The Nerve Impulse Worksheet – Answer Key

1. The resting potential is the voltage difference between the inside and outside of an axon of a “non-conducting” neuron. An action potential is the rapid change in this voltage as ions move across the membrane when the neuron is stimulated.

2. -65 mV. Inside is more negative due to the presence of negatively charged proteins, amino acids, and other molecules. Another factor is that more positive ions are being pumped out of than into the axon. The sodium-potassium pump is pumping 3 Na+ ions out and 2 K+ ions in. This causes the inside to be more negative than the outside.

3. The minimum level to which an axon’s membrane has to be depolarized for an impulse to be transmitted.

4. If the stimulus does not cause depolarization to the threshold, then NO impulses are transmitted but if it reaches threshold or goes above then impulses are transmitted regardless of how far above threshold it gets. In other words, there are no weak or strong impulses, they are all the same – either they go or don’t go.

5. a) Na/K pump stops working. Na gates/channels open and Na+ rushed into the axon by diffusion. This causes the inside to become positive.
   b) Na gates close, K gates open and K+ rushes out of axon by diffusion causing the inside to become negative again.

6. The time period at the end of repolarization during which the Na and K gates are closed and the Na/K pump starts working again to move the Na+ back out of and the K+ back into the axon.

7. The fact that the Na gates cannot open during the refractory period.

8. a) When an impulse “jumps” from one node of Ranvier to another
   b) This occurs in myelinated nerves.
   c) Advantage is that impulses can travel at much greater speeds – up to 200m/s (that’s 720 km/h!!) in myelinated fibres compared to 20 m/s in unmyelinated fibres.

9. 

10. A weak stimulus (not impulse) results in less frequent impulses whereas a strong stimulus results in a higher frequency of impulses.