Unit 7 - Week 4 :

Assignment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-08-28, 23:59 IST.

1) The first law of thermodynamics is a principle of *1 point*

(a) Conservation of mass
(b) Conservation of momentum
(c) Conservation of energy
(d) None of the above

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c

2) Which among the following statements is TRUE? *1 point*

(a) Energy can be either created or destroyed during a process.
(b) Energy can be neither created nor destroyed during a process; it can only change forms.
(c) Energy can only be created but not destroyed during a process.
(d) Energy can only be destroyed but not created during a process.

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

3) Consider a closed system undergoing a cyclic process. The difference between the amount of work done by the system and the amount of heat transferred to the system to bring the system back to its initial state is *1 point*

(a) Always greater than zero
(b) Always less than zero
(c) Always equal to zero
(d) May be greater or lesser than or equal to zero

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

4) Which among the following properties is defined by the first law of thermodynamics? *1 point*

(a) Temperature
(b) Kinetic energy
(c) Potential energy
(d) Total energy

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

5) *1 point*

Which among the following statements is TRUE?

(a) Both work done by a closed system and heat transferred to the system are path functions. Therefore their difference is also a path function.
(b) Both work done by a closed system and heat transferred to the system are path functions. But their difference is a point function.
(c) Both work done by a closed system and heat transferred to the system are point functions. Therefore their difference is also a point function.
(d) Both work done by a closed system and heat transferred to the system are point functions. But their difference is a path function.

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

6) Which among the following statements is TRUE regarding an isolated system? *1 point*

(a) The total energy of an isolated system always remains constant.
(b) The total energy of an isolated system always increases.
(c) The total energy of an isolated system always decreases
(d) The total energy of an isolated system may increase or decrease or remain constant.

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a

7) Consider the equation: *1 point*

$$dh = c_p\, dT$$

Which among the following statements regarding the applicability of this equation is/are TRUE?

(a) For a substance like water, it is valid ONLY for a constant pressure process (assuming no phase change during the process).
(b) For a substance like water, it is valid for ANY process (assuming no phase change during the process).
(c) For an ideal gas, it is valid ONLY for a constant pressure process.
(d) For an ideal gas, it is valid for ANY process.

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
a
d

8) A constant-pressure piston/cylinder assembly contains 0.8 kg water as saturated vapor at 600 kPa. It is now cooled so that the water occupies half of the original volume. Find the heat transferred to the water in this process. *1 point*

(a) -855.5 kJ
(b) -1069.4 kJ
(c) -781.5 kJ
(d) -74 kJ

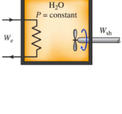
a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:

9) An insulated piston/cylinder device initially contains 8 L of saturated liquid water at a pressure of 175 kPa. Water is stirred by a paddle wheel while a current of 8 A flows for 45 min through a resistor placed in the water. Assume pressure of the water to be constant during this process. If one-half of the liquid (by mass) is evaporated during this constant-pressure process and the paddle wheel work amounts to 800 kJ, determine the voltage of the source. *Hint:* Energy dissipated per unit time by the resistor is given by the formula: *1 point*

$$P = VI$$

where V is the voltage drop across the resistor and I is the current through the resistor.



(a) 320 V
(b) 351 V
(c) 394 V
(d) 425 V

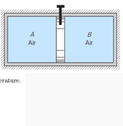
a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

10) *1 point*

Common Data for Questions 10 and 11

An insulated rigid cylinder is divided into two parts of 1 m^3 each by an initially locked piston, as shown in the figure. Side A has air at 200 kPa, 300 K, and side B has air at 1.0 MPa, 1000 K. The piston is now unlocked so that it is free to move, and it conducts heat so that the air comes to a uniform temperature $T_4 = T_B$. Assume air as an ideal gas with constant specific heats.



Determine the final temperature.

(a) 360 K
(b) 580 K
(c) 640 K
(d) 720 K

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
d

11) Find the final pressure. *1 point*

(a) 720 kPa
(b) 600 kPa
(c) 520 kPa
(d) 360 kPa

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
b

12) An insulated rigid tank is divided into two compartments of different volumes. Initially, each compartment contains the same ideal gas at identical pressure but at different temperatures and masses. The wall separating the two compartments is removed and the two gases are allowed to mix. Assuming constant specific heats, find the simplest expression for the mixture temperature written in the form *1 point*

$$T_3 = f\left(\frac{m_1}{m_2}, \frac{m_2}{m_1}, T_1, T_2\right)$$

where m_3 and T_3 are the mass and temperature of the final mixture, respectively.

(a) $T_3 = \left(\frac{m_1}{m_3}\frac{1}{T_1} + \frac{m_2}{m_3}\frac{1}{T_2}\right)^{-1}$
(b) $T_3 = \left(\frac{m_2}{m_3}\frac{1}{T_1} + \frac{m_1}{m_3}\frac{1}{T_2}\right)^{-1}$
(c) $T_3 = \frac{m_1}{m_3}T_1 + \frac{m_2}{m_3}T_2$
(d) $T_3 = \frac{m_2}{m_3}T_1 + \frac{m_1}{m_3}T_2$

a
b
c
d

No, the answer is incorrect.
Score: 0
Accepted Answers:
c