

Quiz Bowl

May 8, 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. What is the general name for the property of a material, which enables it to carry an electric current?
[**Conductivity**]
3. The opposition to the flow of electricity is ...
[**Resistance**]
4. What force causes a moving object to slow and then stop?
[**Friction**]
5. What is the voltage of seven 9-volt batteries connected in parallel?
[**9 volts**]
6. The transfer of energy by the direct passing of energy or electrons from atom to atom is called ...
[**Conduction**]
7. What energy transformation is accomplished by an electric motor?
[electric to mechanical energy]
8. What type of energy is produced when work is done against frictional forces?
[**Heat**]
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 is the unit that the electric company uses (or charges you) for electrical energy?
[**kiloWatt-hour**]
12. When you weigh your EV, what force are you actually measuring?
[**Gravity**]
13. Four 12-volt batteries are connected in series. What is the nominal voltage of the battery pack?
[**48 volts**]
14. The unit of measure for the rate of flow of electric current is a(n) ...
[**Ampere**]

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15. What type of device would you use to measure the electrical potential of a battery?
[**Voltmeter**]
16. An atom consists of protons, electrons, and neutrons. Which of these particles are directly involved in the flow of electricity?
[**Electrons**]
17. What kind of acid is found in a typical lead-acid battery used in EVs?
[**Sulfuric acid**]
18. A potentiometer used in an electrical circuit can change what measurable value in the circuit?
[**Resistance**]
19. A battery supplies electricity by converting one form of energy into another. Name them.
[**Chemical to Electrical**]
20. What does LED stand for?
[**Light Emitting Diode**]

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Round 2

1. Rectifiers are electrical devices which convert alternating current to ...
[**Direct current**]
2. Materials such as silicon, gallium arsenide, and germanium are neither conductors nor insulators. How are they classified?
[**Semiconductors**]
3. Fuel cells use two elements as their fuel. Name either of these.
[**Oxygen, Hydrogen**]
4. What type of electrical current is produced by solar cells?
[**Direct current (DC)**]
5. An astronaut in the International Space Station is said to be weightless. She pushes off from the floor and does a flip. Does she have any kinetic energy?
[**Yes**]
6. What type of electronic device stores charge?
[**Capacitor**]
7. What type of device is used to lower the voltage of an electric utility's power distribution lines for household use?
[**Transformer**]
8. What common household product is used to neutralize an acid spill from a lead-acid battery?
[**Baking Soda**]
9. What component of a DC motor is used to reverse the current to the armature as it rotates?
[**Commutator**]
10. Electric power can be calculated by multiplying the current flowing through the circuit by what?
[**Voltage**]
11. Fire extinguishers are labeled for Class A, B, and C fires. What kind of fire is an electrical fire?
[**Class C**]
12. 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**]
13. What is defined as the rate of change of velocity?
[**Acceleration**]
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**]

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15. The rotating electromagnet in an electric motor is called the...
[**Armature**]
16. Your EM-TV uses a 12-tooth sprocket on the motor and a 72-tooth sprocket on the wheel. What is the gear ratio of the drive system?
[**1:6**]
17. The gear ratio in the previous problem changes the speed and torque of the wheel relative to the motor. This is a two-part answer: It (increases or decreases) speed and (increases or decreases) torque.
[**Decreases speed, Increases torque**]
18. You have two incandescent light bulbs – a 60-Watt and a 100-Watt bulb. You connect these, one at a time, to a 120-Volt AC circuit. Which lamp draws more current?
[**100-Watt lamp**]
19. The 60-Watt lamp draws 0.50 Amps. What is the resistance of the lamp filament?
[**240 Ohms**]
20. Which of the two lamps has a larger diameter filament?
[**100-Watt lamp**]

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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. The name of the variable resistor used as an accelerator pedal input sensor on many Evs.
[What is a **potentiometer**?]
3. You have just taken your EV out for a test run. When you turn the EV off, a potential difference still exists across the B+ and the M- of the controller. This internal component is the cause.
[What is a **capacitor**?]
4. This device conducts electricity through the spinning commutator to the motor armature in a DC motor.
[What is a **Brush**?]
5. This device takes AC power, transforms it to a voltage somewhat higher than that of the EV's battery pack, and rectifies it to DC.
[What is a **battery charger**?]

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Category - Batteries

1. AA batteries are 1.5, golf-cart batteries are 6, and car starter batteries are 12. These numbers represent this property.

[What is **voltage**?]

2. The batteries in the EM-TV are labeled with the abbreviation "AGM". This abbreviation short for this battery type.

[What is **Absorbed Glass Mat**?]

3. Two common types of lead-acid batteries are deep-cycle and starter batteries. These batteries have thicker plates and greater plate spacing.

[What are **deep-cycle batteries**?]

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

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

5. EV Performance changes with weather. Warm weather has this effect on battery capacity.

[Why does battery capacity **increase with temperature**?]

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Category - Calculations

1. You want to double the acceleration of your kart. The amount of force required will have to be increased by this much.

[What is **double the force?**]

2. You want to limit the current in a circuit to 1 Amp. The battery is 12 Volts, one resistor is 10 Ohms, the resistance of the second resistor is this.

[What is **2 Ohms**]

3. The motor on an EM-TV turns at a maximum speed of 6000 rpm. The motor sprocket has 12 teeth. The wheel sprocket has 72 teeth. This is the wheel speed.

[What is **1,000 rpm?**]

4. The EM-TV has four 35 Amp-hour batteries. Your 48-Volt battery charger output is 5 Amps. If the battery is 50% discharged, it will take this many hours to recharge.

[What is **3.5 hours?**]

5. At the end of the autocross course you are traveling at 10 m/s. Your tires can grip well enough to cause a deceleration of 1g. You must slam on the brakes this many meters before the stop box to stop in time?

[What is **10.2 meters?**]

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Category – History

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 production EV, built by a US automobile manufacturer had the lowest drag coefficient of any production car, was the fastest commercially produced EV, and was destroyed in 2003 and 2004.

[What was the GM **EV1**?]

3. Electric vehicles became a commercial success during this decade of the 20th century.

[What happened between **1900 and 1910**?]

4. This event that took place between 1973 and 1974 significantly increased the cost of oil and spurred renewed interest in electric vehicles.

[What was the **Arab Oil Embargo**?]

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 – Safety

1. When working near batteries and control boards, you should remove these personal items.

[What is **jewelry**?]

2. With flooded, lead-acid batteries it is important to do this periodically, especially after filling and recharging.

[What is **cleaning the batteries**?]

3. This mechanical device that is part of the EV's wiring should be used when working on the EV to reduce shock hazards and unexpected operation.

[What is a **disconnect** or **disconnect switch**?]

4. Wiring on electric vehicles must be capable of handling high currents. Of these four common wire sizes, 00-gauge, 10-gauge, 4-gauge, and 16-gauge, this is wire has the smallest current carrying capacity.

[What is **16-guage** wire?]

5. This term refers to the fact that the main battery packs on EVs are not connected to the vehicle frame.

[What is **an isolated pack**?]