Of the two categories, parallel and series, households in the US are wired almost exclusively in one way. Explain why that method is used and what would happen if the other method was used.

Same key point again: what should remain constant as things change?

They are **connected in parallel** and this is **so that all appliances are supplied with the same voltage**. This is also because in a parallel connection, each appliance is controlled independent of the other so that a destruction in just one appliance doesn't lead to a complete shutdown of all other appliance.

Requiring the same current would have bad consequences

They are all done in parallel. If they were done the other way, **in series, plugging in multiple lights would result in them getting dimmer and dimmer with every light added. Since they would require the same current in a series, the potential drop would have to be less for the individual resistor since the sum of all potential drops would be the same**. The dimming of lights when placed in series was demonstrated in class and is not the case in households across the US.

Series connection would imply varying potential drops

The electrical potential difference for all outlets in your house is the same, and the typical voltage for an outlet is 120 volts. They are wired in parallel because if one outlet overpowers, the breaker trips and no more current flows through that outlet while the others still receive a current through them. **If they were wired in series, the current is the same for the resistors, but the potential difference is different**. Therefore if one outlet was overpowered, all of the outlets in the series would stop working because the current would stop flowing through.

A typical electric bill specifies how much electricity a household consumes in units of kilowatt-hours abbreviated kWh (i.e., 1000 watts of power times 1 hour of time). What is the corresponding proper SI unit for the quantity expressed as 1 kWh? Calculate the conversion factor between the two units. If the going rate is 10 cents/kWh, estimate the cost of raising a piano from street level to a tenth floor apartment, neglecting the cost of labor, pizza, and/or donuts. Please explain your reasoning fully and carefully.

Find the energy required

A piano should weigh around **200 kg and ten floors should be around 30 meters**. That means that the gravitational potential energy should be $\Delta U = mgh$

m = 200 kg g = 10 N/kg h = 30 m

ΔU = (200 kg)(10 N/kg)(30 m)

ΔU = 60,000 J = 6 x 10^4 J

A kWh is also equal to 1000 J/s x hr. To convert this is then (1000 J/s x hr) x 3600 s/hr = **3.6 x 10^6 J**

If 1 kWh is 10 cents, then the amount of money it requires to do this could be found because the ratio of the energy it took divided by 1kWh times 10 cents should be the amount required.

(6 x 10^4 J)/(3.6 x 10^6 J) x 10 cents = 1/6 cents

Another good response

1W=1J/s

1 hour =3600 s

1kWh= (1000)(J/s)(3600s)=3.6*10^6 J

We'll estimate each floor is 10 feet high, so ten floors is 100 ft or 33 m. Mass of a piano is about 100 kg (200lb/2).

U_g= (100 kg)(9.8 N/kg)(33 m)=3.3*10^4 J

3.3*10^4 J(1 kWh /3.6*10^6 J) = 1*10^-2 kWh

(10 cents/kWh)(0.01 kWh) =0.1 cents

seems pretty cheap...