1. Select the correct formula to calculate the power output of a solar cell

1 / 1 point

- P_{out} is the power output of the solar cell in watts
- η is the efficiency
- A is the area of the solar cell in squaremeters
- σ is the solar constant in watts per squaremeter

- (●) $P_{out} = \sigma \cdot \eta \cdot A$
- ( ) $P_{out} = \frac{\sigma \cdot \eta}{A}$
- ( ) $P_{out} = \frac{\eta \cdot A}{\sigma}$

✓ **Correct**

That is correct

When we check the units, we see that the units of P_{out} is watts as it should be.

2. Select the correct statement(s)

- [x] The solar constant is inversely proportional to the distance to the sun squared.

✓ **Correct**

The solar constant (σ) can then be calculated as the ratio between the power output of the sun and the surface area of sphere with the Sun/Earth distance as its radius. Therefore the distance is inversely proportional to the radius squared.

- [ ] Jupiter is rougly 5 times further from the Sun as compared to Earth. Therefore the radiation power from the Sun is 5 times lower at Jupiter.
- [x] Gallium arsenide (GaAs) solar cells are used for space applications because of lower weight and higher efficiency compared to silicon solar cells

✓ **Correct**

In the early **1990s** the technology used for space solar cells began to diverge from the silicon technology and shift to **gallium arsenide based technology**. Gallium arsenide (GaAs) single-crystalline solar cells enable **thin film solar cells** and **multi-junction solar cells** leading to both lower weight and higher efficiency compared to silicon solar cells.

- [ ] The Juno space probe became the first space probe to orbit Jupiter in 2016

3. We want to design a mission to Saturn with a space probe delivering the power. The space probe has been designed to operate with a low power consumption of 150 W, and we have access to 30% efficient GaAs solar panels.

   How large of an area do we need to supply the solar panels when we know the distance to Saturn is 9.539 AU or$1.427 \cdot 10^{12}$ m? The luminosity of the sun is $3.828 \cdot 10^{26}$ W.

   Please give the answer in square meters (m^2), do NOT write the units (example answer 25).

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   ✓ **Correct**

   That is correct

   The area needed is 33.4 m^2

4. **Please provide a definition of the efficiency of a solar cell**

   Please provide a written answer

   The portion of energy in the form of sunlight that can be converted via photovolatics into electricity by the solar cell

   ✓ **Correct**

   The **Solar cell efficiency** refers to the portion of energy in the form of sunlight that can be converted via photovoltaics into electricity.

   The efficiency is defined as the ratio between the power outout and the power input.