

Energy is the capacity of a physical system to perform [work](#). Energy exists in several forms such as [heat](#), [kinetic](#) or mechanical energy, light, [potential energy](#), electrical, or other forms.

According to the law of conservation of energy, the total energy of a system remains constant, though energy may transform into another form. Two billiard balls colliding, for example, may come to rest, with the resulting energy becoming sound and perhaps a bit of heat at the point of collision.

The SI unit of energy is the joule (J) or newton-meter ($\text{N} \cdot \text{m}$). The joule is also the SI unit of [work](#).

Force is a quantitative description of the interaction between two physical bodies, such as an object and its environment. Force is proportional to [acceleration](#). In calculus terms, force is the derivative of [momentum](#) with respect to time.

Contact force is defined as the force exerted when two physical objects come in direct contact with each other. Other forces, such as gravitation and electromagnetic forces, can exert themselves even across the empty vacuum of space.

The concept of force was originally defined by Sir Isaac Newton in his [three laws of motion](#). He explained [gravity](#) as an attractive force between bodies that possessed [mass](#) (gravity within Einstein's general relativity doesn't require force).

Force is a [vector](#). The SI unit for force is the *newton* (N). One newton of force is equal to $1 \text{ kg} \cdot \text{m/s}^2$.

Acceleration is the rate of change of [velocity](#) as a function of time. It is [vector](#). In calculus terms, acceleration is the second derivative of position with respect to time or, alternately, the first derivative of the velocity with respect to time.

The SI units for acceleration are m / s^2 (meters per second squared *ormeters per second per second*).

Velocity is a [vector](#) measurement of the rate and direction of motion or, in other terms, the rate and direction of the change in the position of an object. The scalar (absolute value) magnitude of the velocity vector is the [speed](#) of the motion. In calculus terms, velocity is the first derivative of position with respect to time.

The SI units for velocity are m / s (meters per second).

Mass is the quantity of inertia possessed by an object or the proportion between [force](#) and [acceleration](#) referred to in [Newton's Second Law of Motion](#).

This is not a very good operational definition of mass, of course. In most common instances, mass is determined by weighing the object and using the force of [gravity](#) to calculate the value automatically - which is why you can get on a scale and read your mass.

The SI unit of mass is the kilogram (kg).

Because of the relationship between weight and mass, these concepts are frequently confused. You can, in fact, convert exactly between weight and mass on the Earth's surface. This confusion is heightened by the fact that in much of metric world, weight is not dealt with, and mass is used in its place almost exclusively. The main difference is

that if you were to leave the Earth and go to the Moon, your weight would change but your mass would remain constant.

Momentum is the product of an object's [mass](#) and [velocity](#). It is a [vector](#). The SI units of momentum are $\text{kg} \cdot \text{m/s}$.

A vector is a mathematical quantity that has both a magnitude and direction. It is often represented in variable form in boldface with an arrow above it. Many quantities in physics are vector quantities.

A *unit vector* is a vector with a magnitude of 1 and is often denoted in boldface with a carat ($\hat{}$) above the variable.

enlje iz tla karpote ov e fizikol sistim to pafom wurk . enlje exists in sevrol formz sach oz het , kinetik or makonakol enlje , lit , patenchol enlje , alektrikol , or ltil formz .

akardeg to tla lra ov konserveshin ov enlje , tla totol enlje ov e sistim ramenz konstant , tio enlje me chronzform intol ltil form . to bilyid baryl kalideg , for exampol , me kam to rest , witi tla razoleg enlje bekameg soond ond purhops e bit ov het ot tla parent ov kalijhin.

tla es I yonit ov enlje iz tla jowl (joe) or nyotin metl (en tlemz em) . tla jowl iz orlo tla es I yonit ov wurk .

fars iz e qontativ disgripshin ov tla inturokshin bitwen to fizikol bodez , sach oz on objekt ond idas inviramint . fars iz propashinol to oxolareshin . in kolkyolis turmz , fars iz tla darivativ ov momentim witi raspekt to tim .

kontekt fars iz dafind oz tla fars exurtid wen to fizikol objekas kam in drekt kontekt witi ech ltil . ltil farsiz ,

sach óz gravitæshin ónd ælektrómagnetik færsiz , kón exurt
þemsoovz evin ækros þil empde vökyom ov sbæes .

þil konsept ov færs woz ærijinle dáfInd bI sur Izik nyotin in
hiz þre lærz ov mōshin . he ixblæend gravite óz ón ækroktiv
færs bitwen bodez þot pæzes mōs (gravite wiþlin IinstInz
jenról rólætivæte dæzint ræqIæ færs) .

færs iz æ vektæ . þil es I yonit fæ færs iz þil nyotin (en). wæn
nyotin ov færs iz eqól t• wæn kilægróm tImz metiz divIdid bI
sekinas.

óxólææshin iz þil ræet ov chæenj ov vælosæte óz æ flækshin ov
tIm . it iz vektæ . in kólkyolis turmz , óxólææshin iz þil
sekind dærivætiv ov pæzishin wiþ ræspekt t• tIm æ ,
olturnitle , þil furst dærivætiv ov þil vælosæte wiþ ræspekt t•
tIm .

þil es I yonias fæ óxólææshin Δ metiz þur sekind sqeid æ
metiz þur sekind þur sekind.

vælosæte iz æ vektæ meðlæmint ov þil ræet ónd dærekshin ov
mōshin æ , in æþil turmz , þil ræet ónd dærekshin ov þil chæenj
in þil pæzishin ov ón objekt . þil skæelæ (óbsælot völy•)
mognæchod ov þil vælosæte vektæ iz þil sped ov þil mōshin . in
kólkyolis turmz , vælosæte iz þil furst dærivætiv ov pæzishin
wiþ ræspekt t• tIm .

þil es I yonias fæ vælosæte Δ metiz þur sekind .

mōs iz tīl qontāte ov inurshl pāzest bī on objekt α tīl prāpāshin bitwen fōrs ond exolārēshin rāfurd t● in nyōtinz sekind lα ov mōshin .

tīs iz not æ vere gōd opārēshānōl defānisthin ov mōs , ov kōrs . in mōst komin instinsiz , mōs iz dāturmīnd bī wæeēg tīl objekt ond yōzeēg tīl fōrs ov grōvāte t● kōlkyōlæt tīl vōlyō ertāmōtiklē wich iz wī y● kōn get on æ skæil ond red yα mōs . tīl es I yōnit ov mōs iz tīl kilāgrōm

bekōz ov tīl rilēshinship bitwen wæt ond mōs , tīez konseps Δ freqāntlē konfyōzd . y● kōn , in fōkt , konvurt exōktlē bitwen wæt ond mōs on tīl urtlis surfis . tīs konfyōjhin iz hītīnd bī tīl fōkt tīot in māch ov tīl medhrik wūrd , wæt iz not dōlt wīll , ond mōs iz yōzd in iās plāes αmōst eksklōsivlē . tīl mæen difrins iz tīot if y● wur t● lev tīl urtl ond gō t● tīl mōn , yα wæt wōd chēnj bāt yα mōs wōd rāmæen konstint .

mōmentim iz tīl prodākt ov on objekōs mōs ond vālosāte . it iz æ vektλ . tīl es I yōniōs ov mōmentim Δ kilāgrōmz tlemz metiz dāvidid blæ sekinōs skweid.

æ vektλ iz æ mōtīmōtākōl qontāte tīot hōz bōtī æ mōgnāchōd ond dlrekshin . it iz ofin reprāzentid in vereābōl fōrm in boldfōes wīll on orō āblv it . menē qontātez in fizix Δ vektλ qontātez .

æ yōnit vektλ iz æ vektλ wīll æ mōgnāchōd ov 1 ond iz ofin dānōtid in boldfōes wīll æ kōrit āblv tīl vōreābōl.