

## Variant 1.

1) There are four different ways in which the various particles that make up the Universe can interact with one another. Each of these is a particular variety of interaction or to use a more old-fashioned but more common term a force. These four forces are the nuclear, the electromagnetic, the weak and the gravitational. Each particle in the Universe is the source of one or more of these forces. Each particle serves as the center of a volume of space in which that force exists with an intensity that decreases as the distance from the source increases. The nuclear forces are especial and make themselves felt only at incredibly tiny distances about  $10^{-13}$  cm.

2) The constituents (составляющие) of the nucleus were not completely identified until the 1930s. These constituents, collectively called nucleons are neutrons that are uncharged and protons that have a positive charge. A neutron or proton is approximately 1800 times as massive as an electron. A typical nuclear radius is  $10^{-14}$ cm, what is 10000 times smaller than that of atom. The strong nuclear force overwhelms (превосходит) the electric repulsion and holds the protons together.

3) It is very difficult to realize the level of knowledge and the style of reasoning typical for the culture of antiquity. So many centuries separate us from the antiquity. It's often very difficult to appreciate the true measure of the scientific genius of a thinker in antiquity. Heraclitus of Ephesus, a philosopher in ancient Greece, was one of the first to set forth (изложил) a belief that everything in the world changes and changeability is the highest law of nature. But people rather observed the cyclic organization of phenomena in the surrounding nature. So they had been gradually come to the belief that all phenomena change cyclically, returning 'to their proper orbits'.

4) Galileo Galilei developed a new understanding of physics and formulated the first truly substantiations (обоснования, доказательства) of science. Galilei made a lot of important discoveries. The most important was his novel approach to natural sciences. He also discovered the law of motion by inertia [ɪˈnɜːʃə] it was the basis of the principle of mechanical relativity. He built first telescope which helped him to make a lot of discoveries. After the notorious (печально известного) trial (судебного процесса) in 1633 he was kept under house arrest for the remaining (оставшиеся) 12 years of his life.

3.
  1. What discoveries of the 19th century have led to a new reasoning of matter and influenced on other branches of science, technologies and ways of our thinking?
  2. Where do scientists usually represent the results of their work?
  3. When was the electron discovered? (1897, Thomson, tracks of cathode rays)
  4. Who has discovered the neutron? (By whom was the neutron discovered?)
  5. Why has the quark model of the atom been suggested? *Sir James Chadwick, 1932*

## Variant 2.

1) Physics is a branch of science that deals with matter, energy and their interaction. The definition of physics also usually expanded by nothing that physics includes subfields such as mechanics, heat, electricity and so forth. But there is no answer why some fields are included and some of them are not. A better approach to defining physics is to ask what physicists are concerned about. Physicists attempt to understand the basic rules or laws that govern the operation of the natural world in which we live.

2) People with varied interests may find the study of physics interesting and useful. For example, a historian who wants to understand the origin of contemporary society will find significance in the story of the development physics and its relationship to other human activities. Similarly (аналогично), a philosopher concerned about concepts of space and time will profit from understanding the twentieth-century advances in physics. Physical principles underlie the operation of light and electron microscopes, of X-ray machines and nuclear magnetic resonance spectrometers. Physics is also fundamental to a true understanding of chemistry, biology and the earth sciences.

3) Aristotle left a tremendous imprint on all later developments in science and philosophy. He believed that the world we observe by vision and touch was real. Aristotle considered physics as the science treating changing objects that exist in the real world. According to Aristotle the primary properties of matter are opposites: 'warm' and 'cold', 'dry' and 'wet'; the primary elements are earth, water and fire and ether. According to Aristotle the Earth is in the center of the Universe. The Sun, the Moon and the planets are fixed to crystal spheres and revolve around the Earth along concentric circles.

4) The Copernican Revolution produced a dramatic transformation in people's view of the world. First of all he broke a barrier between the terrestrial and the celestial. Copernicus' model showed the Earth to be an ordinary planet, which revolves around the Sun. Copernicus was the first to challenge the dogmas of Aristotelian physics. He understood that everything on the Earth moving by must occur exactly as it would be on the Earth at rest. His treatise was printed in 1543

3.
  1. What is the role of experiment in science and how does it help to create laws?
  2. For what achievements in physics did Rutherford get the Noble Prize in 1908?
  3. What is Aristotle's treatise of the Universe? (What is Aristotle's doctrine of the Universe?)
  4. Why have Copernicus's works been banned for more than two centuries?
  5. What was the novel approach of studying nature suggested by Galileo?

### Variant 3.

1) Since the interests of physics evolve (развивались) with time the basic science called physics also changes with time. Many of the most active contemporary subfields of physics were undreamed of a generation or two ago. On the other hand, some parts of what are now considered to be chemistry or engineering were once considered to be physics. This is because physicists sometimes gradually abandon a field on the basic principles are known, leaving further developments and practical applications to others.

2) Physics is fundamental to a true understanding of chemistry, biology and the earth sciences. The physical laws governing the behavior of molecules, atoms and nuclei are the basis for all chemistry and biochemistry. At the macroscopic level, the effects of forces of various types strongly influence the shapes of anatomical and human-built structures. Physiology also offers many examples of physical processes and principles. In exercise science, various activities can be optimized by the application of physical principles.

3) Scientists have been unable to detect or to find any reason for a fifth force to exist. First of all every particle in the source of one or more of these forces. Each particle serves as the center of a volume of space in which that force exist with an intensity that decreases as the distance from the source increases. The volume of space in which that force can make itself felt is the force field. Any particle that can serve as the source of particular field will respond to such a field set up by another particle.

4) The discovery of the proton the neutron and the electron was just the beginnings of a great increase in the roster (список) of so-called elementary particles. Muons were added to this list in 1937. Pions and strange particles were added in the 1940s. Neutrinos had been proposed by Pauli and were detected in Reines-Cowan experiment. Than with the appearance bubble chambers and the use of particle accelerators, there were developed a lot of different particles including mesons and baryons.

3.
  1. Why is it so difficult to create new elements?
  2. At what distance does nuclear force show itself (work)?
  3. What particles are called the hadrons?
  4. What has Heraclitus taught about?
  5. For what discoveries is Archimedes known (remembered) the most?