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Question Bank: Process Engineering Thermodynamics (VI SEM CT)

1. For a process from state 1 to state 2, heat transfer in a reversible process is given by

Q for reversible=(To)*(S1-S2)

Q for reversible=(To)*(S2-S1)

Q for reversible=(To)/(S1-S2)

Q for reversible=(To)/(S2-S1)

2. For a process from state 1 to state 2, heat transfer in an irreversible process is given by

Q for irreversible=(To)*(S1-S2)

Q for irreversible>(To)*(S1-S2)

Q for irreversible<(To)*(S1-S2)

none of the mentioned

3. Which of the following is true?

Q for reversible > Q for irreversible and work for reversible < work for irreversible

Q for reversible < Q for irreversible and work for reversible > work for irreversible

Q for reversible < Q for irreversible and work for reversible < work for irreversible

Q for reversible > Q for irreversible and work for reversible > work for irreversible

5. Work done in all reversible processes is equal.

a) true

b) false

6. In an open system, for maximum work, the process must be entirely

a) irreversible

b) reversible

Laxminarayan Institute of Technology, Nagpur
Question Bank: Process Engineering Thermodynamics (VI SEM CT)

- c) adiabatic
- d) none of the mentioned

7. Which of the following is true for a steady flow system?

- a) mass entering = mass leaving
- b) mass does not enter or leave the system
- c) mass entering can be more or less than the mass leaving
- d) none of the mentioned

8. Which of the following is true for a closed system?

- a) mass entering = mass leaving
- b) mass does not enter or leave the system
- c) mass entering can be more or less than the mass leaving
- d) none of the mentioned

9. Which of the following is mostly neglected while doing calculations for finding maximum work?

- a) KE
- b) PE
- c) both of the mentioned
- d) none of the mentioned

10. The work done by a closed system in a reversible process is always ___ that done in an irreversible process.

- a) less than or more than
- b) equal to
- c) less than
- d) more than

11. The proof that work done in all reversible processes is same can be done by violating Kelvin-Planck statement.

- a) true
- b) false

Laxminarayan Institute of Technology, Nagpur
Question Bank: Process Engineering Thermodynamics (VI SEM CT)

12. A piston cylinder contains air at 600 kPa, 290 K and a volume of 0.01m³. A constant pressure process gives 54 kJ of work out. Find the final volume of the air.

- a) 0.05 m³
- b) 0.01 m³
- c) 0.10 m³
- d) 0.15 m³

13. A piston-cylinder device initially contains air at 150 kPa and 27°C. At this state, the volume is 400 litre. The mass of the piston is such that a 350 kPa pressure is required to move it. The air is now heated until its volume has doubled. Determine the total heat transferred to the air.

- a) 747 kJ
- b) 757 kJ
- c) 767 kJ
- d) 777 kJ

14. A piston cylinder contains 0.5 kg of air at 500 kPa and 500 K. The air expands in a process so pressure is linearly decreasing with volume to a final state of 100 kPa and 300 K. Find the work in the process.

- a) 56.1 kJ
- b) 66.1 kJ
- c) 76.1 kJ
- d) 86.1 kJ

15. What is $v^2/2$ in the equation for a control volume in space?

- a) Potential energy per unit mass
- b) Kinetic energy per unit mass
- c) Thermal energy per unit mass
- d) Mechanical energy per unit mass

16. Sum of enthalpy and kinetic energy remains a constant in _____

- a) Polytropic flow
- b) Isentropic flow

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Question Bank: Process Engineering Thermodynamics (VI SEM CT)

- c) Adiabatic flow
- d) Mechanical flow

17. For an isentropic flow _____

- a) Enthalpy = 0
- b) Entropy = 0
- c) Pressure = 0
- d) Temperature = 0

18. The compressible flow is assumed to be _____

- a) Isentropic
- b) Adiabatic
- c) Polytropic
- d) Isentropic and adiabatic

19. The fluid speed through the nozzle is altered with_____

- a) Acceleration
- b) Deceleration
- c) Constant speed
- d) Zero

20. What happens to velocity in the converging duct?

- a) Increases
- b) Decreases
- c) Same
- d) Independent

21. Fundamental properties are directly related to:_____

- a) Derived properties
- b) fundamental properties
- c) Both of above

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Question Bank: Process Engineering Thermodynamics (VI SEM CT)

d) None of above.

22. The molal chemical potential is given by

- a) $\partial U / \partial S$
- b) $\partial U / \partial n$
- c) $\partial U / \partial V$
- d) all of the mentioned

23. The Gibbs entropy equation is given by

- a) $TdS = dU - pdV - \sum(\text{molal chemical potential}) * dn$
- b) $TdS = dU + pdV + \sum(\text{molal chemical potential}) * dn$
- c) $TdS = dU + pdV - \sum(\text{molal chemical potential}) * dn$
- d) $TdS = dU - pdV + \sum(\text{molal chemical potential}) * dn$

24. An equation in Gibbs energy is be given by

- a) $dG = Vdp + SdT + \sum(\text{molal chemical potential}) * dn$
- b) $dG = Vdp - SdT - \sum(\text{molal chemical potential}) * dn$
- c) $dG = Vdp + SdT - \sum(\text{molal chemical potential}) * dn$
- d) $dG = Vdp - SdT + \sum(\text{molal chemical potential}) * dn$

25. Chemical potential is an extensive property.

- a) true
- b) false

26. For a phase which has only one constituent,

- a) chemical potential = n/G
- b) chemical potential = $1/(G*n)$
- c) chemical potential = $G*n$
- d) chemical potential = G/n

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Question Bank: Process Engineering Thermodynamics (VI SEM CT)

27. If a closed system is in equilibrium, which of the following remains constant?

- a) entropy
- b) volume
- c) internal energy
- d) all of the mentioned

28. At chemical equilibrium, G will be minimum subjected to the equations of constraint.

- a) true
- b) false

29. For a pure substance existing in a single phase,

- a) C=1
- b) number of phases = 1
- c) f=2
- d) all of the mentioned

30. Which of the following statement is true?

- a) if C=1 and number of phases=2, then f=1
- b) if C=1 and number of phases=3, then f=0
- c) both of the mentioned
- d) none of the mentioned

31. How is the distribution among two or more phases at equilibrium determined by?

- a) Application of entropy
- b) Application of Newton's laws of motion
- c) Application of Gibbs free energy
- d) Application of force

32. At equilibrium the total Gibb's free energy for all phases is

- a) Minimum
- b) Maximum
- c) Infinity
- d) Zero

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Question Bank: Process Engineering Thermodynamics (VI SEM CT)

33. The formula for partial fugacity is:

- a) $F_i = C \exp(\mu_i / RT)$
- b) $F_i = C \exp(\mu_i)$
- c) $F_i = \exp(\mu_i)$
- d) $F_i = C(\mu_i / RT)$

34. What is the phase equilibrium ratio?

- a) Ratio of heat of species in two phases at equilibrium
- b) Ratio of temperature of species in two phases at equilibrium
- c) Ratio of mole fractions of species in two phases at equilibrium
- d) Ratio of equilibrium concentration of species in two phases at equilibrium.

35. Boiling occurs at _____ temperature and _____ pressure, the process appears as a point in ____ diagram.

- a) Constant, constant, P-T
- b) Variable, constant, P-T
- c) Constant, variable, V-T
- d) Variable, variable, V-T5

.36. Saturated liquid or saturated vapour can be found

- a) Along the liquid and vapour equilibrium curve
- b) Along the liquid and solid equilibrium curve
- c) Along the solid and vapour equilibrium curve
- d) None of the mentioned

37. The liquid between the melting curve and the vapour pressure curve is Sub-cooled liquid.

The above given statement is

- a) False
- b) True
- c) Cannot be predicted for any material
- d) None of the mentioned

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Question Bank: Process Engineering Thermodynamics (VI SEM CT)

38. The pressure along the melting curve is

- a) Sublimation pressure
- b) Saturation pressure
- c) Condensation pressure
- d) None of the mentioned

39. Values of vapour at temperature and pressure exceeding those at saturation is

- a) Superheated vapour
- b) Sub-cooled vapour
- c) Below critical point vapour
- d) None of the mentioned

40. According to the Dalton's law of partial pressures, the total pressure of a mixture of ideal gases is equal to the

- a) difference of the highest and lowest pressure
- b) product of the partial pressures
- c) sum of the partial pressures
- d) none of the mentioned

41. Henry's law is used primarily for a component whose mole fraction approaches _____

- a) 0
- b) 0.25
- c) 0.50
- d) 1.00

42. For Henry's law, $P_i = H_i X_i$, Here P_i is

- a) Partial pressure in the gas phase of the dilute component
- b) Vapour pressure in the gas phase of the dilute component
- c) Total ambient pressure in the gas phase of the dilute component
- d) None of the mentioned

43. Henry's law can be applied to diluted gas dissolved in liquid.

The given statement is

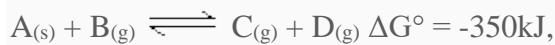
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Question Bank: Process Engineering Thermodynamics (VI SEM CT)

- a) Correct
- b) Incorrect
- c) Can't predict
- d) None of the mentioned.\

44. For an ideal solution the partial vapour pressure of a component in solution is equal to the mole fraction of that component times its vapour pressure. Is the

- a) Henry's Law
- b) Dalton's Law
- c) Charles Law
- d) Raoult's Law

45. For the reversible reaction,



which one of the following statements is true?

- a) The entropy change is negative.
- b) The reaction is thermodynamically non-feasible.
- c) Equilibrium constant is greater than one
- d) The reaction should be instantaneous

46. When compared to ΔG° for the formation of Al_2O_3 , the ΔG° for the formation of Cr_2O_3 is

- a) Higher
- b) Lower
- c) Same
- d) unpredicted

47. the correct statement from the following in a chemical reaction

- a) The entropy always increases
- b) The change in entropy along with suitable change in enthalpy decides the fate of a reaction
- c) The enthalpy always decreases

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Question Bank: Process Engineering Thermodynamics (VI SEM CT)

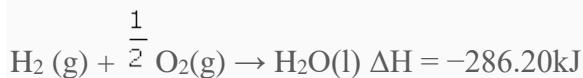
d) Both the enthalpy and the entropy remain constant

48. For a particular reversible reaction at temperature T, ΔH and ΔS were found to be both +ve. If T_e is the temperature at equilibrium, the reaction would be spontaneous when

- a) $T = T_e$
- b) $T_e > T$
- c) $T > T_e$
- d) T_e is 5 times T

49. On the basis of the following thermochemical data:

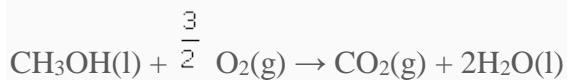
$$(\Delta fG^\circ_{\text{H}^+(\text{aq})} = 0)$$



The value of enthalpy of formation of OH^- ion at 25°C is :

- a) -22.88 kJ
- b) -228.88 kJ
- c) $+228.88 \text{ kJ}$
- d) -343.52 kJ

50. In a fuel cell methanol is used as fuel and oxygen gas is used as an oxidizer. The reaction is



At 298 K standard Gibb's energies of formation for $\text{CH}_3\text{OH(l)}$, $\text{H}_2\text{O(l)}$ and $\text{CO}_2(\text{g})$ are -166.2 , -237.2 and $-394.4 \text{ kJ mol}^{-1}$ respectively. If standard enthalpy of combustion of methanol is -726 kJ mol^{-1} , efficiency of the fuel cell will be

- a) 87%
- b) 90%
- c) 97%
- d) 80%