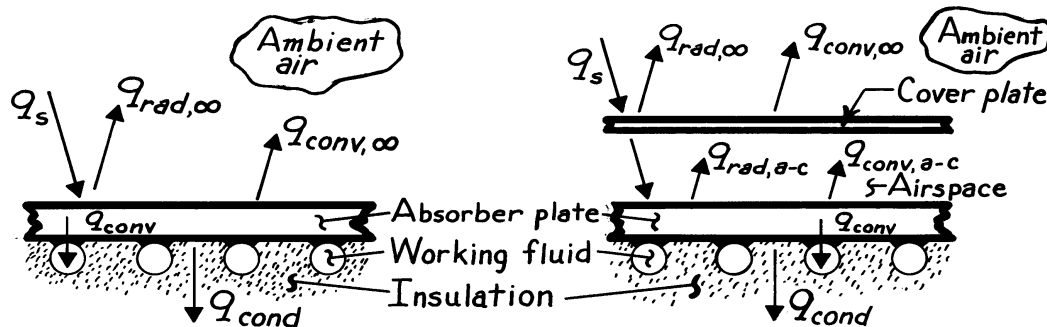


PROBLEM 1.63(b)

KNOWN: Configuration of a flat plate solar collector.

FIND: Relevant heat transfer processes with and without a cover plate.

SCHEMATIC:



The relevant processes without (above left schematic) and with (above right schematic) include:

- q_s Incident solar radiation, a large portion of which is absorbed by the absorber plate. Reduced with use of cover plate (primarily due to reflection off cover plate).
- $q_{rad,\infty}$ Net radiation exchange between absorber plate or cover plate and surroundings,
- $q_{conv,\infty}$ Convection from absorber plate or cover plate to ambient air,
- $q_{rad,a-c}$ Net radiation exchange between absorber and cover plates,
- $q_{conv,a-c}$ Convection heat transfer across airspace between absorber and cover plates,
- q_{cond} Conduction through insulation, and
- q_{conv} Convection to working fluid.

COMMENTS: The cover plate acts to significantly reduce heat losses by convection and radiation from the absorber plate to the surroundings.