Welcome to the Supercharged Science

Robotics Teleclass Webinar!

You can fill out this worksheet as we go along to get the most out of time together, or you can use it as a review exercise at the end of the class to see where your strengths are.

What we're going to cover today:

- What a robot is
- Robot applications
- Four steps to building a robot
- Current and charge
- Electrons
- Basic Circuit fundamentals

Do this NOW: Write down two things you want to learn about robotics:

_____

_____

Do this NOW: Write down WHY you want to learn about the things you mentioned above. What will it give you, or provide you with, or make possible for you if you now understand these things that you wanted to learn?

_____

_____

IMPORTANT: During class, you can either fill out the worksheet, OR if that's too stressful or a hassle, just set it aside and fill it out after class is over so you can enjoy watching the class.

Answer key is on the last page, so put it in a place where you won't be tempted to peek at the answers until after you've given it your best shot.

Material List:

Please note: These items are reusable for experiments you'll be able to do after the class as well. The subject of "Robotics" requires a more expensive set of equipment than usual but we've still tried to keep everything to a minimum cost. So if you're on a tight budget, you can save money by finding old electronic toys or personal handheld fans and rip them apart to salvage wires, motors, battery cases, wheels, propellers, LEDs and more. Foam can be found in packing materials from boxes. Get creative about reusing old items in new ways!

- AA batteries, get 2 (Get the cheap, dollar story type labeled “Heavy Duty”. Alkaline batteries not recommended.)
- AA battery case (Radio Shack #270-408 or Jameco Electronics 216081)
- Alligator wires, get 10 (Radio Shack #278-1157 or Jameco 10444)
- Brass fasteners, get 6
- Drill & bit the size of the motor shaft diameter
- Foam block (2” cube or larger)
- Hot glue gun, razor and adult assistant
- Index card
- Large paper clips, get 2
- LEDs (Radio Shack #276-026 & 276-012 or 276-311 OR Jameco 94553 & 34673)
- Motors, 3VDC, get 2 (Radio Shack #273-223 or Jameco 231925)
- Wooden clothespin*
- Wooden skewers, get 10
- OPTIONAL: Buzzer (Radio Shack #273-792 or Jameco 1956741)

*Before class, drill a hole through the jaw section your clothespin the same size as your motor shaft (refer to image below). You’ll be gluing your clothespin to the motor shaft during the class.

During the Lesson:

You can look over the worksheet so you know what to listen for as you go through the class with me, or you can go through it along with me during class. OR… flip it over and forget about it and just enjoy the class. When class is over, flip it back over and fill it out and be amazed at how much you've picked up and learned!

1. A robot is a _____ device that performs a

   _____ or achieves a _____.

2. A robot can also interact with its _____.

3. _____ work on robots, and _____

   design robots.

4. Name three different areas where you'll find robots:

   a. _____

   b. _____

   c. _____

5. The first step to building a robot is to determine what your robot will _____ or

   _____.

6. The next step is to _____ your robot.

7. The third step is to _____ your robot.

8. The last step is to _____ and

   _____ your robot.

9. What two things have to happen for a motor to work?

   a. _____ has to flow through the wires.

   b. The circuit must be a closed _____.

10. Current is charge that is _____.

11. The _____ in the circuit is carried by electrons.

12. Electricity is the flow of _____.

13. _____ have a negative charge.

14. Name three inventors that did work in the field of electricity:

    _____

    _____

    _____

15. What I didn't know about robotics until class today was:

    _____

    _____

Experiment Ideas: After you build your robot during class, can you add headlights, a buzzer, or another motor to your robot? What if you add weight to the clothespin by opening the jaws and grabbing an object? How would you change it to work in water? What happens if you increase the power to your motor by adding a second battery pack? What if you replace the skewers with crayons or markers? Have fun discovering and inventing!

Vocabulary Words

An **atom** is the smallest bit of stable matter. Atoms are made of a group of neutrons and protons, with an electron cloud circling the nucleus.

The proton has a positive **charge**, the neutron has no **charge** (neutron, neutral get it?) and the electron has a negative **charge**. These charges repel and attract one another kind of like magnets repel or attract. Like charges repel (push away) one another and unlike charges attract one another. Generally things are neutrally charged. They aren't very positive or negative, rather have a balance of both.

When electric current passes through a material, it does it by electrical **conduction**. There are different kinds of conduction, such as metallic conduction, where electrons flow through a conductor (like metal) and electrolysis, where charged atoms (called ions) flow through liquids. Metals are **conductors** not because electricity passes through them, but because they contain electrons that can move.

Current is electric charge that is moving. Electric current flows in a closed loop of an electrical circuit.

LED stands for "Light Emitting Diode". **Diodes** are one-way streets for electricity – they allow electrons to flow one way but not the other.

An **electrical circuit** is a closed loop path in which electrons flow.

Electrons carry the charge in an electric circuit. Electrons have a negative charge.

A **remote control** has a transmitter and receiver that pass signals to control the robot.

Robots are electromechanical devices, meaning that they rely on both electronics and mechanics to do their 'thing'. If a robot has sensors, it can react with its environment and have some degree of intelligence. Sensors include switches, buzzers, and light detectors.

A **static charge** is when there is an imbalance of electric charge (more protons or more electrons).

Objects that are electrically charged can create a **temporary charge** on another object.

The **triboelectric** series is a list that ranks different materials according to how they lose or gain electrons.

Answer Key

1. A robot is a mechanical device that performs a task or achieves a goal.
2. A robot can also interact with its environment.
3. Technicians work on robots, and engineers design robots.
4. Name three different areas where you'll find robots:
    a. Space
    b. Underwater
    c. Medical
    d. Automotive
    e. At home
5. The first step to building a robot is to determine what your robot will do or accomplish.
6. The next step is to design your robot.
7. The third step is to build your robot.
8. The last step is to troubleshoot and test your robot.
9. What two things have to happen for a motor to work?
    a. Charge has to flow through the wires.
    b. The circuit must be a closed loop.
10. Current is charge that is moving.
11. The charge in the circuit is carried by electrons.
12. Electricity is the flow of electrons.
13. Electrons have a negative charge.
14. Name three inventors that did work in the field of electricity: Benjamin Franklin, Nikola Tesla, and Michael Faraday.