



# PHYSICS

## NCERT - NCERT PHYSICS(TELUGU)

### THERMODYNAMICS

#### Exercises

1. A geyser heats water flowing at the rate of 3.0 litres 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 the fuel if its heat of combustion is  $4.0 \times 10^4 J/g$  ?



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2. What amount of heat must be supplied to  $2.0 \times 10^{-2} kg$  of nitrogen (at room temperature) to raise its temperature by  $45^\circ C$  at constant pressure ? (Molecular mass of  $N_2 = 28$ ,  $R = 8.3 J mol^{-1} K^{-1}$ .)



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### 3. Explain why

(a) Two bodies at different temperatures  $T_1$  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 a nuclear plant (i.e., the liquid used to prevent the different parts of a plant from getting too hot) should have high specific heat.

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

(d) The climate of a harbour town is more

temperate than that of a town in a desert at the same latitude.



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4. A cylinder with a movable piston contains 3 moles of hydrogen at standard temperature and pressure. The walls of the cylinder 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

increase if the gas is compressed to half its original volume ?



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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 22.3 J 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 9.35

cal, how much is the net work done by the system in the latter case ? (Take  $1 \text{ cal} = 4.19 \text{ J}$ )



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6. Two cylinders A and B of equal capacity are connected to each other via a stopcock. A contains a gas at standard temperature and pressure. 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 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 ?



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7. A steam engine delivers  $5.4 \times 10^8 J$  of work per minute and services  $3.6 \times 10^9 J$  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 system performs work at a

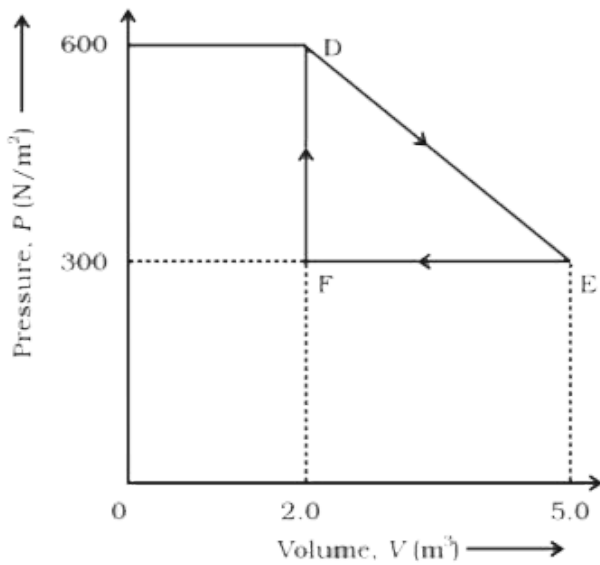


rate of 75 joules per second. At what rate is the internal energy increasing?



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**9.** A thermodynamic system is taken from an original state to an intermediate state by the linear process shown in Fig. (12.13)



Its volume is then reduced to the original value from E to F by an isobaric process. Calculate the total work done by the gas from D to E to F



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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 coefficient of performance.



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