Reaction, momentum, projectile, inertia, Kepler laws, standing waves, fluid, thermodynamics, electromagnetism, atom, nucleus

General

Question:

How do you use physics?

Measure

Question:

Round your student number to 7 significant figures.

Mechanics

Rocket:

Action = - Reaction (3 Law of Newton)

Momentum conservation.

Question:

How does rocket fly?

Question:

How are rockets controlled?

Projectile

Question:

Check correctness of minimal velocity of projectile for x = 10, y =0, g = 10, then Vmin must be 10 and angle of release A must be 45 degrees.

‘ (1+x^2)/(ax-b)

‘ derivative-calculator.net

' minimum velocity for projectile

x = 10

y = 0

g = 10

T1 = (y + Sqr(x \* x + y \* y)) / x

T2 = (y - Sqr(x \* x + y \* y)) / x

'MsgBox T1

'MsgBox T2

'MsgBox x \* T1 - y

v1 = Sqr(g \* x ^ 2 \* (1 + T1 ^ 2) / (2 \* (x \* T1 - y)))

MsgBox v1

'v2 = Sqr(g \* x ^ 2 \* (1 + T2 ^ 2) / (2 \* (x \* T2 - y)))

'MsgBox v2

MsgBox Atn(T1) \* 180 / (4 \* Atn(1))

'MsgBox Atn(T2) \* 180 / (4 \* Atn(1))

Question:

Find all angles of release for projectile for given initial velocity v to hit the point (x,y).

x = 10

y = 0

v = 10

g = 10

T1 = (v \* v \* 2 \* x + Sqr((v \* v \* 2 \* x) ^ 2 - 4 \* g \* x ^ 2 \* g \* x ^ 2 + v \* v \* 2 \* y)) / (2 \* g \* x ^ 2)

T2 = (v \* v \* 2 \* x - Sqr((v \* v \* 2 \* x) ^ 2 - 4 \* g \* x ^ 2 \* g \* x ^ 2 + v \* v \* 2 \* y)) / (2 \* g \* x ^ 2)

MsgBox T1 \* 180 / (4 \* Atn(1))

MsgBox T2 \* 180 / (4 \* Atn(1))

Question:

Shoot from point (0,0) to point (x,y) through point (a,b).

Solve the simultaneous equations.

Inertia

Moment of inertia

hyperphysics.phy-astr.gsu.edu/hbase/mi.html

en.wikipedia.org/wiki/Moment\_of\_inertia

Question:

Give main moments of inertia.

In [physics](https://en.wikipedia.org/wiki/Physics), the **Coriolis force** is an [inertial or fictitious force](https://en.wikipedia.org/wiki/Fictitious_force) that acts on objects in motion within a [frame of reference that rotates](https://en.wikipedia.org/wiki/Rotating_reference_frame) with respect to an [inertial frame](https://en.wikipedia.org/wiki/Inertial_frame_of_reference). In a reference frame with [clockwise](https://en.wikipedia.org/wiki/Clockwise) rotation, the force acts to the left of the motion of the object. In one with anticlockwise (or counterclockwise) rotation, the force acts to the right. [Deflection](https://en.wikipedia.org/wiki/Deflection_(physics)) of an object due to the Coriolis force is called the **Coriolis effect**. Though recognized previously by others, the mathematical expression for the Coriolis force appeared in an 1835 paper by French scientist [Gaspard-Gustave de Coriolis](https://en.wikipedia.org/wiki/Gaspard-Gustave_de_Coriolis), in connection with the theory of [water wheels](https://en.wikipedia.org/wiki/Water_wheel). Early in the 20th century, the term *Coriolis force* began to be used in connection with [meteorology](https://en.wikipedia.org/wiki/Meteorology).

en.wikipedia.org/wiki/Coriolis\_force

Question:

Explain Coriolis force.

Kepler laws

First law of Kepler says that planets move along elliptical orbits, in foci of which there is the star.

Second law of Kepler says that a planet covers the same area during the same time, moving faster when closer to the star and slower when further from the star.

Third law of Kepler says that period squared, divided by average radius cubed is the constant for all the planets.

Question:

Explain laws of Kepler.

Standing wave

en.wikipedia.org/wiki/Standing\_wave

https://youtube.com/watch?v=0Rfushlee0U

Characteristic equation: L = n(λ/2), n = 1,2,3,…

Waves in ocean can travel a great distance, just like sound waves, but some are confined to a specific region, like if you shake rope with one end fixed in space. Waves will travel down this rope and then back again, reflected at the boundary. Some waves are confined between two fixed boundaries, like string, where they experience reflection at both ends of the string, resulting in a multitude wave cycles, traveling in both directions. If this vibration is of particular frequency, it will produce an interference pattern, that is a stationary wave. These are called transverse standing waves. These kinds of waves can only have particular frequencies for strings of given length because they only have integer numbers of half-wavelengths, since the waves must return to zero amplitude at both boundaries. If the number of half-wavelengths was not an integer, the wave could not exist. This means that number of half-waves must be quantized, meaning, it can only exhibit certain discrete values, set of integers and not from continuous spectrum.

Standing waves contain nodes, where there is destructive interference and amplitude of zero, as well as antinodes, where amplitude is at maximum. The string will be stationary at the nodes and other sections, if vibrating rapidly enough, will appear to human eye to create loops and more nodes mean more energy.

Two-dimensional standing waves also exist. The nodes are lines and curves, in this case.

Standing waves are used in music.

Question:

Fill in the blanks:

Any standing wave must have an integer number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

In a standing wave, the place with zero amplitude are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

A standing wave with greater frequency corresponds with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.

standing waves.

standing waves.

Question:

What song do you like? Why? How is it related to standing waves and to physics, in general?

Electromagnetic interaction is responsible for almost everything in classical physics: friction, elasticity, plasticity, fracture, thermodynamics.

Question:

What force is responsible for almost everything in classical physics: friction, elasticity, plasticity, fracture, thermodynamics?

Fluid

Question:

How will water level change if all floating icebergs will melt?

(resistance force (fluid mechanics))

Question:

Find fluid resistance force for C = = A = v = s mod 25.

s = 22123456

a = s Mod 25

C = a

ro = a

area = a

v = a

resistanceForce = C \* ro \* area \* v \* v

MsgBox resistanceForce

MsgBox "Force is measured in Newtons."

MsgBox "1 or 2 significant figures"

In [fluid dynamics](https://en.wikipedia.org/wiki/Fluid_dynamics), the **Euler equations** are a set of [quasilinear](https://en.wikipedia.org/wiki/Differential_equation) [partial differential equations](https://en.wikipedia.org/wiki/Partial_differential_equation) governing [adiabatic](https://en.wikipedia.org/wiki/Adiabatic_process) and [inviscid flow](https://en.wikipedia.org/wiki/Inviscid_flow). They are named after [Leonhard Euler](https://en.wikipedia.org/wiki/Leonhard_Euler). In particular, they correspond to the [Navier–Stokes equations](https://en.wikipedia.org/wiki/Navier%E2%80%93Stokes_equations) with zero [viscosity](https://en.wikipedia.org/wiki/Viscosity) and zero [thermal conductivity](https://en.wikipedia.org/wiki/Thermal_conductivity).

en.wikipedia.org/wiki/Euler\_equations\_(fluid\_dynamics)

Question:

Explain Euler equations in fluid dynamics.

The **Navier–Stokes equations** are [partial differential equations](https://en.wikipedia.org/wiki/Partial_differential_equation) which describe the motion of [viscous fluid](https://en.wikipedia.org/wiki/Viscous_fluid) substances, named after French engineer and physicist [Claude-Louis Navier](https://en.wikipedia.org/wiki/Claude-Louis_Navier) and Irish physicist and mathematician [George Gabriel Stokes](https://en.wikipedia.org/wiki/Sir_George_Stokes,_1st_Baronet). They were developed over several decades of progressively building the theories, from 1822 (Navier) to 1842-1850 (Stokes).

en.wikipedia.org/wiki/Navier–Stokes\_equations

Question:

Explain Navier-Stokes equations.

Thermodynamics

If we want to increase thermal exchange, then we stretch, increasing our area.

If we want to decrease thermal exchange, then we contract, decreasing our area.

Question:

Why do cats often stretch in hot places?

If the surface area is bigger, then heat exchange is also bigger.

Conduction

Conduction is heat transfer in solid.

**Conduction** is the process by which [heat](https://en.wikipedia.org/wiki/Heat) is [transferred](https://en.wikipedia.org/wiki/Heat_transfer) from the hotter end to the colder end of an object. The ability of the object to conduct heat is known as its [*thermal conductivity*](https://en.wikipedia.org/wiki/Thermal_conductivity)

en.wikipedia.org/wiki/Thermal\_conduction

Convection

Convection is heat transfer in fluid.

**Convection** is single or [multiphase](https://en.wikipedia.org/wiki/Multiphase_flow) [fluid flow](https://en.wikipedia.org/wiki/Fluid_flow) that occurs [spontaneously](https://en.wikipedia.org/wiki/Spontaneous_process) due to the combined effects of [material property](https://en.wikipedia.org/wiki/Material_property) [heterogeneity](https://en.wikipedia.org/wiki/Heterogeneity) and [body forces](https://en.wikipedia.org/wiki/Body_forces) on a [fluid](https://en.wikipedia.org/wiki/Fluid), most commonly [density](https://en.wikipedia.org/wiki/Density) and [gravity](https://en.wikipedia.org/wiki/Gravity) (see [buoyancy](https://en.wikipedia.org/wiki/Buoyancy)). When the cause of the convection is unspecified, convection due to the effects of [thermal expansion](https://en.wikipedia.org/wiki/Thermal_expansion) and buoyancy can be assumed. Convection may also take place in soft [solids](https://en.wikipedia.org/wiki/Solids) or [mixtures](https://en.wikipedia.org/wiki/Mixtures) where particles can flow.

Convective flow may be [transient](https://en.wikipedia.org/wiki/Transient_state) (such as when a [multiphase](https://en.wikipedia.org/wiki/Multiphasic_liquid) [mixture](https://en.wikipedia.org/wiki/Mixture) of [oil](https://en.wikipedia.org/wiki/Oil) and [water](https://en.wikipedia.org/wiki/Water) separates) or [steady state](https://en.wikipedia.org/wiki/Steady_state) (see [Convection cell](https://en.wikipedia.org/wiki/Convection_cell)). The convection may be due to [gravitational](https://en.wikipedia.org/wiki/Gravity), [electromagnetic](https://en.wikipedia.org/wiki/Electromagnetism) or [fictitious](https://en.wikipedia.org/wiki/Fictitious_force) body forces. [Heat transfer by natural convection](https://en.wikipedia.org/wiki/Convection_(heat_transfer)) plays a role in the structure of [Earth's atmosphere](https://en.wikipedia.org/wiki/Earth%27s_atmosphere), its [oceans](https://en.wikipedia.org/wiki/Oceans), and its [mantle](https://en.wikipedia.org/wiki/Earth%27s_mantle). Discrete convective cells in the atmosphere can be identified by [clouds](https://en.wikipedia.org/wiki/Clouds), with stronger convection resulting in [thunderstorms](https://en.wikipedia.org/wiki/Thunderstorm). Natural convection also plays a role in [stellar physics](https://en.wikipedia.org/wiki/Stellar_physics). Convection is often categorised or described by the main effect causing the convective flow, e.g. Thermal convection.

en.wikipedia.org/wiki/Convection

Radiation

Radiation is heat transfer through vacuum.

**Thermal radiation** is [electromagnetic radiation](https://en.wikipedia.org/wiki/Electromagnetic_radiation) generated by the [thermal motion](https://en.wikipedia.org/wiki/Thermal_motion) of particles in [matter](https://en.wikipedia.org/wiki/Matter). Thermal radiation is generated when heat from the movement of charges in the material (electrons and protons in common forms of matter) is converted to electromagnetic radiation. All matter with a [temperature](https://en.wikipedia.org/wiki/Temperature) greater than [absolute zero](https://en.wikipedia.org/wiki/Absolute_zero) emits thermal radiation. At [room temperature](https://en.wikipedia.org/wiki/Room_temperature), most of the emission is in the infrared (IR) spectrum. Particle motion results in [charge-acceleration](https://en.wikipedia.org/wiki/Larmor_formula) or [dipole](https://en.wikipedia.org/wiki/Dipole) oscillation which produces electromagnetic radiation.

Infrared radiation emitted by animals (detectable with an [infrared camera](https://en.wikipedia.org/wiki/Infrared_camera)) and [cosmic microwave background radiation](https://en.wikipedia.org/wiki/Cosmic_microwave_background_radiation) are examples of thermal radiation.

If a radiation object meets the physical characteristics of a [black body](https://en.wikipedia.org/wiki/Black_body) in [thermodynamic equilibrium](https://en.wikipedia.org/wiki/Thermodynamic_equilibrium), the radiation is called [blackbody radiation](https://en.wikipedia.org/wiki/Black-body_radiation). [Planck's law](https://en.wikipedia.org/wiki/Planck%27s_law) describes the spectrum of blackbody radiation, which depends solely on the object's temperature. [Wien's displacement law](https://en.wikipedia.org/wiki/Wien%27s_displacement_law) determines the most likely frequency of the emitted radiation, and the [Stefan–Boltzmann law](https://en.wikipedia.org/wiki/Stefan%E2%80%93Boltzmann_law) gives the radiant intensity.

Thermal radiation is also one of the fundamental mechanisms of [heat transfer](https://en.wikipedia.org/wiki/Heat_transfer).

en.wikipedia.org/wiki/Thermal\_radiation

Question:

Explain conduction, convection, radiation.

Thermodynamics laws

The zeroth law states that if two [thermodynamic systems](https://en.wikipedia.org/wiki/Thermodynamic_system) are both in [thermal equilibrium](https://en.wikipedia.org/wiki/Thermal_equilibrium) with a third system, then the two systems are in thermal equilibrium with each other.

en.wikipedia.org/wiki/Zeroth\_law\_of\_thermodynamics

The **first law of thermodynamics** is a formulation of the law of [conservation of energy](https://en.wikipedia.org/wiki/Conservation_of_energy) in the context of [thermodynamic processes](https://en.wikipedia.org/wiki/Thermodynamic_process) in which two principle forms of energy transfer, [heat](https://en.wikipedia.org/wiki/Heat) and [thermodynamic work](https://en.wikipedia.org/wiki/Work_(thermodynamics)), are distinguished that modify a [thermodynamic system](https://en.wikipedia.org/wiki/Thermodynamic_system) of a constant amount of matter. The law also defines the [internal energy](https://en.wikipedia.org/wiki/Internal_energy) of a system, an [extensive property](https://en.wikipedia.org/wiki/Extensive_property) for taking account of the balance of these energies in the system. Energy cannot be created or destroyed, but it can be transformed from one form to another. In an [isolated system](https://en.wikipedia.org/wiki/Isolated_system) the sum of all forms of energy is constant.

en.wikipedia.org/wiki/First\_law\_of\_thermodynamics

The **second law of thermodynamics** is a [physical law](https://en.wikipedia.org/wiki/Physical_law) based on universal experience concerning [heat](https://en.wikipedia.org/wiki/Heat) and [energy interconversions](https://en.wikipedia.org/wiki/Energy_transformation). A simple statement of the law is that heat always flows spontaneously from hotter to colder regions of matter (or 'downhill' in terms of the temperature gradient). Another statement is: "Not all heat can be converted into [work](https://en.wikipedia.org/wiki/Work_(thermodynamics)) in a [cyclic process](https://en.wikipedia.org/wiki/Cyclic_process)."

The second law of thermodynamics establishes the concept of [entropy](https://en.wikipedia.org/wiki/Entropy) as a physical property of a [thermodynamic system](https://en.wikipedia.org/wiki/Thermodynamic_system). It predicts whether processes are forbidden despite obeying the requirement of [conservation of energy](https://en.wikipedia.org/wiki/Conservation_of_energy) as expressed in the [first law of thermodynamics](https://en.wikipedia.org/wiki/First_law_of_thermodynamics) and provides necessary criteria for [spontaneous processes](https://en.wikipedia.org/wiki/Spontaneous_process). For example, the first law allows the process of a cup falling off of a table and breaking on the floor, as well as allowing the reverse process of the cup fragments coming back together and 'jumping' back onto the table, while the second law allows the former and denies the latter. The second law may be formulated by the observation that the entropy of [isolated systems](https://en.wikipedia.org/wiki/Isolated_system) left to spontaneous evolution cannot decrease, as they always tend toward a state of [thermodynamic equilibrium](https://en.wikipedia.org/wiki/Thermodynamic_equilibrium) where the entropy is highest at the given internal energy. An increase in the combined entropy of system and surroundings accounts for the [irreversibility](https://en.wikipedia.org/wiki/Irreversibility) of natural processes, often referred to in the concept of the [arrow of time](https://en.wikipedia.org/wiki/Arrow_of_time).

Historically, the second law was an [empirical finding](https://en.wikipedia.org/wiki/Empirical_evidence) that was accepted as an [axiom](https://en.wikipedia.org/wiki/Axiom) of [thermodynamic theory](https://en.wikipedia.org/wiki/Thermodynamics). [Statistical mechanics](https://en.wikipedia.org/wiki/Statistical_mechanics) provides a microscopic explanation of the law in terms of [probability distributions](https://en.wikipedia.org/wiki/Probability_distribution) of the states of large assemblies of [atoms](https://en.wikipedia.org/wiki/Atom) or [molecules](https://en.wikipedia.org/wiki/Molecule). The second law has been expressed in many ways. Its first formulation, which preceded the proper definition of entropy and was based on [caloric theory](https://en.wikipedia.org/wiki/Caloric_theory), is [Carnot's theorem](https://en.wikipedia.org/wiki/Carnot%27s_theorem_(thermodynamics)), formulated by the French scientist [Sadi Carnot](https://en.wikipedia.org/wiki/Nicolas_L%C3%A9onard_Sadi_Carnot), who in 1824 showed that the efficiency of conversion of heat to work in a heat engine has an upper limit. The first rigorous definition of the second law based on the concept of entropy came from German scientist [Rudolf Clausius](https://en.wikipedia.org/wiki/Rudolf_Clausius) in the 1850s and included his statement that heat can never pass from a colder to a warmer body without some other change, connected therewith, occurring at the same time.

The second law of thermodynamics allows the definition of the concept of [thermodynamic temperature](https://en.wikipedia.org/wiki/Thermodynamic_temperature), but this has been formally delegated to the [zeroth law of thermodynamics](https://en.wikipedia.org/wiki/Zeroth_law_of_thermodynamics).

en.wikipedia.org/wiki/Second\_law\_of\_thermodynamics

The **third law of thermodynamics** states that the entropy of a closed system at [thermodynamic equilibrium](https://en.wikipedia.org/wiki/Thermodynamic_equilibrium) approaches a constant value when its temperature approaches [absolute zero](https://en.wikipedia.org/wiki/Absolute_zero). This constant value cannot depend on any other parameters characterizing the system, such as pressure or applied magnetic field. At absolute zero (zero [kelvins](https://en.wikipedia.org/wiki/Kelvin)) the system must be in a state with the minimum possible energy.

Entropy is related to the number of accessible [microstates](https://en.wikipedia.org/wiki/Microstate_(statistical_mechanics)), and there is typically one unique state (called the [ground state](https://en.wikipedia.org/wiki/Ground_state)) with minimum energy. In such a case, the entropy at absolute zero will be exactly zero. If the system does not have a well-defined order (if its order is [glassy](https://en.wikipedia.org/wiki/Amorphous_solid), for example), then there may remain some finite entropy as the system is brought to very low temperatures, either because the system becomes locked into a configuration with non-minimal energy or because the minimum energy state is non-unique. The constant value is called the [residual entropy](https://en.wikipedia.org/wiki/Residual_entropy) of the system. The entropy is essentially a state-function meaning the inherent value of different atoms, molecules, and other configurations of particles including subatomic or atomic material is defined by entropy, which can be discovered near 0 K.

en.wikipedia.org/wiki/Third\_law\_of\_thermodynamics

Question:

Explain laws of thermodynamics.

**Entropy** is a [scientific](https://en.wikipedia.org/wiki/Science) concept, as well as a measurable physical property, that is most commonly associated with a state of disorder, randomness, or uncertainty. The term and the concept are used in diverse fields, from [classical thermodynamics](https://en.wikipedia.org/wiki/Classical_thermodynamics), where it was first recognized, to the microscopic description of nature in [statistical physics](https://en.wikipedia.org/wiki/Statistical_physics), and to the principles of [information theory](https://en.wikipedia.org/wiki/Information_theory). It has found far-ranging applications in [chemistry](https://en.wikipedia.org/wiki/Chemistry) and [physics](https://en.wikipedia.org/wiki/Physics), in biological systems and their relation to life, in [cosmology](https://en.wikipedia.org/wiki/Cosmology), economics, sociology, [weather science](https://en.wikipedia.org/wiki/Atmospheric_science), [climate change](https://en.wikipedia.org/wiki/Climate_change), and [information systems](https://en.wikipedia.org/wiki/Information_system) including the transmission of information in telecommunication.

en.wikipedia.org/wiki/Entropy

Question:

Explain entropy.

In [thermodynamics](https://en.wikipedia.org/wiki/Thermodynamics), **enthalpy**, is the sum of a [thermodynamic system](https://en.wikipedia.org/wiki/Thermodynamic_system)'s [internal energy](https://en.wikipedia.org/wiki/Internal_energy) and the product of its pressure and volume. It is a [state function](https://en.wikipedia.org/wiki/State_function) used in many measurements in chemical, biological, and physical systems at a constant pressure, which is conveniently provided by the large ambient atmosphere. The pressure–volume term expresses the [work](https://en.wikipedia.org/wiki/Work_(physics)) required to establish the system's physical dimensions, i.e. to make room for it by displacing its surroundings. The pressure-volume term is very small for solids and liquids at common conditions, and fairly small for gases. Therefore, enthalpy is a stand-in for energy in chemical systems; [bond](https://en.wikipedia.org/wiki/Bond_energy), [lattice](https://en.wikipedia.org/wiki/Lattice_energy), [solvation](https://en.wikipedia.org/wiki/Solvation), and other chemical "energies" are actually enthalpy differences. As a state function, enthalpy depends only on the final configuration of internal energy, pressure, and volume, not on the path taken to achieve it.

en.wikipedia.org/wiki/Enthalpy

Question:

What is enthalpy?

Work of gas

For a gas, work is the product of the pressure p and the volume V during a change of volume. On a graph of pressure versus volume, the work is the area under the curve that describes how the state is changed from State 1 to State 2.

Google.com

Question:

Explain work of gas.

Heat energy

All matter contains heat energy. Heat energy is the result of the movement of tiny particles called atoms, molecules or ions in solids, liquids and gases. Heat energy can be transferred from one object to another. The transfer or flow due to the difference in temperature between the two objects is called heat.

Google.com

Question:

Explain heat energy.

Internal energy

The **internal energy** of a [thermodynamic system](https://en.wikipedia.org/wiki/Thermodynamic_system) is the [energy](https://en.wikipedia.org/wiki/Energy) contained within it, measured as the quantity of energy necessary to bring the system from its [standard](https://en.wikipedia.org/wiki/Standard_state) internal state to its present internal state of interest, accounting for the gains and losses of energy due to changes in its internal state, including such quantities as [magnetization](https://en.wikipedia.org/wiki/Magnetization). It excludes the [kinetic energy](https://en.wikipedia.org/wiki/Kinetic_energy) of motion of the system as a whole and the [potential energy](https://en.wikipedia.org/wiki/Potential_energy) of position of the system as a whole, with respect to its surroundings and external force fields. It includes the thermal energy, *i.e.*, the constituent particles' kinetic energies of motion relative to the motion of the system as a whole. The internal energy of an [isolated](https://en.wikipedia.org/wiki/Thermodynamic_system#Isolated_system) system cannot change, as expressed in the law of [conservation of energy](https://en.wikipedia.org/wiki/Conservation_of_energy), a foundation of the [first law of thermodynamics](https://en.wikipedia.org/wiki/First_law_of_thermodynamics).

The internal energy cannot be measured absolutely. Thermodynamics concerns *changes* in the internal energy, not its absolute value. The processes that change the internal energy are transfers, into or out of the system, of matter, or of energy, as [heat](https://en.wikipedia.org/wiki/Heat), or by [thermodynamic work](https://en.wikipedia.org/wiki/Work_(thermodynamics)). These processes are measured by changes in the system's properties, such as temperature, [entropy](https://en.wikipedia.org/wiki/Entropy), volume, electric polarization, and [molar constitution](https://en.wikipedia.org/wiki/Chemical_composition). The internal energy depends only on the internal state of the system and not on the particular choice from many possible processes by which energy may pass into or out of the system. It is a [state variable](https://en.wikipedia.org/wiki/State_function), a [thermodynamic potential](https://en.wikipedia.org/wiki/Thermodynamic_potential), and an [extensive property](https://en.wikipedia.org/wiki/Intensive_and_extensive_properties).

Thermodynamics defines internal energy macroscopically, for the body as a whole. In [statistical mechanics](https://en.wikipedia.org/wiki/Statistical_physics), the internal energy of a body can be analyzed microscopically in terms of the kinetic energies of microscopic motion of the system's particles from [translations](https://en.wikipedia.org/wiki/Translation_(physics)), [rotations](https://en.wikipedia.org/wiki/Rotation), and [vibrations](https://en.wikipedia.org/wiki/Oscillation), and of the potential energies associated with microscopic forces, including [chemical bonds](https://en.wikipedia.org/wiki/Chemical_bonds).

The unit of [energy](https://en.wikipedia.org/wiki/Energy) in the [International System of Units](https://en.wikipedia.org/wiki/International_System_of_Units) (SI) is the [joule](https://en.wikipedia.org/wiki/Joule) (J). The internal energy relative to the [mass](https://en.wikipedia.org/wiki/Mass) with unit J/kg is the *specific internal energy*. The corresponding quantity relative to the [amount of substance](https://en.wikipedia.org/wiki/Amount_of_substance) with unit J/[mol](https://en.wikipedia.org/wiki/Mole_(unit)) is the *molar internal energy*.

en.wikipedia.org/wiki/Internal\_energy

Question:

Explain internal energy.

Isothermal process

youtube.com/watch?v=8y5KX4kzt0A

Isobaric process

youtube.com/watch?v=AzmXVvxXN70

Isochoric process

youtube.com/watch?v=vV1fGs3JKzU

Adiabatic process

youtube.com/watch?v=gaZmZjBtgAM

Question:

Explain isothermal, isobaric, isochoric, adiabatic processes.

Heat engine

efficiency

Q1 is absorbed energy.

Q2 is dissipated energy.

Question:

Calculate heat engine efficiency for Q1 = 100J and Q2 = 50J.

Q1 = 100

Q2 = 50

efficiency = 1 - Q2 / Q1

MsgBox efficiency

MsgBox “Efficiency in dimensionless.”

MsgBox “1 significant figure”

Question:

Q1 = 12000 J

Q2 = 6000 J

T2 = 300 K

Find T1.

Q1 = 12000

Q2 = 6000

T2 = 300

T1 = Q1 \* T2 / Q2

MsgBox T1

MsgBox “Temperature is measured in Kelvins”

MsgBox “1 significant figure”

Carnot cycle

A **Carnot cycle** is an ideal [thermodynamic cycle](https://en.wikipedia.org/wiki/Thermodynamic_cycle) proposed by French physicist [Sadi Carnot](https://en.wikipedia.org/wiki/Nicolas_L%C3%A9onard_Sadi_Carnot) in 1824 and expanded upon by others in the 1830s and 1840s. By [Carnot's theorem](https://en.wikipedia.org/wiki/Carnot%27s_theorem_(thermodynamics)), it provides an upper limit on the [efficiency](https://en.wikipedia.org/wiki/Thermal_efficiency) of any classical [thermodynamic engine](https://en.wikipedia.org/wiki/Heat_engine) during the conversion of [heat](https://en.wikipedia.org/wiki/Heat) into [work](https://en.wikipedia.org/wiki/Work_(thermodynamics)), or conversely, the efficiency of a [refrigeration](https://en.wikipedia.org/wiki/Refrigeration) system in creating a temperature difference through the application of work to the system.

en.wikipedia.org/wiki/Carnot\_cycle

youtube.com/watch?v=ELR1Hx4qymo

Question:

Explain Carnot cycle.

Otto cycle

An **Otto cycle** is an idealized [thermodynamic cycle](https://en.wikipedia.org/wiki/Thermodynamic_cycle) that describes the functioning of a typical [spark ignition](https://en.wikipedia.org/wiki/Spark-ignition_engine) [piston engine](https://en.wikipedia.org/wiki/Piston_engine). It is the thermodynamic cycle most commonly found in automobile engines.

The Otto cycle is a description of what happens to a gas as it is subjected to changes of pressure, temperature, volume, addition of heat, and removal of heat. The gas that is subjected to those changes is called the system. The system, in this case, is defined to be the fluid (gas) within the cylinder. By describing the changes that take place within the system, it will also describe in inverse, the system's effect on the environment. In the case of the Otto cycle, the effect will be to produce enough net work from the system so as to propel an automobile and its occupants in the environment.

en.wikipedia.org/wiki/Otto\_cycle

Question:

Explain Otto cycle.

Diesel cycle

The **Diesel cycle** is a combustion process of a reciprocating [internal combustion engine](https://en.wikipedia.org/wiki/Internal_combustion_engine). In it, [fuel](https://en.wikipedia.org/wiki/Fuel) is ignited by heat generated during the compression of air in the combustion chamber, into which fuel is then injected. This is in contrast to igniting the fuel-air mixture with a [spark plug](https://en.wikipedia.org/wiki/Spark_plug) as in the [Otto cycle](https://en.wikipedia.org/wiki/Otto_cycle) ([four-stroke](https://en.wikipedia.org/wiki/Four-stroke_engine)/petrol) engine. [Diesel engines](https://en.wikipedia.org/wiki/Diesel_engine) are used in [aircraft](https://en.wikipedia.org/wiki/Aircraft_diesel_engine), [automobiles](https://en.wikipedia.org/wiki/Automobile), [power generation](https://en.wikipedia.org/wiki/Power_generation), [diesel–electric](https://en.wikipedia.org/wiki/Diesel%E2%80%93electric_transmission) [locomotives](https://en.wikipedia.org/wiki/Locomotive), and both surface [ships](https://en.wikipedia.org/wiki/Ship) and [submarines](https://en.wikipedia.org/wiki/Submarine).

en.wikipedia.org/wiki/Diesel\_cycle

Question:

Explain diesel cycle.

Question:

Compare efficiency of Carnot, Otto and diesel cycles.

Radiation

Question:

What is the colour of the sun?

Optics

Converging lens directs light to a point at the optical center or axis of the lens. A lens that converts parallel rays of light to convergent rays and produces a real image. As long as the object is outside of the focal point the image is real and inverted.

Google.com

A lens that causes parallel light rays to spread out – hence diverge – away from the optical axis once exiting the lens. The lens surfaces may be plano-concave, double concave or concave-convex. The edge of a diverging lens is always thicker than the center.

Google.com

A **concave mirror**, or **converging mirror**, has a reflecting surface that is recessed inward (away from the incident light). Concave mirrors reflect light inward to one focal point. They are used to focus light. Unlike convex mirrors, concave mirrors show different image types depending on the distance between the object and the mirror.

The mirrors are called "converging mirrors" because they tend to collect light that falls on them, refocusing parallel incoming [rays](https://en.wikipedia.org/wiki/Ray_(optics)) toward a focus. This is because the light is reflected at different angles at different spots on the mirror as the normal to the mirror surface differs at each spot.

en.wikipedia.org/wiki/Curved\_mirror

Concaved mirror is used to focus the rays.

Question:

Explain optics of lenses and concave mirror.

Light absorption is a process by which light is absorbed and converted into energy. An example of this process is photosynthesis in plants. However, light absorption doesn't occur exclusively in plants, but in all creatures/inorganic substances.

Google.com

Question:

Explain absorption of light.

Capacitances addition

In parallel circuit: C = C1 + C2 + C3

In series circuit:

Question:

Calculate compound capacitance of C1 = 1 Farad, C2 = 2 Farad, C3 = 3 Farad.

C1=1

C2=2

C3=3

' For parallel circuit:

CP = C1 + C2 + C3

MsgBox CP

' For series circuit:

CS = C1 \* C2 \* C3 / (C1 \* C2 + C1 \* C3 + C2 \* C3)

MsgBox CS

MsgBox “Capacitance is measured in Farad.”

MsgBox “1 significant figure”

Question:

What is resistance of capacitor to direct current?

What is resistance of inductor to direct current?

Lorentz force

In [physics](https://en.wikipedia.org/wiki/Physics) (specifically in [electromagnetism](https://en.wikipedia.org/wiki/Electromagnetism)), the **Lorentz force** (or **electromagnetic force**) is the combination of electric and magnetic [force](https://en.wikipedia.org/wiki/Force) on a [point charge](https://en.wikipedia.org/wiki/Point_charge) due to [electromagnetic fields](https://en.wikipedia.org/wiki/Electromagnetic_field).

en.wikipedia.org/wiki/Lorentz\_force

Question:

Explain Lorentz force.

Maxwell equations

**Maxwell's equations**, or **Maxwell–Heaviside equations**, are a set of coupled [partial differential equations](https://en.wikipedia.org/wiki/Partial_differential_equation) that, together with the [Lorentz force](https://en.wikipedia.org/wiki/Lorentz_force) law, form the foundation of [classical electromagnetism](https://en.wikipedia.org/wiki/Classical_electromagnetism), classical [optics](https://en.wikipedia.org/wiki/Optics), and [electric circuits](https://en.wikipedia.org/wiki/Electric_circuit). The equations provide a mathematical model for electric, optical, and radio technologies, such as power generation, electric motors, [wireless](https://en.wikipedia.org/wiki/Wireless) communication, lenses, radar, etc. They describe how [electric](https://en.wikipedia.org/wiki/Electric_field) and [magnetic fields](https://en.wikipedia.org/wiki/Magnetic_field) are generated by [charges](https://en.wikipedia.org/wiki/Electric_charge), [currents](https://en.wikipedia.org/wiki/Electric_current), and changes of the fields.

en.wikipedia.org/wiki/Maxwell%27s\_equations

Question:

Explain Maxwell equations.

Question:

Are there electric charges?

Are there magnetic charges?

Question:

Explain amplitude modulation, frequency modulation, phase modulation.

en.wikipedia.org/wiki/Amplitude\_modulation

en.wikipedia.org/wiki/Frequency\_modulation

en.wikipedia.org/wiki/Phase\_modulation

Question:

How can I jam signal?

en.wikipedia.org/wiki/Radio\_jamming

Question:

Explain physics of drones.

Question:

What is physics of missiles and bombs.

Atom:

Question:

Estimate the distances between the atoms of element number T in the periodic table of elements.

s = 22123456

T = s Mod 100

Avogadro\_number = 6 \* 10 ^ 23

'

' For Magnesium = Mg:

If T = 12 Then atomic\_weight = 0.024: density = 1600: GoTo 1

' For Phosphorus = P:

If T = 15 Then atomic\_weight = 0.031: density = 1820: GoTo 1

' For Sulfur = S:

If T = 16 Then atomic\_weight = 0.032: density = 2000: GoTo 1

' For Chlorine = Cl:

If T = 17 Then atomic\_weight = 0.035: density = 3.2: GoTo 1

' For Argon = Ar:

If T = 18 Then atomic\_weight = 0.04: density = 1.8: GoTo 1

' For Patassium = K:

If T = 19 Then atomic\_weight = 0.039: density = 890: GoTo 1

' For Titenium = Ti:

If T = 22 Then atomic\_weight = 0.048: density = 4506: GoTo 1

' For Manganese = Mn:

If T = 25 Then atomic\_weight = 0.055: density = 7430: GoTo 1

' For Iron = Fe:

If T = 26 Then atomic\_weight = 0.056: density = 7874: GoTo 1

' For copper = Cu:

If T = 29 Then atomic\_weight = 0.064: density = 9000: GoTo 1

' For Bromine = Br:

If T = 35 Then atomic\_weight = 0.08: density = 3119: GoTo 1

'

MsgBox "You must find data for your T"

GoTo 2

'

1 distance\_between\_particles = (density \* Avogadro\_number / atomic\_weight) ^ (-1 / 3)

MsgBox distance\_between\_particles

2 your\_data = is\_missing

https://physics16.weebly.com/uploads/5/9/8/5/59854633/distance\_between\_particles\_for\_many\_atoms2019oct.txt

' For copper

Avogadro\_number = 6 \* 10 ^ 23

atomic\_weight = 0.064

density = 9000

distance\_between\_particles = (density \* Avogadro\_number / atomic\_weight) ^ (-1 / 3)

MsgBox distance\_between\_particles

http://physics16.weebly.com/uploads/5/9/8/5/59854633/distance\_between\_particles.txt

Particles:

Energy of photon

Energy: E = hf

h is constant

f is frequency

Energy: E = hc/λ

c is speed of light

λ is wavelength

Momentum: p = h/λ

p is momentum

Question:

Find energy and momentum of photon of s Hz frequency.

s = 22123456

h = 6.62607004 \* 10 ^ (-34)

c = 2.99792458\* 10 ^ 8

frequency = s

E = h \* frequency

Lambda = c / frequency

Momentum = h / Lambda

MsgBox E

MsgBox "Energy is measured in Joules"

MsgBox Momentum

MsgBox "Momentum is measured in kilograms times meters per second"

MsgBox "7 or 8 significant figures"

Question:

Calculate the energy and momentum of a photon for Lambda = 0.05k nanometers.

s = 22123456

k = s Mod 10000

h = 6.62607004 \* 10 ^ (-34)

c = 2.99792458 \* 10 ^ 8

Lambda = 0.05 \* k \* 10 ^ (-9)

E = h \* c / Lambda

MsgBox E

MsgBox "Energy is measured in Joules"

Momentum = h / Lambda

MsgBox Momentum

MsgBox "Momentum is measured in kilograms times meters per second"

MsgBox "Maximum 4 significant figures"

http://physics16.weebly.com/uploads/5/9/8/5/59854633/energy4photon.txt

Question:

Determine the wavelength of an electron that has been accelerated through the potential difference of T Volts.

s = 22123456

k = s Mod 10000

T = s Mod 100

h = 6.62607004 \* 10 ^ (-34)

ec = 1.60217662 \* 10 ^ (-19)

em = 9.10938356 \* 10 ^ (-31)

Voltage = T

velovity = Sqr(2 \* ec \* Voltage / em)

p = em \* velovity

Lambda = h / p

MsgBox Lambda

MsgBox “Wavelength is measured in meters.”

MsgBox “1 or 2 significant figures”

http://physics16.weebly.com/uploads/5/9/8/5/59854633/wavelength4electron.txt

Question:

Calculate the wavelength of k grams desk moving T centimetres per second.

s = 22123456

k = s Mod 10000

T = s Mod 100

h = 6.62607004 \* 10 ^ (-34)

m = k \* 10 ^ (-3)

v = T \* 10 ^ (-2)

p = m \* v

Lambda = h / p

MsgBox Lambda

MsgBox “Wavelength is measured in meters.”

MsgBox “1 or 2 significant figures”

http://physics16.weebly.com/uploads/5/9/8/5/59854633/waves4matter.txt

Question:

What is the matter wavelength of T grams book?

Question:

Find the energy level and angular momentum for hydrogen according to the Bohr Model.

s = 22123456

n = s

h = 6.62607004 \* 10 ^ (-34)

Energy = -13.6 / n ^ 2

AngularMomentum = n \* h / (8 \* Atn(1))

MsgBox Energy

MsgBox “Energy is measured in Joules”

MsgBox “3 significant figures for energy”

MsgBox AngularMomentum

MsgBox “Angular momentum is measured in kilograms times meters squared/ second”

MsgBox “7 or 8 significant figures for angular momentum”

http://physics16.weebly.com/uploads/5/9/8/5/59854633/bohr.txt

Question:

Are massless or mass-full particles used in quantum information? Why?

Question:

Perform correlation and regression analyses of the periodic table for T+2 elements and for m7 + 3 elementary particles.

http://physics16.weebly.com/uploads/5/9/8/5/59854633/correlations4periodic4table.xlsx

http://physics16.weebly.com/uploads/5/9/8/5/59854633/regression4periodic4table.txt

http://physics16.weebly.com/uploads/5/9/8/5/59854633/evergy4lifetime.xlsx

http://physics16.weebly.com/uploads/5/9/8/5/59854633/regression4elementary4particles4energies4life4times.txt

Question:

What particles mediate electromagnetic interaction?

A. electrons

B. protons

C. positrons

D. photons

Question:

What particles mediate strong interaction?

A. neutrons

B. gluons

C. photons

D. protons

Question:

Find the energy of the photon with the frequency of s Hz.

E2 = (mc2)2 + (pc)2.

Questions:

What is the structure of electron?

Give the structure of neutron.

Give the structure of proton.

Use quarks.

ddu = neutron (quarks, nuclear physics)

uud = proton (quarks, nuclear physics)

E = mc^2

Question:

Find the annihilation energy of k grams of matter.

s = 22123456

k = s Mod 10000

T = s Mod 100

c = 2.99792458 \* 10 ^ 8

m = k \* 10 ^ (-3)

energy4annihilation = m \* c ^ 2

MsgBox energy4annihilation

MsgBox “Energy is measured in Joules”

MsgBox “Maximum 4 significant figures”

http://physics16.weebly.com/uploads/5/9/8/5/59854633/energy4binding.txt

Decay:

Question:

Calculate the remaining mass (it is NOT 0) of the decaying substance after k seconds if the decay ratio is T and initial mass is s. Calculate the half-life.

s = 22123456

k = s Mod 10000

T = s Mod 100

remainingmass = s \* Exp(-k \* T)

halflife = Log(2) / T

MsgBox remainingmass

MsgBox “Mass is measured in kilograms”

MsgBox halflife

MsgBox “Half-life is measured in seconds”

MsgBox “1 or 2 significant figures”

http://physics16.weebly.com/uploads/5/9/8/5/59854633/code4nuclear4decay4half4life.txt

Fundamental Physical interactions:

Question:

How many times is Electromagnetic Force weaker than the Strong Nuclear Force?

A. 137

B. 758

C. 3592

D. 126434

Nuclear physics

Drop model:

The liquid drop model proposed by George Gamow is the basis for this theory. The atomic nucleus, according to this model, behaves like the molecules in a drop of liquid. The fluid, on the other hand, is made up of nucleons (protons and neutrons) held together by a strong nuclear force.

Google

Question:

What is the drop model?

Alpha and beta radiation are types of radiation made out of particles. Alpha radiation has a high power of ionisation but low penetration. Beta radiation has a low power of ionisation but high penetration. Gamma radiation is a low-ionising, highly penetrating wave-like radiation.

Google

Question:

Explain alpha, beta, gamma radiation.

Depleted uranium is a dense metal produced as a by-product of enrichment of natural uranium for nuclear fuel. It is still radioactive, but at a much lower level than the starting material. It is used in armour-piercing shells and bombs, to give them more penetrating power. Such munitions were used in both Gulf Wars and in Serbia and Kosovo.

ec.europa.eu/health/scientific\_committees/opinions\_layman/depleted-uranium/en/index.htm

Question:

**What is depleted uranium?**

In [nuclear physics](https://en.wikipedia.org/wiki/Nuclear_physics) and [nuclear chemistry](https://en.wikipedia.org/wiki/Nuclear_chemistry), a **nuclear reaction** is a process in which two [nuclei](https://en.wikipedia.org/wiki/Atomic_nucleus), or a nucleus and an external [subatomic particle](https://en.wikipedia.org/wiki/Subatomic_particle), collide to produce one or more new [nuclides](https://en.wikipedia.org/wiki/Nuclide). Thus, a nuclear reaction must cause a transformation of at least one nuclide to another.

en.wikipedia.org

Nuclear fission is a reaction in which the nucleus of an atom splits into two or more smaller nuclei. The fission process often produces gamma photons, and releases a very large amount of energy even by the energetic standards of radioactive decay.

Google

Nuclear fusion is a process in which two atoms merge into one

This releases an incredible amount of energy in the form of heat, so much heat, in fact, that it can power the sun and other stars.

Google

Question:

Explain nuclear fission and fusion.

In physics, **quantum tunnelling**, **barrier penetration**, or simply **tunnelling** is a [quantum mechanical](https://en.wikipedia.org/wiki/Quantum_mechanics) phenomenon in which an object such as an electron or atom passes through a [potential energy barrier](https://en.wikipedia.org/wiki/Potential_barrier) that, according to [classical mechanics](https://en.wikipedia.org/wiki/Classical_mechanics), the object does not have sufficient energy to enter or surmount.

en.wikipedia.org/wiki/Quantum\_tunnelling

Question:

What is quantum tunnelling.

Question:

How can we survive nuclear war?

Question:

Use quantum computer.

quantum-computing.ibm.com

**General relativity** is a [theory](https://en.wikipedia.org/wiki/Scientific_theory) of [gravitation](https://en.wikipedia.org/wiki/Gravitation) developed by [Albert Einstein](https://en.wikipedia.org/wiki/Albert_Einstein) between 1907 and 1915. The theory of general relativity says that the observed gravitational effect between masses results from their warping of [spacetime](https://en.wikipedia.org/wiki/Spacetime).

en.wikipedia.org

Question:

Explain general relativity.

Question:

Explain 2023 Nobel Prize in physics.

-

Fluid

Hydraulics

Hydraulics is a mechanical function that operates through the force of liquid pressure. In hydraulics-based systems, mechanical movement is produced by contained, pumped liquid, typically through hydraulic cylinders moving pistons.

Pneumatics

Pneumatics (from Greek πνεῦμα pneuma 'wind, breath') is a branch of engineering that makes use of gas or pressurized air. Pneumatic (compressed-air) fireless locomotives like this were often used to haul trains in mines, where steam engines posed a risk of explosion.

Question:

You press the pedal with force of L Newtons. The area of the cross-section of the tube under the pedal is 1 squared millimetre. The area of the cross-section of the tube near the car wheals is 1 squared centimetre. Find the force on the car wheals.

Solution: Pressure is the same. The force is directly proportional to the area of the cross-section.

The force on the wheals will be 100 times bigger than the force on the pedal: 100L Newtons.

s = 22123456

L = s Mod 10

F = 100 \* L

MsgBox F

MsgBox "Force is measured in Newtons."

MsgBox "1 significant figure"

Similarity of mechanics, fluid and thermodynamics:

Mechanical system moves from high potential energy to low potential energy,

fluid frows from high pressure to low pressure,

heat flows from hot to cold, from high temperature to low temperature.

**Space debris** (also known as **space junk**, **space pollution**

Planetary model of atom

The Bohr Model is a structural model of an atom. The model was proposed by physicist Niels Bohr in 1913. In this model, the electrons travel around the nucleus of an atom in distinct circular orbits, or shells. The model is also referred to as the planetary model of an atom.

Google

Boson is a [subatomic particle](https://en.wikipedia.org/wiki/Subatomic_particle) whose [spin quantum number](https://en.wikipedia.org/wiki/Spin_quantum_number) has an integer value (0, 1, 2, ...)

en.wikipedia.org/wiki/Boson

Fermion

Fermion, any member of a group of subatomic particles having odd half-integral angular momentum (spin 1/2, 3/2), named for the Fermi-Dirac statistics that describe its behaviour.

Google

Quantum number

In [quantum physics](https://en.wikipedia.org/wiki/Quantum_mechanics) and [chemistry](https://en.wikipedia.org/wiki/Chemistry), **quantum numbers** describe values of [conserved quantities](https://en.wikipedia.org/wiki/Conserved_quantity) in the dynamics of a [quantum system](https://en.wikipedia.org/wiki/Quantum_system).

en.wikipedia.org/wiki/Quantum\_number

Question:

What is quantum number?

**Schrödinger cat**

In Schrödinger's original formulation, a cat, a flask of poison, and a radioactive source are placed in a sealed box. If an internal radiation monitor (e.g. a Geiger counter) detects radioactivity (i.e. a single atom decaying), the flask is shattered, releasing the poison, which kills the cat.

Google

Question:

Explain Schrodinger cat.

**Schrödinger** equation

The **Schrödinger equation** is a [linear](https://en.wikipedia.org/wiki/Linear_differential_equation) [partial differential equation](https://en.wikipedia.org/wiki/Partial_differential_equation) that governs the [wave function](https://en.wikipedia.org/wiki/Wave_function) of a quantum-mechanical system.

en.wikipedia.org/wiki/Schrödinger\_equation

Question:

Explain Schrodinger equation.

Dirac equation

In [particle physics](https://en.wikipedia.org/wiki/Particle_physics), the **Dirac equation** is a [relativistic wave equation](https://en.wikipedia.org/wiki/Relativistic_wave_equation) derived by British physicist [Paul Dirac](https://en.wikipedia.org/wiki/Paul_Dirac) in 1928.

en.wikipedia.org/wiki/Dirac\_equation

Question:

Explain Dirac equation.

Uncertainty principle

Formulated by the German physicist and Nobel laureate Werner Heisenberg in 1927, the uncertainty principle states that we cannot know both the position and speed of a particle, such as a photon or electron, with perfect accuracy; the more we nail down the particle's position, the less we know about its speed

Google

Big Bang

The **Big Bang** event is a [physical theory](https://en.wikipedia.org/wiki/Physical_theory) that describes how the [universe expanded](https://en.wikipedia.org/wiki/Expansion_of_the_universe) from an initial state of high [density](https://en.wikipedia.org/wiki/Energy_density) and [temperature](https://en.wikipedia.org/wiki/Temperature).

en.wikipedia.org/wiki/Big\_Bang

String theory

In physics, string theory is a theoretical framework in which the point-like particles of particle physics are replaced by one-dimensional objects called strings. String theory describes how these strings propagate through space and interact with each other.

Google

Aliens

**Extraterrestrial life** or **alien life** is [life](https://en.wikipedia.org/wiki/Life) which does not originate from [Earth](https://en.wikipedia.org/wiki/Earth). No extraterrestrial life has yet been conclusively detected. Such life might range from simple forms such as [prokaryotes](https://en.wikipedia.org/wiki/Prokaryote) to [intelligent beings](https://en.wikipedia.org/wiki/Extraterrestrial_intelligence), possibly bringing forth [civilizations](https://en.wikipedia.org/wiki/Civilization) that might be [far more advanced](https://en.wikipedia.org/wiki/Kardashev_scale) than humanity.

en.wikipedia.org/wiki/Extraterrestrial\_life