1. A material is generally considered a semiconductor when...

- [ ] E_G is less than or equal to zero
- [x] E_G is smaller than the thermal energy (3 eV)

Correct

That is correct

If the bandgap of a material is greater than the thermal energy it is considered an insulator.

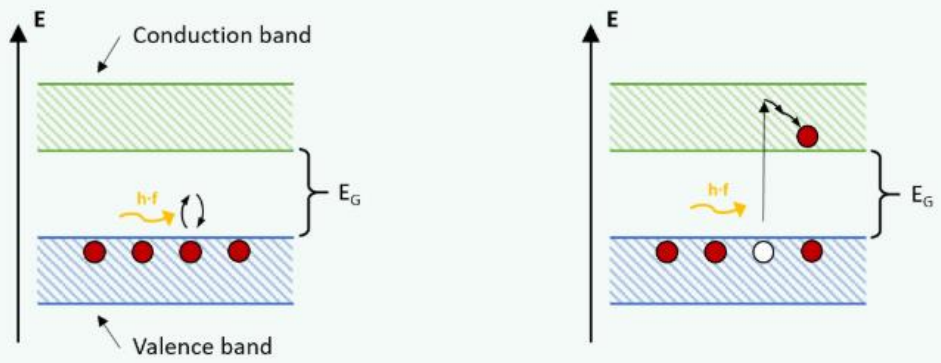
- [ ] The material exclusively consists of one element

2. Which photons result in the highest energy conversion with minimum wasted energy?

- ○ $E_{ph} \geq E_G$ (photon energy equal to or larger than the bandgap)
- ○ $E_{ph} \gg E_G$ (photon energy much greater than the bandgap)
- ◉ $E_{ph} = E_G$ (photon energy equal to the bandgap)
- ○ $E_{ph} < E_G$ (photon energy smaller than the bandgap)

Correct

That is correct



3. Describe the difference between n-type and p-type doped semiconductors. Why are both needed for a solar cell?

I'm n-type semiconductor electrons are majority carriers and hole are minority carriers.in p-type semiconductors hole majority and electrons are minority carriers

✓ **Correct**

In an n-doped semiconductor the concentration of free electron is drastically increased and there is therefore a majority of negative charge carriers. A n-type silicon semiconductor is made by introducing for example Phosphorus, that has one additional valence electron as compared to silicon.

A p-doped semiconductor is created by introducing foreign atoms with less valence electrons (e.g. boron) than the silicon semiconductor. In the p-doped material hole conductance becomes possible.

With both types of doped silicon semiconductor it is possible to form a pn-junction. With the pn-junction a static electric field is formed allowing the charges to be seperated and current extracted from the solar cell.

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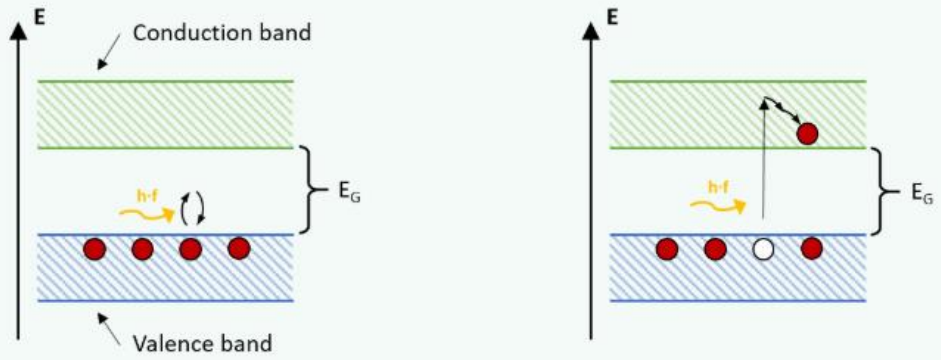

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