

**QUESTIONS of COLLOQUIUM 2 (MODULE 2)**  
**on «PHYSICS and MATHEMATICS»**  
**for anglophone students of the 1 course**  
**over 1 term of 2020/2021**

1. Interference. Coherent waves and the sources of coherent waves. The conditions for maximum and minimum of wave intensity.
2. Interferometers and interference microscope, their use in medicine and biology.
3. Diffraction. Huygens'-Fresnel principle. Diffraction grating. Conditions for basic maxima and minima (basic formula for diffraction grating). Diffraction spectrum.
4. Polarization of light. Natural and polarized light. Methods for producing of polarized light: reflection at the interface of two dielectrics (Brewster's law) and birefringence (double reflection). Polarizable devices: Stoletov's stack, Nicol prism.
5. Light transmission through the system «polarizer- analyzer». Malus law.
6. Rotation of the plane of polarization by optically active substances. Dispersion of optical activity. Application of polarized light for solution of medical and biological problems: polarimetry, photoelasticity, polarizable microscopy.
7. Geometrical optics as limit case of wave optics. Law of reflection and refraction.
8. Total internal reflection. Fiber optics and its use in medicine.
9. Lens. Power of lens. Construction of image in thin lenses. Formula of thin lense. Power of lens. Aberration of lenses: spherical, chromatic, astigmatism.
10. Optical microscopy. Simple magnifying lens (loop), ray-tracing in magnifying lens, its magnification. Ray-tracing in microscope, magnification formula.
11. Resolution limit and useful magnification of microscope. Special technique of microscopy: ultraviolet microscope, immersion mediums, ultramicroscopy, microprojection and microphotography, size measurement of small objects.
12. X-Ray radiation. Braking radiation and its spectrum. Cutoff wavelength. Characteristic X-rays and its spectrum. Mosely law. Weakening of X-Ray flow.
13. Radioactivity. Law of radioactive decay. Decay constant. Half-life.  $\alpha$ -decay,  $\beta$ -decay,  $\gamma$ -radiation.