the surface of the human body.
D/17	Medical imaging methods based on the absorption of X-ray radiation.
D/18	Comparison of the medical imaging methods utilizing radioactive isotopes.
D/19	Basis of mass spectrometry.
D/20	Electrical signals used for therapy: generation, applications.
D/21	Operating principle and information gained by raster scanning light microscopy.
D/22	Operating principle of the FTIR spectrometer and the information gained by its usage.
D/23	Comparison of light end electron microscopes and their applications.
D/24	Application of X-ray diffraction in the structure determination of macromolecules.
D/25	Basis of sonography.