1. First and second generation solar cells are defined as silicon solar cells and thin film solar cells respectively.

   Please select the correct statement(s) regarding first and second generation solar cells.

   - [x] First generation solar cells use **in-direct bandgap materials**

   Correct

   That is correct

   Silicon is an in-direct bandgap material and therefore silicon needs to be relatively thick (>100 micrometer) in order to absorb sufficient light.

   - [ ] First generation solar cells use **direct bandgap materials**
   - [x] First generation solar cells are typically **thicker** than second generation solar cells

   Correct

   That is correct

   The second generation of solar cells are defined as thin film solar cells, since they are comprised of direct bandgap materials, which can absorb light even with thinner layers.

   - [ ] First generation solar cells are typically **thinner** than second generation solar cells

2. We want to compare two different types of solar cells with regard to their losses due to reflection.

   - Solar cell A has a refractive index of 3.1.
   - Solar cell B has a refractive index of 1.3

   Which solar cell will suffer the least from reflection losses?

   - ( ) Solar cell A
   - (•) Solar cell B

   Correct

   That is correct

   The reflection is calculated as

   $$R = \left(\frac{n_1 - n_2}{n_1 + n_2}\right)^2$$

   where n_1 is the index of refraction for air, while n_2 is the index of refraction for the material in question.

3. What type of bandgap would an optimum semiconductor material have for a solar cell?

- (●) A direct bandgap
- ( ) An in-direct bandgap
- ( ) It does not make any difference

✓ **Correct**

That is correct

Ideally a semiconductor material for a solar cell should have a direct bandgap. A direct bandgap material allows a higher absorption coefficient, so thinner materials can be employed.