A virus is a submicroscopic infectious agent that replicates only inside the living cells of an organism Viruses infect all life forms from animals and plants to microorganisms including bacteria and archaea Viruses are found in almost every ecosystem on Earth and are the most numerous type of biological entity Since Dmitri Ivanovskys article describing a nonbacterial pathogen infecting tobacco plants and the discovery of the tobacco mosaic virus by Martinus Beijerinck in more than of the millions of virus species have been described in detail The study of viruses is known as virology a subspeciality of microbiology

When infected a host cell is often forced to rapidly produce thousands of copies of the original virus When not inside an infected cell or in the process of infecting a cell viruses exist in the form of independent viral particles or virions consisting of i genetic material ie long molecules of DNA or RNA that encode the structure of the proteins by which the virus acts ii a protein coat the capsid which surrounds and protects the genetic material and in some cases iii an outside envelope of lipids The shapes of these virus particles range from simple helical and icosahedral forms to more complex structures Most virus species have virions too small to be seen with an optical microscope and are onehundredth the size of most bacteria

The origins of viruses in the evolutionary history of life are still unclear Some viruses may have evolved from plasmids which are pieces of DNA that can move between cells Other viruses may have evolved from bacteria In evolution viruses are an important means of horizontal gene transfer which increases genetic diversity in a way analogous to sexual reproduction Viruses are considered by some biologists to be a life form because they carry genetic material reproduce and evolve through natural selection although they lack some key characteristics such as cell structure that are generally considered necessary criteria for defining life Because they possess some but not all such qualities viruses have been described as organisms at the edge of life and as replicators

Viruses spread in many ways One transmission pathway is through diseasebearing organisms known as vectors for example viruses are often transmitted from plant to plant by insects that feed on plant sap such as aphids and viruses in animals can be carried by bloodsucking insects Many viruses spread in the air by coughing and sneezing including influenza viruses SARSCOV chickenpox smallpox and measles Norovirus and rotavirus common causes of viral gastroenteritis are transmitted by the faecaloral route passed by handtomouth contact or in food or water The infectious dose of norovirus required to produce infection in humans is fewer than particles HIV is one of several viruses transmitted through sexual contact and by exposure to infected blood The variety of host cells that a virus can infect is called its host range this is narrow for viruses specialized to infect only a few species or broad for viruses capable of infecting many

Viral infections in animals provoke an immune response that usually eliminates the infecting virus Immune responses can also be produced by vaccines which confer an artificially acquired immunity to the specific viral infection Some viruses including those that cause HIVAIDS HPV infection and viral hepatitis evade these immune responses and result in chronic infections Several classes of antiviral drugs have been developed