Solutions

Each answer shows the steps, then the **result**.

2.1

- dendrites receive incoming signals from other neurons; the axon carries the outgoing signal away from the cell body

2.2

- a neuron fires at full strength or not at all; a stronger stimulus produces more frequent firing, not a larger action potential

2.3

(a)

- it stays in the gap longer / accumulates

(b)

- the receiving neuron is stimulated for longer, so its firing is more affected

2.4

(a)

- sensory neuron → interneuron (in the spinal cord) → motor neuron

(b)

- the arc passes through the spinal cord without waiting for the brain; the signal to the brain that produces the feeling of pain arrives later

2.5

(a)

- melatonin: regulates sleep, rising in the dark

(b)

- ghrelin: increases hunger

(c)

- oxytocin: social bonding and trust, for example between parent and baby

3.1 B

- intensity is coded by rate because each action potential is the same size

3.2 B

- myelin insulates the axon and speeds conduction

3.3

(a)

- when excitatory input exceeds inhibitory input by enough to reach threshold

(b)

- without inhibition every input would push toward firing, so the nervous system could not select between signals or stop a response

3.4

(a)

- a stimulant, which typically increases neural activity

(b)

- tolerance

(c)

- withdrawal symptoms; her body has adapted to regular caffeine, so when it is no longer consumed the adapted system is left unbalanced and the opposite effects appear

(d)

- alcohol: a depressant, which decreases neural activity
- heroin: an opioid, which acts as a pain reliever

3.5 B

- an antagonist blocks a receptor so the neurotransmitter cannot act; an agonist mimics or encourages it, and a reuptake inhibitor keeps it in the synapse longer

3.6 B

- myelin insulates the axon and speeds conduction, so damage to it slows or interrupts signals