

Chemistry 101/102

Activity 17 - Empirical Formula

Answer Key

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Chemical Formula	Empirical Formula	Molecular Mass (g)	Empirical Mass (g)
CH ₄	CH ₄	16.04	16.04
C ₂ H ₆	CH ₃	30.07	15.03
C ₃ H ₈	CH _{2.67}	44.10	15.03
C ₄ H ₁₀	CH _{2.5}	58.12	15.03
C ₅ H ₁₂	CH _{2.4}	72.15	15.03
C ₆ H ₁₄	CH _{2.33}	86.17	15.03
C ₇ H ₁₆	CH _{2.29}	100.20	15.03
C ₈ H ₁₈	CH _{2.25}	114.23	15.03
C ₉ H ₂₀	CH _{2.22}	128.26	15.03
C ₁₀ H ₂₂	CH _{2.2}	142.29	15.03
C ₁₁ H ₂₄	CH _{2.18}	156.32	15.03
C ₁₂ H ₂₆	CH _{2.17}	170.35	15.03
C ₁₃ H ₂₈	CH _{2.15}	184.38	15.03
C ₁₄ H ₃₀	CH _{2.14}	198.41	15.03
C ₁₅ H ₃₂	CH _{2.13}	212.44	15.03
C ₁₆ H ₃₄	CH _{2.12}	226.47	15.03
C ₁₇ H ₃₆	CH _{2.11}	240.50	15.03
C ₁₈ H ₃₈	CH _{2.11}	254.53	15.03
C ₁₉ H ₄₀	CH _{2.11}	268.56	15.03
C ₂₀ H ₄₂	CH _{2.1}	282.59	15.03
C ₂₁ H ₄₄	CH _{2.1}	296.62	15.03
C ₂₂ H ₄₆	CH _{2.1}	310.65	15.03
C ₂₃ H ₄₈	CH _{2.1}	324.68	15.03
C ₂₄ H ₅₀	CH _{2.1}	338.71	15.03
C ₂₅ H ₅₂	CH _{2.1}	352.74	15.03
C ₂₆ H ₅₄	CH _{2.1}	366.77	15.03
C ₂₇ H ₅₆	CH _{2.1}	380.80	15.03
C ₂₈ H ₅₈	CH _{2.1}	394.83	15.03
C ₂₉ H ₆₀	CH _{2.1}	408.86	15.03
C ₃₀ H ₆₂	CH _{2.1}	422.89	15.03
C ₃₁ H ₆₄	CH _{2.1}	436.92	15.03
C ₃₂ H ₆₆	CH _{2.1}	450.95	15.03
C ₃₃ H ₆₈	CH _{2.1}	464.98	15.03
C ₃₄ H ₇₀	CH _{2.1}	479.01	15.03
C ₃₅ H ₇₂	CH _{2.1}	493.04	15.03
C ₃₆ H ₇₄	CH _{2.1}	507.07	15.03
C ₃₇ H ₇₆	CH _{2.1}	521.10	15.03
C ₃₈ H ₇₈	CH _{2.1}	535.13	15.03
C ₃₉ H ₈₀	CH _{2.1}	549.16	15.03
C ₄₀ H ₈₂	CH _{2.1}	563.19	15.03
C ₄₁ H ₈₄	CH _{2.1}	577.22	15.03
C ₄₂ H ₈₆	CH _{2.1}	591.25	15.03
C ₄₃ H ₈₈	CH _{2.1}	605.28	15.03
C ₄₄ H ₉₀	CH _{2.1}	619.31	15.03
C ₄₅ H ₉₂	CH _{2.1}	633.34	15.03
C ₄₆ H ₉₄	CH _{2.1}	647.37	15.03
C ₄₇ H ₉₆	CH _{2.1}	661.40	15.03
C ₄₈ H ₉₈	CH _{2.1}	675.43	15.03
C ₄₉ H ₁₀₀	CH _{2.1}	689.46	15.03
C ₅₀ H ₁₀₂	CH _{2.1}	703.49	15.03
C ₅₁ H ₁₀₄	CH _{2.1}	717.52	15.03
C ₅₂ H ₁₀₆	CH _{2.1}	731.55	15.03
C ₅₃ H ₁₀₈	CH _{2.1}	745.58	15.03
C ₅₄ H ₁₁₀	CH _{2.1}	759.61	15.03
C ₅₅ H ₁₁₂	CH _{2.1}	773.64	15.03
C ₅₆ H ₁₁₄	CH _{2.1}	787.67	15.03
C ₅₇ H ₁₁₆	CH _{2.1}	801.70	15.03
C ₅₈ H ₁₁₈	CH _{2.1}	815.73	15.03
C ₅₉ H ₁₂₀	CH _{2.1}	829.76	15.03
C ₆₀ H ₁₂₂	CH _{2.1}	843.79	15.03
C ₆₁ H ₁₂₄	CH _{2.1}	857.82	15.03
C ₆₂ H ₁₂₆	CH _{2.1}	871.85	15.03
C ₆₃ H ₁₂₈	CH _{2.1}	885.88	15.03
C ₆₄ H ₁₃₀	CH _{2.1}	899.91	15.03
C ₆₅ H ₁₃₂	CH _{2.1}	913.94	15.03
C ₆₆ H ₁₃₄	CH _{2.1}	927.97	15.03
C ₆₇ H ₁₃₆	CH _{2.1}	942.00	15.03
C ₆₈ H ₁₃₈	CH _{2.1}	956.03	15.03
C ₆₉ H ₁₄₀	CH _{2.1}	970.06	15.03
C ₇₀ H ₁₄₂	CH _{2.1}	984.09	15.03
C ₇₁ H ₁₄₄	CH _{2.1}	998.12	15.03
C ₇₂ H ₁₄₆	CH _{2.1}	1012.15	15.03
C ₇₃ H ₁₄₈	CH _{2.1}	1026.18	15.03
C ₇₄ H ₁₅₀	CH _{2.1}	1040.21	15.03
C ₇₅ H ₁₅₂	CH _{2.1}	1054.24	15.03
C ₇₆ H ₁₅₄	CH _{2.1}	1068.27	15.03
C ₇₇ H ₁₅₆	CH _{2.1}	1082.30	15.03
C ₇₈ H ₁₅₈	CH _{2.1}	1096.33	15.03
C ₇₉ H ₁₆₀	CH _{2.1}	1110.36	15.03
C ₈₀ H ₁₆₂	CH _{2.1}	1124.39	15.03
C ₈₁ H ₁₆₄	CH _{2.1}	1138.42	15.03
C ₈₂ H ₁₆₆	CH _{2.1}	1152.45	15.03
C ₈₃ H ₁₆₈	CH _{2.1}	1166.48	15.03
C ₈₄ H ₁₇₀	CH _{2.1}	1180.51	15.03
C ₈₅ H ₁₇₂	CH _{2.1}	1194.54	15.03
C ₈₆ H ₁₇₄	CH _{2.1}	1208.57	15.03
C ₈₇ H ₁₇₆	CH _{2.1}	1222.60	15.03
C ₈₈ H ₁₇₈	CH _{2.1}	1236.63	15.03
C ₈₉ H ₁₈₀	CH _{2.1}	1250.66	15.03
C ₉₀ H ₁₈₂	CH _{2.1}	1264.69	15.03
C ₉₁ H ₁₈₄	CH _{2.1}	1278.72	15.03
C ₉₂ H ₁₈₆	CH _{2.1}	1292.75	15.03
C ₉₃ H ₁₈₈	CH _{2.1}	1306.78	15.03
C ₉₄ H ₁₉₀	CH _{2.1}	1320.81	15.03
C ₉₅ H ₁₉₂	CH _{2.1}	1334.84	15.03
C ₉₆ H ₁₉₄	CH _{2.1}	1348.87	15.03
C ₉₇ H ₁₉₆	CH _{2.1}	1362.90	15.03
C ₉₈ H ₁₉₈	CH _{2.1}	1376.93	15.03
C ₉₉ H ₂₀₀	CH _{2.1}	1390.96	15.03
C ₁₀₀ H ₂₀₂	CH _{2.1}	1404.99	15.03

- 81. acetylene, C₂H₂
- 82. There are 2 carbon atoms in benzene (C₆H₆).
- 83. C₃H₄
- 84. No, not all hydrocarbons have multiple bonds.
- 85. Double bonds are only used when there's more than one functional group in the compound.
- 86. The nomenclature rules have not changed - carbon based first, oxygen based second, and nitrogen is halogen - always third - and repeated if 2.
- 87. There's one benzene ring in benzene (C₆H₆).
- 88. There's no subscript after benzene in the formula so there is only one benzene ring.
- 89. There are 2 oxygen atoms in benzene (C₆H₆O₂).
- 90. There are 2 oxygen atoms in acetylene (C₂H₂O₂) but since there are parentheses around the entire ion and a subscript of 2, there are 2 nitrate ions in benzene (C₆H₆(NO₃)₂). Thus, there are 2 x 2 oxygen atoms total.
- 91. M₂(SO₄)₃ has 2 aluminum, 3 oxygen, and 2 hydrogen (sulfur and 4 oxygens) but has 2 oxygen and 2 hydrogen and there are 3 sulfate ions so indicated by parentheses and subscript. M₂(SO₄)₃ would have 2 aluminum, 3 oxygen, and 2 hydrogen (since no parentheses, the subscript only applies to the element it follows).
- 92. See nomenclature for M₂(SO₄)₃ above. Aluminum sulfate has 2 aluminum, 3 oxygen and 2 hydrogen.
- 93.

Formula	Index	Chemical Formula	Empirical Formula
CH ₄	1	CH ₄	CH ₄
C ₂ H ₆	2	C ₂ H ₆	CH ₃
C ₃ H ₈	3	C ₃ H ₈	CH _{2.67}
C ₄ H ₁₀	4	C ₄ H ₁₀	CH _{2.5}
C ₅ H ₁₂	5	C ₅ H ₁₂	CH _{2.4}
C ₆ H ₁₄	6	C ₆ H ₁₄	CH _{2.33}
C ₇ H ₁₆	7	C ₇ H ₁₆	CH _{2.29}
C ₈ H ₁₈	8	C ₈ H ₁₈	CH _{2.25}
C ₉ H ₂₀	9	C ₉ H ₂₀	CH _{2.22}
C ₁₀ H ₂₂	10	C ₁₀ H ₂₂	CH _{2.2}
C ₁₁ H ₂₄	11	C ₁₁ H ₂₄	CH _{2.18}
C ₁₂ H ₂₆	12	C ₁₂ H ₂₆	CH _{2.17}
C ₁₃ H ₂₈	13	C ₁₃ H ₂₈	CH _{2.15}
C ₁₄ H ₃₀	14	C ₁₄ H ₃₀	CH _{2.14}
C ₁₅ H ₃₂	15	C ₁₅ H ₃₂	CH _{2.13}
C ₁₆ H ₃₄	16	C ₁₆ H ₃₄	CH _{2.12}
C ₁₇ H ₃₆	17	C ₁₇ H ₃₆	CH _{2.11}
C ₁₈ H ₃₈	18	C ₁₈ H ₃₈	CH _{2.11}
C ₁₉ H ₄₀	19	C ₁₉ H ₄₀	CH _{2.11}
C ₂₀ H ₄₂	20	C ₂₀ H ₄₂	CH _{2.1}
C ₂₁ H ₄₄	21	C ₂₁ H ₄₄	CH _{2.1}
C ₂₂ H ₄₆	22	C ₂₂ H ₄₆	CH _{2.1}
C ₂₃ H ₄₈	23	C ₂₃ H ₄₈	CH _{2.1}
C ₂₄ H ₅₀	24	C ₂₄ H ₅₀	CH _{2.1}
C ₂₅ H ₅₂	25	C ₂₅ H ₅₂	CH _{2.1}
C ₂₆ H ₅₄	26	C ₂₆ H ₅₄	CH _{2.1}
C ₂₇ H ₅₆	27	C ₂₇ H ₅₆	CH _{2.1}
C ₂₈ H ₅₈	28	C ₂₈ H ₅₈	CH _{2.1}
C ₂₉ H ₆₀	29	C ₂₉ H ₆₀	CH _{2.1}
C ₃₀ H ₆₂	30	C ₃₀ H ₆₂	CH _{2.1}
C ₃₁ H ₆₄	31	C ₃₁ H ₆₄	CH _{2.1}
C ₃₂ H ₆₆	32	C ₃₂ H ₆₆	CH _{2.1}
C ₃₃ H ₆₈	33	C ₃₃ H ₆₈	CH _{2.1}
C ₃₄ H ₇₀	34	C ₃₄ H ₇₀	CH _{2.1}
C ₃₅ H ₇₂	35	C ₃₅ H ₇₂	CH _{2.1}
C ₃₆ H ₇₄	36	C ₃₆ H ₇₄	CH _{2.1}
C ₃₇ H ₇₆	37	C ₃₇ H ₇₆	CH _{2.1}
C ₃₈ H ₇₈	38	C ₃₈ H ₇₈	CH _{2.1}
C ₃₉ H ₈₀	39	C ₃₉ H ₈₀	CH _{2.1}
C ₄₀ H ₈₂	40	C ₄₀ H ₈₂	CH _{2.1}
C ₄₁ H ₈₄	41	C ₄₁ H ₈₄	CH _{2.1}
C ₄₂ H ₈₆	42	C ₄₂ H ₈₆	CH _{2.1}
C ₄₃ H ₈₈	43	C ₄₃ H ₈₈	CH _{2.1}
C ₄₄ H ₉₀	44	C ₄₄ H ₉₀	CH _{2.1}
C ₄₅ H ₉₂	45	C ₄₅ H ₉₂	CH _{2.1}
C ₄₆ H ₉₄	46	C ₄₆ H ₉₄	CH _{2.1}
C ₄₇ H ₉₆	47	C ₄₇ H ₉₆	CH _{2.1}
C ₄₈ H ₉₈	48	C ₄₈ H ₉₈	CH _{2.1}
C ₄₉ H ₁₀₀	49	C ₄₉ H ₁₀₀	CH _{2.1}
C ₅₀ H ₁₀₂	50	C ₅₀ H ₁₀₂	CH _{2.1}
C ₅₁ H ₁₀₄	51	C ₅₁ H ₁₀₄	CH _{2.1}
C ₅₂ H ₁₀₆	52	C ₅₂ H ₁₀₆	CH _{2.1}
C ₅₃ H ₁₀₈	53	C ₅₃ H ₁₀₈	CH _{2.1}
C ₅₄ H ₁₁₀	54	C ₅₄ H ₁₁₀	CH _{2.1}
C ₅₅ H ₁₁₂	55	C ₅₅ H ₁₁₂	CH _{2.1}
C ₅₆ H ₁₁₄	56	C ₅₆ H ₁₁₄	CH _{2.1}
C ₅₇ H ₁₁₆	57	C ₅₇ H ₁₁₆	CH _{2.1}
C ₅₈ H ₁₁₈	58	C ₅₈ H ₁₁₈	CH _{2.1}
C ₅₉ H ₁₂₀	59	C ₅₉ H ₁₂₀	CH _{2.1}
C ₆₀ H ₁₂₂	60	C ₆₀ H ₁₂₂	CH _{2.1}
C ₆₁ H ₁₂₄	61	C ₆₁ H ₁₂₄	CH _{2.1}
C ₆₂ H ₁₂₆	62	C ₆₂ H ₁₂₆	CH _{2.1}
C ₆₃ H ₁₂₈	63	C ₆₃ H ₁₂₈	CH _{2.1}
C ₆₄ H ₁₃₀	64	C ₆₄ H ₁₃₀	CH _{2.1}
C ₆₅ H ₁₃₂	65	C ₆₅ H ₁₃₂	CH _{2.1}
C ₆₆ H ₁₃₄	66	C ₆₆ H ₁₃₄	CH _{2.1}
C ₆₇ H ₁₃₆	67	C ₆₇ H ₁₃₆	CH _{2.1}
C ₆₈ H ₁₃₈	68	C ₆₈ H ₁₃₈	CH _{2.1}
C ₆₉ H ₁₄₀	69	C ₆₉ H ₁₄₀	CH _{2.1}
C ₇₀ H ₁₄₂	70	C ₇₀ H ₁₄₂	CH _{2.1}
C ₇₁ H ₁₄₄	71	C ₇₁ H ₁₄₄	CH _{2.1}
C ₇₂ H ₁₄₆	72	C ₇₂ H ₁₄₆	CH _{2.1}
C ₇₃ H ₁₄₈	73	C ₇₃ H ₁₄₈	CH _{2.1}
C ₇₄ H ₁₅₀	74	C ₇₄ H ₁₅₀	CH _{2.1}
C ₇₅ H ₁₅₂	75	C ₇₅ H ₁₅₂	CH _{2.1}
C ₇₆ H ₁₅₄	76	C ₇₆ H ₁₅₄	CH _{2.1}
C ₇₇ H ₁₅₆	77	C ₇₇ H ₁₅₆	CH _{2.1}
C ₇₈ H ₁₅₈	78	C ₇₈ H ₁₅₈	CH _{2.1}
C ₇₉ H ₁₆₀	79	C ₇₉ H ₁₆₀	CH _{2.1}
C ₈₀ H ₁₆₂	80	C ₈₀ H ₁₆₂	CH _{2.1}
C ₈₁ H ₁₆₄ </			