	TRUE	FALSE
1. Biological neural networks are able to carry out complex tasks because neurons operate really fast.	☐	☐
2. Gene regulation plays a role in long-term memory and learning.	☐	☐
3. Feedforward neural networks require backpropagation for training.	☐	☐
4. When fitting a model (e.g. a neural network) to a given data set, one should run the training procedure for as long as possible.	☐	☐

1. Not really – A neuron needs to recover after firing a spike, so that the firing frequency is limited to around 1 kHz. The ability of a brain to carry out complex tasks is instead due to the parallel nature of its computation. In the human brain, there are around 10^{12} neurons => around 10^{15} operations/s.

2. This is TRUE (at least in the case of Aplysia, but in all likelihood in other organisms as well): Long-term memory depends on changes in gene regulation that, in turn, modify synapse strength (permanently).

3. This is FALSE. In general, artificial neural networks (of which feedforward neural networks is an example) constitute a computational structure to which many different training methods can be applied. Backpropagation is often used in cases where one has a set of input-output pairs (so that an error signal can be formed, as the difference between the desired output and the actual output, for every input). In other situations, where a set of input-output pairs is not available, other methods, such as genetic algorithms, may be used.

4. No, this is FALSE. If the training procedure is allowed to run indefinitely, the model will fit the noise in the data, resulting in reduced quality (of interpolation, prediction etc.). Instead, one should measure the error over a separate validation set (while training), and use the error over *that* set (which is not fed back to the training algorithm) to determine when to stop training.