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Physics is a branch of science that studies the structure of matter and the interactions between the fundamental elements of the universe. It explains how electric currents generate magnetic fields and how changing magnetic fields induce electric currents. This fundamental force underlies technologies like motors, generators, and wireless communication. Atomic physics studies the structure of atoms, focusing on electron behavior and interactions with electromagnetic radiation. Nuclear physics explores atomic nuclei, nuclear reactions, and radioactivity. Together, they are important for applications in energy and particle physics. 6. Geophysics: Geophysics is the study of the physical properties and processes of the Earth and its surroundings. It involves using principles of physics to explore things like the Earth's structure, composition, and the forces at work beneath the surface, as well as how these processes impact the environment and human life. The study of physics has played an important role in advancing human knowledge and technology. Through exploration of fundamental physical principles, we've made significant progress across various fields: Improves Technology: Physics has led to the development of technologies like semiconductors, lasers, and computer systems, which are foundational to modern electronics and communication. Advances Energy Solutions: Physics drives innovations in energy production, from nuclear power to renewable sources like solar and wind, helping address the world's energy needs. Enhances Medical Care: Physics has contributed to medical imaging technologies (e.g., X-rays, MRI) and radiation therapy, improving diagnosis and treatment of diseases. Boosts Space Exploration: Physics enables the development of spacecraft, satellite technology, and space exploration missions, expanding our knowledge of the universe. Facilitates Environmental Protection: Physics principles are applied in climate modeling, environmental monitoring, and developing cleaner technologies, aiding in the fight against climate change. Drives Innovation in Engineering: Physics provides the foundation for engineering advancements, from building materials to transportation systems, improving infrastructure, and daily life. Physics offers diverse career opportunities in research, technology, engineering, healthcare, and education, with roles ranging from quantum computing to medical physics and environmental science. Data Scientists: Nuclear Physicists: Meteorologists: Materials Scientists: Astrophysicists: Accelerator Operator: Degree: Avg Salary (Per Annum): B.Sc. (Physics): Research Assistant Lab Technician Teaching Assistant Technical Support Specialist Quality Control Analyst INR-3,00,000 - 5,00,000USD-\$4,000 - \$6,000MSc (Physics) INR-5,00,000 - 8,00,000USD-\$6,500 - \$10,500MSc (Specialized Fields): Theoretical Physicist Computational Physicist Applied Physicist Biophysicist Nanotechnology Researcher Plasma Physicist Condensed Matter Physicist INR-8,00,000 - 12,00,000USD-\$10,500 - \$15,500PhD (Physics) Senior Research Scientist University Professor Physicist in Government Research Labs R&D Specialist Particle Physicist INR-12,00,000 - 20,00,000USD-\$15,500 - \$26,000Advanced Roles (Post-PhD) Quantum Computing Specialist Space Science Research Lead Senior Physicist in Nuclear Industry Research Director INR-20,00,000 - 40,00,000USD-\$26,000 - \$55,00Application of Physics: Physics is an application-based subject. In each branch of Physics, there are various modern applications developed on the basis of Physics. We have categorized the application of Physics based on the branch of Physics. Physics is a branch of science that investigates the fundamental laws of matter, energy, space, and time. It seeks to explain the workings of the universe, from subatomic particles to vast cosmic structures. As the most fundamental science, physics lays the groundwork for other scientific fields, offering insights that drive technological advancements and influence the natural world. Its principles underpin many modern innovations and continue to shape our future. Common Questions on Physics: What is Physics? Physics is the study of matter, energy, and the fundamental forces of nature. Who is the Father of Physics? Galileo Galilei, often called the "Father of Modern Physics," was a key figure in the development of physics, alongside Isaac Newton. Known for his laws of motion and gravity, and Albert Einstein, renowned for his theory of relativity. What is the Full form of Physics? The term "physics" originates from the Greek word φυσικός, meaning "nature." While there is no official full form of "physics," it is sometimes creatively expanded as "Physicists' Positive Humble Yonder Studios' Inexpensive Communicative Scientific" to reflect key traits associated with the field. What is Physics class 11? Physics is the branch of science that explores the structure of matter and the interactions between the fundamental elements of the universe. Why is Physics important? Physics is important because it explains the fundamental laws of nature, driving technological advancements and improving our daily lives. Physics is the most basic discipline in the field of Natural Sciences, which also includes other disciplines, such as chemistry and biology. The word Physics comes from a Greek word Φυσίς which means nature. An ancient Greek philosopher Aristotle introduced this word in the year 350 B.C. In the Sanskrit language, the meaning of physics is Bhaṭṭikī that refers to the study of the physical world. A precise definition of this discipline is as: Physics is a fundamental branch of science that deals with the study of nature and natural phenomenon. In other words, physics is a branch of science that studies the basic laws of nature and their manifestation in different natural phenomena. It is the backbone of study of life as well as the strength of all other branches of natural science. The fundamental goal of physics is to look for and understand the basic laws of nature on which all the physical phenomena depend. Physics studies about how things work, and why things occur the way they do. For example, physics explains about Why does a teaspoon gets hot when it is in the cup of tea? What is the universe made of and how does work? Why sky is blue? Why are rainbows having colors? What atoms and nuclei are made of? Physics explains the answers to all these and many more questions related to life, the universe, and everything in the world using basic laws and fundamental principles. One who studies physics is called a physicist. The creator of the universe has given us things in two forms: matter and energy. Matter refers to anything that occupies space and has mass. It is the material that builds up the physical world around us. It can occur in various states, such as solid, liquid, gas, and plasma, depending on the arrangement and motion of its constituent particles. Everything which is not material in nature like light, heat, sound, waves, etc. are called energy. Thus, we can say that Physics is the branch of natural science that studied about matter and energy and their interconversion. Physics plays a vital role in all the sectors for sustainable growth of the globe. There are the following sectors from which we may link to the physics. They are as: Health: Energy: Technology: Environment: Communication: Bioscience: Space science: Education: Transport: Meteorology: Entertainment and many more. Lets understand a few of them one by one with the help of example. Health: Physics plays a significant role in understanding and improving various aspects of health and medicine. It has revolutionized medical diagnosis, treatment, and research, making better healthcare. The cure of many diseases is possible by new innovative methods like the use of X-rays, laser, spectrometers, ultrasound, computed tomography (CT), etc. Physics plays an important duty in radiation oncology, where high-energy radiation is used to treat cancer. Energy: It is said that energy is the lifeline of the society. Physics is the major contributor to this sector. It discovered all forms of energy, whether conventional or non-conventional energy. Solar energy, wind energy, and geothermal energy will replace conventional forms in the new millennium. Development of solar cells, wind mills, etc. are the main contributors in this field. Communication: Physics plays a vital role in the field of communication network. Development of mobile phones, computer, fax, audio and video transmission and reception, internet services, etc. have made communication both useful and fast. Bioscience: Physics has added a new dimension to the study of bioscience. The use of spectrometer, ultrasound, X-rays, EMR, ESR, and MRI have transformed the face of bioscience. Space science: The study of physics only made it possible for the launching of rockets, satellites, and all different kinds of space crafts. There are two principal thrusts in physics. They are as: We use both of these principles in Physics. So, lets understand it one by one with example. (1) Unification: The word unify means reduce to unity. The process of uniting is called unification. In physics, it is possible to explain different physical phenomena (which are not similar in nature) in terms of a few concepts and laws. For example, the law of gravitational force given by Newton states the force of attraction between two material bodies. The same law can be used to describe the free fall of an apple to the ground, the motion of the moon around the earth, the motion of planets around the sun, or the motion of an electron around the nucleus of an atom. Similarly, the basic laws of electromagnetism (Maxwells equations) explain most of the electric and magnetic phenomena. The ultimate attempt of physics is to unify all the fundamental forces of nature into unity. Here, we are attempting to say that all the available forces in nature are children of a single mother force and this theory is known as unified field theory. (2) Reductionism: The analyzing more complex things in terms of its simple constituents is called reductionism and is the heart of physics. Lets understand it with the help of an example. Microscopic quantities such as pressure, volume, temperature, etc. explain the state of a gas. We know the gas equation PV = RT, where R is a universal gas constant. We can also express the pressure P of the gas in terms of motion of molecules of gas as $P = \frac{1}{3} n m \overline{v^2}$. In this formula, $\frac{1}{3}$ is the mean square velocity of the molecule, which is microscopic quantity. This way of expressing a microscopic quantity (pressure of gas) in terms of a microscopic quantity (velocity of molecule) is called reductionism. The extent of knowledge available on physics is so broad. Thats why, as a matter of convenience, it has been divided into two categories. They are: Classical (old) physics Modern physics (a) Classical physics: The physics prior to 1890 is considered as classical physics. It includes the study of mechanics, gravitation, heat, sound, light, electricity, and magnetism. The law of motion and gravitation given by Newton had provided a solid foundation of mechanics to the impressive height. The four laws of thermodynamics and kinetic theory of matter had provided a satisfactory explanation in understanding of energy conservation and the direction of heat flow. James Clerk Maxwell gave the theory of electromagnetic radiation and described all electrical, magnetic, and optical phenomena. Classical physics cannot work with microscopic particles (e.g. atoms) or objects travelling at very high speed. Therefore, modern physics comes into the existence. However, classical physics correctly and precisely explained the behaviour of the physical world except for the microscopic particles and objects travelling near the speed of light. (b) Modern Physics: The physics after 1890 is considered as modern physics. It deals with the study of quantum mechanics, relativity, atoms, nuclei, elementary particles like electron, proton, and condensed matter. After 1900, there had been tremendous advances in physics, which gave birth the several new concepts. Roentgen discovered X-rays in 1895. A few weeks later, Henry discovered the radioactivity. In the year 1897, a professor of physics at the University of Cambridge in England, J.J. Thomson discovered the first subatomic particle called electron. In 1901, Max Planck gave the quantum theory. This theory states that energy is not radiated continuously, but in discrete packets of energy called quanta. Eventually, these quanta came to be known as photons. In 1905, Albert Einstein proposed a special theory of relativity which gave a new concept to atomic and nuclear physics. In short, the discovery of new theory in the modern physics, after 1890, gave several new concepts to the entire physics. We know that physics is a basic science that tells about the nature of basic things, such as motion, force, energy, matter, light, sound, heat, and the inside of atoms. Apprehension of science starts with the understanding of physics. In this section, we will understand how physics is related to other science subjects. (1) Physics and Mathematics: We have seen that physics depends of the experimental observations and quantitative measurements. Once we have measured, we need mathematics to express the quantity. The laws of physics are usually expressed as mathematical equations. Therefore, we require a considerable knowledge of mathematics. This shows that physics and mathematics are very closely related. (2) Physics and Chemistry: The branch of science, chemistry tells how atoms combine to form molecules and how molecules combine to make up the many kinds of matter around us. In order to describe these concepts, we will have to apply the laws and theories of physics. Eventually, it reveals us how physics is related to chemistry. (3) Physics and Biology: Biology is more complex because it involves matters that are alive. Biological studies are impossible without a microscope invented by the aid of physics. The discovery of radioactivity, X-rays, etc. in physics has cured the number of diseases by improving the method of diagnosis. Without inventions of some electronic equipments like amplifiers, cathode-ray oscillograph, etc. ECG (Electrocardiogram), EEG (Electro Encephalogram) and EMG (Electromyogram) would have been just impossible. (4) Physics and Other Sciences: As physics is a fundamental of natural science, its laws and theories are applied to explain various concepts, processes in biophysics, meteorology, geophysics, oceanography, material science, etc. Both physics and technology differ from each other. Physics provides the knowledge of material universe, whereas technology transfers the knowledge of physics into practical use. For example, physics has offered the knowledge of semiconductors, but technology used it to build up transistor, diodes, IC, LED, etc. Several technologies have been developed based on the knowledge of physics. A few of them are mentioned below: Link between technology and physics: Technology Scientific Principle(s) 1. Aeroplane Bernoullis principle in fluid dynamics 2. Computers Digital logic 3. Electric generator, electric motor, transformer Faradays law of electromagnetism induction 4. Electron microscope Wave nature of electrons 5. Steam engine Laws of thermodynamics 6. Hydroelectric power Conversion of gravitational potential energy into electric energy 7. Lasers Light amplification by stimulated emission of radiation 8. Nuclear reactor Controlled nuclear fission 9. Optical fibres Total internal reflection of light 10. Particle accelerators Motion of charged particles in electromagnetic fields 11. Photocell Photoelectric effect 12. Radio and television Generation, propagation, and detection of electromagnetic 13. Rocket propulsion Newtons law of motion 14. Sonar Reflection of ultrasonic waves 15. Non-reflecting coatings Thin film optical interference The above list of table shows that how the knowledge of physics is important in developing new technologies. The discoveries of laws and theories of physics have made the technologies advanced. The advancement of technology completely changed the human lives. For example, we travel faster than ever before in aeroplanes, use electricity to operate numerous electrical appliances, solve complex problems at amazing speed using computers, and many more. Thus, physics set the future of human society. In this tutorial, we have discussed the definition of physics, its roles in different sectors, classification, and relation with other sciences. Hope that you will have understood the basic points and enjoyed this tutorial. Thanks for reading!!! Being NTU SPMS's central shared facility, it features characterisation equipment such as SEM, XRD, AFM, PPMS, MPMS and NMR. Services includes helium recovery and reliquefaction, LHe and LN2 drawing, and machining services and workshop equipment.

The term "physics" is derived from the Greek word physis (meaning nature) and physika (meaning natural things). It is the study of matter, energy, and the fundamental forces of nature, seeking to understand the behaviour of the universe from the smallest subatomic particles to the largest galaxies. Why Should We Learn Physics? Physics reveals how everything works, from tiny atoms to the vast universe. It explains fundamental principles and solves real-world problems. Blue Sky & Day/Night: Physics explains why the sky is blue and why we have day and night. GPS: The phone in your hand uses orbiting satellites and physics principles to track your location. Ball in a Moving Bus: Drop a ball on a bus? It falls straight down because you, the ball, and the bus all move together. Electric Shock: Ohm's Law explains how current passing through the body causes shocks, with circuit breakers controlling resistance to prevent accidents. Microwave Oven: Physics principles of electromagnetic waves are used in microwave ovens to heat food quickly and efficiently. Smartphone Touchscreen: Capacitive touchscreens in smartphones work based on the principles of electrical conductivity and charge transfer. Solar Panels: Physics explains how solar cells convert sunlight into electricity, providing clean energy. Airplane Flight: Physics explains how the lift generated by the wings of an airplane allows it to stay airborne and navigate through the sky. Lets begin with the fundamentals of physics, where you explore the core principles that govern the universe from subatomic particles to galaxies. This section covers basic concepts of matter and energy, key branches of physics, standard systems of measurement, and the role of physics in everyday life. Atoms & Nuclei: This field focuses on the tiny building blocks of matter, called atoms. It looks at how atoms are made up of a central nucleus (with protons and neutrons) and electrons that orbit around it. The study of nuclei explores how atoms interact, release energy, and change through processes like radioactivity and nuclear reactions. This reveals the forces that shape everything around us. Properties of Matter: This field focuses on the different characteristics that define matter, such as its ability to stretch, compress, flow, and change under various forces. It looks at how materials respond to stress and strain, how fluids exert pressure, and how forces like surface tension and viscosity affect their behavior. The study of these properties helps explain the way solids, liquids, and gases behave in different environments, revealing the fundamental forces and interactions that shape the physical world around us. Kinematics: Kinematics studies the motion of objects, focusing on their position, speed, velocity, and acceleration over time. It describes how objects move using concepts like displacement and time, without considering the forces behind the motion. This helps predict how objects move in different situations. Laws of Motion: The Laws of Motion, formulated by Sir Isaac Newton, are fundamental principles that explain how objects move and interact with forces. These laws describe the relationship between an objects motion and the forces acting on it, providing the foundation for classical mechanics. They allow us to predict the behavior of objects in motion, from simple everyday situations to complex systems in the universe. Work, Energy & Power: Work, energy, and power describe how objects move and interact. Work is done when a force moves an object over a distance. Energy is the ability to do work and comes in forms like kinetic, potential, and thermal energy. Power measures the rate at which work is done or energy is transferred. These concepts explain how energy flows and transforms in physical systems and natural processes. Heat: Heat is a form of energy that flows between two systems or bodies due to a temperature difference. It always flows from the hotter object (higher temperature) to the cooler object (lower temperature). Gravitation: Gravitation is a fundamental force of nature that causes objects with mass to attract each other. It is most noticeable as the force that pulls objects towards the Earth, giving them weight and causing them to fall. This force not only governs the motion of objects on Earth but also influences the movement of planets, moons, and other celestial bodies in space. Rotational Motion & Particle Systems: Rotational motion refers to the movement of an object around a central axis, involving concepts like angular displacement, velocity, and acceleration and the system of particles is a group of interacting particles, and their collective motion can be studied as a whole. This study helps explain the behavior of rigid bodies, moment of inertia, and angular momentum in various physical situations. Thermodynamics: Thermodynamics is the branch of physics that deals with the study of heat, work, and energy transformations. It focuses on how energy is transferred within systems and how it can be transformed from one form to another. It provides a framework for the principles of energy conservation, the direction of natural processes, and the limits of efficiency in mechanical and biological systems. Oscillations: Oscillations are repetitive variations of a physical quantity, such as displacement, velocity, or current, around a central equilibrium position. These motions, seen in both mechanical and electrical systems, are driven by restoring forces that act to return the system to its equilibrium state. Electrostatics: Electrostatics is the branch of physics that studies stationary electric charges and the forces they exert on each other. It focuses on the behavior of charges at rest, the electric fields they generate, and the effects of these fields on other charges. Electrostatics plays a key role in everyday phenomena and technologies, such as capacitors, the behavior of charged particles in materials, and electrostatic interactions. Electrostatic forces work even in a vacuum so, no medium is needed for charges to attract or repel each other. Static electricity can ignite fuel vapors , so grounding is critical when refueling aircraft or tankers. Current Electricity: Current electricity refers to the flow of electric charge in a conductor, typically through a wire, driven by a potential difference (voltage) applied across the conductor. The flow of charged particles (usually electrons) creates an electric current, which is measured in amperes (A). Current electricity is the foundation of electrical circuits, devices, and power systems in our everyday lives. Magnetism: Magnetism is a force produced by moving electric charges, resulting in magnetic fields that cause attraction or repulsion between objects. Its closely related to electricity and forms the basis of electromagnetism. Electromagnetic Induction: Electromagnetic induction is the process by where a changing magnetic field generates an electric current in a conductor. Discovered by Michael Faraday, this principle is foundational to technologies like electric generators, transformers, and wireless charging. When a conductor moves through a magnetic field or when the magnetic field changes, it induces an electromotive force (EMF), driving an electric current. Electromagnetic induction plays an important role in energy generation, transmission, and various modern devices. Ray Optics and Wave Optics: Ray optics and Wave optics are two fundamental branches of optics that describe the behavior of light. Ray optics treats light as rays traveling in straight lines, focusing on phenomena like reflection and refraction. Wave optics, on the other hand, treats light as a wave, explaining phenomena like diffraction and the rainbow effect. Quantum Mechanics: The dual nature of radiation and matter is a concept in quantum mechanics stating that both light and matter exhibit properties of both particles and waves. Light behaves as particles (photons) in phenomena like the photoelectric effect, while matter, such as electrons, shows wave-like behavior in experiments like electron diffraction. Semiconductor Electronics: Semiconductor electronics is the study and use of semiconductor materials, such as silicon, germanium, and gallium arsenide, in electronic devices. Semiconductors have electrical conductivity between that of conductors and insulators. Their conductivity can be controlled by doping, which creates n-type (negative) and p-type (positive) semiconductors. These materials are the foundation of modern electronic devices like diodes, transistors, and integrated circuits, and other technologies. Communication Systems: Communication systems are technologies that enable the transmission and reception of information over distances. They consist of a transmitter to send signals, a medium (such as air, cables, or optical fibers) to carry them, and a receiver to decode the signals. These systems can be analog or digital and are important in fields like telecommunications, broadcasting, and the internet, facilitating global communication for voice, data, and video. Some important facts of physics are: Facts About Energy: Facts About Light: Facts About Atoms: Facts About Gravity: CBSE Physics (Class 8-Class 12th): Quick notes are a great way for students to revise the entire syllabus quickly. CBSE physics notes offer a concise summary of each chapter, highlighting key points that cover all concepts from the NCERT syllabus. These notes are designed to help students prepare efficiently for exams. Following are the links to the CBSE physics notes from Class 8 to Class 12: Physics Syllabus (Class 11th-Class 12th): Here you can check out the detailed Physics syllabus for Class 11th and 12th, covering key topics that form the foundation for advanced studies: CBSE Syllabus for Class 11th Physics: CBSE Syllabus for Class 12th Physics: NCERT Physics (Class 11th-Class 12th): Important physics questions for CBSE classes 11&12 are available here. Our subject matter experts and educators have crafted these questions based on the NCERT curriculum and syllabus. By working through these questions, students can improve their understanding and perform well in their board exams. The following are the links to the NCERT solutions for Class 11 and Class 12 physics: NCERT Solution for Class 11 Physics: NCERT Solutions for Class 12 Physics: Heres a list of key physics formulas that represent fundamental concepts in the field: List of Physics Formulas: Branches of Physics: This section lists important topics crucial for both board exams and competitive exams (like JEE/NEET), covering major physics branches such as Mechanics, Optics, Thermodynamics, Electromagnetism, Atomic and Nuclear Physics, and Geophysics. 1. Mechanics: Mechanics is the branch of physics that studies the motion of objects and the forces that cause or affect this motion. It includes statics (objects at rest), dynamics (objects in motion), and kinematics (describing motion without considering forces). Mechanics is fundamental to classical physics and is widely applied in fields like engineering, astronomy, and daily life. 2. Optics: Optics is the branch of physics that studies light and its interactions with matter. It focuses on phenomena such as reflection, refraction, diffraction, and dispersion. The field includes geometrical optics (light as rays) and physical optics (light as waves). Optics is essential in technologies like lenses, microscopes, lasers, and fiber optics. 3. Thermodynamics: Thermodynamics is the branch of Physics in which we study about interaction between heat, work, temperature, and energy. Thermodynamics broadly refers to the process of moving energy from one location or form to another. Thermodynamics is essential in the design of engines, refrigerators, and various natural processes. 4. Electromagnetism: Electromagnetism is the study of electric and magnetic fields and their interactions. It explains how electric currents generate magnetic fields and how changing magnetic fields induce electric currents. 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Facilitates Environmental Protection: Physics principles are applied in climate modeling, environmental monitoring, and developing cleaner technologies, aiding in the fight against climate change. Drives Innovation in Engineering: Physics provides the foundation for engineering advancements, from building materials to transportation systems, improving infrastructure, and daily life. Physics offers diverse career opportunities in research, technology, engineering, healthcare, and education, with roles ranging from quantum computing to medical physics and environmental science. Data Scientists: Nuclear Physicists: Meteorologists: Materials Scientists: Astrophysicists: Accelerator Operator: Degree: Avg Salary (Per Annum): B.Sc. (Physics): Research Assistant Lab Technician Teaching Assistant Technical Support Specialist Quality Control Analyst INR-3,00,000 - 5,00,000USD-\$4,000 - \$6,000MSc (Physics) INR-5,00,000 - 8,00,000USD-\$6,500 - \$10,500MSc (Specialized Fields): Theoretical Physicist Computational Physicist Applied Physicist Biophysicist Nanotechnology Researcher Plasma Physicist Condensed Matter Physicist INR-8,00,000 - 12,00,000USD-\$10,500 - \$15,500PhD (Physics) Senior Research Scientist University Professor Physicist in Government Research Labs R&D Specialist Particle Physicist INR-12,00,000 - 20,00,000USD-\$15,500 - \$26,000Advanced Roles (Post-PhD) Quantum Computing Specialist Space Science Research Lead Senior Physicist in Nuclear Industry Research Director INR-20,00,000 - 40,00,000USD-\$26,000 - \$55,00Application of Physics: Physics is an application-based subject. In each branch of Physics, there are various modern applications developed on the basis of Physics. 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Development of solar cells, wind mills, etc. are the main contributors in this field. Communication: Physics plays a vital role in the field of communication network. Development of mobile phones, computer, fax, audio and video transmission and reception, internet services, etc. have made communication both useful and fast. Bioscience: Physics has added a new dimension to the study of bioscience. The use of spectrometer, ultrasound, X-rays, EMR, ESR, and MRI have transformed the face of bioscience. Space science: The study of physics only made it possible for the launching of rockets, satellites, and all different kinds of space crafts. There are two principal thrusts in physics. They are as: We use both of these principles in Physics. So, lets understand it one by one with example. (1) Unification: The word unify means reduce to unity. The process of uniting is called unification. In physics, it is possible to explain different physical phenomena (which are not similar in nature) in terms of a few concepts and laws. For example, the law of gravitational force given by Newton states the force of attraction between two material bodies. The same law can be used to describe the free fall of an apple to the ground, the motion of the moon around the earth, the motion of planets around the sun, or the motion of an electron around the nucleus of an atom. Similarly, the basic laws of electromagnetism (Maxwells equations) explain most of the electric and magnetic phenomena. The ultimate attempt of physics is to unify all the fundamental forces of nature into unity. Here, we are attempting to say that all the available forces in nature are children of a single mother force and this theory is known as unified field theory. (2) Reductionism: The analyzing more complex things in terms of its simple constituents is called reductionism and is the heart of physics. Lets understand it with the help of an example. Microscopic quantities such as pressure, volume, temperature, etc. explain the state of a gas. We know the gas equation PV = RT, where R is a universal gas constant. We can also express the pressure P of the gas in terms of motion of molecules of gas as $P = \frac{1}{3} n m \overline{v^2}$. In this formula, $\frac{1}{3}$ is the mean square velocity of the molecule, which is microscopic quantity. This way of expressing a microscopic quantity (pressure of gas) in terms of a microscopic quantity (velocity of molecule) is called reductionism. The extent of knowledge available on physics is so broad. Thats why, as a matter of convenience, it has been divided into two categories. They are: Classical (old) physics Modern physics (a) Classical physics: The physics prior to 1890 is considered as classical physics. It includes the study of mechanics, gravitation, heat, sound, light, electricity, and magnetism. The law of motion and gravitation given by Newton had provided a solid foundation of mechanics to the impressive height. The four laws of thermodynamics and kinetic theory of matter had provided a satisfactory explanation in understanding of energy conservation and the direction of heat flow. James Clerk Maxwell gave the theory of electromagnetic radiation and described all electrical, magnetic, and optical phenomena. Classical physics cannot work with microscopic particles (e.g. atoms) or objects travelling at very high speed. Therefore, modern physics comes into the existence. However, classical physics correctly and precisely explained the behaviour of the physical world except for the microscopic particles and objects travelling near the speed of light. (b) Modern Physics: The physics after 1890 is considered as modern physics. It deals with the study of quantum mechanics, relativity, atoms, nuclei, elementary particles like electron, proton, and condensed matter. After 1900, there had been tremendous advances in physics, which gave birth the several new concepts. Roentgen discovered X-rays in 1895. A few weeks later, Henry discovered the radioactivity. In the year 1897, a professor of physics at the University of Cambridge in England, J.J. Thomson discovered the first subatomic particle called electron. In 1901, Max Planck gave the quantum theory. This theory states that energy is not radiated continuously, but in discrete packets of energy called quanta. Eventually, these quanta came to be known as photons. In 1905, Albert Einstein proposed a special theory of relativity which gave a new concept to atomic and nuclear physics. In short, the discovery of new theory in the modern physics, after 1890, gave several new concepts to the entire physics. We know that physics is a basic science that tells about the nature of basic things, such as motion, force, energy, matter, light, sound, heat, and the inside of atoms. Apprehension of science starts with the understanding of physics. In this section, we will understand how physics is related to other science subjects. (1) Physics and Mathematics: We have seen that physics depends of the experimental observations and quantitative measurements. Once we have measured, we need mathematics to express the quantity. The laws of physics are usually expressed as mathematical equations. Therefore, we require a considerable knowledge of mathematics. This shows that physics and mathematics are very closely related. (2) Physics and Chemistry: The branch of science, chemistry tells how atoms combine to form molecules and how molecules combine to make up the many kinds of matter around us. In order to describe these concepts, we will have to apply the laws and theories of physics. Eventually, it reveals us how physics is related to chemistry. (3) Physics and Biology: Biology is more complex because it involves matters that are alive. Biological studies are impossible without a microscope invented by the aid of physics. The discovery of radioactivity, X-rays, etc. in physics has cured the number of diseases by improving the method of diagnosis. Without inventions of some electronic equipments like amplifiers, cathode-ray oscillograph, etc. ECG (Electrocardiogram), EEG (Electro Encephalogram) and EMG (Electromyogram) would have been just impossible. (4) Physics and Other Sciences: As physics is a fundamental of natural science, its laws and theories are applied to explain various concepts, processes in biophysics, meteorology, geophysics, oceanography, material science, etc. Both physics and technology differ from each other. Physics provides the knowledge of material universe, whereas technology transfers the knowledge of physics into practical use. For example, physics has offered the knowledge of semiconductors, but technology used it to build up transistor, diodes, IC, LED, etc. Several technologies have been developed based on the knowledge of physics. A few of them are mentioned below: Link between technology and physics: Technology Scientific Principle(s) 1. Aeroplane Bernoullis principle in fluid dynamics 2. Computers Digital logic 3. Electric generator, electric motor, transformer Faradays law of electromagnetism induction 4. Electron microscope Wave nature of electrons 5. Steam engine Laws of thermodynamics 6. Hydroelectric power Conversion of gravitational potential energy into electric energy 7. Lasers Light amplification by stimulated emission of radiation 8. Nuclear reactor Controlled nuclear fission 9. Optical fibres Total internal reflection of light 10. Particle accelerators Motion of charged particles in electromagnetic fields 11. Photocell Photoelectric effect 12. Radio and television Generation, propagation, and detection of electromagnetic 13. Rocket propulsion Newtons law of motion 14. Sonar Reflection of ultrasonic waves 15. Non-reflecting coatings Thin film optical interference The above list of table shows that how the knowledge of physics is important in developing new technologies. The discoveries of laws and theories of physics have made the technologies advanced. The advancement of technology completely changed the human lives. For example, we travel faster than ever before in aeroplanes, use electricity to operate numerous electrical appliances, solve complex problems at amazing speed using computers, and many more. Thus, physics set the future of human society. In this tutorial, we have discussed the definition of physics, its roles in different sectors, classification, and relation with other sciences. Hope that you will have understood the basic points and enjoyed this tutorial. Thanks for reading!!! Being NTU SPMS's central shared facility, it features characterisation equipment such as SEM, XRD, AFM, PPMS, MPMS and NMR. Services includes helium recovery and reliquefaction, LHe and LN2 drawing, and machining services and workshop equipment.

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