

# Lemon Batteries

## 柠檬电池

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How to make them and how they work

# How do you measure electricity?

## 你怎样测试电？

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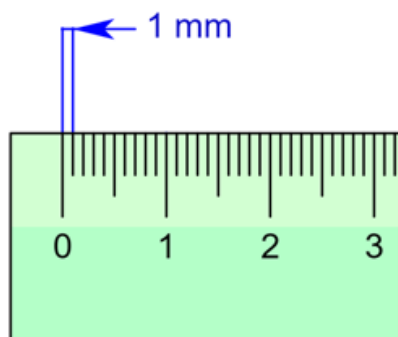


**Volts 伏特** = amount of electric pressure

**Amps 电流** = amount of electric current

**Watts 瓦特** = volts X amps = total power

**Milli** = 1 thousandth



**Example: 3 volts X 2 milliamps = 6 milliwatts**

# What do you need for a lemon battery?

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*a copper strip*



*a zinc strip*



*and a slice of lemon*  
一片柠檬



*or a penny*



*or a galvanized nail*

How many volts and milliamps are generated  
by 1 lemon battery 一个柠檬电池?

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0.938 volts

0.37 milliamps



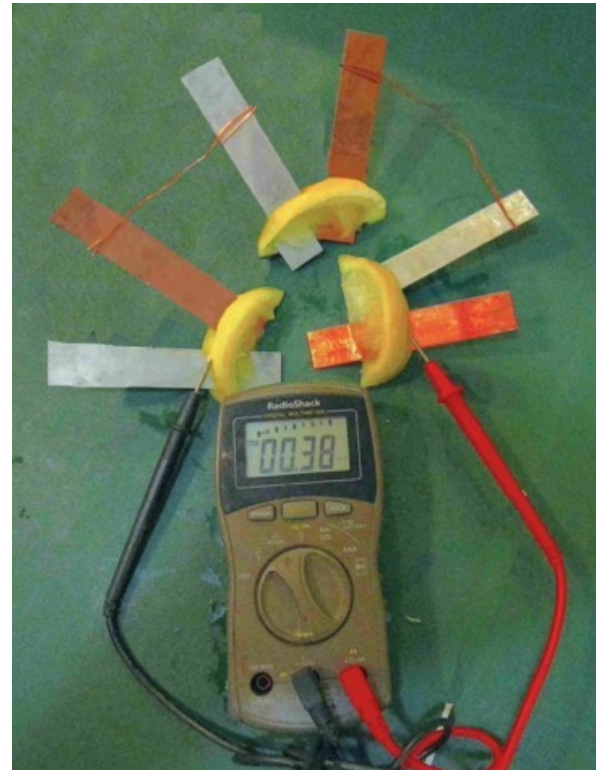
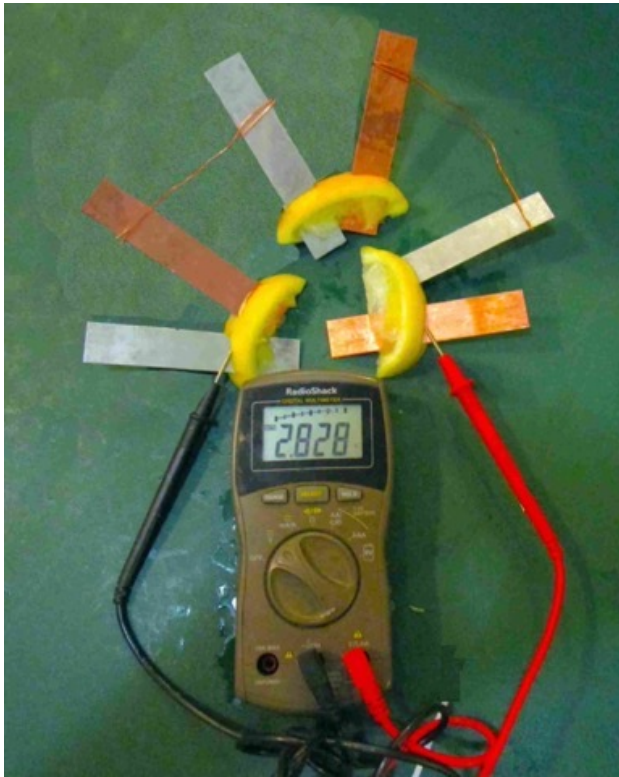
How many volts and milliamps are generated  
by 2 lemon batteries 两个柠檬电池？

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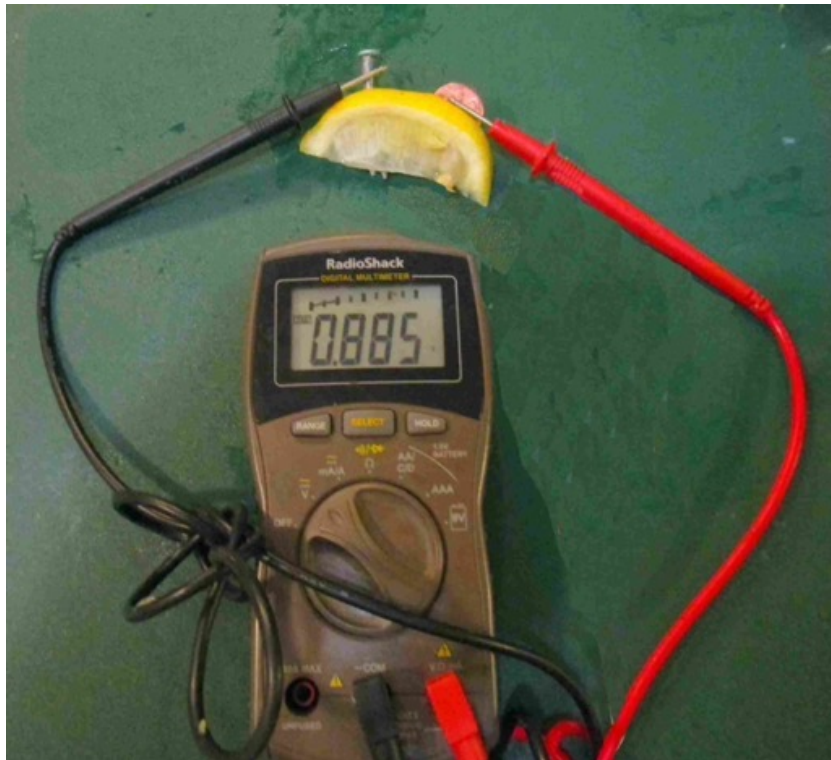
How many volts and milliamps are generated  
by 3 lemon batteries 三个柠檬电池？

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How many volts and milliamps are generated by 1 lemon (一个柠檬) with a nail & penny?

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How many volts and milliamps are generated by 2 lemons(两个柠檬) with nails & pennies?

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How many volts and milliamps are generated by 3 lemons(三个柠檬) with nails & pennies?



How many lemons with metal strips  
do you need to light up an LED?

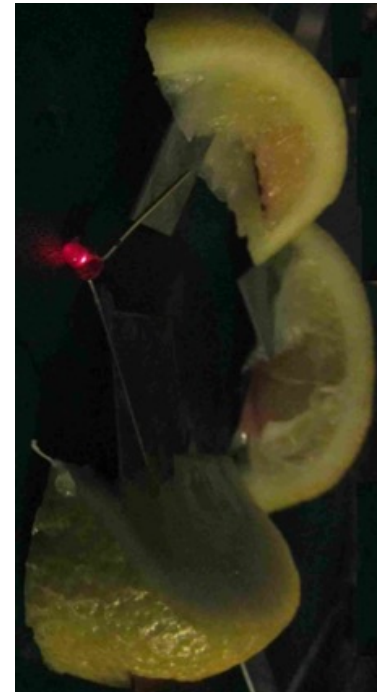
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1 battery 一



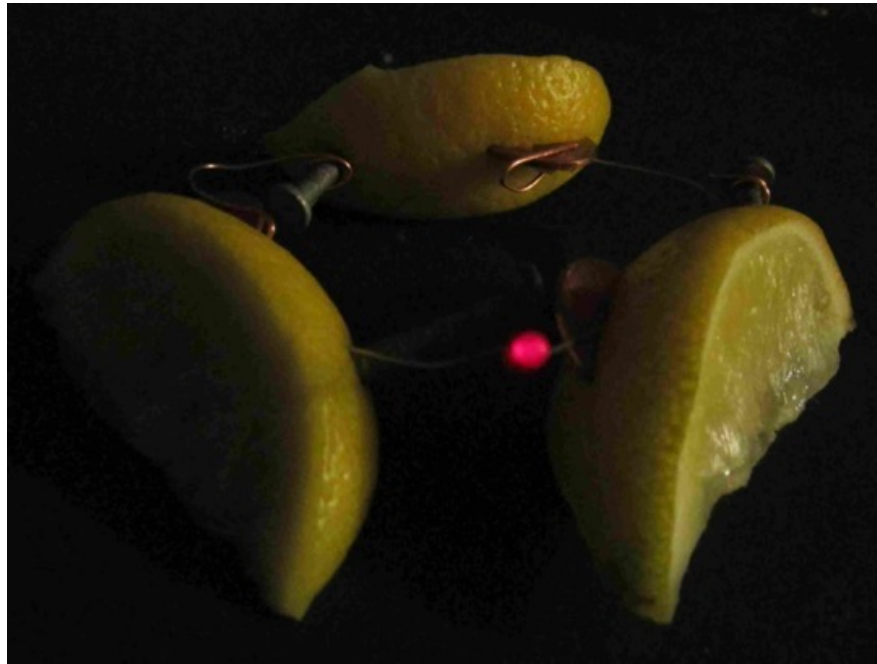
2 batteries 二



3 batteries 三个电池

How many lemons with nails & pennies  
do you need to light up an LED?

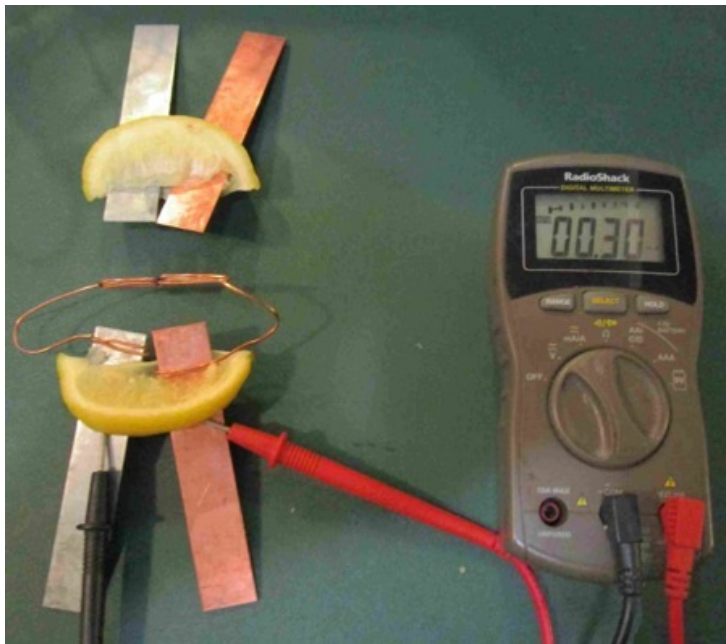
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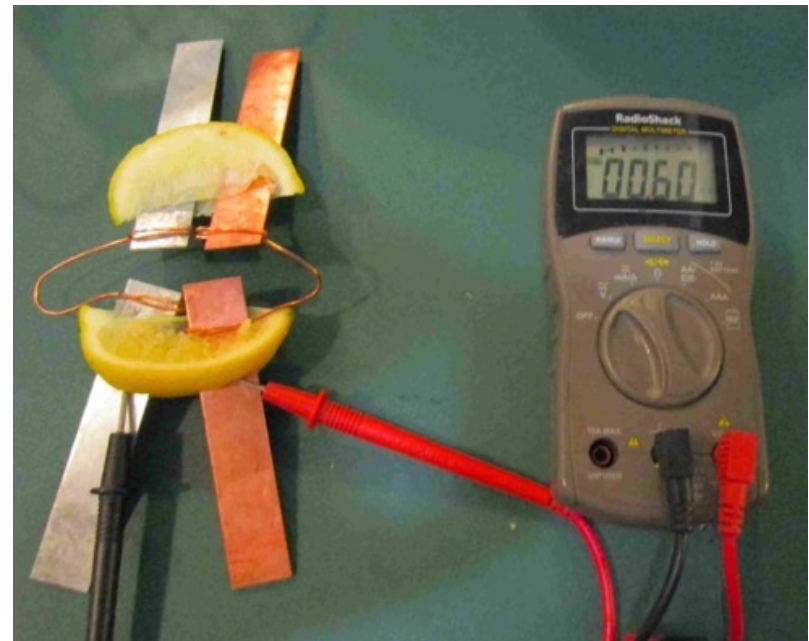
3 batteries



What happens to amperage when you connect the batteries parallel to each other?

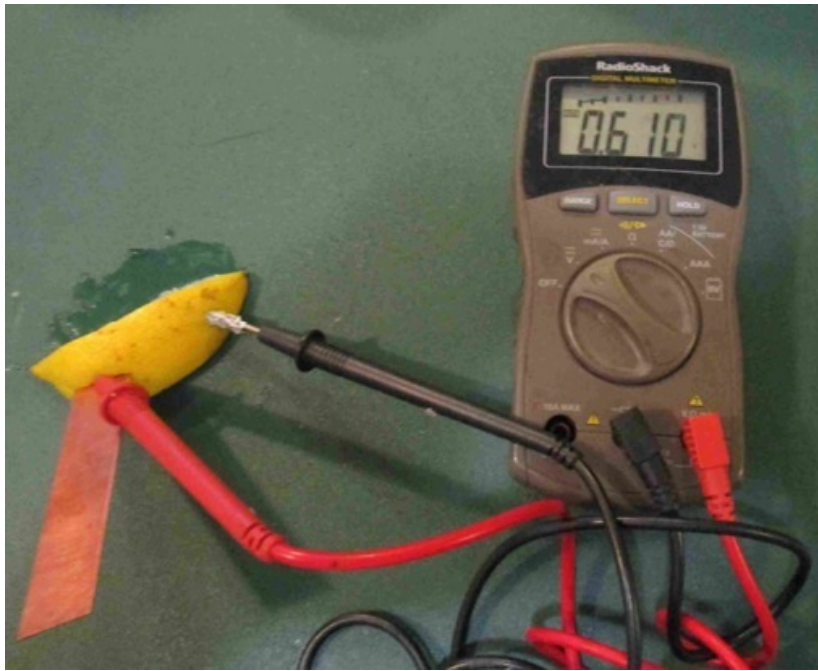


1 battery 一个电池



2 batteries 两个电池

What happens to voltage when you put metals other than zinc and copper into the lemon?



aluminum foil & copper

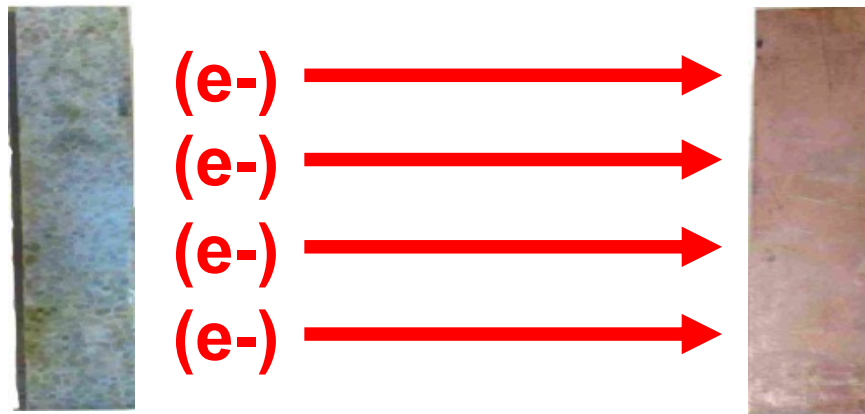


magnesium strip & copper

# Does the lemon generate the electricity?

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No! The electric current flows when the zinc corrodes and passes its electrons to the copper



If you run the battery using galvanized nails for too long the zinc coating will wear off and your voltage will go down