

Consider a device structure (known as a vacuum tube) that consists of two parallel plates in a vacuum. The first plate is grounded and emits electrons at near zero energy and at a constant rate. You can apply a voltage to the second plate and measure the current. Using simple reasoning, tell me how you would determine the characteristics of this device and how you could use this a device in a circuit.

Answer: Vary the voltage on the second plate from negative to positive; realizing that a positive voltage draws current and a negative voltage draws zero current should lead to the conclusion that this device works like a diode. Additional items that would add points to the score would be a discussion of how and why the current varied with voltage, would expect the current to saturate, what would be the affect of different work functions on the two plates.

Now, let's put a grid between the two plates that is attached to its own voltage source. Again, given the measurements you could make on this device, how would you figure out how you could use it in a circuit?

Answer: The grid controls the current and so could be used in an amplifier.