1. Boyle's law is valid at:
A) High pressure
B) Low pressure
C) High temperature
D) All conditions

2. Which law states V ∝ T at constant pressure?
A) Boyle's law
B) Charles' law
C) Avogadro's law
D) Dalton's law

3. Standard temperature is:
A) 273 K
B) 298 K
C) 0°C
D) Both A and C

4. Ideal gas equation is:
A) PV = nRT
B) P = nRT/V
C) PV = RT
D) All

5. Gas constant R value is:
A) 8.314 J mol^{-1} K^{-1}
B) 1.987 cal mol^{-1} K^{-1}
C) Both A and B
D) 10 J mol^{-1} K^{-1}

6. Which gas deviates most from ideal behavior?
A) He
B) H_2
C) NH_3
D) N_2

7. At high pressure gases show:
A) No deviation
B) Negative deviation
C) Positive deviation only
D) Ideal behavior

8. Compressibility factor Z = 1 indicates:
A) Real gas
B) Ideal gas
C) Liquid
D) Solid

9. Avogadro's law states:
A) Equal volume gases have equal mass
B) Equal volume gases have equal molecules
C) Pressure is constant
D) Temperature is constant

10. Molar volume at STP is:
A) 22.4 L
B) 24.5 L
C) 11.2 L
D) 1 L

11. Dalton's law deals with:
A) Diffusion
B) Partial pressure
C) Viscosity
D) Osmosis

12. Graham's law is related to:
A) Pressure
B) Diffusion
C) Temperature
D) Volume

13. Rate of diffusion ∝
A) $\sqrt{M}$
B) $1/\sqrt{M}$
C) M
D) $1/M^2$

14. Real gases behave ideally at:
A) High P, low T
B) Low P, high T
C) High P, high T
D) Low P, low T

15. Which gas has highest rms speed?
A) CO_2
B) O_2
C) H_2
D) N_2

16. RMS speed ∝
A) $\sqrt{T}$
B) T^2
C) $1/T$
D) $1/\sqrt{T}$

17. Unit of pressure:
A) Pa
B) atm
C) mmHg
D) All

18. 1 atm equals:
A) 760 mmHg
B) 760 Pa

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C) 1 bar
D) 100 kPa only

19. Which has lowest intermolecular force?
A) NH_3
B) CO_2
C) H_2
D) H_2O

20. Ideal gas has:
A) No attraction
B) No volume
C) Both A and B
D) High mass

21. van der Waals equation corrects:
A) Volume only
B) Pressure only
C) Both P and V
D) Temperature

22. 'a' corrects for:
A) Molecular volume
B) Intermolecular attraction
C) Pressure error
D) Temperature

23. 'b' represents:
A) Attraction
B) Volume of molecules
C) Pressure
D) Energy

24. Real gas deviates due to:
A) Volume only
B) Forces only
C) Both A and B
D) None

25. At low temperature gases:
A) Behave ideally
B) Deviate more
C) No change
D) Become plasma

26. Critical temperature is:
A) Max temp for liquefaction
B) Min temp for gas
C) Boiling point
D) Freezing point

27. Above critical temperature gas:
A) Can be liquefied
B) Cannot be liquefied
C) Becomes solid
D) Becomes plasma

28. Compressibility factor Z < 1 means:
A) Ideal behavior
B) Attraction dominates
C) Repulsion dominates
D) No gas

29. Z > 1 indicates:
A) Attractive forces
B) Repulsive forces
C) Ideal gas
D) Liquid

30. van der Waals equation applies to:
A) Ideal gas
B) Real gas
C) Liquid
D) Solid

31. Which gas liquefies easily?
A) He
B) NH_3
C) H_2
D) O_2

32. Joule effect is related to:
A) Expansion
B) Heating
C) Cooling
D) Pressure

33. Joule-Thomson effect is:
A) Isothermal
B) Isobaric
C) Isoenthalpic
D) Isovolumetric

34. In JT effect gases:
A) Always cool
B) May cool or heat
C) No change
D) Become solid

35. Inversion temperature is:
A) Max cooling temperature
B) Temp where effect reverses
C) Boiling point
D) Freezing point

36. Which gas has high inversion temperature?
A) H_2

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B) NH_3
C) O_2
D) CO_2

37. van der Waals constant 'a' unit:
A) atm L^2 mol^{-2}
B) L mol^{-1}
C) Pa
D) J

38. Gas showing maximum deviation:
A) He
B) H_2
C) NH_3
D) Ne

39. At high pressure gas volume:
A) Negligible
B) Significant deviation
C) Ideal
D) Zero

40. Real gases approach ideal at:
A) Low T, high P
B) High T, low P
C) High P only
D) Low T only

41. Linde process used for:
A) Liquefaction of gases
B) Catalysis
C) Emulsion
D) Adsorption

42. Liquefaction requires:
A) High temperature
B) Low temperature
C) High pressure
D) Both B and C

43. Critical pressure is:
A) Max pressure for liquefaction
B) Min pressure
C) Zero pressure
D) None

44. CO_2 solid is called:
A) Ice
B) Dry ice
C) Fog
D) Steam

45. Dry ice sublimates at:
A) 0°C
B) -78°C
C) 100°C
D) 25°C

46. JT effect used in:
A) Refrigeration
B) Cooking
C) Combustion
D) Electrolysis

47. Gas cooling in JT effect depends on:
A) Pressure drop
B) Temperature rise
C) Volume increase only
D) Mass

48. Which gas does NOT cool on expansion at room temperature?
A) CO_2
B) NH_3
C) H_2
D) Cl_2

49. Gas liquefaction principle:
A) Cooling + compression
B) Heating
C) Expansion only
D) Diffusion

50. Cryogenic gases involve:
A) High temp
B) Very low temp
C) Plasma
D) Solid only

51. Adsorption is:
A) Bulk phenomenon
B) Surface phenomenon
C) Volume phenomenon
D) None

52. Absorption is:
A) Surface
B) Bulk
C) Chemical only
D) Physical only

53. Adsorption is:
A) Endothermic
B) Exothermic
C) Neutral
D) Irreversible always

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54. Freundlich isotherm relates to:
A) Adsorption
B) Diffusion
C) Catalysis
D) Osmosis

55. Catalyst increases:
A) Activation energy
B) Reaction rate
C) Both
D) None

56. Positive catalyst:
A) Decreases rate
B) Increases rate
C) Stops reaction
D) Changes product

57. Enzyme catalysis is:
A) Physical
B) Biological
C) Chemical only
D) Thermal

58. Colloids particle size:
A) >100 nm
B) <1 nm
C) 1–1000 nm
D) 10 cm

59. Tyndall effect is shown by:
A) True solutions
B) Colloids
C) Solids
D) Gases

60. Brownian motion is:
A) Uniform motion
B) Random motion
C) Linear motion
D) Circular only

61. Emulsion is:
A) Gas in liquid
B) Liquid in liquid
C) Solid in gas
D) Gas in solid

62. Milk is:
A) Solution
B) Emulsion
C) Gel
D) Foam

63. Lyophilic colloids are:
A) Water hating
B) Water loving
C) Gas loving
D) Solid only

64. Lyophobic colloids are:
A) Stable
B) Unstable
C) Highly soluble
D) Gases

65. Coagulation means:
A) Formation of colloid
B) Precipitation of colloid
C) Diffusion
D) Adsorption

66. Protective colloid:
A) Stabilizes system
B) Destabilizes
C) Evaporates
D) Reacts

67. Gold sol is:
A) Lyophilic
B) Lyophobic
C) Gas
D) Solid

68. Catalyst poison:
A) Enhances activity
B) Reduces activity
C) No effect
D) Increases pressure

69. Surface tension is due to:
A) Gravity
B) Cohesive forces
C) Heat
D) Pressure

70. Adsorption increases with:
A) Temperature
B) Pressure (gas)
C) Volume
D) Mass

71. Most ideal gas:
A) CO_2
B) He
C) NH_3
D) H_2O

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72. van der Waals gas constant depends on:
A) Gas type
B) Temperature
C) Pressure
D) Volume

73. Real gas behaves ideally when:
A) Low T
B) High P
C) High T, low P
D) Low P, low T

74. Catalytic converter uses:
A) Fe
B) Pt/Pd
C) Cu
D) Na

75. Emulsion stability increased by:
A) Emulsifier
B) Heat
C) Pressure
D) Light

76. Gas diffusion fastest in:
A) CO_2
B) O_2
C) H_2
D) N_2

77. Adsorption depends on:
A) Surface area
B) Temperature
C) Pressure
D) All

78. Which is colloid?
A) Sugar solution
B) Salt solution
C) Milk
D) Alcohol

79. Catalyst does NOT change:
A) Rate
B) Equilibrium constant
C) Activation energy
D) Mechanism

80. Emulsifier example:
A) Soap
B) Salt
C) Sugar
D) Oxygen

81. Real gas equation reduces to ideal when:
A) a,b = 0
B) P = 0
C) T = 0
D) V = 0

82. Most deviation occurs at:
A) High T, low P
B) Low T, high P
C) High T, high P
D) Low P only

83. Adsorption is maximum at:
A) High T
B) Low T
C) High P
D) Low P

84. Gas liquefaction impossible above:
A) Critical temp
B) Boiling point
C) Freezing point
D) Melting point

85. JT coefficient is positive when gas:
A) Heats
B) Cools
C) Solidifies
D) Ionizes

86. Which is not colloid?
A) Fog
B) Smoke
C) Salt solution
D) Milk

87. Catalyst lowers:
A) Enthalpy
B) Activation energy
C) Entropy
D) Pressure

88. Gas with highest van der Waals constant a:
A) H_2
B) NH_3
C) He
D) Ne

89. Adsorption is spontaneous due to:
A) ΔH positive
B) ΔH negative
C) ΔS zero
D) ΔG positive

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90. Surface chemistry deals with:
A) Bulk
B) Interface
C) Volume
D) Mass

91. Which gas is most compressible?
A) CO_2
B) NH_3
C) H_2
D) N_2

92. Emulsion type of butter:
A) Oil in water
B) Water in oil
C) Gas in liquid
D) Solid in liquid

93. Adsorption decreases with:
A) Pressure
B) Temperature
C) Surface area
D) Catalyst

94. Gas law combining all laws is:
A) PV = nRT
B) Boyle's law
C) Charles law
D) Dalton law

95. Colloids cannot be separated by:
A) Filtration
B) Centrifugation
C) Evaporation
D) Dialysis

96. Tyndall effect proves:
A) True solution
B) Colloid nature
C) Gas nature
D) Solid nature

97. Gas molecules have:
A) Fixed path
B) Random motion
C) No motion
D) Linear motion only

98. Adsorption of gases increases with:
A) Decrease in pressure
B) Increase in pressure
C) Increase in temperature
D) Increase in volume

99. van der Waals correction improves:
A) Ideal gas law
B) Colloid theory
C) Catalyst theory
D) Emulsion

100. Most important factor in catalysis:
A) Pressure
B) Surface area
C) Color
D) Volume

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