

Assignment #9 Physics 346

This assignment will not be graded, but you are responsible for the material covered.

1. Gallium arsenide (GaAs) has an energy gap of 1.43 eV.
 - (a) What range of wavelengths is absorbed by GaAs? What range is transmitted?
 - (b) Light with a wavelength of 600 nm is incident on a GaAs solar cell. Approximately what fraction of the energy is available for electrical work and what fraction goes into heat?
2. We wish to power a house using commercial solar panels. Use the average solar flux data for Denver (see lecture 30). The solar panels are rated at $200\text{W}/\text{m}^2$ under $1000\text{W}/\text{m}^2$ solar flux.
 - (a) What is the solar cell efficiency?
 - (b) Calculate the capacity factor
 - (c) Calculate the number of square meters of solar panels required to provide the average household consumption of 11,000 kWh/year.
3. A single story house has floor dimensions 30 ft by 20 ft and internal wall height of 8 ft. The ceiling is insulated with $R=8$ fiberglass insulation on top of a layer of drywall with $R=0.45$. The air is replaced 3 times per hour due to leakage. The inside air temperature is 72°F and the outside air temperature is 32°F . (R values are in US units: $^\circ\text{F} \cdot \text{ft}^2 \cdot \text{hr}/\text{Btu}$).
 - (a) Calculate the heat loss due to leakage (Btu/hr)
 - (b) Calculate the heat loss through the ceiling (Btu/hr)
 - (c) What is the temperature difference across the drywall? Across the fiberglass insulation?
4. Questions from your text:

Ch 16 #7, 9, 10