

# Classy Car Engine

## Lesson at a glance:

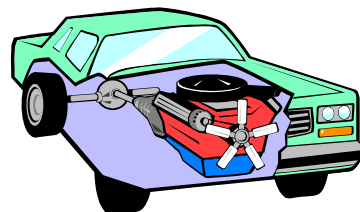
Students will act out the series of actions that take place to cause a car engine to start and run.

## Skills:

Understanding Systems, Communicating, Cooperating, Reading

## Grades:

3-5



## Materials:

### **Make Prior to the Activity:**

- Labels for students representing parts (See Background)
  1. Print out enough PARTS cards so that each of your students will have a role to play.
    - A four-cylinder engine will include roles for 23 students.
    - A six-cylinder engine will include roles for 27 students.
    - An eight-cylinder engine will have roles for 31 students.
  2. Labels should be worn around each student's neck so that they can refer to them easily throughout the activity.
- Props (Optional): Examples ~ Seat for the driver, car keys, shoe box decorated to look like a car battery, bucket of water for the gas tank, straw for the fuel pump, hula hoops for wheels.

## Background:

A car's engine functions only when its parts work together and in the proper sequence. The engine described in this activity is a gasoline-powered internal combustion engine.

Electrical energy created by the battery and the alternator, and heat created by the explosion inside the pistons (with help from the spark plugs) changes into mechanical energy to make the car move. To see diagrams of some moving engine parts, visit *How Stuff Works* <http://auto.howstuffworks.com/engine2.htm> and <http://auto.howstuffworks.com/engine1.htm>. Recommended book for teachers: *How Cars Work*; Newton, Tom; Black Apple Press, 1999 ISBN: 0-966-86230-9

Each of the following parts plays a role in starting the car engine:

Driver	Battery	Starter Motor	Distributor
Fuel Pump	Gas Tank	Carburetor	Crankshaft
Pistons	Spark Plugs	Air Filter	Timing Belt
Alternator			



### **Activity:**

1. Each student will play a role in the starting of a car engine.
2. Hand out an engine part card to each student. Note: If you have more students than parts for a 4-cylinder engine, you can increase your number of pistons and spark plugs to six or eight each for a 6-cylinder or 8-cylinder engine.
3. Have students read their cards out loud from their seats:  
(i.e. "I am a Spark Plug I am connected to the distributor by wires. I get power from the distributor. This power gives me the energy I need to make a spark.")
4. Have students identify which other students (parts) they are connected to.
5. Put the engine flow chart up on an overhead or draw it on the board.
6. Create a space on the floor (clear desks out of the way if needed).
7. Have students (wearing their Parts Labels with their job descriptions) set themselves up (with your help) like the flow chart.
8. Tell each student or group of students (the Spark Plugs and the Pistons) when to take their turn as the engine starts and then runs.
9. As the engine is running have certain parts stop working. Have students notice that when one part stops working, the sequence is disrupted and it affects other parts of the engine.
10. This may take some practice, but the most important thing for students to understand is that all the parts are necessary to make the engine work and ultimately make the wheels move.

### **Conclusion:**

1. Every system is made up of parts that are critical to the success and/or survival of the system.
2. Ask students to name some other systems. (i.e. ecosystem, solar system, the human body, stereo system, etc.)
3. Using another system as an example, ask students what will happen when something is taken out of this system.
  - Some systems can adapt and modify themselves and still continue to function – at least for a period of time.
  - Some systems will work even if certain parts are missing.
4. Ask students to name some parts on a car that, if they were missing, the car would still run. (i.e. windshield wipers, windows, headlights, tailgate)
5. Refer to this lesson when teaching about other systems, such as machines other than a car, individual organisms (including humans) and natural ecosystems.

### **Assessment:**

Have students draw or describe an engine or other system of their own design.

### **Extensions:**

1. Take a class field trip out to the parking lot to see a real car engine.
2. Have students research the other parts of a car's engine.



# Teacher's Guide

## Driver – 1 student

- Get into driver's seat
- Put on seatbelt
- Put key in ignition and turn key to send a signal to the battery to send electricity to the starter motor, the distributor and the fuel pump.



## Battery – 1 student

- Receives signal from the ignition when the driver turns the key.
- Sends out electricity to the starter motor, the distributor and the fuel pump.



## Starter Motor – 1 student

- Uses electrical energy from the battery
- Make the whirring sound of a starting engine when it receives electricity from the battery
- Sends power to the crankshaft to make it turn the pistons



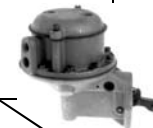
## Distributor – 1 student

- Uses electrical energy from the battery at the same time that the battery sends power to the starter motor.
- Sends this power to the spark plugs.



## Fuel Pump – 1 student

- Uses energy from the battery to suck gas from the gas tank the same way that we would sip from a straw.
- Sends the gas to the carburetor.



## Crankshaft - 1 student

- Turns using power from the starter motor
- The energy created by the turning crankshaft starts the fuel pump.



## Gas tank – 1 student

- Holds the gasoline which is sucked out by the fuel pump and sent to the carburetor.

## Spark Plugs – 4, 6 or 8 students:

- Wires connect each spark plug to the distributor.
- The distributor provides the power needed to create a spark.
- These sparks create heat (energy) that ignites the mixture of gas and air. This creates a controlled explosion!



## Carburetor – 1 student

- Draws air in through the air filter to mix with the gas from the fuel pump.
- This combination of air (oxygen) and gas causes an explosion that starts the engine with the help of a spark from the spark plugs.



## Pistons – 4, 6 or 8 students – The same as the number of spark plugs that your engine has.

- The explosion created by the spark plug causes the corresponding piston to go down. (Each piston only goes down when the spark plug next to it sparks).
- As they go up and down, the pistons push on rods connected to the crank shaft, causing it to turn.
- Whenever a piston goes up it pushes out the exhaust and pulls in new air and fuel from the carburetor to create the next explosion.
- Pushing on the gas pedal speeds up this process.



## Timing belt – The teacher

- Tells the distributor when to send the signal to the spark plugs to spark.



## Alternator – 1 student

- Takes over for the battery after the pistons have started moving.
- Provides electricity for the spark plugs.
- Recharges the battery while the engine is running.

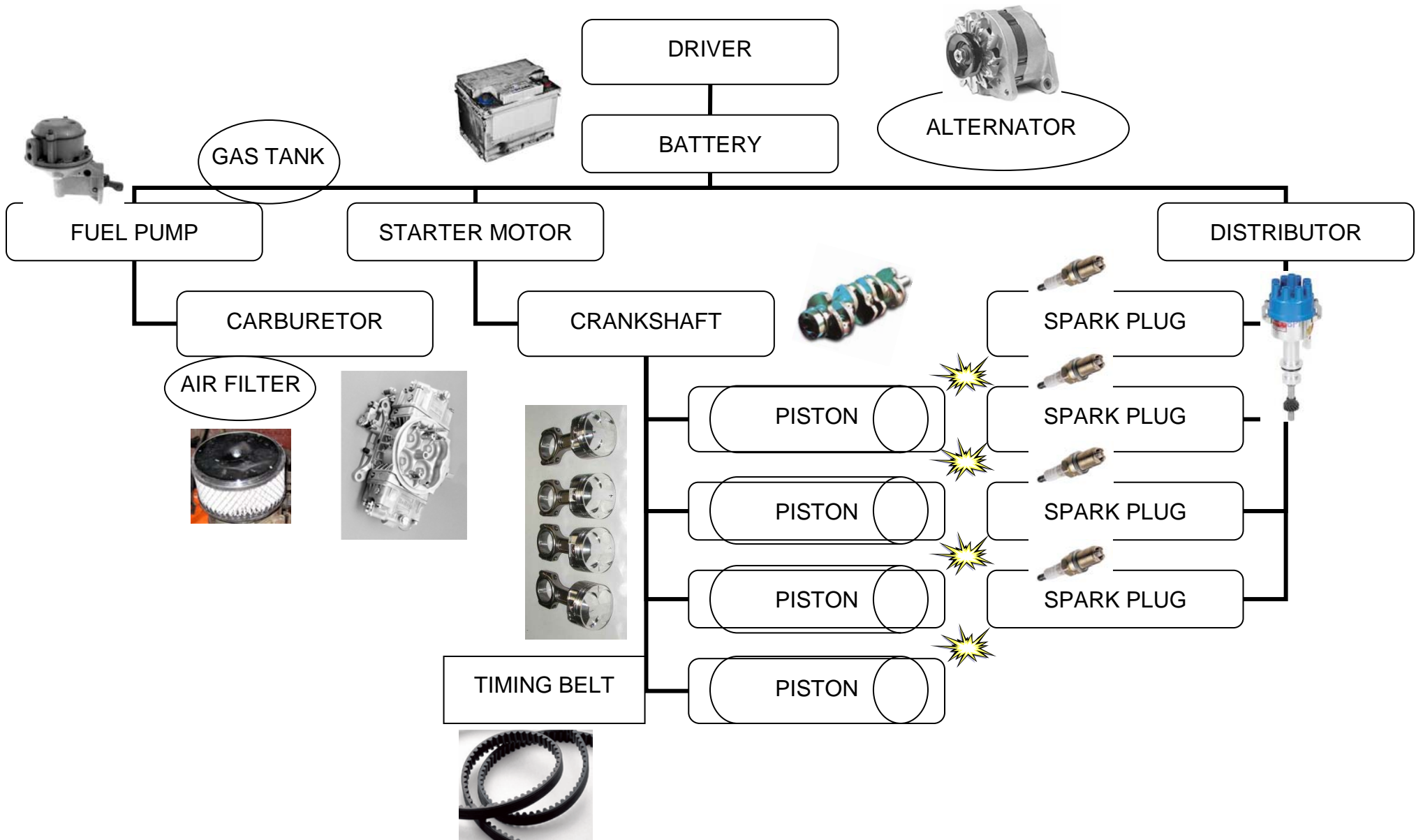


## Air Filter – 1 student

- Covers the Carburetor
- Collects dirty particles from the outside air to help keep the engine clean.



# Parts Diagram



# Student Car Engine Part Labels

## I am the Driver

- When I get into driver's seat I will put on my seatbelt and then put the key in the ignition.
- When I turn the key, the ignition sends a signal to the battery telling it to send electricity to the starter motor, the distributor and the fuel pump.

## I am the Battery

- I store electricity for the engine.
- I get a signal from the ignition when the driver turns the key.
- I then send electricity to the starter motor, distributor and fuel pump.



## I am the Distributor

- I get electrical energy from the battery at the same time that the battery sends power to the starter motor.
- I send this power to the spark plugs so they can make a spark.



## I am the Starter Motor

- I use electrical energy sent to me from the battery.
- I make the sound of a starting engine when I receive electricity from the battery and send it to the crankshaft.
- The crankshaft uses the electricity to turn and move the pistons.



## I am the Fuel Pump

- I use the energy I get from the battery to suck gas from the gas tank the same way that you would sip from a straw.
- I send the gas to the carburetor where it will mix with air before it goes to the pistons.



## **I am the Gas Tank**

- I hold the gasoline which is sucked out by the fuel pump and sent to the carburetor.
- When I have gas in my tank the engine can run.
- An engine will not work if the gas tank is empty.



## **I am the Carburetor**

- I pull air from outside the engine in through the air filter.
- This air mixes with the gas I get from the fuel pump.
- This combination of air (oxygen) and gas is sent to the pistons.
- The air and gas mixture meets in a piston's cylinder.
- When a spark from a spark plug enters the cylinder, there is a controlled explosion.



## **I am the Crankshaft**

- I begin to turn when I get power from the starter motor
- When I turn this starts the fuel pump and the timing belt.
- When I turn the pistons go up and down.
- The timing belt makes sure that I turn at the right speed so each piston meets the spark plug next to it when it is ready to spark.



## **I am the Air Filter**

- I am attached to the carburetor
- I catch and hold on to the dirty particles from the outside air.
- This helps to keep the carburetor and the rest of the engine clean.



## **I am the Timing belt**

- I tell the distributor when to send electricity to the spark plugs to make a spark.
- I make sure the crankshaft is turning at the right speed, so that each piston meets its spark plug when it is ready to spark.



## **I am a Spark Plug**

- I am connected to the distributor by wires.
- I get power from the distributor.
- This power gives me the energy I need to make a spark.
- Each spark I make creates heat that ignites the mixture of gas and air in the cylinder above the piston next to me.
- This mixture makes a controlled explosion
- This makes the piston next to me go down inside its cylinder.



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## I am a Piston

- I am inside a cylinder (tube).
- I am attached to a rod that is connected to the crankshaft.
- When an explosion is created in my cylinder, by the spark plug next to me, I go down inside my cylinder.
- After each explosion I come back up to the top of my cylinder to wait for the next explosion.
- When I go up and down, I push on rods connected to the crank shaft, causing it to turn.
- Whenever I go up I push out the exhaust and pull in new air and gas from the carburetor to make the next explosion.
- When the driver pushes on the gas pedal this process speeds up.



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