

Quiz Bowl

November 13, 2004

Round 1

1. What type of test instrument is used to measure the specific gravity of the electrolyte in a lead-acid battery?
[**Hydrometer**]
2. A Leyden jar stores what kind of electricity?
[**Static**]
3. What common household product is used to neutralize an acid spill from a lead-acid battery?
[**Baking Soda**]
4. The opposition to the flow of electricity is ...
[**Resistance**]
5. What force causes a moving object to slow and then stop?
[**Friction**]
6. What is the voltage of four 6-volt batteries connected in series?
[**24 volts**]
7. What energy transformation is accomplished by an electric motor?
[**electric to mechanical energy**]
8. Substances like rubber, glass, mica, and sulfur do not conduct electricity they are often called what?
[**Insulators**]
9. A car parked at the top of a hill has what kind of energy?
[**Potential Energy**]
10. The car rolls down the hill. At the bottom of the hill the potential energy of the car has been converted to what?
[**Kinetic Energy**]
11. What force always opposes motion?
[**Friction**]
12. Electrical potential is measured in what units?
[**Volts**]
13. Gasohol is typically a blend of 95% gasoline and 5% of what type of alcohol?
[**Ethanol**]
14. When you step on a bathroom scale, are you measuring your mass or weight?
[**Weight**]

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15. An atom consists of protons, electrons, and neutrons. Which of these particles are directly involved in the flow of electricity?
[**Electrons**]
16. What kind of acid is found in a typical lead-acid battery used in EVs?
[**Sulfuric acid**]
17. Fluorescent lights use a “ballast” to produce the high voltage needed to make the lamp glow. A more accurate name for this component is ...
[**Step-up transformer**]
18. A 100-ohm resistor and a 200-Ohm resistor are connected in series. True or false, the current flowing through each resistor is the same.
[**True**]
19. What does LED stand for?
[**Light Emitting Diode**]
20. You yank the tablecloth off the table. The dishes remain on the table. What property of matter makes this possible?
[**Inertia**]

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Round 2

1. Rectifiers are electrical devices which convert alternating current to ...
[**Direct current**]
2. What is the common name for alcohols such as ethylene glycol and propylene glycol used in automobiles?
[**Antifreeze**]
3. Two gases are liberated through the electrolysis of water. Name both of them.
[**Hydrogen and Oxygen**]
4. Batteries are often grouped as “primary cells” or “secondary cells” Of which group does the typical alkaline battery belong?
[**Primary cell**]
5. What type of electrical current is produced by fuel cells?
[**Direct current (DC)**]
6. This electronic device stores energy in the form of a magnetic field. What is it?
[**Inductor**]
7. What is the unit that the electric company uses (or charges you) for electrical energy?
[**kiloWatt-hour**]
8. What type of device is used to lower the voltage of an electric utility’s power distribution lines for household use?
[**Transformer**]
9. In a DC motor name the component that connects the commutator to the source of electricity
[**Brushes**]
10. Electric power can be calculated by multiplying the Voltage applied to the circuit by what?
[**Current**]
11. Fire extinguishers are labeled for Class A, B, and C fires. A careless employee sets the French fry cooker ablaze right before filling your order. What class of extinguisher should you use to save your fries?
[**Class B**]
12. Specific gravity is the density of a substance compared to what?
[**Water**]
13. Your old pick-up truck won’t start. The battery is too weak. You decide to jump-start it using a 12-Volt battery from your EV. Do you connect the batteries in series or parallel?
[**Parallel**]

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14. Some EVs and Hybrid vehicles recover kinetic energy from the vehicle when braking by switching the drive motor to act as a generator. What is this type of braking called?
[**Regenerative Braking**]
15. As an electric motor begins to turn, something is created that opposes the flow of current in the motor. What is this called?
[**Back EMF or Counter EMF**]
16. You have two 12-Volt batteries. Would you connect them in series or in parallel to provide the highest current output?
[**Parallel**]
17. What is the unit of electric power?
[**Watt**]
18. You dip your battery cables in liquid helium. The resistance drops to nearly nothing. The cables have become what?
[**Superconducting**]
19. Which did Nikola Tesla invent: the AC motor or the DC motor
[**AC Motor**]
20. Your MP3 player uses a power supply to convert 120V AC power to 9 Volts DC. You want to power it from your EV's 12-Volt auxiliary battery. What electrical component could you use to drop the voltage?
[**Resistor**]

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Round 3

Category – Electrical devices

1. This protective device opens an electric circuit if too much current flows through it
[What is a **fuse**?]
2. This electromagnetic / mechanical component uses a small current to switch high currents safely.
[What is a **relay**? or What is a **solenoid**?]
3. This electronic component can be used as a switch or an amplifier
[What is a **transistor**?]
4. This component of a DC motor is used to reverse the current to the armature as it rotates.
[What is a **Commutator**?]
5. This term describes the method by which a controller varies the power send to a motor by varying the amount of time the controller turns on and off.
[What is a **Pulse-Width Modulation**?]

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Category - Batteries

1. You were given a truckload of flooded lead-acid batteries. You determine that they are this nominal voltage because they have 4 filler caps on each battery.

[What is an **Eight-Volt** battery?]

2. You cut one of these batteries open (wearing proper safety equipment) to determine whether it is a deep cycle or starting battery. It has thick lead plates spaced far apart.

[What is **deep-cycle battery**?]

3. You want high performance EV batteries. This specification relates energy capacity to weight.

[What is **energy density**?]

4. As a lead-acid battery is recharged, the specific gravity of the electrolyte goes through this change

[Why does specific gravity **increase**?]

5. You determine the Amp-hour capacity of your new 12-Volt battery by powering a 300-Watt lamp for 5 hours.

[What is **125 Amp-hours**?]

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Category - Calculations

1. You double the wheel diameter on your EM-TV. Doing so has this effect on top speed **and** this effect on acceleration. (2-part response)

[What is **increase top speed and decrease acceleration?**]

2. The motor on an EM-TV turns at a maximum speed of 6000 rpm. The motor sprocket has 10 teeth. The wheel sprocket has 60 teeth. This is the wheel speed.

[What is **1000 rpm?**]

3. In autocross, your vehicle is capable of cornering at an acceleration of 0.75g's. You plan to install batteries that are 20% heavier to improve range. Considering only the effect of weight on tire traction, the new battery pack will have this effect on cornering.

[What is **no change?**]

4. Your MP3 player draws 0.1 amps at 9 Volts. You want to power it from the EV's auxiliary battery. You need this size resistor in series.

[What is **30 Ohms?**]

5. On level ground at a constant 30 mph speed, the instruments indicate 50-Amp current draw at 48-Volts. The batteries are rated at 35 Amp-hours. Ignoring current vs. capacity effects, theoretically you can drive this far.

[What is **21 miles?**]

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Category – People

1. This Italian physicist, known for his pioneering work in electricity, is credited with inventing the first battery in 1799.

[Who was **Alessandro Volta**?]

2. This inventor, known as the “Wizard of Menlo Park”, invented the motion pictures in addition to many inventions related to electricity.

[Who was **Thomas Edison**?]

3. This German scientist described the relationship between current, voltage, and resistance in 1826.

[Who was **Georg Simon Ohm**?]

4. This person developed a mathematical relationship relating heat produced in an electrical circuit to the current and resistance of the circuit.

[Who was James Joule?]

5. This president created the Rural Electrification Administration that enabled Jackson EMC to bring electricity to Jackson County. (provide full name)

[Who was **Franklin D. Roosevelt**?]

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Category – Troubleshooting

1. You are asked to test whether a fuse bad or good. With your VOM, you measure no continuity across the fuse.

[What is **bad fuse**?]

2. You replace the fuse with a good one. When you turn on the power, the switch immediately blows. This happens because there is a _____ circuit.

[What is **short circuit**?]

3. You know the controller is getting power. You suspect it is not getting a signal from is electronic device connected to the accelerator pedal.

[What is a **potentiometer**?]

4. This device labeled “GFI” on your battery charger tripped when you plugged it in, indicating a particular wiring problem.

[What is a **Ground-Fault Interrupter**?]

5. Your EV uses four 12-Volt batteries. The manufacturer recommends that you not discharge your vehicle more than 1.95 Volts per cell for maximum life. This is the resulting minimum pack voltage.

[What is **46.8 Volts**?]