What happens to (i) the typical time to threshold and (ii) the accuracy of responses in an integrator-type decision-making circuit if:

Quoted from the book " the threshold is raised, then decisions are slower and more accurate. They are slower because it takes activity more time to reach threshold. They are more accurate, because noise accumulates as the square root of time, while the signal accumulates linearly with time in an integrator—so given sufficient time the signal can dominate over the noise." , " For an integrator, a scaling down of its inputs acts exactly like a scaling up of its threshold, assuming both the stimulus and noise terms to be integrated scale identically."

a. Noise in the inputs is increased?

(i) Typical Time to Threshold: Decreases.
(ii) Accuracy of Responses: Decreases. With more noise, the integrated signal becomes less reliable, making it harder to distinguish true differences from noise fluctuations. This can lead to more incorrect decisions.

b. Input synapses are strengthened?

(i) Typical Time to Threshold: Decreases. Stronger synapses amplify both signal and noise. While noise increases, the signal is amplified to a greater degree, allowing it to reach the threshold faster.
(ii) Accuracy of Responses: I personally think it can increase or decrease depending on the relative strength of signal and noise. If the signal is amplified more than the noise, accuracy improves. However, if noise is amplified more due to its random fluctuations, it can overwhelm the signal, decreasing accuracy. But considering " For an integrator, a scaling down of its inputs acts exactly like a scaling up of its threshold, assuming both the stimulus and noise terms to be integrated scale identically." the accuracy should decrease.

c. Thresholds of all units are increased?

(i) Typical Time to Threshold: Increases.
(ii) Accuracy of Responses: Increases

A firing-rate model produces oscillations with a frequency of 20 Hz with neurons never firing at a rate above 15 Hz. Can such a model apply to real spiking neurons, and if it can, what would you expect to see in the neural spike trains?

Yes, such a model can apply to real spiking neurons. In this case, the 20 Hz oscillation likely reflects the synchronized rhythmic activity of a group of neurons. Individual neurons within this population would likely fire at an average rate below 15 Hz, but with some variability that could include bursts exceeding this limit. These bursts wouldn't be sustained though. Interestingly, the timing of individual spikes within the population might be phase-locked to the 20 Hz oscillation. This means there would be a higher probability of firing at specific points within the oscillation cycle, even though there would still be some variability in the firing patterns of individual neurons.