2024 Higher Chemistry Paper 2 – Q10

Section: Chemistry in Society
Topic: Chemical Analysis (Hydrogen NMR)

Question summary (Q10):
Hydrogen NMR spectra provide information about hydrogens in different chemical environments.
(a) Using the data booklet, state the chemical shift range for hydrogens in the environment:
–C≡C–H (alkyne proton).

Worked Solution:
• In H-1 NMR, different environments give characteristic chemical shift ranges (δ, ppm).
• Alkyne hydrogens (–C≡C–H) resonate at relatively high field values compared with alkenes.
• From the data booklet, –C≡C–H protons appear in the range: 2.5 – 3.0 ppm.

Final Answer:
Chemical shift range for –C≡C–H hydrogens: 2.5 – 3.0 ppm

Revision Tips:
• Chemical shift values depend on electron density around the proton (deshielding).
• Order (approximate ranges, ppm):
Alkane 0.5–1.5 Alkyne 2.5–3.0 Alkene 4.5–6.5 Aromatic 6.0–9.0 Aldehyde 9.4–10.0 Carboxylic OH 10–13
• Remember: number of peaks = number of distinct environments; peak height/area = number of H in each environment.