# Homework Answers

1) What functions could be served by axons with many boutons en passant? Describe two possibilities. (Ch 1) Answer: Axons with many boutons en passant can serve the function of transmitting information to multiple targets simultaneously. They can also facilitate communication between different regions of the nervous system by forming connections with multiple neurons along their path. 2) Give two examples of behavior patterns that a reflex model of behavior (or, more broadly, an S-R model) cannot adequately explain. (Ch 2) Answer: A reflex model of behavior cannot adequately explain complex behaviors that involve cognitive processes such as decision-making or problem-solving. It also cannot explain behaviors that are influenced by external factors such as social interactions or environmental stimuli. 3) What is the axons-of-passage problem one must deal with when using stains for axon degeneration for the tracing of axonal pathways and connections? What axon tracing technique overcomes this problem? (Ch 2) Answer: The axons-of-passage problem refers to the difficulty in distinguishing between the axons of interest and the axons that are passing through the area of interest. This problem can be overcome by using the retrograde tracing technique, which involves injecting a tracer substance into the target region and tracing back the labeled axons to their cell bodies. 4) Do web searches to find evidence of a very primitive chordate that is more advanced than amphioxus but less advanced than animals resembling lampreys and hagfish. Try searching for “Haikouella.” Fossils of this species were found in China in recent years. Write a one-paragraph description noting similarities to, and differences from, the lancelets (amphioxus). You can find pictures using Google, and scientific reports using Google Scholar. (Ch 3) Answer: Haikouella is a very primitive chordate that is more advanced than amphioxus but less advanced than animals resembling lampreys and hagfish. Similar to lancelets, Haikouella possesses many characteristics of primitive vertebrates, such as a notochord and a dorsal neural tube. However, it also exhibits certain features that are more advanced, such as the presence of a distinct head region with primitive eyes and possible gills. 5) Do web searches for information on the brains of cynodonts (mammal-like reptiles, the group from which the earliest mammals evolved). Write one or two paragraphs on findings of interest, using papers found using Google Scholar. Describe only major points. Start by explaining how a fossil skull can tell us anything about the brain. (Ch 3) Answer: Fossil skulls of cynodonts, the group from which the earliest mammals evolved, can provide valuable insights into brain structure and evolution. By examining the shape and size of the cranial cavity, researchers can infer the overall brain size and the relative development of different brain regions. Studies have revealed that cynodonts showed increased encephalization compared to their reptilian ancestors, indicating a trend towards higher cognitive abilities and more complex behaviors. 6) Describe the three major expansions of the vertebrate forebrain depicted in chapter 4. Answer: The three major expansions of the vertebrate forebrain depicted in chapter 4 are the olfactory bulbs, the cerebral hemispheres, and the neocortex. The olfactory bulbs are responsible for processing and interpreting olfactory signals, while the cerebral hemispheres play a role in higher cognitive functions such as memory, learning, and decision-making. The neocortex, which is unique to mammals, is responsible for complex cognitive processes and is involved in sensory perception, motor control, and language.