# Powered Race Car

**Objectives:**

- To create a powered race car for maximum speed and distance
- To calculate velocity, acceleration, momentum and force of the car
- To graph distance vs. time for a moving object
- To relate Newton's Laws of Motion to a moving object

**Materials provided by teacher:**

- 9 inch balloon (standard size)
- Regular school supplies like tape, glue, markers, paper, etc.
- Regular sized drinking straws

**Materials you need to find/bring:**

- Base for the car
- Wheels for the car
- Pipe or tube to let air in and out of the balloon

**Rules:**

- The car can be powered by 1 or 2 balloons. 2 Balloons is not always better.
- You can build the car base out of anything. The lighter it is the better.
- It must have at least 3 wheels. Wheels are defined as anything round that goes around. They can **NOT** be from a toy car. *They must be made from something that was not originally meant to be used as wheels.*
- The car may not leave the ground at any time during the race and must move on its wheels – not slide.
- Do not take your car apart after you race. We will display them around the room and vote for the best looking car.

**Awards:** (for cars that follow the rules and actually move)

- Best looking car (you will vote)
- Fastest car (in first 5 meters)
- Farthest distance traveled

# Balloon Car Rubric

| | |
|---|---|
| Made up of recycled materials | 20% |
| Creative car | 10% |
| moved on wheels/turbine | 20% |
| fully assembled | 20% |
| exhibited force and acceleration | 30% |
| | 100% |

## Procedure

1) Create a blueprint of your design
2) Fill out the Materials and tools sections
3) Bring materials from home and work on your car IN CLASS.
4) When your car is finished go back and update the *Materials and Step by Step directions* – you probably have changed some things.
5) Fill out the *Challenges and Technical Difficulties* section. You must list at least 3 problems (and solutions) you had when designing, building, or testing your car.
6) Practice racing your car, but be careful…too much practice can wear your car out

***Race Day:***

(On race day we will set up a track. The time will be taken at 1 m, 2 m, and the finish line. The total distance will be measured. Each car will be allowed three trial runs. This allows a second or third chance if the car turns, material malfunctions, etc. Many cars need to be raced. If your car takes too long to prepare, another group will race and you will get pushed to the end of the line.)

7) Race your car. You MUST be finished with everything above before you are allowed to race.

# Physical Science

**QUIZ 4: Newton's Third Law of Motion**

**Name _____ Period: Date :**

1) Which of the following has the most momentum?
   a) a more massive thing moving slowly
   b) a less massive thing moving slowly
   c) a less massive thing moving fast
   d) a more massive thing moving fast
   e) a very massive thing not moving at all

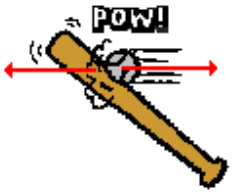
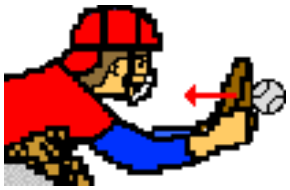
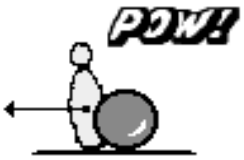
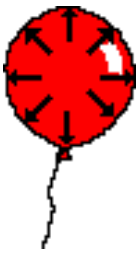
2) What is the momentum of a 1,000 N person running at 5 m/s? Show your solution.

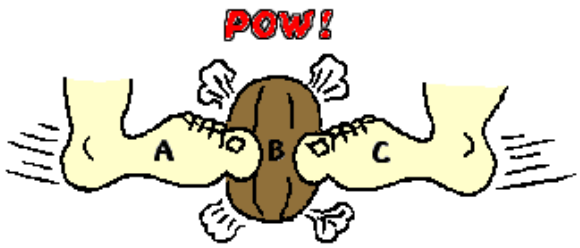
3) If a big truck is driving down the highway and runs into an insect, which of the following is NOT true?
   a) The truck slows down when it hits the insect.
   b) They both accelerate at the same rate.
   c) They both experience the same force.
   d) They both experience the same change in momentum.
   e) The insect has a greater change in velocity.

4) How can you increase the momentum of something?
   a) Increase its mass.
   b) Increase its velocity.
   c) Apply a net force to it.
   d) a & b
   e) a, b, & c

5) If a truck has a momentum of 10,000 kg·m/s, and it is moving at 5 m/s, what is its mass?
   a) 2,000 kg·m/s
   b) 2,000 N
   c) 20,000 N
   d) 2,000 kg
   e) 50,000 kg

***Identify the action and reaction force in each of the following situations. The first one is done for you.***

| Example | Action | Reaction |
|---|---|---|
|  | The <u>baseball</u> pushes the <u>bat</u> to the **left** *(an action).* | The <u>bat</u> pushes the <u>ball</u> to the **right** *(the reaction).* |
|  | Baseball pushes glove to the left. | |
|  | Bowling ball pushes pin to the left. | |
|  | Enclosed air particles push the wall of the balloon outwards. | |




Action-Reaction Pair #1:

Action-Reaction Pair #2:

Identify **BOTH** action-reaction pairs in this situation with Foot A, Ball B, and Foot C

Identify at least **SIX** action-reaction pairs in this diagram.