PHYSICS

BOOKS - BHARATI BHAWAN PHYSICS (HINGLISH)

SECOND LAW OF THERMODYNAMICS

Others

1. A Carnot engine works between temperature $0^{\circ} C$ and $100^{\circ} C$. Calculate its efficiency.

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2. Carnot engine working as a refrigerator between $260K$ and $300K$ receives $500cal$ of heat from the freezing chamber. Calculate the heat rejected by it to the higher temperature reservior and also the work done per cycle to operate the refrigerator.

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3. Calculate change in entropy when $5g$ of pure ice melts to form water at $0^\circ C$ Given latent heat of ice is $80cal/g$ at $0^\circ C$.

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4. A mass m of water at T_1 is mixed with an equal mass of water at T_2. Find the change in entropy in the process Sp. Heat capacity of water $= C$.

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5. Show that the entropy of a perfect gas can be written as $S = C_v Inp + C_p InV + S_0$ where S_0 is a constant.

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6. A Carnot engine works between two temperatures differing by $100^\circ C$. If it absorbs $746J$ of heat and gives $546J$ of heat ot the sink, calculate the temperature of the source and sink.

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7. In a two stage heat engine a quantity of heat Q_1 is absorbed at a temperature T work W_1 is done and a quantity of heat Q_2 expelled at a lower temperature T_2 by the first state. The second state absorbs the heat expelld by the first, does work W_2 and expels a quanity of heat Q_3 at a lower temperature T_2 Calculate the effiency of the combination engine.

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8. In a Carnot engine the temperature of the source and sink are T and T'', respectively. In the first instant the temperature of the source is increased by ΔT, keeping the sink at T'' and then T'' is decreased by ΔT keeping the source at T. In which case does the engine have greater efficiency?

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9. In a mechanical refrigerator the low - temperature coils are at a temperature of $-13^{\circ}C$ and the compressed gas in the condenser at a temperature $27^{\circ}C$. What is the theoretical coefficient of performance.

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10. Find the efficiency of a cycle consisting of two isochoric and two adiabatic lines if the

volume of the ideal gas changes $n = 10$ times within the cycle. The working gas has $\gamma = 1.5$.

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11. Calculate the efficiency of a cycle consisting of two isobaric and two adiabtic lines, if the pressure changes $n = 10$ times within the cycle. The working substances is an ideal gas of adiabatic exponent $\gamma = 1.5$.

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12. The heat capacity of a refrigerating chamber is $80000cal$. Calculate the time in which the temperature of the chamber is reduced from $0.5^\circ C$ ot $0^\circ C$ if the power of the motor working the machine is $300W$. Ambient temperature $= 27^\circ C$.

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13. In a specific heat experiment $100g$ of lead (sp. Heat $= 145Jkg^{-1}K^{-1}$) at $100^\circ C$ is

mixed with $200g$ of water at 20°. Find the change in entropy.

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14. The entropy of $v = 4.0$ moles of an ideal gas increases by $\Delta S = 23J/K$ due to the isothermal expansion. How many times should the volume $v = 4.0$ moles of the gas be increased ?

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15. A brass rod is in thermal contact with a heat reservoir at $127^\circ C$ at one end and a heat reservoir at $27^\circ C$ at the other end. Find the total change in entropy arising from the process of conduction of 1200 cal of heat through the rod. Does the entropy of the rod change?

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16. Show that the entropy of a perfect gas is given by $S = C_V InT + RInV + S_0$

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