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Subject : Basic Electro Mechanical Engineering.

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Answer # 01 (a)

Ans **Diode :-**

→ A diode is an electronic component that has two terminals limit current to one direction.

→ Diode have an anode and a cathode.

→ Positive current normally flows from the anode to the cathode.

→ Diode are usefull for Protecting Circuitry from harmful voltage or current.

→ Diodes are a basic building block of the charge-collecting elements in many detectors.

P.T.O

* Diff between half wave and full wave.

Ans

Half Wave	Full wave
• A half wave rectifier is an electronic circuit which converts only one half of the AC cycle into pulsating DC. It utilize only half of AC cycle for the conversion process.	• Full wave rectifier is an electronic circuit which convert entire cycle of AC into pulsating DC.
• Fundamental frequency of ripple is equal to supply frequency	• Fundamental frequency of ripple is double of supply frequency.
• Number of diode only 1.	• Number of diodes vary from 2 to 4.

Answer # 01 Part (B)

Solution :-

$$-\text{Lose heat} = \text{Gain heat}$$

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

$$-[(0.129\ J/g^\circ C)(979\ g)(T_f - 785^\circ C)] = (4.184)(323\ g)(T_f - 15^\circ C)$$

$$-[(12.5)(T_f - 785^\circ C)] = (1.35 \times 10^3)(T_f - 15^\circ C)$$

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

$$3 \times 10^4 = 1.36 \times 10^3\,T_f$$

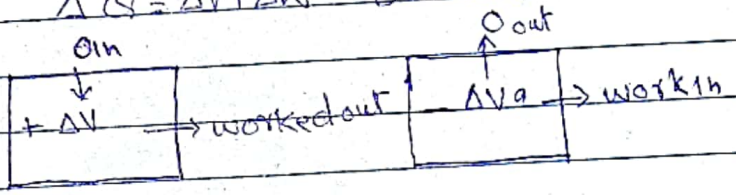
$$T_f = 22.1^\circ C.$$

Answer # 2 Part (a)

Ans(a) Isobaric Process:-

Constant Pressure, $\Delta P = 0$

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



Heat in = Wout + increase is internal Energy.

Heat out = Wout + Decrease in internal Energy.

(b) Isometric Process:-

In this System there is no change in the volume i.e volume is constant.

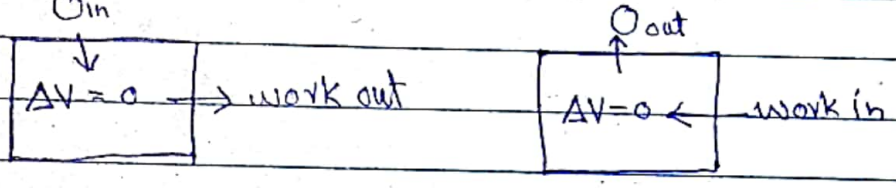
$$\Delta Q = \Delta V + \Delta W$$

$$\boxed{\Delta Q = \Delta V}$$

(C) Isothermal Process :-

Const. Temp, $\Delta T = 0$, $\Delta V = 0$

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



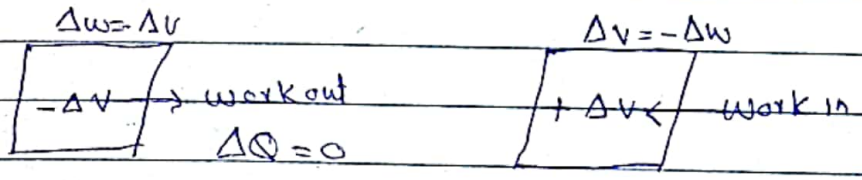
Net Heat exchange, $\Delta Q = 0$

work input = hot heat only.

(D) Adiabatic Process :-

No heat exchange, $\Delta Q = 0$

$\Delta Q = \Delta V + \Delta W$; $\Delta W = -\Delta V$ or $\Delta V = -\Delta W$



Work done at expence of internal energy input work increase internal energy.

Answer #02 Part (b)

Solution :-

$e = 1 - \frac{T_C}{T_H}$ Actual $e = 0.5 e_i = 20\%$

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

$e = 40\%$ $W = e Q_H = 0.20 (600L)$

$WORK = 120\ J$

Answer # 3 Part (a)

* Diff between Internal combustion engine and external combustion engine.

Ans

Internal Combustion Engine	External Combustion Engine
Combustion of fuel take Place inside the cylinder.	Combustion of fuel take Place outside the cylinder.
Working fluid may be Petrol Diesel & gases	working fluid steam.
Require less space	Require large space.
Capital cost is relatively low	Capital cost is relatively high.
Starting of this engine is easy and Quick.	Starting of this engine require time.
Thermal efficiency is high	Thermal Efficiency is low
Power develop Per unit weight of these engine is high	Power develop Per unit weight of these engine is low

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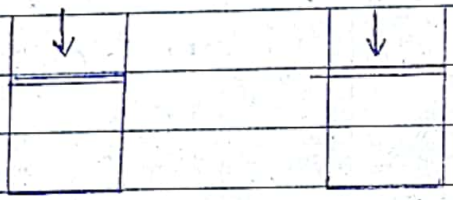
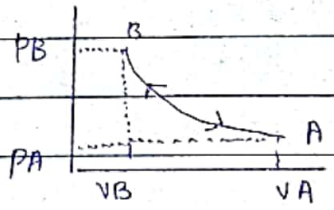
Answer #3 Part (b)

Solution :-



$\Delta Q = 0$

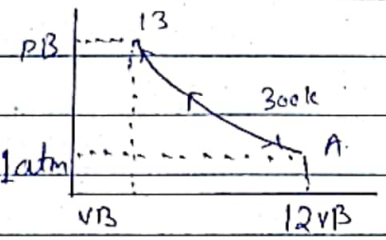


$$P_A V_A^{\gamma} = P_B V_B^{\gamma}$$

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

Solve For BB

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



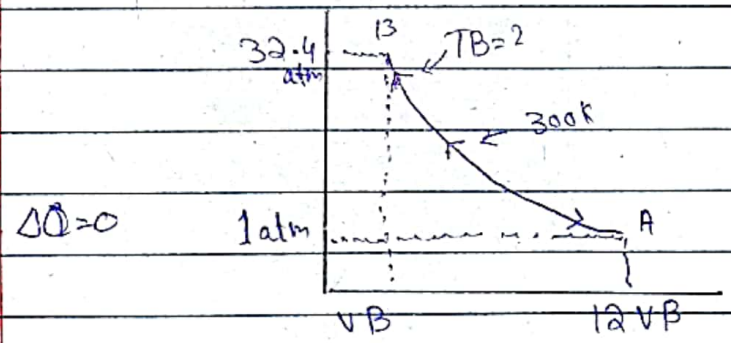
$$P_A V_A^{\gamma} = P_B V_B^{\gamma}$$

Solve for

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

$P_B = 32.4$ atm or 3204 kPa.

Adiabatic Find T_B



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

Solve For T_B

$$\frac{(1\text{ atm})(12V_B)}{(300\text{K})} = \frac{(32.4\text{ atm})(1V_B)}{T_B}$$

$$\boxed{T_B = 810\text{ K}}$$

Answer #04 Part (a)

Q#4 Differentiate between Conduction & Convection.

Conduction	Convection
→ Energy transfered by direct contact.	→ Occurs in gases and liquid.
→ Energy flows directly from warmer to cooler objects.	→ Movement of large number of particles in same direction
→ Continues until object temperature are equal.	→ Cycle occurs while temperature difference exist.

Answer #4 Part (b)

Solution :-

$$Q_{water} = -Q_{pb}$$

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

$$125(4.18)(T_f - 23) = -75(0.13)(T_f - 435)$$

$$522.5\,T_f - 12017.5 = -9.75\,T_f + 4241.25$$

$$+\ 9.75T_f + 12017.5 \qquad +9.75 \quad +12017.5$$

$$532.25\,T_f = 16258.75$$

$$\boxed{T_f = 30.5^{\circ}C}$$

Answer #5

Solution :-

Nothing that heat transfer through the roof is by condition and the area of the roof is ;

$$A = 6m \times 8m = 48\ m^2.$$

The steady rate of heat transfer through the roof is determined to be ;

$$\dot{Q} = kA\frac{(T_1 - T_2)}{L} = (0.8)(48)(25-0 = 3840\ W = 3.84\ kW.$$

The amount of heat lost through the roof during a 10-hour Period and its cost are determined from

$$Q = \dot{Q} \cdot \Delta t = (3.84\ kW)(10h) = 38.4\ kWh.$$

Cost/day = (Amount of energy) (unit cost of energy)

$$= (38.4\ KWh)(\$0.2/kWh) = \boxed{\$\ 7.68}$$

Cost/month = $\$\ 7.68 \times 30 = \boxed{\$\ 230.4}$