

Solutions

2.1

- The refractory period ($\sim 1 \text{ ms} \rightarrow \sim 1000/\text{s}$).

2.2

- Na^+ in (upstroke), then K^+ out (repolarisation).

2.3

- Cardiac refractory ($\sim 200 \text{ ms}$) lasts as long as the twitch: no summation window.

3.1

- Unmyelinated: 1 s for 1 m ; myelinated: $\sim 17 \text{ ms}$ ✓.
- Myelin insulates and channels cluster at nodes: the spike jumps (saltatory) instead of regenerating continuously.
- Demyelination strips the insulation: conduction slows, then blocks (the safety factor fails).

3.2

- Low ECF K^+ hyperpolarises: the K^+ equilibrium potential becomes more negative, dragging rest further from threshold.
- A larger depolarisation is now needed: spikes fail, so contraction fails.
- Episodic because the trigger (insulin after meals, driving K^+ in) wanes with the glucose.