

# Unit 11 - Week 9 : Balances on Transient Process

<b>Course outline</b>
How does an NPTEL online course work?
<b>Week 0 : Prerequisite</b>
<b>Week 1: Introduction</b>
<b>Week 2: Process Variables and Rate</b>
<b>Week 3: Fundamentals of Material Balance</b>
<b>Week 4: Basic Principles of Compressible System</b>
<b>Week 5 : Basic principles of multiphase system</b>
<b>Week 6 : Energy and Its Forms</b>
<b>Week 7 : Energy Balances on Nonreactive Processes</b>
<b>Week 8 : Energy Balances on Reactive Systems</b>
<b>Week 9 : Balances on Transient Process</b>
<input type="radio"/> Lecture 1: Material balance of transient process <input checked="" type="radio"/> Lecture 2: Unsteady state energy balance <input type="radio"/> Quiz : Assignment 9 <input type="radio"/> Feedback form
<b>Week 10 : Computational Techniques</b>
<b>Week 11 : Computer-aided balance calculations</b>
<b>Week 12 : Case Study for a Process</b>
<b>Download Videos</b>
<b>Text Transcripts</b>

## Assignment 9

The due date for submitting this assignment has passed. **Due on 2020-04-01, 23:59 IST.**  
 As per our records you have not submitted this assignment.

- 1) Which of the following is correct 1 point
- Accumulation = Input – Output + Generation - Consumption
  - Accumulation = Input + Output + Generation - Consumption
  - Accumulation = Input + Output - Generation - Consumption
  - Accumulation = Input – Output - Generation - Consumption

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $Accumulation = Input - Output + Generation - Consumption$

- 2) In a closed system, the rate of change of energy inside the closed system is nothing more than the rate of change of internal energy, which, in turn, is essentially the same as the rate of 1 point
- Change of entropy
  - Change of enthalpy
  - Change of temperature
  - Change of specific heat

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $Change\ of\ enthalpy$

- 3) A pan of water containing 5.00 L of water at 20°C is placed on an electric heater where the heat is supplied as  $Q = 2500\ J/s$  to boil the water. Find out the time at which water begins to boil. 1 point

$$\frac{dT}{dt} = \frac{\dot{Q}}{\rho V C_p}$$

Data given:  
 Heat added to the pan:  $Q(\text{dot}) = 2500\ J/s$   
 Specific heat of water:  $C_p = 4.18\ J/g\ ^\circ C$   
 Volume of the pan:  $V = 5.0\ L$   
 Density of the water in the kettle:  $\rho = 1000\ g/L$

- 668.8 s
- 66.8 s
- 714 s
- 88.6 s

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $668.8\ s$

- 4) Concept of material balance based upon 1 point
- Conservation of mass
  - Conservation of energy
  - Conservation of momentum
  - Conservation of Volume

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $Conservation\ of\ mass$

- 5) When  $Q = 0$ , there is possibility that 1 point
- Temperature of system and surrounding are same
  - System is an adiabatic system
  - Both a and b
  - Neither a nor b

No, the answer is incorrect.  
 Score: 0

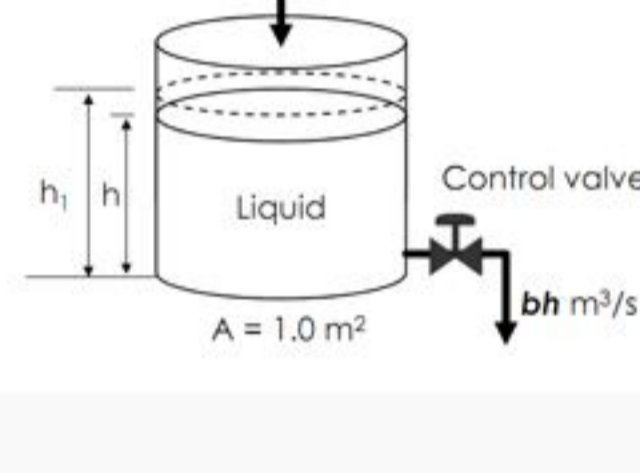
Accepted Answers:  
 $Both\ a\ and\ b$

- 6) The unsteady state process is also called 1 point
- Isothermal process
  - Transient process
  - Turbulent process
  - None of the above

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $Transient\ process$

- 7) Consider a liquid tank of  $1.0\ m^2$  cross sectional area is filled with water at a rate of  $a\ m^3/s$ . When the height of the liquid is  $h_1\ m$  in the tank, a control valve installed on the exit stream at the bottom of the tank opens up, and the liquid flows at a rate proportional to the head of the fluid as  $bh\ m^3/s$ , where  $h$  is the height of liquid in meters. Express the height of the liquid as a function of time. What is the steady-state height of the liquid in the tank?  $a$  and  $b$  are constants. 1 point



- $b/a$
- $a/b$
- $a$
- $b$

No, the answer is incorrect.  
 Score: 0

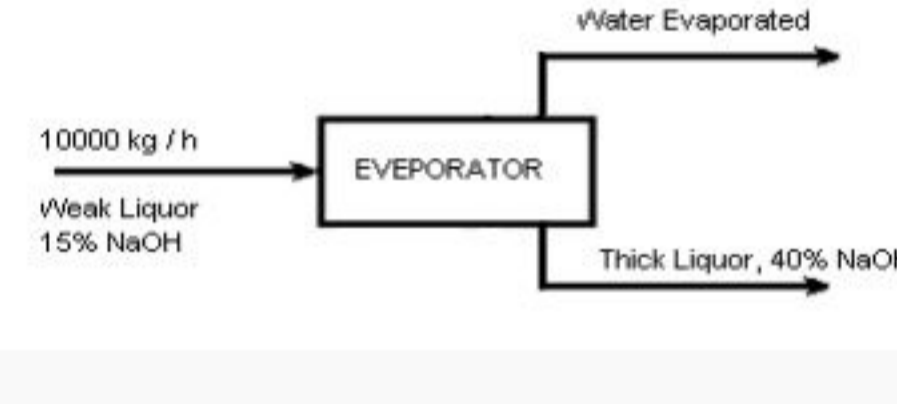
Accepted Answers:  
 $a/b$

- 8) If no heat is transferred to or from the surroundings, then process is called 1 point
- Isothermal
  - Isentropic
  - Adiabatic
  - None

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $Adiabatic$

- 9) A single effect evaporator is fed with  $10000\ kg/h$  of weak liquor containing  $15\ %$  caustic by weight and is concentrated to get thick liquor containing  $40\ %$  by weight caustic. Calculate  $kg/h$  of thick liquor. 1 point



- 6250 kg/h
- 3750 kg/h
- 10000 kg/h
- 8750 kg/h

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $3750\ kg/h$

- 10) Set of 'm' linear equations with 'n' unknown variables and the rank of matrix in 'n', then the nature of solution is 1 point
- Unique solution
  - Infinite number of solution
  - No solution
  - Can not solved

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $Unique\ solution$

- 11) If  $\frac{d(pV)}{dt} = 0$ , then 1 point
- $C_p > C_v$
  - $C_p = C_v$
  - $C_p < C_v$
  - $C_p = C_v + R$

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $C_p = C_v$

- 12) A pan of water containing 1 L of water at 0°C is placed on an electric heater where the heat is supplied as  $Q = 2500\ J/s$  to increase the water temperature to 60 °C. Calculate the time required.  $C_p = 4.18\ J/g\ ^\circ C$  1 point
- 167.2 min
  - 72.8 min
  - 1003.2 min
  - 103.2 min

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $167.2\ min$

- 13) In a sewage treatment plant, a large concrete tank initially contains  $440,000\ L$  liquid and  $10,000\ kg$  fine suspended solids. To flush this material out of the tank, water is pumped into the vessel at a rate of  $10,000\ L/h$ , and liquid containing solids leave at the same rate. Estimate the concentration of suspended solids in the tank at the end of 3 h. 1 point

$$\frac{d(VC)}{dt} = \dot{V}_m C_{in} - \dot{V}_{out} C_{out}$$

- 0.016 kg/L
- 0.021 kg/L
- 0.16 kg/L
- 1.6 kg/L

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $0.021\ kg/L$

- 14) Unit of  $C_V$  1 point
- J/kg
  - J/kg·K
  - J
  - J/K

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $J/kg\cdot K$

- 15) Which one is true from following equation? 1 point
- $H = U - pV$
  - $H + U = pV$
  - $H = U + pV$
  - $H = U + pV + C(T_1 - T_2)$

No, the answer is incorrect.  
 Score: 0

Accepted Answers:  
 $H = U + pV$