Proton NMR — Answer Key

Ten carefully checked problems • Spectroscopy • Instructor copy

INSTRUCTOR ANSWER KEY — Correct answers and explanations appear in red.

1. What does δ represent in ^{1}H NMR?

   Answer: Chemical shift, expressed in parts per million (ppm).

2. What does an integral ratio 3:2:3 indicate?

   Answer: Three sets of hydrogen environments with relative proton populations 3, 2 and 3.

3. How many lines are expected for CH_3 coupled to 2 equivalent H?

   Answer: Triplet: n + 1 = 3.

4. How many lines are expected for CH_2 coupled to 3 equivalent H?

   Answer: Quartet: n + 1 = 4.

5. Where is the terminal CH_3 of ethyl acetate approximately located?

   Answer: Near δ 1.2 ppm as a triplet integrating to 3H.

6. Where is the O–CH_2 of ethyl acetate approximately located?

   Answer: Near δ 4.1 ppm as a quartet integrating to 2H.

7. Where is the acetyl CH_3 of ethyl acetate approximately located?

   Answer: Near δ 2.0 ppm as a singlet integrating to 3H.

8. Why are O–CH_2 protons usually more downfield than a simple CH_3?

   Answer: The electronegative oxygen deshields nearby protons.

9. Why may alcohol O–H not display regular n + 1 splitting?

   Answer: Rapid exchange and hydrogen bonding commonly broaden or suppress coupling.

10. Which direction represents higher δ values on a conventional spectrum?

    Answer: To the left.