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Section : A
Dep : BS (Civil Engineering)
Subject : Basic electro
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Q1 Part a

Answer

Diode is an electromagnetic Component that has two terminals, and limit current to one direction.

* Diode has an anode and Cathode.
* positive Current normally Flow from the anode ~~and~~ to the Cathode.
* Diode are useful for protecting Circuitry from harmful voltage or Current.
* Diodes are basic building block of Charge the Collecting element in many detectors.

Half wave Rectifier

It is the equilant circuit of the half wave rectifier with diode replaced with its battery plus-resistance Model

* Transfer the characterictics of the rectifier circuit
* Input and output waveforms, Assuming that $r_D << R$

* It Converts that cycle of applied A.C signal into D.C signal.
  * ordinary transformer is used

Full wave Rectifier

The transfer characteristics assuming a constant voltage drop model for the diode

* ip input and output wave form
* Centre tap transformer is used
* It Converts the whole cycle of applied A.C signal into D.C signal.

Part B

solution

Required final temperature of mixture

Sol $-Lose_{heat} = Gain_{heat}$

$-[(C_{Au})(mass)(\Delta T)] = (C_{H_2O})(mass)(\Delta T)$

$\therefore [(0.129 J/g°c)(97g)(T_F - 785°c)] = [(4.184 J/g°c)(323)(T_F - 15°c)]$

$-[(12.5)(T_F - 785°c)] = (1.35 \times 10^3)(T_F - 15°C)$

$-12.5 T_F + 9.82 \times 10^3 = 1.35 \times 10^3 T_F - 2.02 \times 10^4$

$3 \times 10^4 = 1.36 \times 10^3 T_F$

$T_F = 22.1°C$ Ans

Shoa
Part A

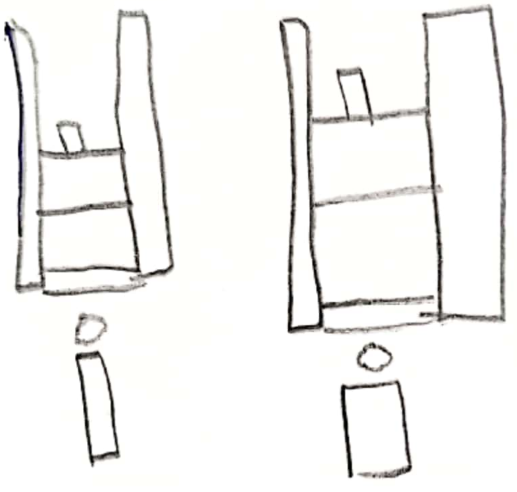
Isobaric process

Constant pressure, $\Delta P = 0$

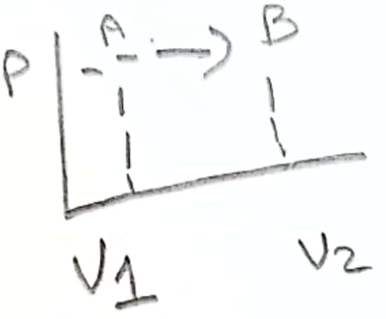
$\Delta Q = \Delta U + \Delta W$ But $\Delta W = P \Delta V$

Heat in = Wout + increase in internal energy
Heat out = Wout + Decrease internal energy.

Example



Heat input increases V with constant P



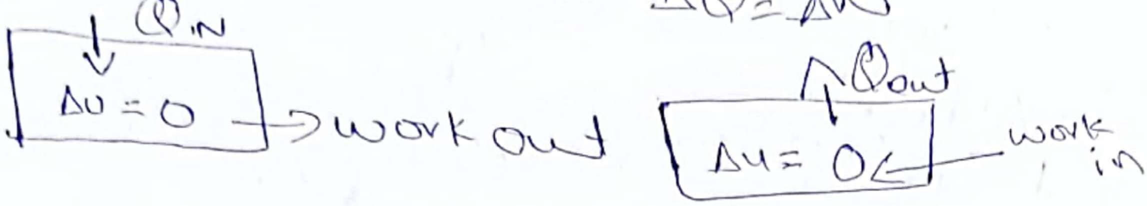
$\frac{V_A}{T_A} = \frac{V_B}{T_B}$

400 J heat does 120 Jo 67 work energy by 280 J

Isothermal process

Constant temperature $\Delta T = 0$, $\Delta U = 0$

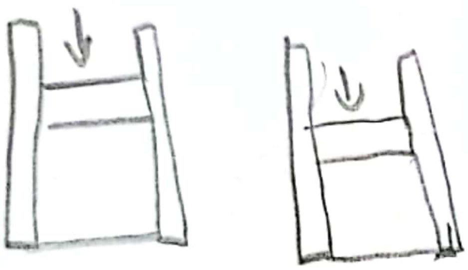
$\Delta Q = \Delta U + \Delta W$ and $\Delta Q = \Delta W$



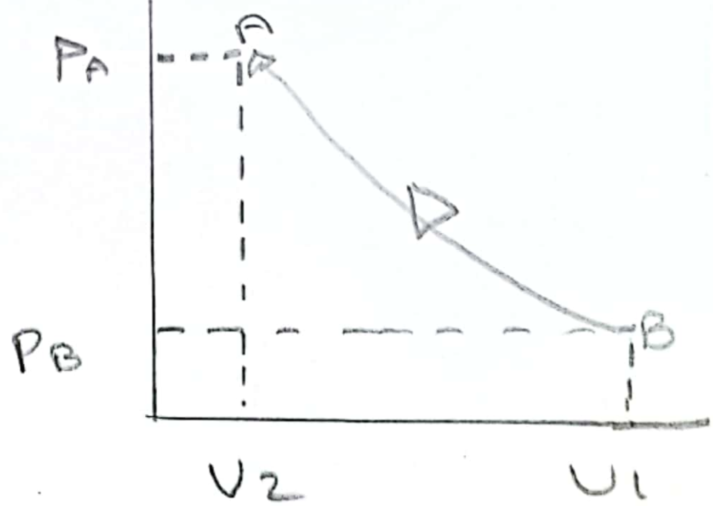
Net heat input = work output

work input = Net heat out.

example (constant T):



$\Delta U = \Delta T = 0$



$$P_A V_A = P_B V_B$$

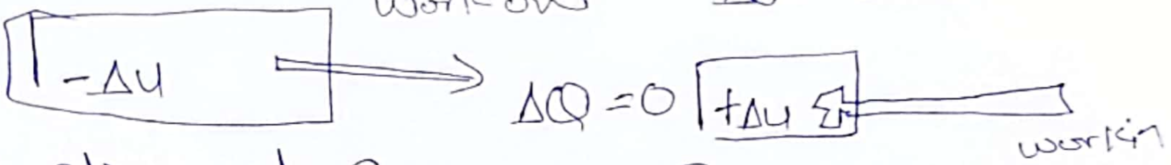
Slow compression at constant temperat no change in U.

Adiabatic process

No heat exchange, $\Delta Q = 0$

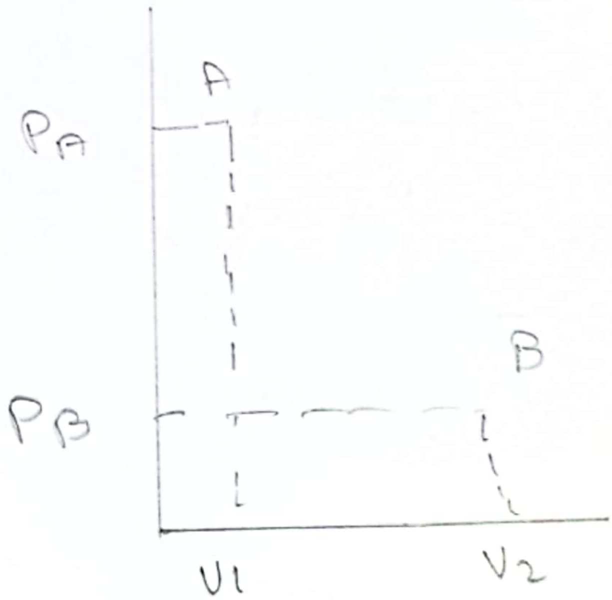
$\Delta Q = \Delta U + \Delta W$; $\Delta W = -\Delta U$ OR $\Delta U = -\Delta W$

$\Delta W = -\Delta U$ $\Delta U = -\Delta W$



work done at expense of internal energy. input work increases Internal energy.

insulated walls $\Delta Q = 0$



Expanding gas does work with zero heat loss

Work $= \Delta U$.

Q2 Part B

Answer

Solution

$$e = 1 - \frac{T_C}{T_H}$$

$$e = 1 - \frac{300K}{500K}$$

$$e = 40\%$$

Actual $e = 0.5e_i = 20\%$

$$e = \frac{W}{Q_H}$$

$$W = eQ_H = 0.20(600J)$$

$$\text{work} = 120J$$

Q3 (a)

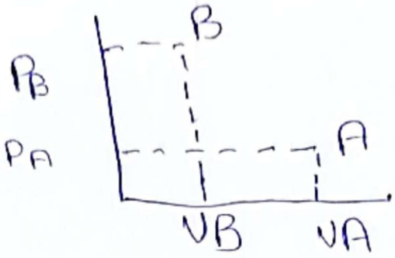
Answer

Internal Combustion Engine	External Combustion Engine.
① Take place inside Cylnder	Take place outside the Cylinder.
② Temperature is higher	Temperature is lower
③ Pressure is high	Efficiancy is lower
④ Lighter in weight	Heavy in weight.
⑤ This Engine is Costly	This Engine is Cheaper than I.E. Engine.
⑥ Less time requir to Start	Need more time to start.
⑦ Fuel tank required to store fuel	Boiler and water storager require To generate steam
⑧ Pressure generated from inside engine the engine is due to Combustion of Fuel.	Pressure generated inside the engine is due to steam of water.

Q3 Part b

Solution

$\Delta Q = 0$



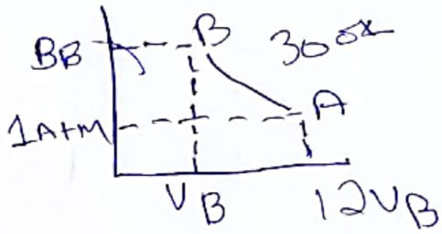
$P_A V_a = P_b V_b$

$\frac{P_A V_A}{T_A} = \frac{P_b V_b}{T_b}$

=> Find

$P_A V_A = P_b V_b$

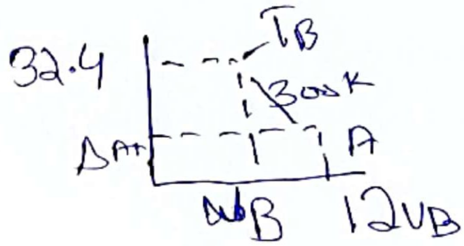
$P_B = P_A \left(\frac{V_A}{V_b}\right)^{\gamma}$



$P_b = 32.4$ atm OR 3284 kPA

=> Find T_B

$\frac{P_A V_a}{T_A} = \frac{P_B V_B}{T_B}$



$\Rightarrow \frac{1 \times 12}{300K} = \frac{(32.4)(1)}{T_B}$

$T_B = 810K$

Question 4
Part a
Answer

Conduction	Convection
1) It is the transfer of heat by direct physical Contact	It is the transfer of heat by the motion of a fluid.
2) It is due to temperature difference. Heat flows from high temperature region to low Temperature.	2) It is due to difference in density Heat flows from low density region to high density region.
3) It occurs in Solids throug molecular Collisions, without actual flow of matter.	3) It occurs in fluid by actual flow of matter.
4) It is a slow process.	4) It is also slow Process.
5) It doesnot obey the laws of reflection and refraction.	5) It does not obey the laws of reflection and refraction.

Q4 Part b

Ans.

$Q_{water} = Q_{Pb}$

$\Rightarrow m_{watter} = -Q_{Pb}$

$m_{water} C_{water} \Delta T_{water} = -(m_{Pb} C_{Pb} \Delta T_{Pb})$

$125(4.18)(T_F - 23) = -75(0.13)(T_F - 455)$

$522.5T_F - 12017.5 = -9.75 T_F + 4441.25$

$+9.75T_F \quad +12017.5 + 9.75T_F + 12017.5$

$532.25T_F = 16258.75$

$T_F = 30.5°C.$

Question 5

Answer

Given

$T_1 = 15C$
$T_2 = 4C$
$L = 0.25m$

Required

Solution:

The inner and outer surface of flat concrete roof electrically heated are home are maintained at specified Temp during night.

Accumption: steady operating condition exists during the entire night since the roof's temperature remain constant.

2. Constant properties can use for Analysis: Nothing that heat Transfer through the roof is condition and are of

roof is

$A = 6m \times 8m$

$= 48 m^2$

The steady rate of heat transfer through the roof is determined.

$$\dot{Q} = \frac{kA(T_1 - T_2)}{L}$$

$$= \frac{(0.8)(48)(25.0)}{0.25}$$

$= 3840$ kw

$\boxed{= 3.84 \text{ kw}}$

The amount of heat lost through the roof during of 10 hour period at cost determined from

$Q = \dot{Q}\Delta T$

$= (3.84 \text{ kw})(10h)$

$= \boxed{38.4 \text{ kwh}}$

So cost per day = (amount of energy)(unit cost energy)

$= (38.4 \text{ kwh})(0.2/\text{kwh})$

$= \boxed{7.68}$ $

Cost/month = cost/day × 30 day

$= 7.68 \times 30 = \boxed{230.4}$