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| 1 | Which interactions relate to fundamental? |
| 2 | List the fundamental interactions in ascending order of the relative intensity. |
| 3 | What is the gravitational waves and what are the possible sources of their nature? |
| 4 | In which physical phenomena is weak interactions occur? |
| 5 | Why weak interactions are considered as short-action? |
| 6 | At what values of the interaction energy can we talk about merger of weak and electromagnetic interactions? |
| 7 | Pions and gluons are two kinds of quanta in the strong interaction. |
| 8 | Why neutrinos are an important source of information on thermonuclear processes inside the Sun and stars? |
| 9 | How can register neutrinos? |
| 10 | What is neutrino oscillations? |
| 11 | What changes have been the concept of "rest mass" and "relativistic mass" in recent developments in particle physics? |
| 12 | What is meant by the terms "technology" and "quantum" sensitivity limits in the physical experiment? |
| 13 | "Colored" and "colorless" particles. |
| 14 | What is the cumulative particle? |
| 15 | What is the concept of "mass defect" and how they define the "valley of stability"? |
| 16 | What four groups divided presently known radioactive processes? |
| 17 | How the model of "liquid drop" explains nuclear fission? |
| 18 | Which nuclei characterized proton and double-proton radioactivity? |
| 19 | What is a cluster radioactivity? |
| 20 | How beams of accelerated radioactive nuclei are used to obtain and study of exotic isotopes? |
| 21 | Specify the main features and characteristics of the interactions of charged particles. |
| 22 | Specify the main features of the strong interaction. |
| 23 | Describe the basic characteristics of the weak interaction. |
| 24 | How to call the particles or field which creates interaction? |
| 25 | How to call the particles that are elementary components of matter? |
| 26 | What does mean quantum  number "color" for quarks? |
| 27 | What is the difference of "gluons" and quarks? |
| 28 | What means and describe Feynman diagrams? |
| 29 | Planck's constant - quantum  of what quantity in physics? |
| 30 | What is the physical meaning of indeterminacy? |
| 31 | What an important role plays weak interaction  in the formation of our Universe? |
| 32 | Why do we need high-energy particle accelerators? Why they can be used to understand the physics of the early Universe? |
| 33 | What is the Large Hadron Collider? |
| 34 | What is a cyclotron? Describe the basic principles of its operation. |
| 35 | Yukawa potential and the Coulomb potential - describe their main characteristics and differences. |
| 36 | Leptons. Give the types of leptons and  their characteristics. |
| 37 | Spins of elementary particles. |
| 38 | Pauli principle and structure of nuclei. Describe the construction of the electron orbits in atoms. |
| 39 | Fermi and Bose particles. |
| 40 | What are the properties of particles associated with quantum number "strangeness"? |
| 41 | The binding energy of the nuclei. |
| 42 | How to determine the binding energy of the nucleus, knowing the mass of the nucleus, the mass of the proton and neutron? |
| 43 | Find a specific energy of a nucleus of a helium atom. |
| 44 | Determine the total binding energy of a nucleus of uranium-238. |
| 45 | Determine the total specific binding energy of a nucleus of molybdenum- 96. |
| 46 | Determine the total binding energy of a nucleus of osmium -191. |
| 47 | Describe the types of radioactivity of different nuclei. |
| 48 | Describe the reaction of the alpha decay of nuclei. |
| 49 | Describe the reaction of the beta decay of nuclei. |
| 50 | Reaction of electron capture. |
| 51 | Gamma and beta radiation of nuclei. |
| 52 | The reaction of spontaneous fission of heavy nuclei. Describe the fission products. |
| 53 | Principle of operation of nuclear reactors based on uranium fission. |
| 54 | Fission chain reaction. |
| 55 | The reaction of light nuclei. Write the fusion reaction of protons with form of deuterium nuclei. |
| 56 | Burning the nuclei of hydrogen atoms on the Sun. |
| 57 | Cycles of thermonuclear burning of hydrogen with form of helium nuclei. |
| 58 | Which means "island of stability" for the nuclei of chemical elements? |
| 59 | Properties of nuclei far from island of stability. Give examples. |
| 60 | Abundances of chemical elements in nature. |