**Table 4.2.** JUNCTIONAL DELAYS AND RECEPTOR LATENCIES. This table gives minimum delays except when otherwise indicated. Synaptic delay is defined for this purpose as the time transpiring between first electrical sign of a single presynaptic impulse or synchronized volley occurring in presynaptic terminals and the first electrical sign of response in the postsynaptic unit. It is not always possible to bring published values to a common basis because different interpretations prevail as to the moment in a presynaptic spike when activity can be said to have entered the terminals, or, in the other cases, different bases have been used for correcting for conduction time between presynaptic electrodes and the terminals. All figures except those footnoted include the original author's corrections. Note that time is measured to the beginning of postsynaptic response, often a synaptic potential and not a spike. Since the spike may be initiated any time up to or slightly beyond the crest of the junctional potential, a separate section gives values for crest time of such potentials. Central, peripheral, and artificial synapses are included, and response times (to first sign, slow wave or spike) of some primary sensory neurons to abruptly applied adequate stimuli are given in a separate section.

| | Group and Species* | Preparation, Junction and Condition | Corrected Delay (msec)* | Temp. (°C) |
|---|---|---|---|---|
| | | **Synapses, including Neuromuscular Junctions** | | |
| | **Coelenterata** | | | |
| 1 | Sea anemone, *Metridium senile* | Nerve net; mesentery; through-conduction pathway | <2.5[1] | — |
| | **Annelida** | | | |
| 2 | Plume worm, *Protula intestinum* | Natural synapse between giants, in brain; fresh | 0.8 | 16 |
| 3 | *Protula intestinum* | Natural synapse between giants, in brain; fatigued | 6.5 | 16 |
| 4 | *Protula intestinum* | "Quasi-artificial" jumping between giant fibers; fresh | 0.6 | 16 |
| 5 | *Protula intestinum* | "Quasi-artificial" jumping between giant fibers; fatigued | 7+ | 16 |
| 6 | Earthworm, *Lumbricus terrestris* | Oblique septum between segmental giant fiber units | <0.1[1] | 24 |
| | **Arthropoda** | | | |
| 7 | Crayfish, *Cambarus clarkii* | Lateral giant fibers, segmental, septal synapse | <0.1 | — |
| 8 | *Cambarus clarkii* | Lateral giant fibers, commissural synapse | 0.5 | — |
| 9 | *Cambarus clarkii* | Ipsilateral lateral giant to third root motor fiber | 0.1 | 20 |
| 10 | *Cambarus* sp. | First synapse in proprioceptive pathway; exposed ventral ganglia | 3.5–4.5[1] | — |
| 11 | Ghost shrimp, *Callianassa* | Last abdominal ganglion; giant central fiber to motor fibers in telson | 0.25 | 20–22 |
| 12 | Cockroach, *Periplaneta americana* | Last abdominal ganglion; cercal afferents to ascending pseudogiant fibers | 0.6–1.5 | — |
| | **Mollusca** | | | |
| 13 | Slug, *Ariolimax columbianus* | Pedal ganglion, isolated | 33 | 7.6 |
| 14 | *Ariolimax columbianus* | Pedal ganglion | 19 | 21.8 |
| 15 | Squid, *Loligo opalescens* | Synapse in stellate ganglion, 2nd to 3rd order giant fibers | 0.5 | 24 |
| | **Chordata** | | | |
| 16 | Frog, *Rana* sp. | Neuromuscular junction; semitendinosus | 0.8 | 22.5 |
| 17 | Cat, *Felis cattus*[4 or 5] | Neuromuscular junction; soleus and other muscles | 0.55–0.65 | 37–39 |
| 18 | *Felis cattus*[5] | Monosynaptic reflex, ventral horn motoneurons, wire electrodes | 0.3–0.45[13] | 37 |
| 19 | Rabbit, *Oryctolagus cuniculus*[3] | Trochlear motoneurons, stimulating superior colliculus | 0.7 aver. | 37 |
| 20 | *Oryctolagus cuniculus*[3] | Trochlear motoneurons, weak stimulus | 0.9 max. | 37 |
| 21 | *Oryctolagus cuniculus*[3] | Trochlear motoneurons, facilitated | 0.5 min. | 37 |
| 22 | Cat, *Felis cattus*[10] | Cochlear nucleus in medulla (trapezoid fibers) | 0.8 | — |
| 23 | Turtle, *Pseudemys* sp | Sympathetic ganglion, superior cervical, B-fibers | 8[14] | — |
| 24 | *Pseudemys* sp. | Sympathetic ganglion, superior cervical, C-fibers | 25[14] | — |
| 25 | Cat, *Felis cattus*[4] | Sympathetic ganglion, superior cervical, synapse facilitated | 2 | 35 |
| 26 | *Felis cattus*[5] | Stellate ganglion, in situ | 3–4 | 37–39 |

| | | | | |
|---|---|---|---|---|
| 27 | Earthworm, *Lumbricus terrestris* | Single giant fiber, after-discharge arising near anodally depressed locus | 5+ | 24 |
| 28 | Crabs, several species | Two isolated nerves or fibers in contact | 7+ | — |
| 29 | Cuttlefish, *Sepia officinalis* | Two isolated giant fibers in contact; normal or citrated | 2.5[2]–5 | — |
| 30 | *Sepia officinalis* | The same; citrated; rhythmic subthreshold activity | >40[2] | — |
| 31 | Cat, *Felis cattus*[7 or 4] | Cut end of nerve; A-fibers; motor to sensory | 0.1–0.3 | — |
| 32 | *Felis cattus*[9] | Cut end of dorsal columns of spinal cord; dorsal root to dorsal root | 0.1–0.3 | — |

Response Time of Sense Organs to Abruptly Applied Physiological Stimuli

| | | | | |
|---|---|---|---|---|
| | **Mechanoreceptors** | | | |
| 33 | Crayfish, *Cambarus* sp. | Tactile hairs on telson | 0.5–1.5 | — |
| 34 | Frog, *Rana temporaria* | Touch receptors, dorsal skin | 0.7–14.6 max.[1] | 20.6–29.6 |
| 35 | Cat, *Felis cattus*[7 or 4] | Pacinian corpuscle, single, mesenteric | 0.5.–1.5 | — — |
| 36 | *Felis cattus*[8] | Baroceptors in carotid body, single fibers | $<10^{1.2}$ | — — |
| 37 | *Felis cattus* | Auditory nerve spikes, click stimulus (incl. 0.1 msec latency of microphonic) | 0.6[1]min.–0.8[1]max. | — — |
| 38 | Guinea pig, *Cavia porcellus* | Cochlear microphonic to action potential | 0.15[1] | — |
| | **Radiation receptors** | | | |
| 39 | Clam, *Mya arenaria* | Photoreceptors in siphon; electrical response at "on." | 720–16,000 | 20 |
| 40 | Horseshoe crab; *Limulus* | Spikes in optic nerve; near-maximal and near-threshold stimuli | 77–750 | — |
| 41 | *Limulus* | ERG, [12] intracellular electrode in ommatidial receptor | 70 | — |
| 42 | *Limulus* | ERG, near-maximal light flash and 5 log units weaker, respectively | 10;55 | 25–28 |
| 43 | Isopoda, *Ligia occidentalis* | ERG, near-maximal intensity and $10^{-5}$ of this | 6–20 | 22 |
| 44 | Grasshopper, *Melanoplus* | ERG, near-maximal and $10^{-6}$ of this | 9.3–59.6 | — |
| 45 | Fly, *Calliphora* | ERG, near-maximal | 6[2] | — |
| 46 | Frog, *Rana* sp. | ERG, a-wave; $10^{6}$ and $10^{2}$ times threshold | 28–120 | 18 |
| 47 | Cat, *Felis cattus* | ERG, a-wave | 4 | — |
| 48 | *Felis cattus*[4] | ERG; b-wave, near-maximal and very weak stimuli, respectively | 25;80 | — |
| 49 | Rattlesnake, *Crotalus viridis*[11] | Infrared receptor in facial pit organ | 15–50+ | 23 |

Rise Time (foot to summit) of Junctional Potentials

| | | | | |
|---|---|---|---|---|
| 50 | Plume worm, *Protula* | Giant synapse in brain, in situ | 1 | 16 |
| 51 | Various crabs, crayfish | Various leg muscles; end-plate potential | 3 | 17 |
| 52 | Squid, *Loligo pealii* | Giant synapse in stellate ganglion | 0.3–1.5+ | 23 |
| 53 | Frog, *Rana temporaria*[13] | Neuromuscular junction; isolated skeletal muscle; internal electrode | 1.2 | 20 |
| 54 | *Hyla aurea* | Isolated muscle fiber; external microelectrode on single endplate | 0.5 | — |
| 55 | Cat, *Felis cattus*[11] | Neuromuscular junction; soleus strip with circulation intact | 0.8 | 37–39 |
| 56 | *Felis cattus*[6] | Spinal cord; ventral horn motoneuron; internal electrode | 0.6–1.0 | 36–38 |
| 57 | *Felis cattus* | Sympathetic ganglion, stellate, in situ | 10–20 | 37–39 |
| 58 | Rabbit, *Oryctolagus cuniculus*[11] | Sympathetic ganglion, superior cervical, isolated | 25–35 | 35 |

*([1]) Uncorrected for (i.e. includes) conduction time. ([2]) Measured from illustrations. ([3]) Decorticate. ([4]) Decerebrate. ([5]) Nembutal. ([6]) Pentobarbitone. ([7]) Chloralose. ([8]) Chloralose-urethane. ([9]) Dial. ([10]) Avertin anesthesia. ([11]) Curarized. ([12]) ERG = electroretinogram. ([13]) Measured from peak of positive wave of presynaptic volley. ([14]) Measured from first reversal of sign of diphasic prespike; conduction-time correction not stated.