# 100 Practice Numerical Problems with Answers

## Atomic Structure & Mole Concept

1. Number of moles in 18 g of water
   **Answer:** 1 mol
2. Number of molecules in 1 mol of $CO_2$
   **Answer:** 6.022×1023
3. Mass of 2 mol NaCl
   **Answer:** 117 g
4. Moles in 44 g $CO_2$
   **Answer:** 1 mol
5. Number of atoms in 2 mol He
   **Answer:** 1.204×1024
6. Molar mass of $H_2SO_4$
   **Answer:** 98 g/mol
7. Mass of 0.5 mol $O_2$
   **Answer:** 16 g
8. Moles in 22 g $N_2$
   **Answer:** 0.786 mol
9. Molecules in 0.5 mol $H_2O$
   **Answer:** 3.011×1023
10. Atoms in 1 mol $CH_4$
    **Answer:** 5×6.022×1023

## Stoichiometry

11. Moles of $O_2$ needed for 1 mol $CH_4$ combustion
    **Answer:** 2 mol
12. $CO_2$ formed from 1 mol $CH_4$
    **Answer:** 1 mol
13. Mass of $CO_2$ from 1 mol C
    **Answer:** 44 g
14. Limiting reagent: 2 mol $H_2$ + 1 mol $O_2$
    **Answer:** $H_2$
15. Water formed from 2 mol $H_2$
    **Answer:** 2 mol
16. Mass of $O_2$ needed for 12 g C
    **Answer:** 32 g

17. Moles of NaCl from 1 mol Na
    **Answer:** 1 mol
18. Yield if actual = 80 g, theoretical = 100 g
    **Answer:** 80%
19. Empirical formula of $CH_2O$
    **Answer:** $CH_2O$
20. Molecular formula if molar mass = 180
    **Answer:** $C_6H_{12}O_6$

## Gas Laws

21. Volume at STP of 1 mol gas
    **Answer:** 22.4 L
22. Pressure if volume halves (Boyle's law)
    **Answer:** Doubles
23. Volume change if temperature doubles (Charles's law)
    **Answer:** Doubles
24. Pressure of 1 mol gas at 22.4 L, 273 K
    **Answer:** 1 atm
25. Gas constant R
    **Answer:** 0.0821 L·atm/mol·K
26. Moles in 44.8 L gas at STP
    **Answer:** 2 mol
27. Volume of 2 mol gas at STP
    **Answer:** 44.8 L
28. Temperature if pressure doubles (constant volume)
    **Answer:** Doubles
29. Density of gas formula
    **Answer:** PM/RT
30. Pressure of gas with n=1, T=300K, V=24.6L
    **Answer:** 1 atm

## Thermochemistry

31. Heat absorbed in endothermic reaction
    **Answer:** Positive
32. Heat released in exothermic reaction
    **Answer:** Negative
33. Specific heat formula
    **Answer:** $q=mc\Delta Tq = mc\Delta Tq=mc\Delta T$
34. Heat for 1 g water, $\Delta T=10°C$
    **Answer:** 41.8 J
35. Enthalpy change unit
    **Answer:** kJ/mol

36. ΔH for combustion is
    **Answer:** Negative
37. Hess's law application
    **Answer:** Add equations
38. Calorimeter measures
    **Answer:** Heat
39. Heat capacity unit
    **Answer:** J/°C
40. Energy unit SI
    **Answer:** Joule

## Solutions & Concentration

41. Molarity =
    **Answer:** mol/L
42. Moles in 1 M, 1 L solution
    **Answer:** 1 mol
43. 0.5 M solution means
    **Answer:** 0.5 mol/L
44. Dilution formula
    **Answer:** $M_1V_1=M_2V_2$
45. 1 L of 2 M → diluted to 2 L
    **Answer:** 1 M
46. Mass of NaCl in 1 L of 1 M solution
    **Answer:** 58.5 g
47. ppm means
    **Answer:** mg/L
48. Mole fraction formula
    **Answer:** moles/total moles
49. Solubility unit
    **Answer:** g/L
50. Normality =
    **Answer:** eq/L

## Periodic Trends

51. Atomic radius increases
    **Answer:** Down group
52. Ionization energy increases
    **Answer:** Across period
53. Most electronegative element
    **Answer:** F
54. Metallic character increases
    **Answer:** Down group

55. Smallest atom
    **Answer:** He
56. Largest atom
    **Answer:** Cs
57. Electron affinity highest
    **Answer:** Cl
58. Shielding effect increases
    **Answer:** Down group
59. Valency of Group 1
    **Answer:** 1
60. Valency of Group 17
    **Answer:** 1

## Chemical Bonding

61. Bond in NaCl
    **Answer:** Ionic
62. Bond in $H_2$
    **Answer:** Covalent
63. Shape of $CH_4$
    **Answer:** Tetrahedral
64. Bond angle in $CH_4$
    **Answer:** 109.5°
65. Hybridization in $CH_4$
    **Answer:** $sp^3$
66. Hybridization in $C_2H_2$
    **Answer:** sp
67. Polar molecule example
    **Answer:** $H_2O$
68. Nonpolar molecule
    **Answer:** $CO_2$
69. VSEPR theory predicts
    **Answer:** Shape
70. Lone pair reduces angle
    **Answer:** Yes

## States of Matter

71. Gas compressibility
    **Answer:** High
72. Liquid volume
    **Answer:** Fixed
73. Solid shape
    **Answer:** Fixed

74. Intermolecular forces strongest in
    **Answer:** Solids
75. Boiling point increases with
    **Answer:** IMF strength
76. Vapor pressure increases with
    **Answer:** Temperature
77. Ideal gas assumption
    **Answer:** No interactions
78. Real gas deviation at
    **Answer:** High pressure
79. Diffusion rate $\propto$
    **Answer:** $1/\sqrt{M}$
80. Graham's law
    **Answer:** Rate ratio = $\sqrt{(M_2/M_1)}$

## Mixed Problems

81. Moles in 9 g water
    **Answer:** 0.5 mol
82. Volume of 0.5 mol gas at STP
    **Answer:** 11.2 L
83. Mass of 1 mol $O_2$
    **Answer:** 32 g
84. Atoms in 1 mol $O_2$
    **Answer:** 2×6.022×1023
85. Pressure at half volume
    **Answer:** Doubles
86. Heat if $\Delta T$ negative
    **Answer:** Released
87. 1 mol ideal gas at 300K volume
    **Answer:** 24.6 L
88. Molarity of 2 mol in 1 L
    **Answer:** 2 M
89. Empirical formula from 40%C, 6.7%H, 53.3%O
    **Answer:** $CH_2O$
90. Limiting reagent concept
    **Answer:** Smallest product
91. Mass of 2 mol $CO_2$
    **Answer:** 88 g
92. Density of gas at STP
    **Answer:** M/22.4
93. Bond angle $NH_3$
    **Answer:** 107°

94. Hybridization $NH_3$
**Answer:** $sp^3$
95. Energy released sign
**Answer:** Negative
96. Volume doubles → pressure
**Answer:** Halves
97. Temperature unit SI
**Answer:** Kelvin
98. Moles = mass/molar mass
**Answer:** Formula
99. Avogadro number
**Answer:** 6.022×1023
100. Gas equation
**Answer:** PV=nRTPV = nRTPV=nRT