2025 Ch H2 Q10

Section: Nature's Chemistry
Topic: Skin Care and Natural Products

Question Summary:
This question covers capsaicinoid structures, distinguishing reactions, solubility behaviour, HPLC retention time, cost calculations, and an ion–electron equation.

Worked Solution

(a)(i) Amide link in CAP
The amide link is the -CONH- group joining the aromatic portion of the molecule to the hydrocarbon chain.

(a)(ii) Chemical test to distinguish CAP and DHC
Add bromine solution. CAP contains a carbon–carbon double bond, so the bromine solution will quickly decolourise. DHC does not contain a double bond, so bromine solution will remain orange/brown.

(b) Why drinking water does not reduce burning sensation
Capsaicinoids are non■polar and hydrophobic, so they do not dissolve in water. Water cannot wash them away from the receptors in the mouth.

(c) Retention time of CAP
The graph shows CAP eluting at 2.25 minutes.
Convert to seconds: 2.25 × 60 = 135 seconds.

(d) Cost of CAP in a 60 g tube of cream
0.025% of 60 g = 0.00025 × 60 = 0.015 g CAP.
Cost of 1 kg = £1930.32 = 193032 p.
Cost per gram = 193032 ÷ 1000 = 193.032 p/g.
Cost of CAP in one tube = 0.015 × 193.032 = 2.89548 p $\rightarrow$ 3 p.

(e) Ion–electron equation for oxidation of vitamin C
$C_6H_8O_6(aq) \rightarrow C_6H_6O_6(aq) + 2H^+ + 2e^-$

Revision Tips

- Amide links contain the sequence C=O bonded to an N atom.
- Bromine solution is a standard test for unsaturation.
- Non■polar molecules do not dissolve in water—‘like dissolves like’.
- Retention time is measured from injection to the centre of the peak.

- Ion–electron equations must balance atoms and charges.