FUNDAMENTAL LAWS OF PHYSICS LIST pdf

1: 10 Scientific Laws and Theories You Really Should Know | HowStuffWorks

Most significant laws in science are conservation laws. These fundamental laws follow from homogeneity of space, time and phase, in other words symmetry. Noether's theorem: Any quantity which has a continuous differentiable symmetry in the action has an associated conservation law.

References and Further Reading 1. Laws of Nature vs. Laws of Science what he at that time called "physical laws" â€" with few exceptions â€" are inaccurate, are at best approximations of the truth, and are of limited range of application. The theme has since been picked up and advanced by Nancy Cartwright. If scientific laws are inaccurate, then â€" presumably â€" there must be some other laws statements, propositions, principles , doubtless more complex, which are accurate, which are not approximation to the truth but are literally true. When, for example, generations of philosophers have agonized over whether physical determinism precludes the existence of free will for example, Honderich , they have been concerned with these latter laws, the laws of nature itself. It is the explication of these latter laws, the Laws of Nature, that is the topic of this article. We will not here be examining the "approximate truths" of science. Thus, to cite just one example, the controversy over whether scientific laws are merely instruments lies outside the topic of this article. Regularity Recent scholarship for example, that of J. Wright and of Beauchamp and Rosenberg makes a convincing case that the received view as to what David Hume offered as an explication of the concept of law of nature was quite mistaken, indeed the very opposite of what Hume was arguing. What, historically, until late in the Twentieth Century, was called the "Humean" account of Laws of Nature was a misnomer. Hume himself was no "Humean" as regards laws of nature. Hume, it turns out, was a Necessitarian â€" i. His legendary skepticism was epistemological. He was concerned, indeed even baffled, how our knowledge of physical necessity could arise. What, in experience, accounted for the origin of the idea? What, in experience, provided evidence of the existence of the property? He could find nothing that played such a role. Yet, in spite of his epistemological skepticism, he persisted in his belief that laws of nature are physical necessities. So as not to perpetuate the historical error as to what "Humean" properly connotes, I will abandon that term altogether and will adopt the relatively unproblematical term "Regularity" in its stead. There is no physical necessity, either in laws or in nature itself. There is no intermediate state between logical necessity on the one hand and sheer contingency on the other. Necessitarianism Necessitarians, in contrast, argue that there is physical or as they sometimes call it "nomic" or "nomological" necessity. They offer two different accounts. According to some Necessitarians, physical necessity is a property of the Laws of Nature along with truth, universality, etc. Thus, for example, on the first of these two Necessitarian theories, electrons will bear the electrical charge On this latter account, the statement "All electrons bear a charge of Laws of Nature 1. But "Stars exist" although true does not express a law of nature: Categorical claims which are equivalent to conditional claims e. Laws of physics which are expressed mathematically are taken to be elliptical for conditional truths. Regularists say "yes"; Necessitarians, "no". Laws of Nature Moas a large flightless bird that lived in New Zealand have been extinct for more than a century. Suppose it died at the age of n years. Thus the statement "No moa lives beyond the age of n years" is true where "lives" is being used as a tenseless verb. Moreover this statement satisfies all the other necessary conditions specified above. But, Necessitarians will argue, the statement "No moa lives beyond the age of n years" is not a law of nature. It is counterintuitive to believe that such a statement could be on the same metaphysical footing as "No perpetual motion machine of the first kind exists", or, citing another example, "No object having mass is accelerated beyond the speed of light". The difference lies in the alleged fact that the latter two cases about perpetual motion machines and about massy objects are physically necessary truths; the former about moas is a mere accidental truth. Now suppose that Ludwig had a younger brother, Johann, hatched from the same clutch of eggs, one hour later than Ludwig himself. Poor Johann â€" he was shot by a hunter 10 minutes before Ludwig died of his illness. But, surely, had Johann not been shot, he would have lived to a greater age than Ludwig. Unlike his very slightly older brother, Johann was in perfect health. His death was a misfortune; it was not mandated by a law of nature. Given that what it is to be physically impossible is to be logically inconsistent with a law of nature, then every false existential statement of the sort "Some S is P" or "There is an S that is a P" would turn out to be, not just false, but physically impossible. But surely the statement "There is a river of cola", although false, is not physically impossible. There could be such a river. It would merely require a colossal accident such as befell Boston in when a huge vat of molasses ruptured , or the foolish waste of a great deal of money. If "there is a river of cola" is not to be regarded as physically impossible, then some one or more further conditions must be added to the set of necessary conditions for lawfulness. Physical necessity would seem to be that needed further condition. Failure Suppose 1 that Earth is the only planet in the universe to have supported intelligent life; and 2 that all life on Earth perished in when the earth was struck by a meteor 10, km in diameter. Clearly, under those conditions, the Wright Brothers would never have flown their plane at Kitty Hawk. Even though tinkerers and engineers had been trying for centuries to build a heavier-than-air motorized flying machine, everyone had failed to produce one. But their failure was merely failure; these projects were not doomed. Yet, if the universe had had the slightly different history just described, the statement "there is a heavier-than-air motorized flying machine" would turn out to be physically impossible; hence the project was doomed. But, Necessitarians will argue, not all projects that fail are doomed. Some are doomed, e. Again, just as in the case of accidental truths and lawful truths, we do not want to collapse the distinction between doom and failure. Some projects are doomed; others are mere failures. The distinction warrants being preserved, and that requires positing physical necessity and â€” what is the other side of the same coin â€" physical impossibility. The Case for Regularity With the dawning of the modern, scientific, age came the growing realization of an extensive sublime order in nature. To be sure, humankind has always known that there is some order in the natural world â€" e. But until the rise of modern science, no one suspected the sweep of this order. The worldview of the West has changed radically since the Renaissance. From a world which seemed mostly chaotic, there emerged an unsuspected underlying order, an order revealed by physics, chemistry, biology, economics, sociology, psychology, neuroscience, geology, evolutionary theory, pharmacology, epidemiology, etc. And so, alongside the older metaphysical question, "Why is there anything, rather than nothing? What accounts for it? Naturalizing Philosophy Even as recently as the Eighteenth Century, we find philosophers e. Montesquieu explicitly attributing the order in nature to the hand of God, more specifically to His having imposed physical laws on nature in much the same way as He imposed moral laws on human beings. There was one essential difference, however. In the Twentieth Century virtually all scientists and philosophers have abandoned theistic elements in their accounts of the Laws of Nature. But to a very great extent â€" so say the Regularists â€" the Necessitarians have merely replaced God with Physical Necessity. Regularists reject this view of the world. Regularists eschew a view of Laws of Nature which would make of them inviolable edicts imposed on the universe. Such a view, Regularists claim, is simply a holdover from a theistic view. It is time, they insist, to adopt a thoroughly naturalistic philosophy of science, one which is not only purged of the hand of God, but is also purged of its unempirical latter-day surrogate, namely, nomological necessity. The difference is, perhaps, highlighted most strongly in Necessitarians saying that the Laws of Nature govern the world; while Regularists insist that Laws of Nature do no more or less than correctly describe the world. I will not further pursue the issue of reductivism in this article. Just this say the Necessitarians: How can Regularists reply to this seemingly devastating attack, issuing as it does from deeply entrenched philosophical intuitions? Regularists will defend their theory against this particular objection by arguing that the expression "physically impossible" has different meanings in the two theories: That is, anything that is inconsistent with a Law of Nature is "physically impossible". On a prescriptivist account of Laws of Nature, one would say Laws of Nature "rule out" certain events and states-of-affairs. On both accounts â€" Necessitarianism and Regularity â€" what is physically impossible never, ever, occurs â€" not in the past, not at present, not in the future, not here, and not anywhere else. What is physically impossible is not merely nonoccurrent or nonexistent. These events and states-of-affairs simply could not occur or exist. When Necessitarians say of a claim â€" e. In contrast, when Regularists say that some situation is physically impossible â€" e. There is no nomic dimension to their claim. They are not making the modal claim that there could not be such a river; they are making simply the factual nonmodal claim that there timelessly is no such river. According to Regularists, the concept of physical impossibility is nothing but a special case of the concept of timeless falsity. It is only when one imports from other theories Necessitarianism, Prescriptivism, etc. Understand the ambiguity of the expression, and especially its nonmodal character in the Regularity theory, and the objection that the Necessitarians level is seen to miss its mark. There is an allied residual problem with the foundations of Necessitarianism. Some recent authors [e. Armstrong and Carroll] have written books attempting to explicate the concept of nomicity. But they confess to being unable to explicate the concept, and they ultimately resort to treating it as an unanalyzable base on which to erect a theory of physical lawfulness. Regularity and Explanation Another philosophical intuition that has prompted the belief in Necessitarianism has been the belief that to explain why one event occurred rather than another, one must argue that the occurring event "had to happen" given the laws of nature and antecedent conditions.

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2: Outline of physics - Wikipedia

The laws of physics are considered fundamental, although many of them refer to idealized or theoretical systems that are hard to replicate in the real world. Like other fields of science, new laws of physics build on or modify existing laws and theoretical research.

For example, atomic and nuclear physics studies matter on the smallest scale at which chemical elements can be identified. The physics of elementary particles is on an even smaller scale since it is concerned with the most basic units of matter; this branch of physics is also known as high-energy physics because of the extremely high energies necessary to produce many types of particles in particle accelerators. On this scale, ordinary, commonsense notions of space, time, matter, and energy are no longer valid. Classical mechanics approximates nature as continuous, while quantum theory is concerned with the discrete nature of many phenomena at the atomic and subatomic level and with the complementary aspects of particles and waves in the description of such phenomena. The theory of relativity is concerned with the description of phenomena that take place in a frame of reference that is in motion with respect to an observer; the special theory of relativity is concerned with motion in the absence of gravitational fields and the general theory of relativity with motion and its connection with gravitation. Both quantum theory and the theory of relativity find applications in all areas of modern physics. Loosely speaking, the laws of classical physics accurately describe systems whose important length scales are greater than the atomic scale and whose motions are much slower than the speed of light. Outside of this domain, observations do not match predictions provided by classical mechanics. Albert Einstein contributed the framework of special relativity , which replaced notions of absolute time and space with spacetime and allowed an accurate description of systems whose components have speeds approaching the speed of light. Later, quantum field theory unified quantum mechanics and special relativity. General relativity allowed for a dynamical, curved spacetime , with which highly massive systems and the large-scale structure of the universe can be well-described. General relativity has not yet been unified with the other fundamental descriptions; several candidate theories of quantum gravity are being developed. Mathematics and ontology are used in physics. Physics is used in chemistry and cosmology. Prerequisites Mathematics provides a compact and exact language used to describe the order in nature. This was noted and advocated by Pythagoras , [48] Plato , [49] Galileo , [50] and Newton. Physics uses mathematics [51] to organise and formulate experimental results. From those results, precise or estimated solutions are obtained, quantitative results from which new predictions can be made and experimentally confirmed or negated. The results from physics experiments are numerical data, with their units of measure and estimates of the errors in the measurements. Technologies based on mathematics, like computation have made computational physics an active area of research. The distinction between mathematics and physics is clear-cut, but not always obvious, especially in mathematical physics. Ontology is a prerequisite for physics, but not for mathematics. It means physics is ultimately concerned with descriptions of the real world, while mathematics is concerned with abstract patterns, even beyond the real world. Thus physics statements are synthetic, while mathematical statements are analytic. Mathematics contains hypotheses, while physics contains theories. Mathematics statements have to be only logically true, while predictions of physics statements must match observed and experimental data. The distinction is clear-cut, but not always obvious. For example, mathematical physics is the application of mathematics in physics. Its methods are mathematical, but its subject is physical. Every mathematical statement used for solving has a hard-to-find physical meaning. The final mathematical solution has an easier-to-find meaning, because it is what the solver is looking for. Physics is also called "the fundamental science" because the subject of study of all branches of natural science like chemistry, astronomy, geology, and biology are constrained by laws of physics, [53] similar to how chemistry is often called the central science because of its role in linking the physical sciences. Structures are formed because particles exert electrical forces on each other, properties include physical characteristics of given substances, and reactions are bound by laws of physics, like conservation of energy, mass, and charge. Physics is applied in industries like engineering and medicine. An applied physics curriculum usually contains a few classes in an applied discipline, like geology or electrical engineering. It usually differs from engineering in that an applied physicist may not be designing something in particular, but rather is using physics or conducting physics research with the aim of developing new technologies or solving a problem. The approach is similar to that of applied mathematics. Applied physicists use physics in scientific research. For instance, people working on accelerator physics might seek to build better particle detectors for research in theoretical physics. Physics is used heavily in engineering. For example, statics , a subfield of mechanics , is used in the building of bridges and other static structures. The understanding and use of acoustics results in sound control and better concert halls; similarly, the use of optics creates better optical devices. An understanding of physics makes for more realistic flight simulators , video games , and movies , and is often critical in forensic investigations. With the standard consensus that the laws of physics are universal and do not change with time, physics can be used to study things that would ordinarily be mired in uncertainty. It also allows for simulations in engineering which drastically speed up the development of a new technology. Research Scientific method Physicists use the scientific method to test the validity of a physical theory. By using a methodical approach to compare the implications of a theory with the conclusions drawn from its related experiments and observations, physicists are better able to test the validity of a theory in a logical, unbiased, and repeatable way. To that end, experiments are performed and observations are made in order to determine the validity or invalidity of the theory.

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3: Principles of physical science | www.enganchecubano.com

LAWS OF PHYSICS The basic laws of physics fall into two categories: classical physics that deals with the observable world (classical mechanics), and atomic physics that deals with the interactions between elementary and sub atomic particles (quantum mechanics). The basic laws of both are listed here in alphabetical order.

Bobbywhy Gold Member mat, your question is a good one. One way you could approach the answer is by taking a physics book and studying it completely. I created the below list for a different project. No math, just words. It is not a complete list of all physcial laws, but a place to begin for you. The Forces of Nature The Strong force affects quarks in nuclear reactions and is described by quantum chromodynamics. The Electromagnetic force affects charged particles in chemistry and is described by quantum electrodynamics. The Weak force affects quarks and leptons in radioactive decay. Gravity affects all particles and is described by General Relativity. These four forces mediate all events in the universe. They lead directly to The Law of Causality All events have a certain cause, at least to the limits of quantum uncertainties. The Conservation Laws Mass, energy, momentum, angular momentum, and charge are always conserved: The acceleration of a body is proportional to the force acting on it and inversely proportional to its mass. For every force that acts on a body there is exerted an equal and opposite force. The gravitational attraction between two bodies is proportional to the product of their masses and inversely proportional to the square of the distance between their centers. The line from the planet to the sun sweeps equal areas in equal times. For any two planets the squares of their periods of revolution are proportional to the cubes of their average distances from the Sun. The speed of light is constant for all observers and it is the maximum possible velocity. At relativistic velocities the Lorentz transformations cause length to contract, time to dilate, and mass to increase. Energy of mass is equal to that mass multiplied by the speed of light squared. Mass curves spacetime and curved spacetime dictates how mass and energy move. Thermodynamic Laws All the heat energy added to a closed system can be accounted for as mechanical work, increase in internal energy, or both. The entropy of an isolated system not in equilibrium will tend to increase and approach maximum value at equilibrium. As temperature approaches absolute zero the entropy approaches a constant minimum. At a constant temperature the volume of a gas varies inversely as the pressure. In a gaseous system at constant pressure the temperature increase and the relative volume increase stand in approximately the same proportion for all perfect gasses. The force between two charges at rest is proportional to the product of the magnitude of the charges and inversely proportional to the square of the distance between them. Every part of an electric circuit is acted upon by a force tending to move it so as to enclose the maximum amount of magnetic flux. The potential difference between any two points in a circuit equals the current times the resistance. The algebraic sum of the currents entering any junction point in a circuit is zero. The algebraic sum of the changes in potential around any closed circuit path is zero. In the processes of electrolytic changes equal quantities of electricity charge or discharge equivalent quantities of ions at each electrode. A flowing current generates a magnetic field around it. An induced electromotive force tends to set up a current whose action opposes the change that caused it. A chemical compound always contains exactly the same proportion of elements by mass. The pressure exerted by a mixture of gasses equals the sum of the separate pressures which each gas would exert if it alone occupied the whole volume. It is impossible to know precisely both the position and the momentum of a quantum particle. Describes how the quantum state of a physical system changes in time. No pair of identical subatomic particles can simultaneously occupy the same quantum state.

4: Basic Laws of Physics | TutorVista

Must the Fundamental Laws of Physics be Complete? marc lange University of North Carolina, Chapel Hill The beauty of electricity, or of any other force, is not that the power is myste-.

See Article History Principles of physical science, the procedures and concepts employed by those who study the inorganic world. Physical science , like all the natural sciences, is concerned with describing and relating to one another those experiences of the surrounding world that are shared by different observers and whose description can be agreed upon. One of its principal fields, physics , deals with the most general properties of matter, such as the behaviour of bodies under the influence of forces, and with the origins of those forces. In the discussion of this question, the mass and shape of a body are the only properties that play a significant role, its composition often being irrelevant. Physics, however, does not focus solely on the gross mechanical behaviour of bodies but shares with chemistry the goal of understanding how the arrangement of individual atoms into molecules and larger assemblies confers particular properties. Moreover, the atom itself may be analyzed into its more basic constituents and their interactions. The present opinion, rather generally held by physicists, is that these fundamental particles and forces, treated quantitatively by the methods of quantum mechanics , can reveal in detail the behaviour of all material objects. This is not to say that everything can be deduced mathematically from a small number of fundamental principles, since the complexity of real things defeats the power of mathematics or of the largest computers. Nevertheless, whenever it has been found possible to calculate the relationship between an observed property of a body and its deeper structure, no evidence has ever emerged to suggest that the more complex objects, even living organisms, require that special new principles be invoked , at least so long as only matter, and not mind, is in question. The physical scientist thus has two very different roles to play: This modern view of a unified science , embracing fundamental particles, everyday phenomena, and the vastness of the Cosmos , is a synthesis of originally independent disciplines , many of which grew out of useful arts. The extraction and refining of metals, the occult manipulations of alchemists, and the astrological interests of priests and politicians all played a part in initiating systematic studies that expanded in scope until their mutual relationships became clear, giving rise to what is customarily recognized as modern physical science. For a survey of the major fields of physical science and their development, see the articles physical science and Earth sciences. The development of quantitative science Modern physical science is characteristically concerned with numbers â€”the measurement of quantities and the discovery of the exact relationship between different measurements. Yet this activity would be no more than the compiling of a catalog of facts unless an underlying recognition of uniformities and correlations enabled the investigator to choose what to measure out of an infinite range of choices available. Proverbs purporting to predict weather are relics of science prehistory and constitute evidence of a general belief that the weather is, to a certain degree, subject to rules of behaviour. Modern scientific weather forecasting attempts to refine these rules and relate them to more fundamental physical laws so that measurements of temperature , pressure, and wind velocity at a large number of stations can be assembled into a detailed model of the atmosphere whose subsequent evolution can be predictedâ€”not by any means perfectly but almost always more reliably than was previously possible. Between proverbial weather lore and scientific meteorology lies a wealth of observations that have been classified and roughly systematized into the natural history of the subjectâ€”for example, prevailing winds at certain seasons, more or less predictable warm spells such as Indian summer , and correlation between Himalayan snowfall and intensity of monsoon. In every branch of science this preliminary search for regularities is an almost essential background to serious quantitative work, and in what follows it will be taken for granted as having been carried out. Compared with the caprices of weather, the movements of the stars and planets exhibit almost perfect regularity, and so the study of the heavens became quantitative at a very early date, as evidenced by the oldest records from China and Babylon. Objective recording and analysis of these motions, when stripped of the astrological interpretations that may have motivated them, represent the beginning of scientific astronomy. The heliocentric planetary model c. A distinction may be drawn between an observational science like astronomy, where the phenomena studied lie entirely outside the control of the observer, and an experimental science such as mechanics or optics, where the investigator sets up the arrangement to his own taste. Before proceeding as far as this, however, attention must be paid to the mechanical studies of Galileo Galilei , the most important of the founding fathers of modern physics, insofar as the central procedure of his work involved the application of mathematical deduction to the results of measurement. Page 1 of 7.

5: A Comprehensive List of All the Physics Formulas

According to physics, the physical laws of matter, energy and the fundamental forces of nature govern the interactions between particles and physical entities (such as planets, molecules, atoms or the subatomic particles).

What type of subject is physics? An academic discipline â€” one with academic departments, curricula and degrees; national and international societies; and specialized journals. A scientific field a branch of science â€” widely recognized category of specialized expertise within science, and typically embodies its own terminology and nomenclature. Such a field will usually be represented by one or more scientific journals, where peer-reviewed research is published. A natural science â€” one that seeks to elucidate the rules that govern the natural world using empirical and scientific method. A physical science â€” one that studies non-living systems. A biological science â€” one that studies the role of physical processes in living organisms. See Outline of biophysics. Branches of physics[edit] Astronomy â€” studies the universe beyond Earth, including its formation and development, and the evolution, physics, chemistry, meteorology, and motion of celestial objects such as galaxies, planets, etc. Astrodynamics â€” application of ballistics and celestial mechanics to the practical problems concerning the motion of rockets and other spacecraft. Astrometry â€” branch of astronomy that involves precise measurements of the positions and movements of stars and other celestial bodies. Astrophysics â€” study of the physical aspects of celestial objects Celestial mechanics - the branch of theoretical astronomy that deals with the calculation of the motions of celestial objects such as planets. Extragalactic astronomy â€” branch of astronomy concerned with objects outside our own Milky Way Galaxy Galactic astronomy â€” study of our own Milky Way galaxy and all its contents. Physical cosmology â€” study of the largest-scale structures and dynamics of the universe and is concerned with fundamental questions about its formation and evolution. Planetary science â€” scientific study of planets including Earth , moons, and planetary systems, in particular those of the Solar System and the processes that form them. Stellar astronomy â€” natural science that deals with the study of celestial objects such as stars, planets, comets, nebulae, star clusters and galaxies and phenomena that originate outside the atmosphere of Earth such as cosmic background radiation Atmospheric physics â€” study of the application of physics to the atmosphere Atomic, molecular, and optical physics â€” study of how matter and light interact Optics â€” branch of physics which involves the behavior and properties of light, including its interactions with matter and the construction of instruments that use or detect it. Biophysics â€” interdisciplinary science that uses the methods of physics to study biological systems Neurophysics â€” branch of biophysics dealing with the nervous system. Polymer physics â€” field of physics that studies polymers, their fluctuations, mechanical properties, as well as the kinetics of reactions involving degradation and polymerisation of polymers and monomers respectively. Quantum biology - application of quantum mechanics to biological phenomenon. Chemical physics â€” branch of physics that studies chemical processes from the point of view of physics. Computational physics â€” study and implementation of numerical algorithms to solve problems in physics for which a quantitative theory already exists. Condensed matter physics â€” study of the physical properties of condensed phases of matter. Electromagnetism â€” branch of science concerned with the forces that occur between electrically charged particles. Geophysics â€” the physics of the Earth and its environment in space; also the study of the Earth using quantitative physical methods Mathematical physics â€” application of mathematics to problems in physics and the development of mathematical methods for such applications and for the formulation of physical theories. Mechanics â€” branch of physics concerned with the behavior of physical bodies when subjected to forces or displacements, and the subsequent effects of the bodies on their environment. Aerodynamics â€” study of the motion of air. Biomechanics â€” study of the structure and function of biological systems such as humans, animals, plants, organs, and cells by means of the methods of mechanics. Classical mechanics â€” one of the two major sub-fields of mechanics, which is concerned with the set of physical laws describing the motion of bodies under the action of a system of forces. Kinematics â€” branch of classical mechanics that describes the motion of points, bodies objects and systems of bodies groups of objects without consideration of the causes of motion. Dynamics â€” study of the causes of motion and changes in motion Fluid mechanics â€” study of fluids and the forces on them. Statistical mechanics â€” branch of physics which studies any physical system that has a large number of degrees of freedom. Thermodynamics â€” branch of physical science concerned with heat and its relation to other forms of energy and work. Nuclear physics â€” field of physics that studies the building blocks and interactions of atomic nuclei. Particle physics â€” branch of physics that studies the properties and interactions of the fundamental constituents of matter and energy. Psychophysics â€” quantitatively investigates the relationship between physical stimuli and the sensations and perceptions they affect. Plasma physics â€” the study of plasma, a state of matter similar to gas in which a certain portion of the particles are ionized. Quantum physics â€” branch of physics dealing with physical phenomena where the action is on the order of the Planck constant. Relativity â€” theory of physics which describes the relationship between space and time. General Relativity - the geometric theory of gravitation the current description of gravitation in modern physics. Special Relativity - a theory that describes the propagation of matter and light at high speeds. Other Agrophysics â€” study of physics applied to agroecosystems Soil physics â€” study of soil physical properties and processes. Econophysics â€” interdisciplinary research field, applying theories and methods originally developed by physicists in order to solve problems in economics Materials physics â€” use of physics to describe materials in many different ways such as force, heat, light and mechanics. Vehicle dynamics â€” dynamics of vehicles, here assumed to be ground vehicles. History of physics[edit] History of physics â€” history of the physical science that studies matter and its motion through space-time, and related concepts such as energy and force History of acoustics â€” history of the study of mechanical waves in solids, liquids, and gases such as vibration and sound History of agrophysics â€” history of the study of physics applied to agroecosystems History of soil physics â€” history of the study of soil physical properties and processes. History of astrophysics â€” history of the study of the physical aspects of celestial objects History of astronomy â€” history of the studies the universe beyond Earth, including its formation and development, and the evolution, physics, chemistry, meteorology, and motion of celestial objects such as galaxies, planets, etc. History of astrodynamics â€” history of the application of ballistics and celestial mechanics to the practical problems concerning the motion of rockets and other spacecraft. History of astrometry â€” history of the branch of astronomy that involves precise measurements of the positions and movements of stars and other celestial bodies. History of cosmology â€” history of the discipline that deals with the nature of the Universe as a whole. History of extragalactic astronomy â€” history of the branch of astronomy concerned with objects outside our own Milky Way Galaxy History of galactic astronomy â€” history of the study of our own Milky Way galaxy and all its contents. History of physical cosmology â€” history of the study of the largest-scale structures and dynamics of the universe and is concerned with fundamental questions about its formation and evolution. History of planetary science â€” history of the scientific study of planets including Earth , moons, and planetary systems, in particular those of the Solar System and the processes that form them. History of stellar astronomy â€” history of the natural science that deals with the study of celestial objects such as stars, planets, comets, nebulae, star clusters and galaxies and phenomena that originate outside the atmosphere of Earth such as cosmic background radiation History of atmospheric physics â€” history of the study of the application of physics to the atmosphere History of atomic, molecular, and optical physics â€” history of the study of how matter and light interact History of biophysics â€” history of the study of physical processes relating to biology History of medical physics â€” history of the application of physics concepts, theories and methods to medicine. History of neurophysics â€” history of the branch of biophysics dealing with the nervous system. History of chemical physics â€” history of the branch of physics that studies chemical processes from the point of view of physics. History of computational physics â€” history of the study and implementation of numerical algorithms to solve problems in physics for which a quantitative theory already exists. History of condensed matter physics â€” history of the study of the physical properties of condensed phases of matter. Dynamics â€” history of the study of the causes of motion and changes in motion History of econophysics â€” history of the interdisciplinary research field, applying theories and methods originally developed by physicists in order to solve problems in economics History of electromagnetism â€” history of the branch of science concerned with the forces that occur between electrically charged particles. History of geophysics â€”

history of the physics of the Earth and its environment in space; also the study of the Earth using quantitative physical methods History of materials physics â€” history of the use of physics to describe materials in many different ways such as force, heat, light and mechanics. History of mathematical physics â€” history of the application of mathematics to problems in physics and the development of mathematical methods for such applications and for the formulation of physical theories. History of mechanics â€” history of the branch of physics concerned with the behavior of physical bodies when subjected to forces or displacements, and the subsequent effects of the bodies on their environment. History of biomechanics â€” history of the study of the structure and function of biological systems such as humans, animals, plants, organs, and cells by means of the methods of mechanics. History of classical mechanics â€” history of the one of the two major sub-fields of mechanics, which is concerned with the set of physical laws describing the motion of bodies under the action of a system of forces. History of continuum mechanics â€” history of the branch of mechanics that deals with the analysis of the kinematics and the mechanical behavior of materials modeled as a continuous mass rather than as discrete particles. History of fluid mechanics â€” history of the study of fluids and the forces on them. History of quantum mechanics â€” history of the branch of physics dealing with physical phenomena where the action is on the order of the Planck constant. History of thermodynamics â€” history of the branch of physical science concerned with heat and its relation to other forms of energy and work. History of nuclear physics â€” history of the field of physics that studies the building blocks and interactions of atomic nuclei. History of optics â€” history of the branch of physics which involves the behavior and properties of light, including its interactions with matter and the construction of instruments that use or detect it. History of particle physics â€” history of the branch of physics that studies the existence and interactions of particles that are the constituents of what is usually referred to as matter or radiation. History of psychophysics â€” history of the quantitative investigations of the relationship between physical stimuli and the sensations and perceptions they affect. History of plasma physics â€” history of the state of matter similar to gas in which a certain portion of the particles are ionized. History of polymer physics â€” history of the field of physics that studies polymers, their fluctuations, mechanical properties, as well as the kinetics of reactions involving degradation and polymerisation of polymers and monomers respectively. History of quantum physics â€” history of the branch of physics dealing with physical phenomena where the action is on the order of the Planck constant. History of solid state physics â€” history of the study of rigid matter, or solids, through methods such as quantum mechanics, crystallography, electromagnetism, and metallurgy. History of vehicle dynamics â€” history of the dynamics of vehicles, here assumed to be ground vehicles. General concepts of physics[edit] Basic principles of physics[edit] Physics â€” branch of science that studies matter [9] and its motion through space and time , along with related concepts such as energy and force. According to physics, the physical laws of matter, energy and the fundamental forces of nature govern the interactions between particles and physical entities such as planets, molecules, atoms or the subatomic particles. Some of the basic pursuits of physics, which include some of the most prominent developments in modern science in the last millennium, include: Describing the nature, measuring and quantifying of bodies and their motion, dynamics etc.

FUNDAMENTAL LAWS OF PHYSICS LIST pdf

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The Fundamental Laws of Physics Class Posted on April 14, by Elli Goudzwaard The introductory college physics class is governed by a few fundamental principles.

Minkowski space-time Quantum Field Theory Inside it: Electrostatics, magnetostatics, geometric optics. The different possible ways by which the known laws may not suffice to understand or predict effects: The real fundamental unpredictability randomness: Namely, almost every specific accessible physical phenomenon can be either properly described by some physical theory i. But despite this success, we might still feel not fully satisfied as we have not one theory but different theories for different ranges of observable phenomena or phases of computations of phenomena , and we do not currently know how to unify them or rather, the most fundamental among known ones, from which others come as approximations into a single fully coherent theory, that would make exactly well-defined predictions thus, predictions on any observation "possible in principle" , and thus would more deeply explain everything as deduced from a clear common foundation. The connections between quantum field theory and gravity by other theories namely, relativistic mechanics and the Least Action Principle , provide hints in the search for possible theories unifying them while the issue of quantum measurement and thermodynamics is usually ignored by necessity, by lack of reasonable possibilities to dig into it , but anyway this search is extremely hard, involving very high mathematical works where it is far from clear on what conceptual basis might things be coherently defined anyway, even if found, a unification theory will probably remain very hard to understand, quite harder than current theories. In fact this problem of currently having a mere "pack of prediction tools" with a limited but satisfying accuracy enough well defined for what our limited tools of observation could check in practice rather than a mathematically well-defined and coherent theory, is not specific to the problem of uniting several existing theories, but is already an intrinsic defect of one of these known fundamental "theories", namely the Standard Model. Indeed, this "theory" is full of hard mathematical concepts but only forming a sort of approximate expression of a theory, not a fully well-defined mathematical theory, despite the huge play of internal reformulations that were applied. Some extreme physical phenomena very hard to detect: But these "extreme phenomena" still do not explicitly touch the problem of quantum gravity. Pedagogical issues About intuitive understanding of theories, and the risk of wrong intuitions A usual mistake of many people especially beginners about physics, is to fail making the full proper distinction between these 3 things: The way things feel to our senses in our daily experience The most efficient ways to use our imagination to express and understand some theories mathematical structures or aspects of fundamental physics. Any idea of "what is physical", any ontology "deep nature" of things. To most efficiently learn theoretical physics, we need to study it in the form of mathematical theories. While our available understanding abilities structures of imagination are the way they are coming from our human nature, the optimal ways to use them to understand the known concepts of theoretical physics structures of the world , are a matter of being convenient optimal to the clear expression of the mathematical theories, which may require to break the specific connections dependence of our imagination with the world, usually given by our daily direct perceptions at least for things we happen to perceive at all , or that may come from any ontological ideas we may have. Such mathematically optimal ways to imagine things the practical level of knowledge which suffices in most cases , while in principle closer to these things, may still remain as empty of significance to any possible "true nature" ontology of these things, as any other discussion. More about the ontological implications I see from theoretical physics The pedagogical order It is possible to tell a lot of things about fundamental physics with very little mathematical background, namely with the mere dimensional analysis - even if this is just a sort of popularization without genuine understanding of the theories. More fundamental physics, especially special relativity and quantum physics , can be done just based on the understanding of affine geometry and vector spaces. The mathematical formalism of tensors is necessary for a clean general expression of most theories of fundamental physics, including classical mechanics. It is reputed "difficult", but in fact not only because it is really difficult somehow it is but not necessarily so much , but also because the common way of introducing this formalism is not as clear as it could and would deserve to be. Thus ideally, a scientific curriculum that aims to teach physics up to some good level, should give some priority to the development of the algebraic concepts needed for the clean introduction of tensors. It would not be quite hard for students if it was well done as compared to the current first year mathematics curriculum ; it just requires some changes, some new concepts and ways to define things. In parallel and before the achievement of that goal, some theoretical physics can already be introduced. Already the following concepts are example of such things made made odd obscure by the try to express them without their natural framework of tensors: It is well-known that general relativity is normally expressed with tensors, but there is still some way to simply express it without tensors but only in principle, in a way that does not appear like "a formula" but as concepts to be carefully applied, and only usable in practice for the simplest, most symmetric types of applications such as cosmology and the Schwarzchild black hole Now, what are the theories and other useful mathematical concepts for physics, that can be cleanly introduced before tensors, and in which order? Here are they, and a possible order in which to put them. Euclidean geometry Articulations between different geometric theories that can use the concept of Galois connection, relating transformations with invariant structures: Affine and projective geometries Classification of quadratic forms; particular case of the Minkowski space-time Concepts of fields, conservation of quantities; case of the conservation of electric charges and current; Least action principle and some of the resulting conservation laws: In two dimensions only: Classical thermodynamics introduced at any time after the concept of conservation laws, to express that entropy may be conserved of created but not reduced. Equations of gases; acoustics, wave propagation Introduction to quantum physics as linked above.

7: Laws of Nature | Internet Encyclopedia of Philosophy

Most people who know about such things would say that the most fundamental law of physics (as we understand it now) is the principle of least action. The idea is that any problem in physics can be understood in some sense as a transition from an initial state to a final state - for instance, a ball starts at the top of a hill (initial state.

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the basic laws of physics falls into two categories; classical physics that deals with the observable world [classical mechanics], and atomic physics -that deals with the interactions between elementary and sub atomic particles [quantum mechanics].

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The fundamental forces (or fundamental interactions) of physics are the ways that individual particles interact with each other. It turns out that for every single interaction observed taking place in the universe can be broken down to be described by only four (well, generally fourâ€”more on that.

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