

Pdf free Chapter 16 relativity momentum mass energy and gravity (2023)

in physics the energy momentum relation or relativistic dispersion relation is the relativistic equation relating total energy which is also called relativistic energy to invariant mass which is also called rest mass and momentum it is the extension of mass energy equivalence for bodies or systems with non zero momentum it can be 7 matter waves 7 5 mass momentum and energy page id david j raymond new mexico tech via the new mexico tech press in this section we relate the classical ideas of mass momentum and energy to what we have done so far historically these connections were first made by max planck and louis de broglie with help from albert einstein about transcript momentum p is equal to mass m times velocity v but there are other ways to think about momentum force f is equal to the change in momentum Δp over the change in time Δt and the change in momentum Δp is also equal to the impulse j impulse has the same units as momentum kg m s^{-1} or N s created by sal khan 9 3 4 vectors momentum mass and energy last updated save as pdf page id 57037 since mass is a scalar when velocity is in a negative direction i e opposite the direction of motion the momentum will also be in a negative direction and when velocity is in a positive direction momentum will likewise be in a positive direction the si unit for momentum is kg m s^{-1} the physics of mass energy equivalence 1 1 review of mass momentum and kinetic energy in newtonian physics 1 2 mass and energy in relativity preliminaries and notation 1 3 the physical significance of einstein s equation 1 4

mass and energy in atomic physics 1.5 why does $E = mc^2$ the stress energy tensor sometimes called the stress energy momentum tensor or the energy momentum tensor is a tensor physical quantity that describes the density and flux of energy and momentum in spacetime generalizing the stress tensor of newtonian physics now the momentum is mv mass $\times$ velocity this means for an object having constant mass which is almost always the case of course rate of change of momentum mass $\times$ rate of change of velocity this means that newton's second law can be rewritten force rate of change of momentum in order to define momentum in a way that resembles the classic definition one can think of the mass of the object as depending on the speed of the object we define the rest mass m_0 of the object as the mass that is measured when the object is at rest we can then model the mass of the object as increasing with its speed introduction to momentum google classroom review your understanding of momentum in this free article aligned to ngss standards key terms equations introduction to momentum both the mass and velocity of an object impact momentum there's a different one for time time dilation and a different one for space length contraction and now there's a different one for momentum relativistic momentum and another different one for energy relativistic energy the equation for relativistic momentum looks like this $p = mv \sqrt{1 - v^2/c^2}$ revisiting the work energy theorem the work energy theorem discussed in the previous section was derived from newton's second law which carries with it a reference to the center of mass of the object on which the force is acting momentum mass velocity in physics the symbol for the quantity momentum is the lower case p thus the above equation can be rewritten as $p = m v$ where m is the mass and v is the velocity the equation illustrates that momentum is directly proportional to an object's mass and directly proportional to the object's

velocity the chapter 5 mass momentum and energy equations flow rate and conservation of mass 1 cross sectional area oriented normal to velocity vector simple case where v a u constant q volume flux $u a$ m s m^2 m^3 s u constant q $u da$ a similarly the mass flux m p $u da$ a 2 general case q v n da cs $v \cos \theta$ da cs bibliography external links momentum in newtonian mechanics momentum pl momenta or momentums more specifically linear momentum or translational momentum is the product of the mass and velocity of an object it is a vector quantity possessing a magnitude and a direction how does the total energy of a particle depend on momentum it turns out to be useful to have a formula for e in terms of p now $e^2 = m^2 c^4 + m^2 v^2 c^2$ so $m^2 c^4 + m^2 v^2 c^2 = m^2 c^4 + m^2 v^2 c^2$ $m^2 v^2 c^2 = m^2 c^4 + m^2 c^2 v^2$ hence using $p = mv$ we find $e = m^2 c^4 + c^2 p^2$ if p is very small this gives $e = m^2 c^2 p^2 = 2m\theta$ the energy of a particle mass m moving with momentum p is given by $e^2 = p^2 c^2 + m^2 c^4$ or $e^2 = p^2 c^2 + m^2 c^4$ you may have noticed that particle physicists often refer to particle masses and momenta in electron volt energy units of mev or gev the student knows that changes occur within a physical system and applies the laws of conservation of energy and momentum the student is expected to calculate the mechanical energy of power generated within impulse applied to and momentum of a physical system introduction in this little document we justify einstein's famous equation $e = mc^2$ sections 1 and 2 demonstrate how the relativistic mass increase arises they are essentially non mathematical and only require the following background information we now have two physical quantities that exhibit conservation laws energy and momentum here we look at their interplay and get new insight into the work energy theorem

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 the stress energy momentum tensor or the energy momentum tensor is a tensor physical
 quantity that describes the density and flux of energy and momentum in spacetime
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 the case of course rate of change of momentum mass $\times$ rate of change of velocity this
 means that newton s second law can be rewritten force rate of change of momentum

24 7 relativistic momentum and energy physics libretexts Jul 24 2023 in order to
 define momentum in a way that resembles the classic definition one can think of the
 mass of the object as depending on the speed of the object we define the rest mass
 m_0 of the object as the mass that is measured when the object is at rest we can then
 model the mass of the object as increasing with its speed

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 time dilation and a different one for space length contraction and now there s a
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 energy relativistic energy the equation for relativistic momentum looks like this p

$mv^2 = \frac{1}{2}mv^2$

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