

QUES 02:-

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?

**Sol.** Here the process is adiabatic compression and  $V_2 = \frac{V_1}{2}$ ,  $P_2 = 1 \text{ atm}$  and for hydrogen (a diatomic gas)  $\gamma = 1.4$ .

$$\therefore P_1 V_1^\gamma = P_2 V_2^\gamma$$

$$\text{Hence } P_2 = P_1 \left( \frac{V_1}{V_2} \right)^\gamma = 1 \text{ atm} \left( \frac{V_1}{\frac{V_1}{2}} \right)^{1.4}$$

$$\Rightarrow P_2 = (2)^{1.4} \text{ atm}$$

$$= 2.64 \text{ atm}$$