Lewis Structures — Answer Key

Instructor reference • Worked solutions in red

Explanations use introductory chemistry conventions. Equivalent valid structures or correctly rounded numeric answers may also receive credit.

1. Draw a complete Lewis structure for H_2O. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

8 total valence e^-. Two O–H single bonds and two lone pairs on O. Formal charges 0.

2. Draw a complete Lewis structure for NH_3. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

8 e^-. Three N–H single bonds and one lone pair on N. Formal charges 0.

3. Draw a complete Lewis structure for CH_4. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

8 e^-. Four C–H single bonds; carbon has no lone pairs. Formal charges 0.

4. Draw a complete Lewis structure for CO_2. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

16 e^-. O=C=O; each O has two lone pairs. Formal charges 0.

5. Draw a complete Lewis structure for HCN. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

10 e^-. H–C≡N; nitrogen has one lone pair. Formal charges 0.

6. Draw a complete Lewis structure for N_2. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

10 e^-. N≡N, with one lone pair on each N. Formal charges 0.

7. Draw a complete Lewis structure for O_2. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

12 e^-. O=O, with two lone pairs on each O. Formal charges 0.

8. Draw a complete Lewis structure for BF_3. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

24 e^-. Three B–F single bonds; each F has three lone pairs. Boron has six bonding electrons (incomplete octet). Formal charges 0.

9. Draw a complete Lewis structure for NH_4^+. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

8 e^-. Four N–H bonds; no lone pair on N. Formal charge +1 on N; total charge +1.

10. Draw a complete Lewis structure for NO_3^-. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

24 e^-. One N=O and two N–O^- bonds per contributor. N has +1 formal charge, two single-bond O have −1 each; three equivalent resonance contributors.

11. Draw a complete Lewis structure for CO_3^{2-}. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

24 e^-. One C=O and two C–O^- bonds per contributor; two single-bond O each −1. Three equivalent resonance contributors.

12. Draw a complete Lewis structure for PCl_3. Show all lone pairs; label any nonzero formal charges and resonance contributors, if appropriate.

26 e^-. Three P–Cl single bonds; P has one lone pair, each Cl has three lone pairs. Formal charges 0.