Physics 2

Elementary Physics of Energy

Practice Final

1. Two resistors with resistances 2 Ohms and 3 Ohms are connected to a 10 V battery,
   (a) in series
   (b) in parallel.
   For each case find the voltage drop across each, and the amount of Joule heating produced in each resistor.

2. A power plant generates 1000 MW which is transmitted by a power line that carries a current of 500 Amps. If the end voltage is 800,000 V what is the resistance of the line?

3. A hot-tub heater with resistance of 20 Ohms is used in a household with voltage 115 volts, for 2 hour every morning. Assuming that it is used to heat up water at 70% efficiency, and that the temperature boost required is 50^0C, what is the quantity of water used each day? What are the electricity charges for this usage per month? (Assume 25 cents/ kWH charges).

4. A car wash needs 500 gallons of water a day heated from 50^0F to 100^0F. How large a solar collector would be needed to do this? The incident insolation is 1000 Btu/ft^2 and the collector efficiency is 30%.

5. A hydel project has a head of 90 meters. Calculate the rate of flow of the lake needed to obtain 1 MW power working at 80% efficiency. If the velocity of water in flow is 20 kms per hour, what is the area of the lake? Here the volume flow rate is related to the velocity and the area, by imagining that the lake flows at a steady rate with the surface water discharged into the dam.

Problems from Ristinen & Kraushaar:

Ch. 5 Problems (pg. 167): 6, 8
Multiple Choice Questions: 4, 5

Ch. 6 (pg. 207): 4, 18

Additionally you are advised to review the concepts of specific heat and latent heat from the first half of the course.