Answer on Question #56003, Physics / Other

Task: The maximum possible efficiency of the half wave rectifier is _____.

a) 40.60%

b) 50.6%

c) 70%

d) 30%

Answer: a) 40.60%

Rectification efficiency is defined as the ratio between the output power to the ac input power.

Efficiency, η = DC power delivered to the load/AC input power from the transformer = P_{dc}/P_{ac}

DC power delivered to the load, $P_{dc} = I^2_{dc} R_L = (I_{max}/_{pi})^2 R_L$

AC power input to the transformer, P_{ac} = Power dissipated in diode junction + Power dissipated in load resistance R_L

$= I^2_{rms} R_F + I^2_{rms} R_L = \{I^2_{MAX}/4\}[R_F + R_L]$

So, Rectification Efficiency, $\eta = P_{dc}/P_{ac} = \{4/^2\}[R_L/ (R_F + R_L)] = 0.406/\{1+ R_F/_{R_L} \}$

The maximum efficiency that can be obtained by the half wave rectifier is 40.6%. This is obtained if $R_F$is neglected.