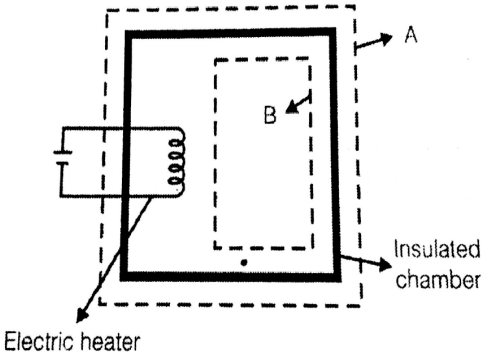
1. An electric heater is put inside an insulated chamber containing a gas. Considering the system boundaries A and B as shown in the figure we have



(a) Heat transfer across A and B
(b) Heat transfer across A, work transfer across B
(c) Work transfer across A, work transfer across B
(d) Work transfer across A, Heat transfer across B

2. A certain mass of air is initially at 260^0C and 700kPa and occupies 0.028 m^3. The air is expanded at constant pressure to 0.084 m^3. A polytropic process with $n = 1.50$ is then carried out followed by a constant temperature process which completes the cycle. Considering all processes as reversible, the net work of the cycle is _____kJ

3. During a thermodynamic process, 100 kJ of heat is transferred from a reservoir at 800K to a sink at 400K. The ambient temperature is 300K. The loss of available energy is _____kJ

4. A system is partitioned into two equal parts. An intensive property of each part will
(a) Become half
(b) Remain unchanged
(c) Double
(d) Depend on the nature of intensive property

5. A mass of 8 kg gas expands with in a flexible container so that the p-v relation is of the form $PV^{1.2} =$ constant. The initial pressure is 1000kPa and initial volume is 1m^3. Final pressure us 5kPa. If specific internal energy of gas decreases by 40 kJ/kg, magnitude of heat transfer will be _____ kJ

Common Data for 6, 7
A reversible heat engine receives heat inputs of 300kJ and 200 kJ from two thermal reservoirs at 1000K and 800K, respectively. The engine rejects heat (Q) to a reservoir at 300 K

6. The value of Q is
(a) 65 kJ (b) 165 kJ
(c) 100 kJ (d) 265 kJ

7. The work delivered by the engine is
(a) 35 kJ (b) 135 kJ
(c) 235 kJ (d) 335 kJ

8. Two kg of water at 80^0C are mixed adiabatically with 3kg of water at 30^0C in a constant pressure process of 1 atmosphere. The increase in the entropy of the total mass of water due to mixing process is _____ kJ/K

9. A heat engine is developed which operates with a nuclear-fuel-generated energy source whose temperature is 550K and a sink at 300K that radiates waste heat. This engine is claimed to produce 5 kW power while rejecting heat at a rate of 15000 kJ/hr. The engine can be called as
(a) a reversible engine (b) an irreversible engine
(c) an impossible engine (d) none of the above

10. A copper block of 600g mass and C_p of 150J/k at 100^0C is placed in a lake at 8^0C. As a result of this process, the entropy change of the universe is _____ J/K