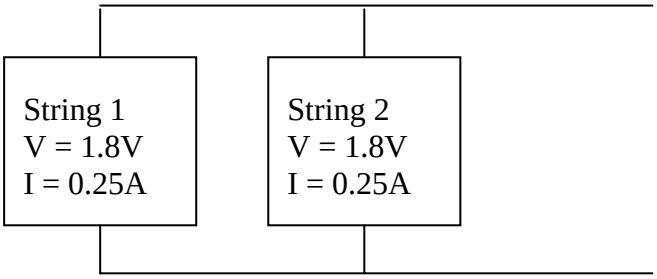
Cell Interconnection Worksheet Solutions

a) Because the cells are in series the voltages of each cell add together
So V = 0.6+0.6+0.6
V = 1.8V
The current is limited to the lowest current flowing from each cell. In this case each cell has the same current output (not always the case in real life) so

I = 0.25 (lowest current value)

b) The voltage and current for each string are as we have calculated in a). This time we have the two strings in parallel so the answers are different. We can model the string as one large solar cell with V = 1.8V and I = 0.25A (from a)) so that the circuit looks like



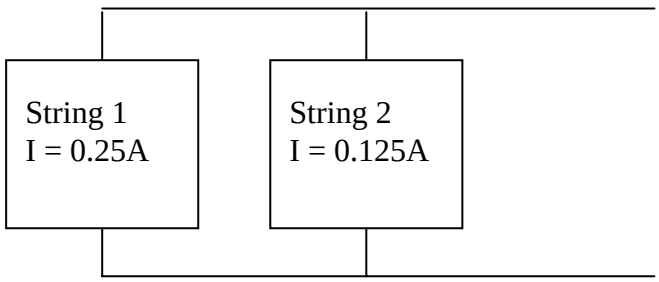
So because the two strings (modelled as cells above) are in parallel, the voltage is that of each string so
V = 1.8V

The strings (modelled here as cells) are in parallel so the current form each string add together, so
I = 0.25+0.25
I = 0.5A

c) The current is limited to the lowest current flowing from each cell. In this case each cell has the same current output (not always the case in real life) so

I = 0.125 (lowest current value)

d) Again we will model each string as a single cell as we did in part b).



The strings (modelled here as cells) are in parallel so the current form each string add together. The currents in each string have been calculated previously in part a) fro string 1 and part c) for string 2.

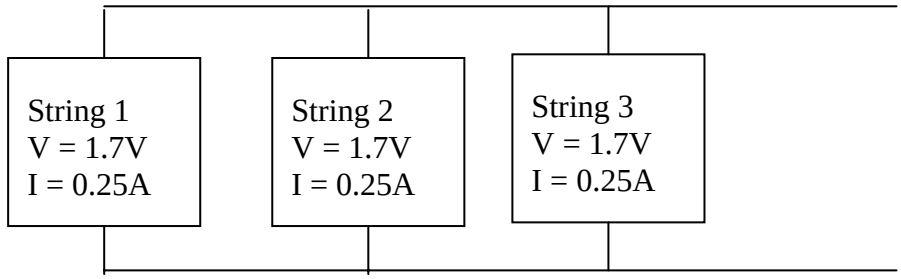
Add the current form each string gives
I = 0.125+0.25
I = 0.375A

e) Consider each string individually before we combine them

First calculate the voltage and current in string A-B-C.
The voltage is the addition of each cell voltage so
V = 0.6+0.6+0.5
V = 1.7V
The current is limited to the smallest current in the string
So I = 0.25

Second consider strings D-E-F and H-I-J. They have the same cell arrangement as string A-B-C so have a voltage of 1.7V and current of 0.25A.

Now we model the strings as single cells as we did in d)



So the voltage at the output is equal to the voltage of each string
V = 1.7V

As the strings are in parallel the current from each sting is added to give the output current, so
I = 0.25+0.25+0.25
I = 0.75A

This example shows the current restrictions that can occur to solar cells. Notice that the output of cell A is 0.31A but the output current of the string A-B-C is only 0.25. This means that 0.31-0.25 = 0.06A is lost and contributes to inefficiency of the system. t is therefore important that the power output characteristics of cells within an array are almost identical so that the array operates at its optimum efficiency.