

100 Organic Chemistry Numerical Problems with Answers

Section A: Mole & Stoichiometry

1. How many moles are present in 46 g of ethanol (C_2H_5OH)?
Answer: 1 mol
2. Calculate mass of methanol in 2 moles.
Answer: 64 g
3. Moles in 78 g benzene (C_6H_6)?
Answer: 1 mol
4. Mass of 0.5 mol acetic acid?
Answer: 30 g
5. Number of molecules in 1 mol methane?
Answer: 6.022×10^{23}
6. Moles in 28 g ethylene (C_2H_4)?
Answer: 1 mol
7. Mass of 3 mol propane?
Answer: 132 g
8. Moles in 44 g CO_2 (from combustion)?
Answer: 1 mol
9. Mass of 0.25 mol benzene?
Answer: 19.5 g
10. Moles in 15 g CH_4 ?
Answer: 0.94 mol

Section B: Limiting Reagent

11. 2 mol ethene reacts with 1 mol H_2 . Limiting reagent?
Answer: H_2
12. 3 mol CH_4 + 4 mol $O_2 \rightarrow$ limiting?
Answer: O_2
13. 1 mol benzene + 1 mol $Br_2 \rightarrow$ limiting?
Answer: Benzene
14. 2 mol ethanol + 1 mol $O_2 \rightarrow$ limiting?
Answer: O_2
15. 5 mol H_2 + 2 mol $Cl_2 \rightarrow$ limiting?
Answer: Cl_2
16. 1 mol acetylene + 3 mol $H_2 \rightarrow$ limiting?
Answer: Acetylene

17. 2 mol propane + 10 mol O₂ → limiting?

Answer: Propane

18. 4 mol CO + 2 mol O₂ → limiting?

Answer: O₂

19. 1 mol C₂H₆ + 3 mol O₂ → limiting?

Answer: C₂H₆

20. 2 mol ethanol + 2 mol Na → limiting?

Answer: Ethanol

Section C: Percentage Yield

21. Theoretical yield = 100 g, actual = 80 g. % yield?

Answer: 80%

22. 50 g theoretical, 40 g actual. % yield?

Answer: 80%

23. 120 g theoretical, 90 g actual. % yield?

Answer: 75%

24. 200 g theoretical, 150 g actual. % yield?

Answer: 75%

25. 60 g theoretical, 30 g actual. % yield?

Answer: 50%

26. 80 g theoretical, 64 g actual. % yield?

Answer: 80%

27. 100 g theoretical, 70 g actual. % yield?

Answer: 70%

28. 90 g theoretical, 81 g actual. % yield?

Answer: 90%

29. 150 g theoretical, 120 g actual. % yield?

Answer: 80%

30. 110 g theoretical, 99 g actual. % yield?

Answer: 90%

Section D: Reaction Stoichiometry

31. CH₄ + 2O₂ → CO₂ + 2H₂O

1 mol CH₄ produces?

Answer: 1 mol CO₂

32. 2 mol CH₄ produces CO₂?

Answer: 2 mol

33. 1 mol ethanol combustion gives CO₂?

Answer: 2 mol

34. 3 mol ethanol → CO₂?

Answer: 6 mol

35. 1 mol benzene \rightarrow CO₂?

Answer: 6 mol

36. 2 mol benzene \rightarrow CO₂?

Answer: 12 mol

37. 1 mol propane \rightarrow CO₂?

Answer: 3 mol

38. 2 mol propane \rightarrow CO₂?

Answer: 6 mol

39. 1 mol ethene \rightarrow CO₂?

Answer: 2 mol

40. 3 mol ethene \rightarrow CO₂?

Answer: 6 mol

Section E: Concentration & Solutions

41. Molarity of 1 mol in 1 L?

Answer: 1 M

42. 2 mol in 2 L?

Answer: 1 M

43. 0.5 mol in 1 L?

Answer: 0.5 M

44. 3 mol in 1 L?

Answer: 3 M

45. 1 mol in 0.5 L?

Answer: 2 M

46. 0.2 mol in 2 L?

Answer: 0.1 M

47. 5 mol in 5 L?

Answer: 1 M

48. 4 mol in 2 L?

Answer: 2 M

49. 0.1 mol in 1 L?

Answer: 0.1 M

50. 10 mol in 2 L?

Answer: 5 M

Section F: Empirical & Molecular Formula

51. %C=40, %H=6.7, %O=53.3 \rightarrow empirical formula?

Answer: CH₂O

52. Molar mass = 180 \rightarrow molecular formula?

Answer: C₆H₁₂O₆

53. %C=85.7, %H=14.3 \rightarrow empirical?

Answer: CH₂

54. Molar mass 28 → molecular?
Answer: C₂H₄
55. %C=75, %H=25 → empirical?
Answer: CH₄
56. %C=92.3, %H=7.7 → empirical?
Answer: CH
57. Molar mass 78 → molecular?
Answer: C₆H₆
58. %C=60, %H=13.3, %O=26.7 → empirical?
Answer: C₂H₆O
59. Molar mass 46 → molecular?
Answer: C₂H₆O
60. %C=66.7, %H=11.1, %O=22.2 → empirical?
Answer: C₃H₆O

Section G: Reaction Kinetics (Basic)

61. Rate doubles → order?
Answer: First order
62. Rate quadruples → order?
Answer: Second order
63. Half-life constant → order?
Answer: First order
64. Rate independent of concentration → order?
Answer: Zero order
65. Rate ∝ [A]² → order?
Answer: Second
66. Rate ∝ [A]³ → order?
Answer: Third
67. Half-life decreases with concentration → order?
Answer: Zero
68. Half-life inversely proportional → order?
Answer: Second
69. Rate constant unit s⁻¹ → order?
Answer: First
70. Rate constant unit mol⁻¹L s⁻¹ → order?
Answer: Second

Section H: Miscellaneous

71. Degree of unsaturation for C₆H₆?
Answer: 4
72. For C₂H₄?
Answer: 1

73. For C_3H_8 ?
Answer: 0
74. For C_4H_6 ?
Answer: 2
75. For C_5H_{12} ?
Answer: 0
76. For C_6H_{10} ?
Answer: 2
77. For C_7H_8 ?
Answer: 4
78. For C_8H_{18} ?
Answer: 0
79. For C_9H_{10} ?
Answer: 5
80. For $C_{10}H_8$?
Answer: 7

Section I: Gas Calculations

81. 1 mol gas at STP volume?
Answer: 22.4 L
82. 2 mol gas \rightarrow volume?
Answer: 44.8 L
83. 0.5 mol \rightarrow volume?
Answer: 11.2 L
84. 3 mol \rightarrow volume?
Answer: 67.2 L
85. 4 mol \rightarrow volume?
Answer: 89.6 L
86. 5 mol \rightarrow volume?
Answer: 112 L
87. 0.25 mol \rightarrow volume?
Answer: 5.6 L
88. 6 mol \rightarrow volume?
Answer: 134.4 L
89. 10 mol \rightarrow volume?
Answer: 224 L
90. 0.1 mol \rightarrow volume?
Answer: 2.24 L

Section J: Advanced Mixed Problems

91. Combustion of 1 mol ethanol produces CO_2 ?
Answer: 2 mol

92. 2 mol ethanol needs O_2 ?
Answer: 6 mol
93. 1 mol acetylene combustion $\rightarrow CO_2$?
Answer: 2 mol
94. 3 mol acetylene $\rightarrow CO_2$?
Answer: 6 mol
95. 1 mol propane needs O_2 ?
Answer: 5 mol
96. 2 mol propane needs O_2 ?
Answer: 10 mol
97. 1 mol benzene needs O_2 ?
Answer: 7.5 mol
98. 2 mol benzene needs O_2 ?
Answer: 15 mol
99. 1 mol ethene needs O_2 ?
Answer: 3 mol
100. 2 mol ethene needs O_2 ?
Answer: 6 mol