**Lesson 8: Electricity and safety**

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**TASK 1: How can birds sit on electric cables without getting electrocuted?**

It’s not uncommon for a character in the movies to end up with a blackened face and a headful of frizzy hair after touching a live electrical wire. What makes for a good gag in the entertainment biz, however, is likely to kill you in real life — unless you’re a bird. Birds have no problem sitting, unruffled, on the high-voltage power lines you often see lining the road. This ability has nothing to do with them being birds, explains Ranbel Sun, a recent graduate from electrical engineering and computer science who currently teaches at Phillips Academy in the USA. It’s all about the connections they’re making — or, more importantly, not making.

“Electric current is the movement of electrons,” explains Sun. The movement of electrons through a device like your TV is what gives it the energy to display images and produce sound. Sun describes the long process these moving electrons take to get to your house. “The electrons are essentially being pulled from the ground by the power station,” she says. “They move through the power lines, through your TV, and eventually they make their way back into the ground from where they came.” This creates a complete loop, which is required for electricity to flow.

The other thing electrons need in order to move is motivation — or, more specifically, a difference in what’s called electrical potential. “Imagine lugging a bunch of bowling balls up a mountain,” Sun explains. “If you give them a path, the balls will naturally roll down the mountain to a lower position.” At the top of the mountain, the bowling balls (which represent the electric current) have a high potential, and they will travel down any path that becomes available. When a bird is perched on a single wire, its two feet are at the same electrical potential, so the electrons in the wires have no motivation to travel through the bird’s body. No moving electrons means no electric current. Our bird is safe, for the moment anyway… If that bird stretches out a wing or a leg and touches a second wire, especially one with a different electrical potential, it will open a path for the electrons — right through the bird’s body.

*[Aaron Johnson for MIT Ask an Engineer]*

**Discuss the questions below with your partner.**

1. According to the text, what **two** things are needed for a current to flow?

a. What two things does a TV need energy for?

b. Where does this energy come from?

1. Why do electrons not move through birds when they are perched on a single wire?
2. What model is used by the author to help the reader understand what electric potential is?
3. What needs to happen for a bird to get an electric shock?
4. Explain what causes the electric current to pass through the bird in this case.

**TASK 2:**

**Explain what precautions an electrician should take when fixing a plug socket.**

**Your answer should:**

* **Explain** why fixing electrical fittings can be dangerous.
* **Explain** what the risk to the electrician is.
* **List** 3 precautions the electrician can take to keep safe**.**
* **Explain** how these precautions reduce the risk to the electrician.

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**MARK SCHEME**

Read through your partner’s work carefully.

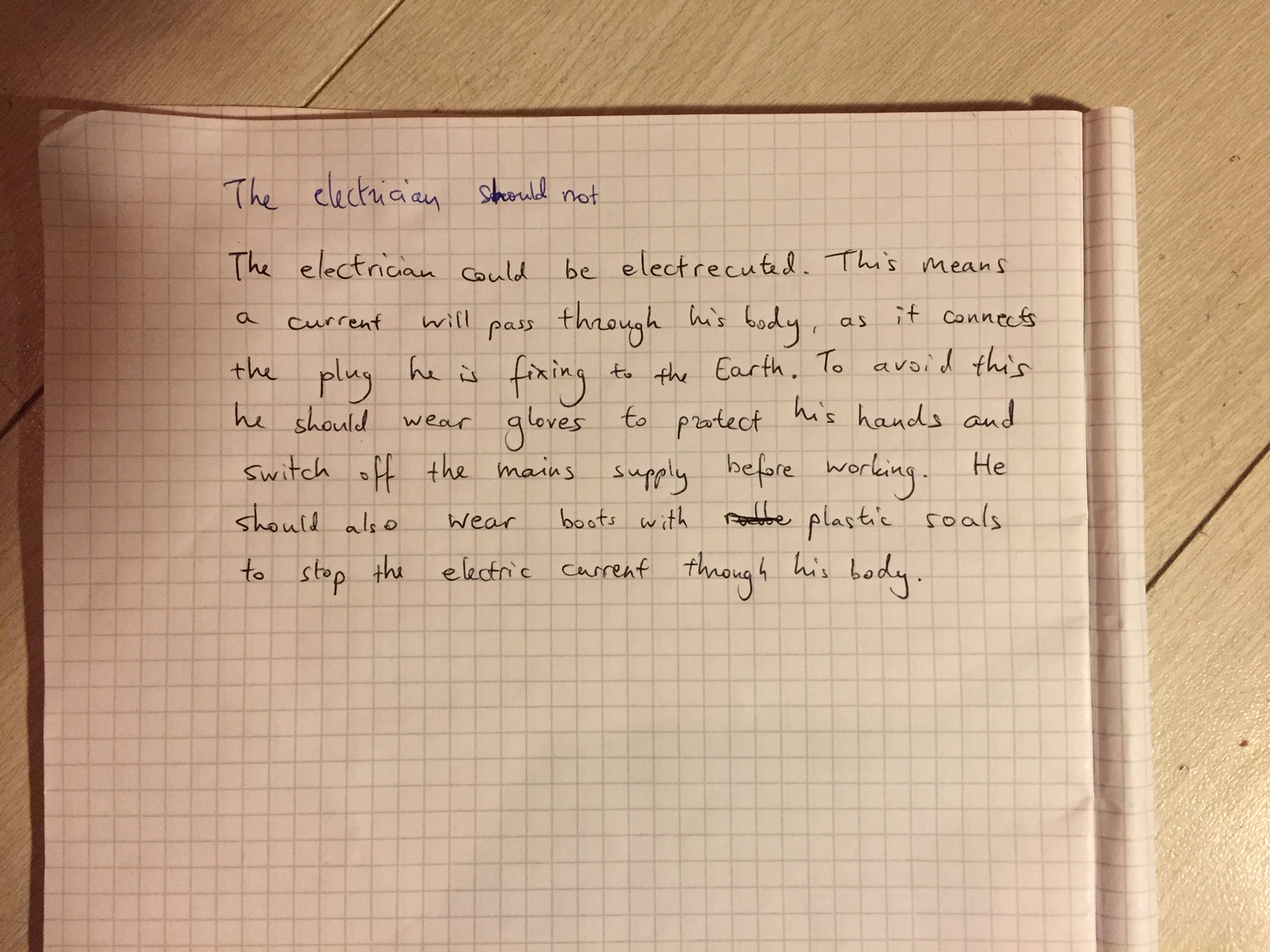
Each bullet point is worth 1 mark.

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| **Explain** why fixing electrical fittings can be dangerous. | * Large **potential difference** * Between the socket and the **Earth** * **Current** passes through the body | **3 marks** |
| **Explain** what the risk to the electrician is. | * **Electrocution** * Risk of injury or death | **2 marks** |
| **List** 3 precautions the electrician can take to keep safe**.**  **Explain** how these precautions reduce the risk to the electrician. | * Wear **insulating/rubber gloves** * To stop **current** from passing into the body from the socket * Wear boots with **insulating/rubber/plastic soles** * To prevent a connection to the **Earth** * Switch off the **mains supply** * So **current** cannot flow. | **6 marks** |
| **Spelling** | * **All keywords spelled correctly**   Current, Potential difference, Resistance, Insulator, Insulating, Connection, Circuit, Electrocution, Electrocuted | **1 mark** |

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| **Marked by:** | **Marks: /12** |
| **What was good about this work?** | **How could it be made even better?** |

**MARKING PRACTICE**

How many marks would this piece of work get?

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