WEEK-02 of 08

Due date: July 15, 2023

Dear All

I appreciate your punctuality. I hope for an even better upcoming response. This review will make you skill and give clarity. Please print and send me through WhatsApp on time.

I will check and reply to you.

Follow the due date please! You will get the next HW after completion.

SUMMER BREAK WEEKLY CHALLENGE

THINGS TO DO THIS SUMMER BREAK: -

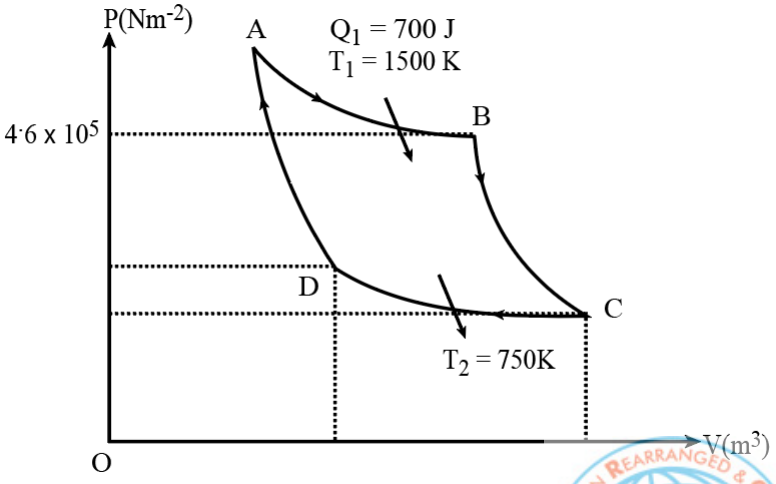
Task: Look through the formula and solve all the relevant problems

Make sure to include all the relevant units.

$$PV^{\gamma} = Const.$$
$$TV^{\gamma-1} = Const$$
$$TP^{\frac{\gamma}{1-\gamma}} = Const$$

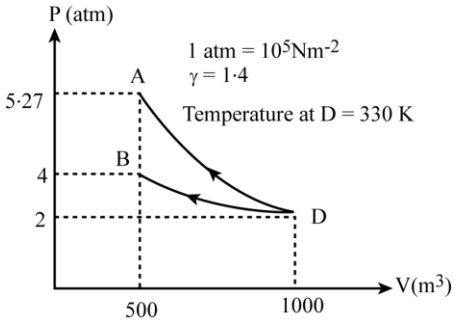
PROBLEM: 01

Four steps of working substance in a Carnot's Engine are shown in the figure given below—



(c) Calculate the pressure at the point 'C' refer to above figure. 3

PROBLEM: 02



In the figure, a cycle is shown with the graph P–V.

(d) According to the figure, the temperatures are not same for same amount of compression of the gas along the path DB and DA-Why? Explain with mathematical analysis. 4

PROBLEM: 03

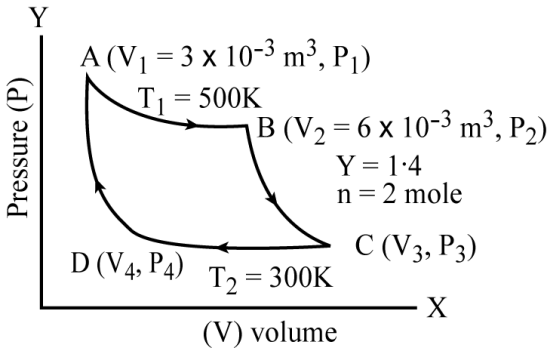
At normal temperature and pressure one mole Hydrogen gas is kept in a cylinder. Later the volume of that Hydrogen gas is changed 1˙7 times first isothermally and then adiabatically.

(c) Calculate the final pressure of the gas at adiabatic process. 3

(d) Calculate the final temperature of the gas.

PROBLEM: 04

In the following P—V figure the Carnot cycle is doing work with effective materials that also shows:



(c) Determine the volume at point C. 3

PROBLEM: 05

1 mol nitrogen gas is stored in two cylinders with frictionless piston made of material of heat conductor and heat insulator at temperature of 750K and at 3×10^5 Pa pressure. Then the amount of pressure in both cylinders is halved. In case of nitrogen. $\gamma = 1{\cdot}4$ and $R = 8{\cdot}31 Jmol^{-1}k^{-1}$.

(c) Find the final temperature of gas in heat insulated cylinder. 3

PROBLEM: 06

While practicing a footballer suddenly noticed that the wind is blowing out from bursting football. He also noticed that air coming out of the football was warmer than the surroundings. The indoor air temperature of the football was 30°C, volume $1m^3$ and $\gamma = 1{\cdot}6$.

(c) Determine the final volume of the gas bursting out from the football. 3

(d) Why the air coming out from the football is warmer than the air of the surrounding? Explain with mathematical analysis. 4

PROBLEM: 07

At a temperature of 227°C, A Carnot engine is powered by 1 mole of gas. The ration of contraction or expansion at each step of the Carnot cycle is 1:6. (Universal Gas Constant $R = 8{\cdot}37\ Jmol^{-1}K^{-1}$ and $\gamma = 1{\cdot}6$)

(c) Determine the minimum temperature of the engine. 3

(d) Will the amount of work done in the isothermal expansion and contraction of the Carnot cycle be the same? Verify mathematically. 4

PROBLEM: 08

Sara was experimenting with 56g Nitrogen gas in a cylinder at a temperature of 70^0C under standard pressure. She compressed the gas in an adiabatic process and raised the temperature to 170^0C.

c. What will be the final pressure of the gas used in Sara?

d. What will be the change in the volume of the gas? Analyze mathematically.