Week 2 – Questions – Excitability

2.1 Voltage-gated ion channels

1. What is meant by a “voltage-gated ion channel”?

2. What structural features underlie the voltage-dependence of a “voltage-gated ion channel”?

2.2 Voltage-gating kinetics

3. Describe / sketch the kinetics of a typical axonal voltage-gated sodium channel opening in response to a depolarising voltage step from -80 mV to 0 mV.

4. Describe / sketch the kinetics of a typical axonal voltage-gated potassium channel opening in response to a depolarising voltage step from -80 mV to 0 mV.

5. Describe / sketch the recovery from inactivation of a typical axonal voltage-gated sodium channel.

2.3 The action potential

6. Describe the sequence of events underlying the action potential.

7. What determines the amplitude and time-course of the action potential?

8. Different classes of neurons can fire at different maximal frequencies. Why might that be?

2.4 Action potential propagation

9. Where does the action potential usually initiate? Why?

10. What underlies action potential propagation?

11. What are the key determinants of action potential propagation velocity?