Question 237

In this question use: W = work, Q = heat, S = Entropy. Which of the following are state functions, i.e. path independent? 1. W 2. Q-W 3. S 4. Q 5. Q-2*W
(a)   Only 2.
(b)   3 and 4.
(c)   1, 2 and 4.
(d)   2 and 5.
(e)   2, 3.

19-10   Some Special Cases of the First Law of Thermodynamics

Question 238

Nitrogen gas (m = 1.00 kg) is confined in a cylinder with a movable piston at a pressure of 1 atm. A quantity of heat of 25 kcal is added to the gas in an isobaric process, and its internal energy increases by 8 kcal. What is the change in the volume of the gas?
(a)   1.4 m**3
(b)   1.2 m**3
(c)   0.4 m**3
(d)   0.2 m**3
(e)   0.7 m**3

Question 239

Which one of the following statements is true?
(a)   In an adiabatic process, the heat flow is positive
(b)   In an isovolumetric process, the work done is positive
(c)   The internal energy of a system is not a state function
(d)   In a cyclic process, the change in internal energy is zero
(e)   In an isobaric process, the change in internal energy is always zero

Question 240

One gram of water is heated from 0 degree-C to 80 degree-C at a constant pressure of 1 atm. Determine the change in internal energy of the water. Neglect the change in volume of the water. (Cwater = 4186 J/kg*K.)
(a)   50 cal
(b)   80 cal
(c)   100 cal
(d)   250 cal
(e)   180 cal

Question 241

Assume an ideal gas expands adiabatically. Which one of the following statements is TRUE.
(a)   the temperature of the gas increases.
(b)   the pressure of the gas increases.
(c)   the internal energy of the gas remains constant.
(d)   the temperature of the gas decreases.
(e)   the pressure of the gas remains constant.

Question 242

In a certain process a gas ends in its original thermodynamic state. Of the following statements, which is possible as the net result of the process?
(a)   The gas absorbs 50 J of heat and 50 J of work is done on it.
(b)   The gas does no work but rejects 50 J of heat.
(c)   The gas does no work but absorbs 50 J of heat.
(d)   The gas absorbs 50 J of heat and does 50 J of work.
(e)   The gas rejects 50 J of heat and does 50 J of work.

19-10

Question 243   0.36-34%
One gram of water is cooled from 100 degrees-C to zero degrees-C and becomes all ice.
Determine the change in internal energy during this process. (Neglect any change in the
volume of the water.) (For water: C= 4186 J/kg degrees-C and Lf= 3.33*10**5 J/kg.)
(a)   752 J
(b)   -752 J
(c)   -100 J
(d)   419 J
(e)   -419 J

19-10

Quest on 244
Two kilograms of water, at 100 degree Celsius, occupy a volume of 2.0*10**-3 m**3. When
this amount of water is boiled, at atmospheric pressure, it becomes 3.3 m**3 of steam. Find
the change in the inernal energy.
(a)   3.4*10**4 J.
(b)   4.2*10**6 J.
(c)   - 4.2*10**6 J.
(d)   2.1*10**6 J.
(e)   - 2.1*10**6 J.

19-10

Question 245
3.00-kg of water at 100 degrees Celsius is converted to steam at 100 degrees Celsius by
boiling at one atmospheric pressure. For one kg of water, the volume changes from an initial
value of 1.0*10**(-3) m**3 as a liquid to 1.671 m**3 as steam. The work done by the water
in this process is:
(a)   5.07*10**5 J.
(b)   1.23*10**5 J.
(c)   1.69*10**5 J.
(d)   2.45*10**5 J.
(e)   3.01*10**5 J.

19-10

Question 246   0.37-31%
Which of the following statements is CORRECT for a gas undergoing an adiabatic process:
(a)   The pressure of the gas remains constant.
(b)   The temperature of the gas remains constant.
(c)   The volume of the gas remains constant.
(d)   There is no heat exchange between the gas and its environment.
(e)   The internal energy of the gas is always zero.

19-10

Question 247   0.45-51%
A system undergoes an adiabatic process in which its internal energy increases by 20 J.
Which of the following correctly describes changes in the system ?
(a)   Heat: 40 J added,   Work: 20 J by the system
(b)   Heat: 20 J added,   Work: none
(c)   Heat: none,   Work: 20 J by the system
(d)   Heat: 20 J removed,   Work: none
(e)   Heat: none,   Work: 20 J on the system

Question 248
A gas is compressed at a constant pressure of 0.800 atm from a volume of 9.00 L to a volume of 2.00 L. In the process, 400 J of heat flows out of the gas. What is the change in the internal energy of the gas ?
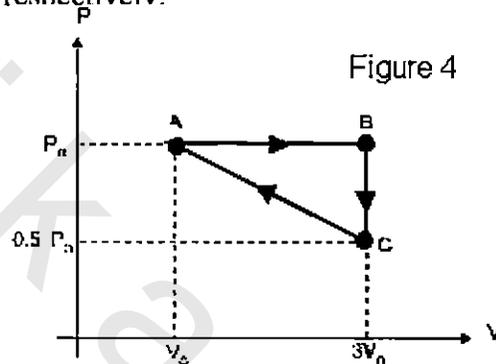(a)   - 966 J
(b)   - 566 J
(c)   566 J
(d)   - 166 J
(e)   166 J

Question 249
An ideal gas is taken through the cycle ABCA, shown in figure 4. The work done along the paths AB, BC and CA, are respectively:
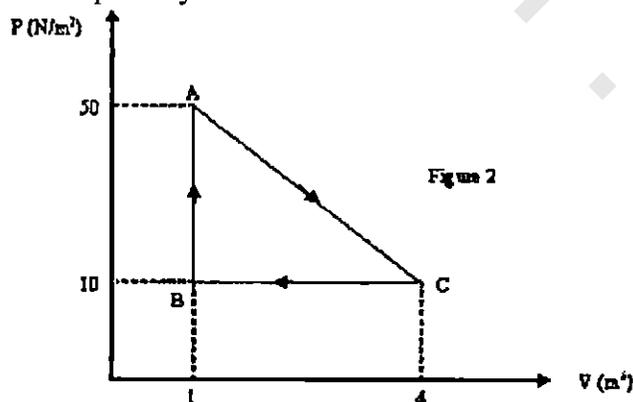

Figure 4

(a)   2*Po*Vo, zero , +1.5*Po*Vo
(b)   2*Po*Vo, zero , -2*Po*Vo
(c)   2*Po*Vo, zero , -1.5*Po*Vo
(d)   2*Po*Vo, Po*Vo, -1.5*Po*Vo
(e)   2*Po*Vo, zero , -Po*Vo

Question 250
Gas within a closed chamber undergoes the cycle shown in Fig. 2. Calculate the net heat added to the system in a complete cycle.

Figure 2

(a)   10   J.
(b)   73   J.
(c)   14   J.
(d)   31   J.
(e)   60   J.