Fysiikan historia / History of Physics

Loppukoe / Final exam

18.04.2011

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

   Which general factors paved way for the Scientific Revolution? List the most important physicists of the Scientific revolution and give a brief account of their role in the revolution.

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

   The first part of the 1930s is considered as a particularly important era in the history of physics. What important happened in physics then?

3. Kerro, miten käsitys valon luonteesta on kehittynyt aikojen kuluessa.

   Describe the development in understanding the nature of light.

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

   Tell about some in your opinion important event or a series of events in the history of physics (about 1 page).

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

   Below there are six pieces of tex that each tell about an important physicist (the names and some concepts are blacked out). Identify the persons. If you cannot remember the name, describe the person in some other way so that one is convinced that you know who is the person in question.

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) [redacted] always appeared to have a clear view of the problems of physics and the determination to solve them. He had a strategy of his own and was able to visualize the main stages on the way to his goal. He regarded his major achievements as mere

stepping-stones for the next advance. At the start of his scientific work, [redacted] realized the inadequacies of Newtonian mechanics and his [redacted] stemmed from an attempt to reconcile the laws of mechanics with the laws of the electromagnetic field. He dealt with classical problems of statistical mechanics and problems in which they were merged with quantum theory: this led to an explanation of the Brownian movement of molecules. He investigated the thermal properties of light with a low radiation density and his observations laid the foundation of the photon theory of light.

C) [redacted] is most famous for his contributions to the understanding of electricity and electrochemistry. In this work he was driven by his belief in the uniformity of nature and the interconvertibility of various forces, which he conceived early on as fields of force. In 1821 he succeeded in producing mechanical motion by means of a permanent magnet and an electric current—an ancestor of the electric motor. Ten years later, in 1831, he converted magnetic force into electrical force, thus inventing the world's first electrical generator.

D) [redacted] fame is based on his invention of statistical mechanics. This he did independently of Willard Gibbs. Their theories connected the properties and behaviour of atoms and molecules with the large scale properties and behaviour of the substances of which they were the building blocks. [redacted] obtained the [redacted] distribution in 1871, namely the average energy of motion of a molecule is the same for each direction. He was one of the first to recognise the importance of Maxwell's electromagnetic theory.

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) Besides logic, natural philosophy is the other field in which [redacted] has enjoyed some recognition. This is largely due to the efforts of the pioneering historians of science Pierre Duhem and Anneliese Maier, who saw that [redacted] played a key role in the demise of the Aristotelian view of the cosmos. [redacted] major contribution here was to develop and popularize the theory of impetus, or impressed force, to explain projectile motion. Rejecting the discredited Aristotelian idea of antiperistasis, according to which the tendency of a thrown projectile to continue moving is due to a proximate but external moving cause (such as the air surrounding it), he argues that only an internal motive force, transmitted from the mover to the projectile, could explain its continued motion.