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@ 1PM

QUESTION SERIES ME

THERMODYNAMICS

60x30 = 1800 QUESTIONS

1500+ QUESTIONS

Time- 1pm Date- 10 april 2023

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Kanisth sir

Q. If the compression or expansion of a gas takes place in such a way that the gas neither gives heat nor takes heat from its surroundings, the process is said to be

(a) Isothermal

(b) Adiabatic ✓

(c) Isobaric

(d) None of these

Q. The unit of work is

(a) kW ⇒ $\frac{kJ}{s}$

(b) kWh ✓

(c) kW/h ×

(d) kJ/s ×

$\frac{kJ}{s}$ ×

Q. Pick the correct statement regarding path function.

(a) The differentials of point functions are inexact differentials

(b) The differentials of point functions & path functions are exact differentials.

(c) The differentials of path function are inexact differentials.

(d) The differentials of path functions are exact differentials.

Q. A heat engine developes 60 kW work having an efficiency of 60%, Amount of heat rejected will be: -

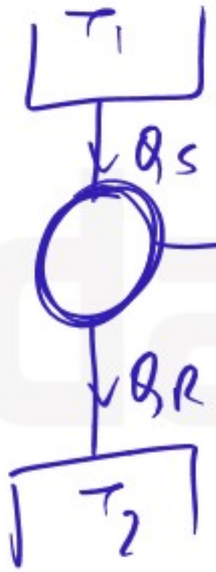
(a) 400 kW

(b) 10 kW

(c) 40 kW

(d) 20 kW

$60 \times 30 \Rightarrow 1800$ ***



$60KW = W$

$Q_S = Q_R + W$

$Q_R = 100 - 60$

$= 40$

$\eta = 60\%$

$0.6 = \frac{W}{Q_S}$

$Q_S = \frac{60}{0.6} \quad 100$

$Q_S = 100$

Q5 In Carnot cycle, addition and rejection of heat takes place at: -

(a) Constant pressure

(b) Constant temperature ✓

(c) Constant volume

(d) Constant speed

Q6. The change of entropy, when heat is absorbed by the gas, is

(a) positive

(b) negative

(c) positive or negative

(d) zero

7

Q. Which one of the following statements applicable to a perfect gas will also be true for an irreversible process?

(a) $\delta Q = dU + pdV$

(b) $dQ = TdS$

(c) $T\delta S = dU + pdV$

(d) None of these

Q. The change in entropy is zero during

(a) Hyperbolic process

(b) Constant pressure process

(c) Reversible adiabatic process

(d) Polytropic process

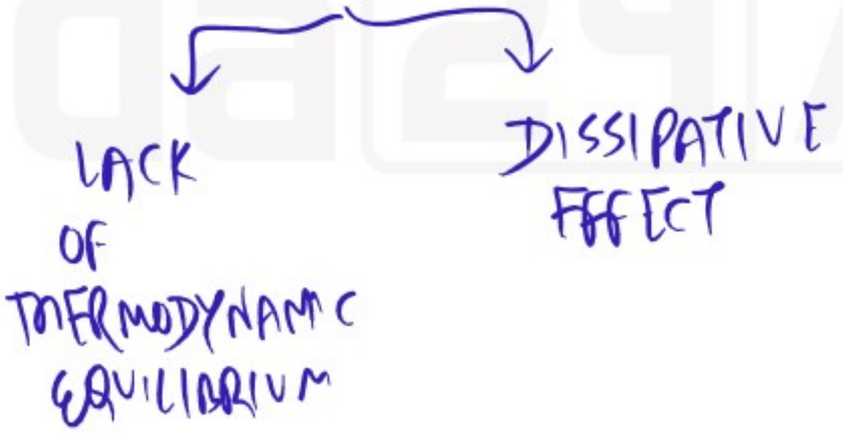
Q. The main cause of the irreversibility is

(a) Mechanical and Fluid Friction

(b) Unrestricted expansion

(c) Heat transfer with a finite temperature difference

(d) All of the above



For a thermodynamic process to be reversible, the temperature difference between hot body and working substance should be (10)

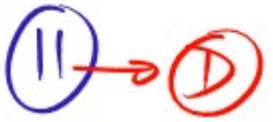
(a) zero
(b) minimum
(d) maximum
(d) infinity

Entropy change depends on

(a) heat transfer (b) mass transfer

(c) change of temperature

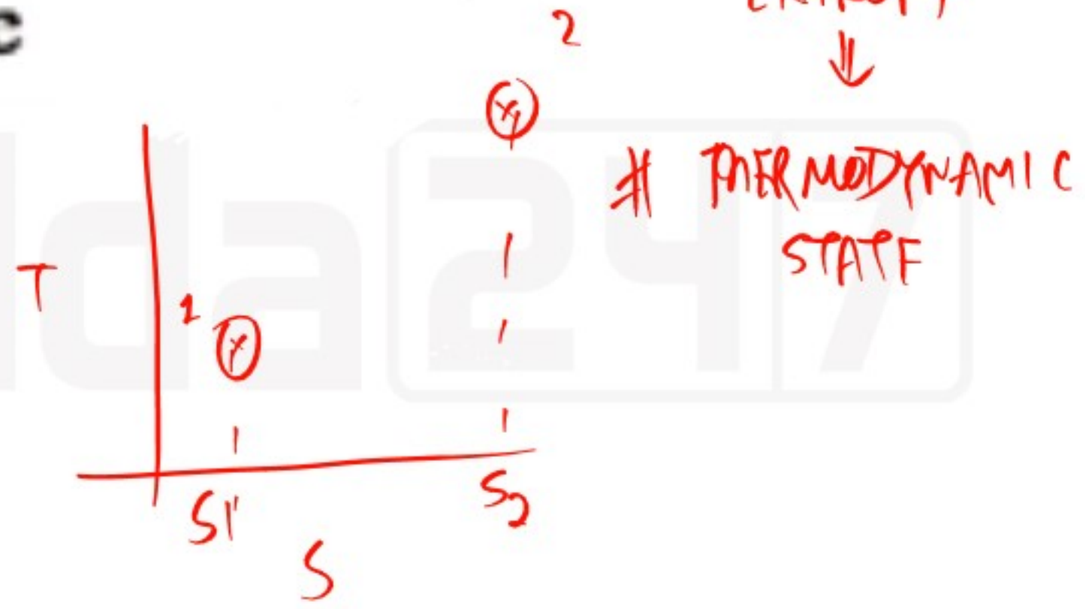
(d) thermodynamic state



ENTROPY

⇓

THERMODYNAMIC STATE



The value of Joule-Kelvin coefficient for an ideal gas is (12 → D)

(a) 1

(b) some – ve value

(c) some + ve value

(d) zero

A diathermic wall is one which

(13)

(a) prevents thermal interaction

(b) permits thermal interaction

(c) encourages thermal interaction

(d) discourages thermal interaction

14 → a

An adiabatic wall is one which

(a) prevents thermal interaction

(b) permits thermal interaction

(c) encourages thermal interaction

(d) discourages thermal interaction

Q. Two reversible engines are connected in series between a heat source and a sink. The efficiencies of these engines are 60% and 50%, respectively. If these two engines are replaced by a single reversible engine, the efficiency of this engine will be

(a) 60%
(b) 70%
(c) 80%
(d) 90%

15 C

$(1-\eta_0) = (1-\eta_1)(1-\eta_2)$

$= (1-0.6)(1-.5)$

$= 0.4 \times 0.5$

$1-\eta_0 = 0.2$

$\eta_0 = 0.8$

$= 80\%$

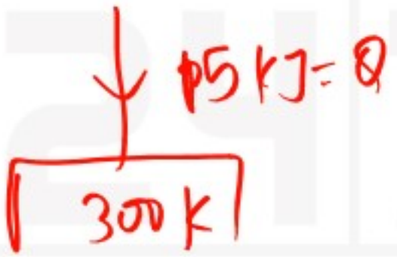
Q. A heat engine transfers 15 kJ of heat to a thermal reservoir at 300 K. The change of entropy of the reservoir in the process is :

(a) $\Delta S_{\text{reservoir}} = -50 \text{JK}^{-1}$

(b) $\Delta S_{\text{reservoir}} = +50 \text{JK}^{-1}$

(c) $\Delta S_{\text{reservoir}} = +200 \text{KJ}^{-1}$

(d) $\Delta S_{\text{reservoir}} = +4500 \text{ kJ. K}$



16

$\Delta S = \frac{+Q}{T_{RFS}}$

$= \frac{15}{300} S$

$= .05 \text{ KJ/K}$

$= 50 \text{ J/K}$

Q. The unit of entropy is

(a) kg/JK

(b) J/kg.m

(c) J/kg K

(d) J / S

17 → C

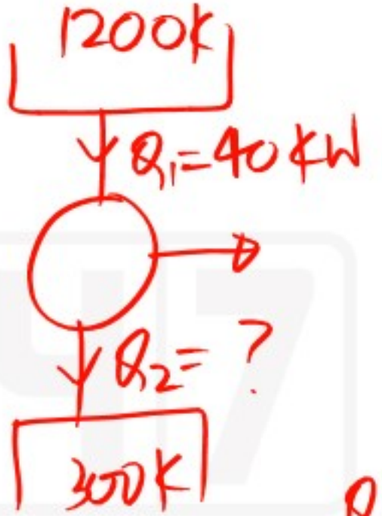
$\Delta S = \int \frac{\delta Q}{T} = \frac{J}{K} \text{ or } \frac{kJ}{K}$

$\Delta S = \frac{J}{kgK}$

A heat engine working on Carnot cycle receives heat at the rate of 40 kW from a source at 1200 K and rejects it to a sink at 300 K. The heat rejected is

(a) 30 kW
(b) 20 kW
(c) 10 kW
(d) 5 kW

(18)



$$\frac{Q_1}{T_1} = \frac{Q_2}{T_2}$$

$$Q_2 = \frac{40 \times 300}{1200}$$

$$= 10 \text{ kW}$$

19
C

Which one of the following statements is **not** correct?

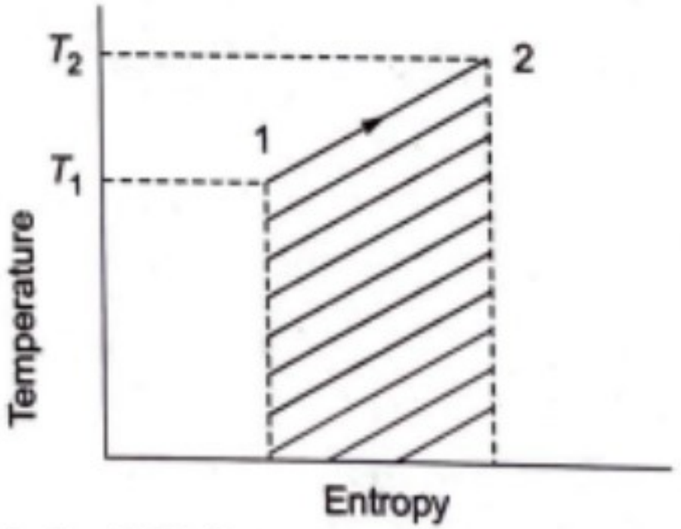
(a) Change in entropy during a reversible adiabatic process is zero ✓

(b) Entropy increases with the addition of heat ✓

(c) Throttling is a constant entropy expansion process ✗

(d) Change in entropy when a gas is heated under constant pressure is given by ✓

$s_2 - s_1 = mC_p \log_e T_2/T_1$



In the T-S diagram shown in the figure, which one of the following is represented by the area under the curve ?

(a) Total work done during the process
(b) Total heat absorbed during the process
(c) Total heat rejected during the process
(d) Degree of irreversibility

Which one of the following is the correct statement? Two adiabatics will

(a) intersect at absolute zero temperature

(b) never intersect

(c) become orthogonal at absolute zero temperature

(d) become parallel at absolute zero temperature

(21)

S → PRACTICE

J → CONCEPT

The statement that the entropy of a pure substance in complete thermodynamic equilibrium becomes zero at the absolute zero of temperature is known as

(a) law of entropy.
(b) first law of thermodynamics.
(c) second law of thermodynamics.
(d) third law of thermodynamics.

Which one of the following expressions for Tds is true for a simple compressible substance? (Notations have the usual meaning)

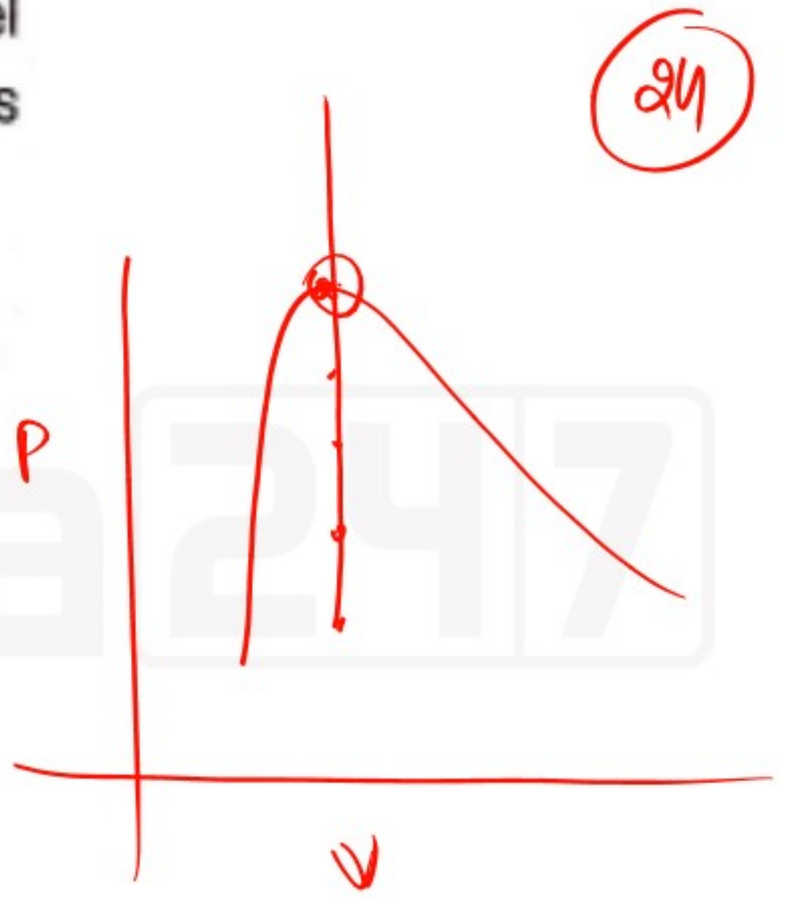
(a) $dh - vdp$ (b) $dh + vdp$

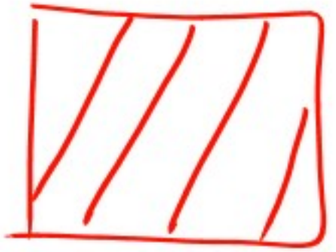
(c) $dh - pdv$ (d) $dh + pdv$

If a pure substance contained in a rigid vessel passed through the critical state on heating, its initial state should be

(a) subcooled water (b) saturated water

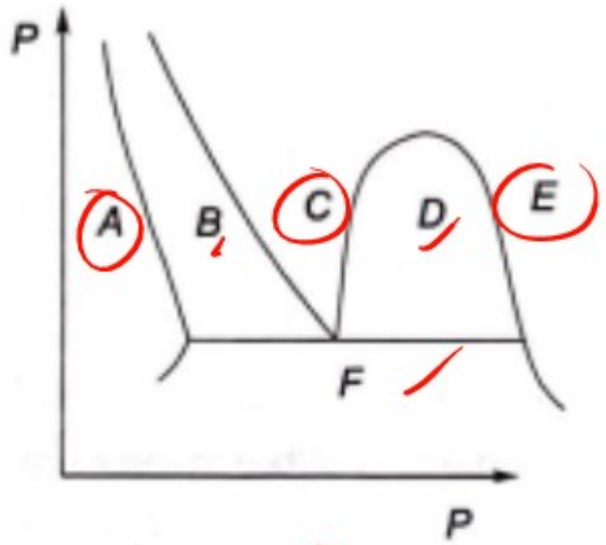
(c) wet steam (d) saturated steam





$\frac{V}{m} = v$

Two-phase regions in the given pressure-volume diagram of a pure substance are represented by



(a) *A*, *E* and *F*
(b) *B*, *C* and *D*
(c) *B*, *D* and *F*
(d) *A*, *C* and *E*

25 → C

1 PM (5 to 6) X 30

₹1500 to 1800 QUESTION

Triple point temperature of water is

(a) 273 K (b) 273.14 K

(c) 273.15 K (d) 273.16 K

Dryness fraction of steam means the mass ratio of

(a) wet steam to dry steam

(b) dry steam to water particles in steam

(c) water particles to total steam

(d) dry steam to total steam

Which one of the following is the correct statement? Steam is said to be superheated when the

(a) actual volume is greater than volume of saturated steam

(b) actual volume is less than volume of saturated steam

(c) actual volume is equal to volume of saturated steam

(d) None of the above

Which one of the following properties remains unchanged for a real gas during Joule—Thomson process?

(a) Temperature
(b) Enthalpy
(c) Entropy
(d) Pressure

If h, p, T and v refer to enthalpy, pressure, temperature and specific volume respectively; and subscripts g and f refer to saturation conditions of vapour and liquid respectively, then Clausius-Clapeyron equation applied to change of phase from liquid to vapour states is

(a) $\frac{dp}{dt} = \frac{(h_g - h_f)}{(v_g - v_f)}$ (b) $\frac{dp}{dt} = \frac{(h_g - h_f)}{T(v_g - v_f)}$

(c) $\frac{dp}{dt} = \frac{(h_g - h_f)}{T}$ (d) $\frac{dp}{dt} = \frac{(h_g - h_f)T}{(h_g - h_f)}$

For an ideal gas, the expression

$$\left[T\left(\frac{\partial s}{\partial T}\right)_p - T\left(\frac{\partial s}{\partial T}\right)_v\right]$$ is equal to

(a) zero
(b) C_p / C_v
(c) R
(d) RT

For a gas, pressure p, volume v and temperature T are dependent on each other. Then which one of the following p -v -T relationship will be obeyed?

(a) $\left(\frac{\partial p}{\partial T}\right)_v\left(\frac{\partial v}{\partial T}\right)_p\left(\frac{\partial v}{\partial p}\right)_T = -1$

(b) $\left(\frac{\partial p}{\partial T}\right)_v\left(\frac{\partial T}{\partial v}\right)_p\left(\frac{\partial v}{\partial p}\right)_T = -1$

(c) $\left(\frac{\partial p}{\partial T}\right)_v\left(\frac{\partial v}{\partial T}\right)_p\left(\frac{\partial p}{\partial v}\right)_T = -1$

(d) $\left(\frac{\partial p}{\partial T}\right)_v = \left(\frac{\partial T}{\partial v}\right)_p\left(\frac{\partial p}{\partial v}\right)_T$

Which one of the following is the correct statement? Clapeyron equation is used for

(a) finding specific volume of vapour
(b) finding specific volume of liquid
(c) finding latent heat of vaporization
(d) finding sensible heat

Constant pressure lines in the super-heated region of the Mollier diagram have what type of slope?

(a) A positive slope
(b) A negative slope
(c) Zero slope
(d) May have either positive or negative slopes

According to the Maxwell relation, which of the following is/are correct?

(a) $\left(\frac{\partial v}{\partial T}\right)_P = -\left(\frac{\partial s}{\partial P}\right)_T$

(b) $\left(\frac{\partial s}{\partial v}\right)_T = -\left(\frac{\partial P}{\partial T}\right)_v$

(c) $\left(\frac{\partial P}{\partial T}\right)_v = \left(\frac{\partial s}{\partial v}\right)_T$

(d) All of the above

If u, T, v, s, h and p refer to internal energy temperature, volume, entropy, enthalpy and pressure respectively; and subscript 0 refers to environmental conditions, availability function for a closed system is given by

(a) $u + p_0v - T_0s$ (b) $u - p_0v + T_0s$

(c) $h + p_0v - T_0s$ (d) $h - p_0v + T_0s$

In free expansion of a gas between two equilibrium states, the work transfer involved

(a) can be calculated by joining the two states on p-v coordinates by any path and estimating the area below

(b) can be calculated by joining the two states by a quasistatic path and then finding the area below

(c) is zero

(d) is equal to heat generated by friction during expansion

Variation of pressure and volume at constant temperature are correlated through

(a) Charle'slaw
(b) Boyle's law
(c) Joule's law
(d) Gay Lussac's law

For a non-flow constant pressure process the heat exchange is equal to

(a) zero
(b) the work done
(c) the change in internal energy
(d) the change in enthalpy

The equation of state :

$$pv = RT\left(1+\frac{B}{v}+\frac{C}{v^2}+\frac{D}{v^3}+\ldots\right),$$

is known as

(a) Van der Waals equation

(b) Benedict-Webb-Rubin equation

(c) Gibbs equation

(d) Virial equation

Which one of the following is the correct expression for change in the internal energy for a small temperature change ΔT for an ideal gas?

(a) $\Delta U = C_v \times \Delta T$ (b) $\Delta U = C_p \times \Delta T$

(c) $\Delta U = \frac{C_p}{C_v} \times \Delta T$ (d) $\Delta U = (C_p - C_v)\Delta T$

What is the ratio of the slopes of p-v curves for an adiabatic process and an isothermal process?

(a) $\frac{1}{\gamma}$

(b) $\gamma + 1$

(c) γ

(d) $\frac{1}{\gamma} + 1$

For a gas that is allowed to expand reversibly and adiabatically, there is no change in

(a) internal energy (b) temperature

(c) entropy (d) enthalpy

Q. A series of operations, which takes place in a certain order and restore the initial conditions at the end, is known as

(a) Reversible cycle

(b) Irreversible cycle

(c) Thermodynamic cycle

(d) None of these

Q. A 120 - V electric resistance heater draws 10 A. It operates for 10 min in a rigid volume. Calculate the work done on the air in the volume.

(a) 720000 kJ

(b) 720 kJ

(c) 12000 J

(d) 12 kJ

Q. Which of the following processes is irreversible process

(a) Isothermal

(b) Adiabatic

(c) Throttling

(d) All of the above

Q. In a reversible adiabatic process the ratio (T_1/T_2) is equal to -

(a) $\left(\frac{p_1}{p_2}\right)^{\frac{\gamma-1}{\gamma}}$

(b) $\left(\frac{v_1}{v_2}\right)^{\frac{\gamma-1}{\gamma}}$

(c) $(v_1 v_2)^{\frac{\gamma-1}{2\gamma}}$

(d) $\left(\frac{v_2}{v_1}\right)^{\gamma}$

Q. In the polytropic process equation PV^n = constant if n is infinitely large, the process is termed as -

(a) Constant volume

(b) Constant pressure

(c) Constant temperature

(d) Adiabatic

Q. Internal energy of system containing perfect gas depends on

(a) Pressure only

(b) Temperature only

(c) Pressure and temperature

(d) Pressure temperature and specific heat

Q. Which of the following equations is incorrect? (where V,P,T and Q are volume, pressure, temperature and heat transfer respectively)

(a) $\oint dV = 0$

(b) $\oint dP = 0$

(c) $\oint dT = 0$

(d) $\oint dQ = 0$

Q. A polytropic process with n = –1, initiates with P = V = 0 and ends with P = 600 kPa and V = 0.01 m3. The work done is

(a) 2 kJ

(b) 3 kJ

(c) 4 kJ

(d) 6 kJ

Q. For an ideal gas, enthalpy is represented by

(a) $H = U - RT$

(b) $H = U + RT$

(c) $H = RT - U$

(d) $H = -(U + RT)$

Q. Certain quantities cannot be located on the graph by a point but are given by the area under the curve corresponding to the process. These quantities in concepts of thermodynamics are called as

(a) cyclic functions

(b) point functions

(c) path functions

(d) real functions

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