Program MidtermExam
on the discipline «**Nuclear astrophysics**» for 1st course master students of specialty
«6M060400 – Physics »

The proposed MidtermExam program on discipline «**Nuclear astrophysics**» is made according to the discipline syllabus. The program determines the requirements for the levels of mastering the academic discipline: what the student should have *an idea* after studying the course for 7 weeks, which should know what *skills* and *habits* should be formed.

At MidtermExam, students will be asked two theoretical questions and one task.

Midterm addresses the following questions:

1. To write down the complete density of energy and energy falling on one baryon in terms of concentration of baryons
2. To write down the expression for a quantity of heat received in terms of one baryon
3. To write down an equilibrium condition in an element of Wednesday through warmth and entropy, falling on one baryon
4. To write down the first law of thermodynamics through the energy falling on one baryon, and concentration of baryons
5. To give values for weight and the radius of the Sun; to give the reference values for masses and the sizes of neutron stars, white dwarfs and black holes in mass units and the extent of the Sun; to give the range of values of mass of stars - predecessors of compact stars (in Sun mass units)
6. To write down dependence of warmth of dQ in an element of Wednesday from temperature of T and ds – an entropy on one baryon
7. To write down for an environment element in equilibrium the equation for the energy falling on one baryon depending on pressure, volume (falling on one baryon) and temperature
8. To write down for an environment element in equilibrium the equation for the energy falling on one baryon depending on pressure, concentration of particles of a grade of i and their chemical potential, and temperature
9. To write down a differential equation of dependence of pressure and temperature on density of number of baryons
10. To write down a differential equation of dependence of chemical potential on density of number of particles of a grade of i
11. To write down reactions of an electron capture and to offer an explanation of course of such reactions in superdense environments (crystals)
12. Cumulative distribution function of particles in case of Fermi statisticians and in a case to Bosa statisticians
13. To write down relativistic parameter in terms of an impulse of Fermi
14. To write down density of electrons through Fermi impulse for a degenerate electronic Fermi liquid
15. To give values for weight and the radius of the Sun; to give the reference values for masses and the sizes of neutron stars, white dwarfs and black holes in mass units and the extent of the Sun; to give the range of values of mass of stars - predecessors of compact stars (in Sun mass units)

BIBLIOGRAPHY

1. Richard N. Boyd. An Introduction to Nuclear Astrophysics. University of Chicago Press (April 15, 2008)
2. Norman K. Glendenning. Compact Stars: Nuclear Physics, Particle Physics, and General Relativity. Springer; 2nd edition (June 16, 2000)
3. D. Perlov, A.Vilenkin Cosmology for the Curious. Springer; 1st ed. 2017 edition. July 20, 2017
4. Gershberg R.E. Active solar-type main sequence stars. Odessa: Astroprint 2002.
5. B.Greene.The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory Hardcover – October 17, 2003
6. Cotnikova R. T Astrophysics. Irkutsk .: RIO 2005.
7. A.G.W. Cameron and David Miles Kahl.Stellar Evolution, Nuclear Astrophysics, and Nucleogenesis Dover Publications; 2 edition (March 21, 2013) Feb 21, 2013