memory of facts and episodic memory of events are the same.

- The MTL is not the storage site. It binds together neocortical memory traces. Over time, these become independent of the MTL.

Memory consolidation occurs when the hippocampal system repeatedly reactivates representations in neocortex, leading eventually to strong interconnections among cortical sites, which can support memory independently of the hippocampal system.

Multiple Trace Theory (Nadel and Moscovitch 1997)

Every time we remember something we lay a new memory trace in the hippocampus. So older memories are less susceptible to be wiped away by hippocampal damage – as they are distributed more widely so larger lesions needed to affect remote memories. Also, with time they lose detail and only retain gist of event, i.e. become more semantic, and they are no longer mediated by hippocampus but by neocortex instead.

However, true and detailed episodic memories always depend on the hippocampus. This is because the spatial and temporal contextual information that make a memory episodic is dependent on the involvement of the hippocampus (spatial context) and frontal cortex (temporal context). Eventually a memory can become independent of the hippocampus but to remember it vividly, the hippocampus is needed.

4. Discuss how the biophysical properties of a single neuron can determine what type of function it performs (4 marks).

Neurotransmitters it produces and receives

The type of ion channels

Different metabotropic channels

Leakage

Outline the simplifications made in the models of neurons used in typical artificial neural networks (4 marks).

A simple artificial neurons have a threshold logic function, the network uses a simple integrate and fire model. There are input neurons, connection weights and output neurons, but there is no physical structure or stimulation of spikes. The 'net input' to the neuron is calculated as the 'weighted sum' of input activations. In the artificial network, if the total amount of input activation and connection weights are limited, the maximum net input and thus the output firing rate occurs when the pattern of input activation and connection weights match. This is like calculating a dot product of vectors.

Captures the idea of ‘response’ (body turn) learning in basal ganglia, versus ‘place’ presentation in hippocampus. The simple model takes more account of place representation, and may be will allow more short cuts to occur.

The Brown and Sharp model performs complex ‘stimulus-response’ learning- takes into account place and direction and then make a body turn of either left or right in order to get to the goal. It learns by trial and error and gets the animal to the goal, but may not take into account novel shortcuts.

Solves the temporal credit assignment problem by using the recency-weighted cumulative Hebbian value associated with each connection. Not sure how plausible this is or isn’t. There may be something in the synapses that governs LTP which takes into account decay. It may be possible. But then it is impossible for one synapse to know all the other synaptic activity of the other synapses.

Solves the non-linearly separable nature of navigation by providing an expanded representation, separate neurons for place by turn.