Fysiikan historia

Loppukoe

Elokuu 2012

1. Mitkä yleiset seikat loivat maaperää tieteelliselle vallankumoukselle? Luettele tieteellisen vallankumouksen tärkeimmät fyysikot ja kerro lyhyesti heidän roolinsa vallankumouksessa.

2. 1930-luvun alkupuolta pidetään eritysen merkittävänä ajanjaksona fysiikan historiassa. Mitä merkittävää silloin tapahtui?

3. Atomimallin kehitysvaiheet.

4. Kerro jostain fysiikan historian omasta mielestäsi erityisen mielenkiintoisesta tapahtumasta tai tapahtumasarjasta (sivun verran).

5. Seuraavassa on kuusi englannin kielistä tekstikatkelmaa, joista jokainen liittyy johonkin fysiikan historian merkkihenkilöön (nimet mustattu). Tunnista henkilöt. Jos nimi ei tule millään mieleen, niin kerro henkilöstä sellaisia muita tietoja, jotka tekevät hänet tunnistettavaksi.

A) In a famous memoir he asked: "How can we know that the steam is used in the most advantageous way possible to producemotive power?" [redacted], 1824). [redacted] studied heat engines whose thermal interaction with their surroundings consists only in the exchange (absorption or rejection) of heat with appropriate reservoirs of fixed temperatures, and he showed that the reversibly operating engine is more efficient than its irreversible counterpart when working between the same temperatures.

B) In 1878, he published an essay on the relation between the velocity of light in a medium and the density and composition thereof. The resulting formula, proposed almost simultaneously by the Danish physicist Lorenz, has become known as the Lorenz[redacted] formula.

[redacted] also made fundamental contributions to the study of the phenomena of moving bodies. In an extensive treatise on the aberration of light and the problems arising in connection with it, he followed A.J. Fresnel's hypothesis of the existence of an immovable ether, which freely penetrates all bodies. This assumption formed the basis of a general theory of the electrical and optical phenomena of moving bodies.

From [redacted] stems the conception of the electron; his view that his minute, electrically charged particle plays a rôle during electromagnetic phenomena in ponderable matter made it possible to apply the molecular theory to the theory of electricity, and to explain the behaviour of light waves passing through moving, transparent bodies.

C) *On Nature* is a bold and ambitious work. It is based on the claim that everything is composed of four material elements; these elements are moved by two opposing forces. The elements are fire, air, earth, and water; the forces are Love and Strife. "Air" refers to aither, the upper, atmospheric air, rather than the air that we breathe

here on earth. Aristotle credits [redacted] with being the first to distinguish clearly these four elements, traditional in Greek physical theory.

D) [redacted] work, which embodied the results of many years research, was distinguished by its strict adherence to the scientific method of investigation by experiment, and by the originality of its matter, containing, as it does, an account of the author's experiments on magnets and on electrical attractions, and also his great conception that the earth is nothing but a large magnet, and that it is this which explains, not only the direction of the magnetic needle north and south, but also the variation and dipping or inclination of the needle.

...

[redacted] magnetism was the invisible force that many other natural philosophers, such as Kepler, seized upon, incorrectly, as governing the motions that they observed. While not attributing magnetism to attraction among the stars, [redacted] pointed out the motion of the skies was due to earth's rotation, and not the rotation of the spheres, 20 years before Galileo.

E) After taking his doctorate [redacted] went on a trip to Finland then, in October 1923, he returned to Göttingen as Born's assistant. From September 1924 until May 1925 he worked with Niels Bohr at the University of Copenhagen, returning for the summer of 1925 to Göttingen. [redacted] invented matrix mechanics, the first version of quantum mechanics, in 1925. He did not invent these concepts as a matrix algebra, however, rather he focused attention on a set of quantised probability amplitudes. These amplitudes formed a non-commutative algebra.

F) [redacted] was a diligent and successful student, being the first great discoverer in optics after the time of Ptolemy. He first explained the apparent increase of heavenly bodies near the horizon, although Bacon gives the credit of this discovery to Ptolemy. He taught that vision does not result from the emission of rays from the eye, and wrote also on the refraction of light, especially on atmospheric refraction, showing, *e.g.* the cause of morning and evening twilight.