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Theoretical And Experimental Study Of Balloon Car Balloon

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Introducton

Turn on pile trash into a toy car- and watch it go! In this activity you will learn some physics concepts and use recycled materals to build a toy car that s propeled by a ballon. You can even find a friend, build two cars and race them against each other. Whose car will gofater?

Background

It might not seem like it at first, but a simple ballon car is loaded with physics and engeneering concepts! When you inflate a bullon , it stores potential energy in the form of streched rubber and the compressed air inside. When you release the ballon , the energy is converted to kinetic energy — the energy of motion- as the ballon zooms around the room . Some of the energy is also converted to heat due to friction . Accoring to law of conservation of energy , the total enrgy is conserved. Energy never "dissappears"- it just changes to anoherform.

Another way to think about the ballon's movement is to use Newton's third law of motion : for every action there is equal and opposite reactin. Whn you inflate the ballon and then release the nozzle, the rubber contracts and pushes the air out the nozzle. This means there must be an equal and opposite reaction- the air pushes back on the rubber, propelling the ballon forward. The principle is used in real rockets and jets that shoot a high-speed stream of gases out th back of thir engines, propelling the vehicle forward. In this project you will use the principle to build a toy car hat is propelled forward by the stream of air escaping a ballon as it deflates.

The car is also contains a simple machine: the wheel and axle. This invention has been around so long, we take it for granted- and many of us ride in wheeled vehicles every day. You will see, however,getting yur wheel and axle to spin smoothly is a critical part of getting your ballon car to work!

Key words

- Plastic bottle.
- Four wheels.
- Straws.
- Ballon.
- Tape.
- Scissors or sharp knife.

Title:-

Their cars will need a body, wheels, axles,and will be propelled forward by air escaping from a ballon. The goal is to see who can build a car that travels the fathest before coming to a soap.

Principle:-

When the air is released, the potental energyb is converted into the energy of motion, whichb also known as Kinetic energy. This is the energy you see when the car is propelled forward. The more potential energy is stored, the more kinetic energy the car will have when you let it go!

Introductory Activities:

show the WVU STEMCARE ballon car video. Tell youths that they have been tasked with designing, building and testing a betweenpowered racecar to slow demonstrate Newtons three laws of motion.

Review Newton's law of motion in relation to race cars.

> Newtons first law
the law of inertia- motion, or a lack of motion , will not change unless acted upon by an unbalenced force.

Example :- a toy car will not move unless given a push. Friction will eventually cause the toy car to slow down and come to a stop. Both the push and friction are examples of an unbalenced force.

> Newtons second law:-

the law of force

-Force = mass x acceleration (F =M X A)

Example :-

given the same push, a smaller, lighter toy car will move faster and farther than a bigger, heavier toy car.

> Newtons third law :- the law of action and reaction -for every action there

is an equal and opposite reaction

Exampl:-

a jet engine forces hot air in one direction causing the plane to move forward in the opposite direction this phenomenon is known as thrust, newtons laws given how modern racecars are designed , how they perform and what safety features are implemented.

Inertia is the resistance to change in motion a racecar is moving ,it and everything inside wants to keep moving in the same direction, if the racecars is stopped abruptly by an outside force , safety helts help slow the driver and present him or her from flying out of the vehicle.

Racecars are designed for speed, using the law of force, mechanical engineers design vehicles with powerful engines and lightweight bodies made from materials such as aluminium and corbon fiber composite.

A race car accelerates forward when the engine transfers force to the fires, the tires then push backward against the pavment in a direction equal and opposite to the movement of the race car.

CORE LEARNING ACTIVITY

Build and test a ballon racecar

In this activity, youths will design and build a ballonpowered racecar. The use of the ballon "moter" provides a visual demonstration of both the law action and reaction (first and third laws) in step 2, teams investigate the relationship between force, mass and acceleration (second law) in few trails, teams will sequentially add penny to the body of their race cars to increase the mass by constructing the amount of air in the ballon and the force quien in each trail, teams should see their racecars travel a shorter distance with each penny addition. The final activity will hacve the teams improve their designs to complete in a group race — off

The following instructions may be distributed to the students or they may follow you step as you build Build The Racecar.

Using the materials provided , each team will build a racecar body, wheels and axles.Use the wheel template to trace and cut out four wheels from the cardstock.

Using the tip of the pencil or bamboo skewer, make a small hole in the centre of each wheel and secure with a small piece of tape.

Turn the plastic foam tray or card board body upside down and tape the straws on each end of the body, these will serue as shafts for the wheel axels.

Cut the skewers such that there is h inch extending beyond each straw end when inserted. Slide one skewer through each straw these will serue as the wheel axels.

Put one wheel into each end of the skewers, make sure your race car rolls freely when pushed.

STEP 2: Test your car

Test your race car demonstrate Newton's first and third laws of motion.

Carefully cut the elastic rim off the end of your balloon.

Insert the jumbo straw about 1 inch inside the balloon and tape to the straw to secure it in place. Make sure there are no gaps that will allow air to leak. (Note: regular straws also will work but require more caution in taping closed the gaps) .

Tape the straw to the top-middle of the race car body. The straw opening should stick out a bit from the end of the tray.

Blow in to the straw to inflate the balloon and pinch the straw to keep it from deflating. Place the race car on the smooth surface and let go of the straw. What happened ?

THINK ABOUT IT

Did your race car move? If so, what direction did it travel in relation to the air in the balloon?

- If your race car did not move, inspect your wheels and axels what might you do to remedy this problem?

- The balloon is the source of force to move the race car, when the balloon is inflated and the straw is pinched, the force of the out side air pushing in on the balloon is equal to the force of the inside air pushing out on the balloon. Explain how your race car demonstrated Newton's first and third laws.

STEP 3 : Investigate Newton's second law of motion.

Mark a starting line for the placement of your race car (to be setup by the facilitator). Blow in to the straw to inflate the balloon and pinch to keep it from deflating.

(Notes: because the balloon provides the force, it is important that it is inflated to the same size for each trial using a piece of string, measure the circumference of the balloon at its widest part. Mark the string with a pen or pencil and use to set the balloon size for all trials).

Place the race car at the starting line and let go of the straw

Measure the distance the car traveled and record in the data chart

Place two Penny's on the race car body on top of the plastic foam tray and repeat steps 2 through 4.

Repeat step 5 with two additional pennies until you have added total of six pennies to the tray and recorded data for a total of four trials.

THINK ABOUT IT :

- How did the distance travelled by the race car change as you added pennies to the body?
- The addition of the pennies results in a higher mass. How does this demonstrated Newton's second law of motion (F= mxa)?

Reimagine and redesign :

Building from the concept of force and mass learning in steps 1 Through 3 , redesign and improve race cars in preparation for a race-o

EVALUATION :
Students will reflect and answer "think about it " questions.

TAKE A FURTHER :

Using the national science foundation's "science of speed special report to watch videos and learn more about the science behind the sport of race cars.

ABSTRACT

Do you think you could build a car powered by nothing but air? A baloon. Powered by air escaping from a balloon and it is fun and easy to build with materials you already have around your own balloon powered car to look? Can you design a car that will travel as far as possible? Get ready to grab some simple supplies to bring your ideal to life!

OBJECTIVE

The Engineering goal in this project will be to design, build,and test a car so it can travel as far as possible.

COMPONENTS

1. The body of the car (piece of cardboard or plastic bottle)
2. The wheels of the car (CDs or plastic bottle caps)
3. The axles, which connect the wheels to the body, and allow the wheels to spin (wooden skewers)

HOW IT WORKS?

Ever blown up a balloon then let it go, without trying it shut? The air rapidly escapers from making it zip all over the room! This is because when you blow up a balloon. You increase the air pressure stretched rubber store potential energy, or energy that is "waiting" to do something. When you let the balloon go, the rubber contract, and aur is rapidly squeezed out opening of the balloon. The potential energy inside the Balloon is converted to kinetic energy, or energy of the motion of the fast. Moving air through the opening because the air is pushed out the rapidly backwards, there is a reaction force that pushes the balloon forward. This principle comes from

Newtown's third law of motion, which states 'for every action .there is an equal and opposite reaction.' When you just let a balloon go on its own, it tends to randomly fly around the room, and is almost impossible to steer. However, when you attached the balloon to a car, you can harmess the balloon,s energy to propel the car forward !

RISK MANAGEMENT

The main hazards are the hot glue gun and cruft kniefe. The hot glue gun does get very hot at the tip of the gun and can cuse the minor burns. These need to be monitored and students must be wanted of safety instruction prior.

ACTIVITY

Students follow the directions in constructing a balloon powered car resource.

Once the car has been completed to the students liking and works successfully, students will make specific alterations to different part of the car. These can infused but but are not limited to, adding and distributing weight, altering the friction of the wheels and changing the balloon types or creating more resistance of air travelling out of the balloon.

ADVANTAGES

In comparison to petrol or diesel powered vehicles "air powered vehicles" have following advantages :

- Air, on its own, is non-flammable, abundant, economical, transportable, storable and, most importantly, nonpolluting.
- Compressed air technology reduces the cost of vehicle production by about 20%, because there is no need to build a cooling system, fuel tank, spark plugs or silencers.
- High torque for minimum volume.
- The mechanical design of the engine is simple and robust.
- Low manufacture and maintenance costs as well as easy maintenance.
- Lighter vehicles would mean less abuse on roads, thus, resulting in longer lasting roads. ➢ The price of fueling air powered vehicles will be significantly cheaper than current fuels.

When the air is being compressed at reasonable speeds, it heats up. The heat given off during compression could be reclaimed for space heating or water heating, or used in a Stirling engine.

- Transportation of the fuel would not be required due to drawing power off the electrical grid. This presents significant cost benefits. Pollution created during fuel transportation would be eliminated.

Compressed-air vehicles are comparable in many ways even to electric vehicles and their potential advantages over electric vehicles include:

- Compressed-air vehicles are unconstrained by the degradation problems associated with current battery systems.

- Much like electrical vehicles, air powered vehicle would ultimately be powered through the electrical grid which makes it easier to focus on reducing pollution from one source, as opposed to the millions of vehicles on the road.
  - Compressed-air tanks can be disposed of or recycled with less pollution than batteries.
- The tank may be able to be refilled more often and in less time than batteries can be recharged, with refueling rates comparable to liquid fuels.
- The tanks used in a compressed air motor have a longer lifespan in comparison with batteries, when after a while suffer from a reduction in performance.

DISADVANTAGES

Just like the modern car and most household appliances, the principle disadvantage is that of indirect energy use. Energy is used to compress air, which — in turn provides the energy to run the motor. Any indirect step in energy usage results in loss. For conventional combustion motor cars, the energy is lost when oil is converted to usable fuel- including drilling, refinement, labor and storage. For compressed-air cars, energy is lost when electrical energy is converted to compressed air.

FURTHER DISADVANTAGES:

- According to thermodynamics, when air is expanded in the engine, it cools via adiabatic cooling and thereby loses pressure, reducing the amount of power passed the engine at lower temperatures. Furthermore, it is difficult to maintain or restore the temperature of the compressed or compressing air using a heat exchanger due to the high rate of flow. The ideal isothermic energy capacity of the tank will therefore not be realized. Low temperatures may also encourage the engine to ice up.
- Refuelling the compressed air container using a home or low-end conventional air compressor may take as long as 4 hours. Service stations may have specialized equipment that may take only 3 minutes.
- Early tests have demonstrated the limited storage capacity of the tanks, the only published test of a vehicle running on compressed air alone was limited to a range of 7.22km.
  - Balloon safety is risky
  - After complete air-out difficult to handle
    - Heat obsorption of balloon can make it to broken
    - No reverse moving system
  - There is no specific station or bunks for filling air as fuel
  - Lack of advanced technologies.

FUTURE SCOPE OF BALLOON CAR

First to resolve problem of reverse motion by adding separate machinical engine

- Air station was to be made as like petrol and disel station were made
- Bulk weight management riske to be resolved
- Balloon safety was first so that the balloon car move continuously.
- Contracting an advance techlogy to mange or reselove high risky problems
- Equipmenting digital system like music, camera sensors wifi networking technology
- With modern technology further change were to be made for safety of balloon or air container
- We have to fix air measuring technology like for how much distance it trace how much energy it provides its precautions like pressure, compression etc
- Making plan for complete pollution avoiding and ecofriendly and any one can drive with digital system of driving or auto-driving system.

HYPOTHESIS

If the six of the balloon effect the distance the balloon powered car travel then the car powered by the bigger balloon will travel further than the car powered by the smaller balloon. This is because according to the article “Balloon powered car”, Newtons third law of motion.

CONCLUSION

Conclusion contain thoughtful, relavant , and responsible reflection including

- States whether the hypothesis was or was not supported
- A description of possible source of error
- Suggest solution to these source of error and “Next Steps” determined as a result of this investigation.

COMMENTS

This student presents some good reflection about the source of error in their experiment and how to make improvements it sounds like it was tricky to get the cars to go in a result to use a new balloon for each trial. While the student points out this interfered with the data , they collected still demonstrated a trend of increasing distance the student should expand on what type of design they might want to test and why.

EXPECTED RESULTS

The original car design will travel only about 1-2m. Once the car is modified and the milk carton cut open, the car will travel slower, but further. Adding weight to the car will add some distance, especially if added towards the front of the car. However it too much weight is added the car slow down to much. After using the different sorts of the balloons due to the ability to blow them up to a greater capacity.

DIFFICULTIES

Having the little gap between the wheels and straw is important. A large gap will make the wheels, wobble, causing the car to veer lefte or right and overall reducing the distance travelled. With no gap the straw will impeded the wheels turning.

Having a bit of resistance has been found to Stop the car from traveling fast but allows it to travell further, however getting the hole for the balloon to be a good balloon to be a good size can be difficult.

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EXTRA ENRICHMENT

Modify your car. What happens when you use two straws instead of one? Use buttons as wheels instead of bottle caps. Does this change the speed or distance your car traveled?

Blow the balloon up just a little and then blow the balloon up a lot and compare the results.

What happens if you attach the balloon and straw to the bottle in the other direction? Does the car travel further with the lid of the bottle facing forwards or backwards? Why do you think that is so?

Decorate your bottle car with paint or markers. Write about wind energy or Newton’s 3 rd law of Motion and what each one have to do with making this car go.

RESULT OF A BALLON CAR

The potential energy of the car is stored in the expanding elastic material of the balloon. As the balloon fills with air, it adds more potential or stored energy. As the air flows from the balloon, the energy changes to kinetic energy or the energy of motion.

The moving Balloon-Powered Car is using kinetic energy.

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