PHYSICS

NCERT - NCERT PHYSICS(ENGLISH)

THERMODYNAMICS

Exercise

1. A geyser heats water flowing at the rate of 3 kg per minute from $27^{\circ}C$ to $77^{\circ}C$. If the geyser operates on a gas burner, what is the

rate of consumption of fuel if the heat of combustion is $4 \times 10^4 J/g$? Given specific heat of water is $4.2 \times 10^3 J/kg/K$.

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2. What amount of heat must be supplied to $2 \times 10^{-2} Kg$ of nitrogen at room temperature to rise its temperature by $45^\circ C$ at constant pressure? Given molecular mass of nitrogen is 28 and $R = 8.3 Jmole^{-1} K^{-1}$

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3. Explain why

(a) Two bodies at different temperature T_1 and T_2 if brought in thermal contact do not necessarily settle to the mean temperature $(T_1 + T_2)/2$?

(b) The coolant in a chemical or nuclear plant (i.e., the liquid used to prevent different parts of a plant from getting too hot)should have high specific heat. Comment.

(c) Air pressure in a car tyre increases during driving . Why?

(d) The climate of a harbour town is more temperature (i.e., without extremes of heat and cold) than that of a town in a desert at the same latitude. Why?

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4. A cyclinder with a movable piston contains $3mols$ of hydrogen at standard temperature and pressure. The walls of the cyclinder are made of a heat insulator, and the piston is insulated by having a pile of sand on it. By

what factor does the pressure of the gas increases, if the gas is compressed to half its original volume? Given $\gamma = 1.4$.

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5. In changing the state of a gas adiabatically from an equilibrium state A to another equilibrium state B, an amount of work equal to $22.3J$ is done on the system. If the gas is taken from State A to B via a process in which the net heat absorbed by the system is $9.35cal$

., How much is the net work done by the system in the later case? (Take $1cal. = 4.9J$)

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6. Two cyclinder A and B of equal capacity are connected to eachother via a stopcock. The cyclinder A contains an ideal gas at standard temperature and pressure, while the cyclindr B is completely evacuated. The entire system is thermally insulated. The stopcock is suddenly opened. Answer the following:

(a) What is the final pressure of the gas in A and B?

(b) What is the change in internal energy of the gas?

(c) What is the change in temperature of a gas?

(d) Do the intermidiate states of the system (before settling to the final equilibrium state)lie on its $P - V - T$ surface?

A. What is the final pressure of the gas in A and B ?

B. What is the change in internal energy of the gas ?

C. What is the change in the temperature of the gas ?

D. Do the intermediate states of the system (before settling to the final equilibrium state) lie on its P.V.T surface ?

Answer:

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7. A stream engine delivers $5.4 \times 10^8 J$ of work per minute and absorbs $3.6 \times 10^9 J$ of heat per minute from its boiler. What is the efficiency of the engine? How much heat is wasted per minute?

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8. An electric heater supplies heat to a system at a rate of $100W$. If sustem performs work at a rate $74 Joe\underline{s}$ per second, at what rate is the internal energy increasing?

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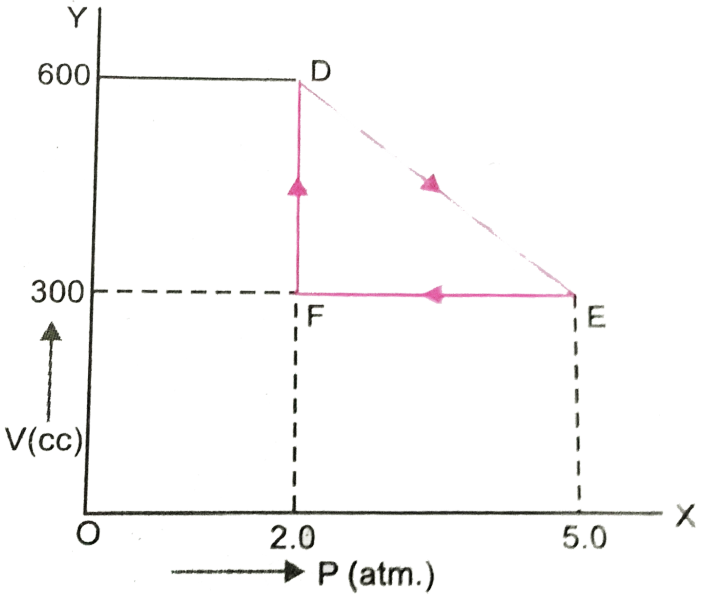
9. A thermodynamic system is taken from an original state D to an intermediate state E by the linear process shown in (figure)



Its volume is then reduced to the original

value from E to D via F by an isobaric process. Calculate the total work done by the gas from D to E to F to D.

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10. A refrigerator is to maintain eatables kept inside at $9^{\circ}C$, if room temperature is $36^{\circ}C$. Calculate the cofficient of performance.

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