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Q1(a) What is Diode? Difference between half wave rectification and full wave rectification?

Ans Diode:

A semiconductor device with two terminals, typically allowing the flow of current in one direction only, A thermionic value having two electrodes (an anode and cathode.)

Difference between Half-wave and full wave ractification.

Half wave	Full wave.
→ Half wave rectifies current only during positive half cycle af the applied input.	Full wave rectifies, both the halves af the input signal is utilized at the same time af operation.
→ It has unidirectional characteristic	It has bidirectional characteristics.
→ Requires only one diode.	Two or even 4 diodes are used in circuit.

Q1(b) A 97.0g of sample of gold - - -

- - - - - - - - - - -

- - - - - - in state of matter.

(water specific heat = 4.184 J/g°C).

To find $T_f = ?$

Solution:

$$-\text{Lose}_{heat} = \text{gain}_{heat}$$

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

$$-[(0.129)(97g)(T_f - 785°C)] = (4.184\ J/g°C)(323g)(T_f - 15°C)$$

$$-[(12.5)(T_f - 785°C)] = (1.35\times10^3)(T_f - 15°C)$$

$$-12.5\,T_f + 9.82\times10^3 = 1.35\times10^3\,T_f - 2.02\times10^4$$

$$3\times10^4 = 1.36\times10^3\,T$$

$$\boxed{T_f = 22.1°C}$$

Q2(a) Explain the Isobaric process, Isometric process, and adiabatic process on the basis of first law of thermodynamics.

Ans: Isobaric process: An isobaric ~~per basic~~ process is a thermodynamic process in which the pressure remains ~~same~~ constant. This is usually obtained by allowing the volume to expand or contract in such a way to neutralize any pressure changes that would be caused by heat transfer.

Explaination:- In an isobaric process, there are typically internal changes. Work is done by the system, and heat is transferred, so none of the quantities in the first law of thermodynamics readily reduce to zero. However, the work at a constant pressure can be fairly easily calculated with the equation.

$$W = P \times \Delta V.$$

Isometric process:-

The volume of the closed system undergoing such a process remains constant. System is confined by mechanically rigid boundaries. According to first law of thermodynamics there is no change in volume, in which case the system does not work.

Isothermal Process:- A process is said to be iso-thermal if the temperature of the process remains at constant during the process. According to thermodynamics process there is no change in temperature.

Adiabatic Process:- In this process the temperature does not remain constant and no heat is transfer into or out of the system.

Q2(b) A steam engine absorbes

How much work is done?

Ans Data:

Heat = Q_H = 600J

T_H = 500K

T_C = 300K

Req:- Work done = ?

Solution:-

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

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

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

$$\boxed{e = 40\%}$$

$$\text{Actual} = 0.5e_i = 20\%$$

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

$$W = e \cdot Q_H$$

$$W = 0.20(600J)$$

$$\boxed{W = 120\,J}$$

Q3(a) Differentiate between internal ~~initial~~ combustion engine and external combustion engine?

Ans:- External vs with an internal combustion chamber lies right in the middle of engine. External engines have a working fluid that is heated by the fuel. Internal combustion engines rely on the explosive power of the fuel within the engine to produce work.

Q3(b) A diatomic gass 300K and 1 atm

... . . - ——— - - — —— .

-. - —— . ——— - —— .

-- What is new temperature? ($\gamma = 1.4$).

Sol^n Data

$T_A = 300K$

$P_A = 1 atm$

$V = \frac{1}{12}$ $(V_A = 12 V_B)$

V_A

Req Now.

$T_B = ?$

$P_B = ?$

Ans

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

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

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

Solution for P_B

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

$$P_B = P_A \left(\frac{12 \cdot V_B}{V_B} \right)^{\gamma = 1.4}$$

$$P_B = P_B \left(\frac{12 V_B}{V_B} \right)^{1.4}$$

$$= (1\ atm)(12)^{1.4}$$

$$P_B = 32.4\ atm \text{ or } 3284\ kPa$$

$T_B = ?$

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

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

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

$$T_B = 810 K$$

Q4(a) Differentiate b/w conduction and convection?

Ans:-

Conduction	Convection:-
→ Heat transfer take place between objects by direct contact.	Heat transfer take place within the fluid. ~~The heat transfer take place due to temperature difference~~
→ The heat transfer due to the difference in temperature	The heat transfer occurs due to difference in density
→ It's slower.	It's faster.

(b) A 75.0g piece of lead . . . — — — — — — — — — — — — — — — — — — . What is final temperature of the mixture?

Ans

Data

$C_{Pb} = 0.130\ J/g°C$

$T_i = 435°C$

$m_1 = 75g$

Mass of water $m_2 = 125g$

$T_i = 23°C$

Req: $T_f = ?$

A Solution:

$$-Q_{water} = -Q_{Pb}$$

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

$$125(4.18)(T_f - 23) = -(75)(0.130)(T_f - 435)$$

$$522.5(T_f - 23) = -(9.75)(T_f - 435)$$

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

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

$$532.25\,T_f = 16258.75$$

$$T_f = \frac{16258.75}{532.25}$$

$$\boxed{T_f = 30.5°C}$$

Q5 The roof of an electricity heated home is 6m long, 8m wide and 0.25m thick & is made of a flat layer of concrete ——

—— $ 0.2/KWh.

Ans Solution

Area of roof = $A = 6m \times 8m = 48m$

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

$Q = KA(T_1 - T_2)/L$

$= (0.8)(48)(25 - 0)/0.25$

$= \dfrac{(0.8)(48)(25)}{0.25}$

$= 3840\ W$

$\boxed{= 3.84\ KW}$

Now The amount of heat lost through the roof during a 10-hours period & its cost are determined from:

$Q = Q \cdot \Delta T$

$= (3.84)(10h)$

$\boxed{Q = 38.4\ kWh}$

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

$= (38.4\ kWh)(\$0.2/kWh) = \$7.68$

Cost/month = (cost/day) x (30 day/month)

$= \$7.68 \times 30$

$\boxed{= \$230.4}$