Assessment Items for Chemical Engineering Thermodynamics, exported from Blackboard

1. The boundary of a closed system prevents exchange of _____ with the surroundings.

a. heat
b. work
*c. mass
d. heat and mass

2. An adiabatic boundary prevents exchange of _____ with the surroundings.

*a. heat
b. work
c. mass
d. heat and mass

3. An impermeable boundary prevents the exchange of _____ with the surroundings.

a. heat
b. work
*c. mass
d. heat and mass

4. The boundary of an isolated system prevents exhange of _____ with the surroundings.

a. heat
b. work
c. mass
*d. heat and mass

5. Temperature is an _____ property.

*a. intensive
b. extensive

6. Volume is an _____ property.

a. intensive
*b. extensive

7. Pressure is an _____ property.

*a. intensive
b. extensive

8. The value of an _____ property depends on the size of a system.

a. intensive
*b. extensive

9. Which of these quantities is written in SI units?

a. N/cm²
*b. N/m²
c. bar

10. Which of these quantities is written in SI units?

a. L
b. cm³
*c. m³

11. Which of these quantities is written in SI units?

a. J/g
*b. J/kg
c. J/L

12. Which of these quantities is written in SI units?

a. bar-L
b. Pa-cm³
*c. Pa-m³

13.

1.0 mole of ideal gas at temperature 1000 K and volume 0.083 m³ has a pressure of ____ kPa.

*a. 100
b. 10
c. 1.0

14.

2.0 mole of ideal gas at pressure 100 kPa and volume 0.083 m³ has a temperature of _____ K.

*a. 500
b. 1000
c. 50

15.

1.0 mole of ideal gas at pressure 4 kPa and temperature 400 K has a volume of _____ m³.

*a. 0.83

b. 1.66
c. 16.6

16.

10.0 mole of ideal gas at temperature 1000 K and pressure 100 kPa has a volume of _____ m^3.

*a. 0.83
b. 1.66
c. 8.3

17.

A system consisting of water vapor in equilibrium with liquid water has ___ degrees of freedom.

*a. 1
b. 2
c. 3

18. A system consisting of a mixture of oxygen and nitrogen gases has ___ degrees of freedom.

a. 1
b. 2
*c. 3

19. A system consisting of liquid water in equilibrium with ice has ___ degrees of freedom.

*a. 1
b. 2
c. 3

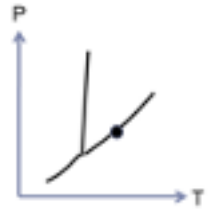
20. A system consisting of solid carbon dioxide in equilibrium with a mixture of carbon dioxide and oxygen gases has ___ degrees of freedom.

a. 1
*b. 2
c. 3

21. Identify the equilibrium phase(s) at the indicated point.

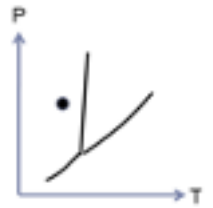
*a. gas
b. liquid
c. solid
d. gas and liquid
e. solid and liquid

22. Identify the equilibrium phase(s) at the indicated point.



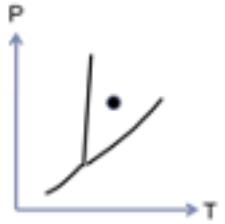
a. gas
b. liquid
c. solid
*d. gas and liquid
e. solid and liquid

23. Identify the equilibrium phase(s) at the indicated point.



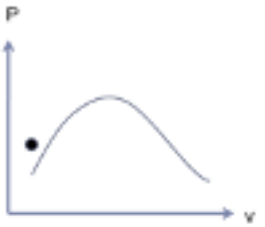
a. gas
b. liquid
*c. solid
d. gas and liquid
e. solid and liquid

24. Identify the equilibrium phase(s) at the indicated point.



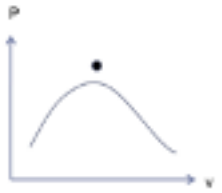
a. gas
*b. liquid
c. solid
d. gas and liquid
e. solid and liquid

25. Identify the equilibrium phase(s) at the indicated point.



a. vapor
*b. liquid
c. vapor and liquid
d. supercritical fluid

26. Identify the equilibrium phase(s) at the indicated point.

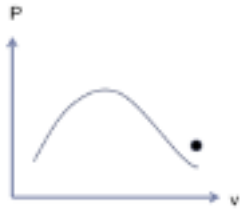


a. vapor
b. liquid
c. vapor and liquid
*d. supercritical fluid

27. Identify the equilibrium phase(s) at the indicated point.

a. vapor
b. liquid
*c. vapor and liquid
d. supercritical fluid

28. Identify the equilibrium phase(s) at the indicated point.



*a. vapor
b. liquid
c. vapor and liquid
d. supercritical fluid

29. To determine the specific volume of water vapor at 400 °C and 100 kPa, you would use the _____ steam table.

a. Saturated Water: Temperature
b. Saturated Water: Pressure
*c. Superheated Vapor
d. Subcooled Liquid

30. To determine the specific volume of liquid water at 40 °C and 100 kPa, you would use the _____ steam table.

a. Saturated Water: Temperature
b. Saturated Water: Pressure
c. Superheated Vapor
*d. Subcooled Liquid

31. To determine the saturation pressure of water at 40 °C, you would use the _____ steam table.

*a. Saturated Water: Temperature
b. Saturated Water: Pressure
c. Superheated Vapor
d. Subcooled Liquid

32. To determine the saturation temperature of water at 100 kPa, you would use the _____ steam table.

a. Saturated Water: Temperature
*b. Saturated Water: Pressure
c. Superheated Vapor
d. Subcooled Liquid

33. Expanding a system from 10 m^3 to 20 m^3 against a constant pressure of 100 kPa produces ____ kJ of work.

Correct Answer Range:
1000 +/- 0.

34. Compressing a system from 25 m^3 to 20 m^3 using a constant pressure of 20 kPa requires ____ kJ of work.

Correct Answer Range:
100 +/- 0.

35. 500 kJ of work is produced by expanding a system from 50 m^3 to 60 m^3 using a constant pressure ____ kPa.

Correct Answer Range:
50 +/- 0.

36. Using a constant pressure of 20 kPa, 100 kJ of work is required to compress a system from 30 m^3 to ____ m^3.

Correct Answer Range:
25 +/- 0.

37. Gas in a cylinder is compressed requiring 25 J of work but no heat is added or removed. The internal energy of the gas _____ after this process.

*a. increases
b. decreases
c. remains the same

38. 25 J of heat is added to gas in a cylinder but no work is performed. The internal energy of the gas _____ after this process.

*a. increases
b. decreases
c. remains the same

39. 25 J of heat is added to gas in a cylinder and the gas expands performing 25 J of work. The internal energy of the gas _____ after this process.

a. increases
b. decreases
*c. remains the same

40. 25 J of heat is removed from gas in a cylinder and it is compressed requiring 25 J of work. The internal energy of the gas _____ after this process.

a. increases
b. decreases
*c. remains the same

41. In compressing the volume of a gas from 10 L to 5 L, a reversible process _____ work.

*a. requires the minimum
b. requires more than minimum
c. produces the maximum
d. produces less than maximum

42. In expanding the volume of a gas from 5 L to 10 L, a reversible process _____ work.

a. requires the minimum
b. requires more than maximum
*c. produces the maximum
d. produces less than maximum

43. In expanding the volume of a gas from 5 L to 10 L, an irreversible process _____ work.

a. requires the minimum

b. requires more than minimum
c. produces maximum
*d. produces less than maximum

44. In compressing the volume of a gas from 10 L to 5 L, an irreversible process _____ work.

a. requires the minimum
*b. requires more than minimum
c. produces the maximum
d. produces less than maximum

45. Gas is contained in a cylinder by a piston applying 100 kPa of pressure. The piston pressure is instantly reduced to 10 kPa. This process is:

a. a reversible compression
b. a reversible expansion
c. an irreversible compression
*d. an irreversible expansion

47. Gas is contained in a cylinder by a piston applying 100 kPa of pressure. The piston pressure is instantly increased to 200 kPa. This process is:

a. a reversible compression
b. a reversible expansion
*c. an irreversible compression
d. an irreversible expansion

48. Gas is contained in a cylinder by a piston applying 100 kPa of pressure. The piston pressure is increased to 200 kPa using many small steps. This process is:

*a. a reversible compression
b. a reversible expansion
c. an irreversible compression
d. an irreversible expansion

49. Gas in a cylinder is compressed requiring 25 J of work but no heat is added or removed. From this description you can say that the process is

*a. adiabatic
b. irreversible
c. isothermal

d. reversible

50. Gas in a cylinder is compressed requiring 25 J of work. Heat is removed so that the temperature does not change. From this description you can say that the process is

a. adiabatic
b. irreversible
*c. isothermal
d. reversible

51. A reaction occurs in a vessel that is perfectly insulated so that no heat is exchanged with the surroundings. From this description you can say that the process is

*a. adiabatic
b. irreversible
c. isothermal
d. reversible

52. A reaction occurs in a vessel and heat is removed to keep the temperature constant. From this description you can say that the process is

a. adiabatic
b. irreversible
*c. isothermal
d. reversible

53. The pressure of an ideal gas is reduced from 100 kPa to 50 kPa while holding the temperature constant. The internal energy of the gas

a. increases
b. decreases
*c. remains the same

54. The pressure of an ideal gas is reduced from 100 kPa to 50 kPa while increasing the temperature. The internal energy of the gas

*a. increases
b. decreases
c. remains the same

55. The pressure of an ideal gas is increased from 100 kPa to 200 kPa while decreasing the temperature. The internal energy of the gas

a. increases
*b. decreases
c. remains the same

56. The pressure of an ideal gas is increased from 100 kPa to 200 kPa while holding the temperature constant. The internal energy of the gas

a. increases
b. decreases
*c. remains the same

57. An ideal gas is compressed from 3.0 m^3 to 2.0 m^3 by instantly increasing the applied pressure to 200 kPa. In order to hold the temperature constant, _____ kJ of heat must be added.

Correct Answer Range:
200 +/- 0.

58. An ideal gas is expanded from 1.0 m^3 to 2.0 m^3 by instantly reducing the applied pressure to 100 kPa. In order to hold the temperature constant, _____ kJ of heat must be added.

Correct Answer Range:
100 +/- 0.

59. An ideal gas is compressed from 5.0 m^3 to 4.0 m^3 by instantly increasing the applied pressure. In order to hold the temperature constant, 300 kJ of heat is removed. The applied pressure is _____kPa.

Correct Answer Range:
300 +/- 0.

60. An ideal gas is expanded from 3.0 m^3 to 4.0 m^3 by instantly decreasing the applied pressure. In order to hold the temperature constant, 100 kJ of heat is added. The applied pressure is _____kPa.

Correct Answer Range:
100 +/- 0.

61. An ideal gas has heat capacity (Cv) equal to 20 J/mole-K. One mole of this gas undergoes adiabatic compression requiring 100 J of work. The temperature change of the gas is _____K.

Correct Answer Range:
5 +/- 0.

62. An ideal gas has heat capacity (Cv) equal to 20 J/mole-K. One mole of this gas undergoes adiabatic expansion performing 200 J of work. The temperature change of the gas is _____K.

Correct Answer Range:
-10 +/- 0.

63. An ideal gas has heat capacity (Cv) equal to 20 J/mole-K. When one mole of this gas undergoes adiabatic compression the temperature rises 10 K. The quantity of work required for this compression is _____ J.

Correct Answer Range:
200 +/- 0.

64. An ideal gas has heat capacity (Cv) equal to 20 J/mole-K. When one mole of this gas undergoes adiabatic expansion the temperature drops 5 K. The quantity of work performed by this expansion is _____ J.

Correct Answer Range:
100 +/- 0.

65. A 1.0 mole block of material has heat capacity (Cp) equal to 25 J/mole-K. Holding the pressure constant, _____ J of heat is added to raise the temperature 40 K.

Correct Answer Range:
1000 +/- 0.

66. A 1.0 mole block of material has heat capacity (Cp) equal to 25 J/mole-K. Holding the pressure constant, _____ J of heat is removed to lower the temperature 10 K.

Correct Answer Range:
250 +/- 0.

67. A 1.0 mole block of material has heat capacity (Cp) equal to 25 J/mole-K. Holding the pressure constant 500 J of heat is added to the block. The temperature change for the block is _____ K.

Correct Answer Range:
20 +/- 0.

68. A 1.0 mole block of material has heat capacity (Cp) equal to 25 J/mole-K. Holding the pressure constant 100 J of heat is removed from the block. The temperature change for the block is _____ K.

Correct Answer Range:
-4 +/- 0.

69. Holding pressure constant the enthalpy of 100 kg of water is increased by 50 kJ. The quantity of heat transferred to the water is _____kJ.

Correct Answer Range:
50 +/- 0.

70. Holding pressure constant the enthalpy of 50 kg of steam is decreased by 50 kJ. The quantity of heat transferred from the steam is _____ kJ.

Correct Answer Range:
50 +/- 0.

71. Holding pressure constant, 100 kJ of heat is added to 50 kg of steam. The enthalpy change for the steam is _____kJ.

Correct Answer Range:
100 +/- 0.

72. Holding pressure constant, 20 kJ of heat is removed from 10 kg of steam. The enthalpy change for the steam is _____kJ.

Correct Answer Range:
-20 +/- 0.

73. Holding volume constant the internal energy of 100 kg of water is increased by 50 kJ. The quantity of heat transferred to the water is _____kJ.

Correct Answer Range:
50 +/- 0.

74. Holding volume constant the internal energy of 50 kg of steam is decreased by 50 kJ. The quantity of heat transferred from the steam is _____kJ.

Correct Answer Range:
50 +/- 0.

75. Holding volume constant 100 kJ of heat is added to 50 kg of steam. The internal energy change for the steam is _____kJ.

Correct Answer Range:
100 +/- 0.

76. Holding volume constant 20 kJ of heat is removed from 10 kg of steam. The internal energy change for the steam is _____kJ.

Correct Answer Range:
-20 +/- 0.

77. The heat capacity of argon (Ar) gas is _____ than the heat capacity of nitrogen (N2) gas.

a. greater
*b. less

78. The heat capacity of oxygen (O2) gas is _____ than the heat capacity of helium (He) gas.

*a. greater
b. less

79. The heat capacity of oxygen (O2) gas is _____ than the heat capacity of neon (Ne) gas.

*a. greater
b. less

80. The heat capacity of helium (He) gas is _____ than the heat capacity of hydrogen (H2) gas.

a. greater
*b. less

81. For nitrogen (N2) gas the constant pressure heat capacity (Cp) is 29 J/mole-K. The constant volume heat capacity (Cv) is _____.

*a. 29-R
b. 29
c. 29+R

82. For helium (He) gas the constant volume heat capacity (Cv) is 12.5 J/mole-K. The constant pressure heat capacity (Cp) is _____.

a. 12.5-R
b. 12.5
*c. 12.5+R

83. For nitrogen (N2) gas the constant volume heat capacity (Cv) is 20 J/mole-K. The constant pressure heat capacity (Cp) is _____.

a. 20-R
b. 20
*c. 20+R

84. For nitrogen (N2) gas the constant pressure heat capacity (Cp) is 20 J/mole-K. The constant volume heat capacity (Cv) is _____.

*a. 20-R
b. 20
c. 20+R

85. For the reaction H_2 + ½ O_2 --> H_2O, Δh_r = -242 kJ/mole. For the reaction H_2O --> H_2 + ½ O_2, Δh_r = _____ kJ/mole.

*a. +242
b. -484
c. -242
d. +484

87. For the reaction H_2O --> H_2 + ½ O_2 , Δh_r = +242 kJ/mole. For the reaction H_2 + ½ O_2 --> H_2O, Δh_r = _____ kJ/mole.

a. +242
b. -484
*c. -242
d. +484

88. For the reaction H_2 + ½ O_2 --> H_2O , Δh_r= -242 kJ/mole. For the reaction 2 H_2 + O_2 --> 2 H_2O , Δh_r= _____ kJ/mole.

a. +242
*b. -484
c. -242

d. +484

89. A reaction that produces heat is _____.

*a. exothermic
b. isothermal
c. endothermic
d. adiabatic

90. A reaction that absorbs heat is _____.

a. exothermic
b. isothermal
*c. endothermic
d. adiabatic

91. When methane reacts with oxygen the reaction vessel gets hotter. This reaction is _____.

*a. exothermic
b. isothermal
c. endothermic
d. adiabatic

92. When carbon monoxide reacts with graphite the reaction vessel gets cooler. This reaction is _____.

a. exothermic
b. isothermal
*c. endothermic
d. adiabatic

93. When gas passes through a turbine its:

a. pressure and temperature increase
b. pressure decreases and temperature increases
*c. pressure and temperature decrease

94. When gas passes through a compressor its:

*a. pressure and temperature increase

b. pressure decreases and temperature increases
c. pressure increases and temperature decreases.

95. When gas passes through a turbine:

a. its pressure increases and power is produced
*b. its pressure decreases and power is produced
c. its temperature increases and power is consumed

96. When gas passes through a compressor:

a. its pressure increases and power is produced
b. its pressure decreases and power is consumed
*c. its pressure increases and power is consumed