This print-out should have 8 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Please notice that for your homework to be considered towards your grade, it needs to be submitted one hour before the corresponding recitation starts.

PLEASE REMEMBER THAT YOU MUST CARRY OUT YOUR CALCULATIONS TO AT LEAST THREE SIGNIFICANT FIGURES. YOUR ANSWER MUST BE WITHIN ONE PERCENT OF THE CORRECT RESULT TO BE MARKED AS CORRECT BY THE SERVER.

---

001 (part 1 of 2) 6 points

A Carnot engine has a power output of 234 kW. The engine operates between two reservoirs at 21°C and 532°C.

How much thermal energy is absorbed per hour? Answer in units of J.

---

002 (part 2 of 2) 6 points

How much thermal energy is lost per hour? Answer in units of J.

---

003 (part 1 of 1) 7 points

A Carnot engine has an efficiency of 39.1 percent when the hot reservoir temperature is 529°C.

If we want to improve the efficiency to 31.9 percent, what should be the temperature of the hot reservoir, assuming everything else remains unchanged? Answer in units of °C.

---

004 (part 1 of 1) 7 points

The efficiency of a 1561 MW nuclear power plant is 34.9%.

If a river of flow rate 2.85×10^6 kg/s were used to transport the excess thermal energy away, what would be the average temperature increase of the river? Answer in units of °C.

---

005 (part 1 of 2) 6 points

A gasoline engine has a compression ratio of 6.1 and uses a gas for which $\gamma = 1.6$.

What is the efficiency of the engine if it operates in an idealized Otto cycle?

---

006 (part 2 of 2) 6 points

If the actual efficiency is 20.9%, what fraction of the fuel is wasted as a result of friction and unavoidable heat losses? (Assume complete combustion of the air-fuel mixture.)

---

007 (part 1 of 2) 6 points

A refrigerator has a coefficient of performance equal to 7.55.

If the refrigerator absorbs 101.3 J of thermal energy from a cold reservoir in each cycle, find the work done in each cycle. Answer in units of J.

---

008 (part 2 of 2) 6 points

Find the thermal energy expelled to the hot reservoir. Answer in units of J.