Physics Project
Momentum

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Review of the concepts (formulas)

J=Ft Impulse equals force x time

Delta p = m x delta v momentum = mass x delta velocity

m1v1 + m2v2=m1v3 m2v4

M1v1 + m2v2 = (m1 + m2)V3

KE=1/2mv^2 one-half mass x velocity squared

Review of the concepts

Momentum is a vector and dependent on your reference frame. It is measured in kg•m/s

The more momentum an object has the harder it is to stop it. Also,it will have a greater effect if brought to rest by impact or collision when an object has more momentum.

System — a set of objects that interact with each other

Change in momentum is called impulse

Isolated system — system in which the only forces present are those between the objects of the system

Review of the concepts

When two objects collide, both objects deform

You can find Impulse by finding the area underneath the curve

If the two objects in a collision are very hard and no heat is produced in the collision then kinetic energy is conserved as well

Collisions where total kinetic energy is conserved are called elastic collisions

Perfect elastic collisions are an ideal which is never quite met ➢ At least a little thermal energy is always lost.

Collisions where kinetic energy is not conserved are called inelastic collisions

Review of concepts

Center of Mass (CM) of an object (or system of objects) is the unique point where all mass is considered to be “concentrated” and motion behaves as though all mass were converged into a point. Also, a net force can be applied without causing the object to rotate and the object can be balanced.

Center of Gravity (CG) is the point at which the force of gravity can be considered to act at least for the purposes of determining translational motion

Newton’s 2nd Law can be rewritten in terms of momentum ➤ $F_{net} = \Delta p/\Delta t$

Thus, the rate of change of momentum is equal to the net applied force

Review of concepts

The law of conservation of momentum states that the total momentum of an isolated system remains constant.

An isolated system is one where there is no net external force.

3 common mistakes

1. One common mistake is forgetting to incorporate the negative sign when there are two velocities that go in opposite directions. This can be avoided by thinking to yourself “What is the direction of both objects?” after you read the problem.
2. A common misconception could be about the indifference between inelastic collisions and perfectly inelastic collisions. An inelastic collision does NOT stick together and a perfectly inelastic collision does stick together.
3. Another common mistake is forgetting to square the velocity when using equations such as KE=1/2mv^2. In order to remember to square the velocity, it is important to write detailed work and do not forget the steps. This may lead to silly mistakes as such.

How to tackle free response questions

If the question asks for the momentum of an object- P=mv

If the question asks you for the change in momentum- P=Fnet x Δt Your answer for this question will be in Joules of impulse

Questions with two objects and finding one of their speed or mass- m1v1+m2v2= m1'v1'+m2'v2'

Questions that involve elastic collisions will use the formula 1/2m1v1(2)+1/2m2v2(2)= 1/2m1'v1'(2)+1/2m2'v2'(2) The 2's in the parenthesis are exponents squaring the velocity

Questions which involve a perfectly inelastic collisions use the formula m1v1+m2v2= (m1+m2)vf, This is when the two objects collide and stay together

Momentum and its relation to other topics

The units topic is helpful in that you can use that knowledge to make sure you have the correct units when solving.

The energy topic helps when solving for Kinetic Energy as we use the same formula and same concept.

Kahoot time : D