Explain neural pruning, with reference to one relevant study. [9]

Mini intro (starter)	Neural pruning is a natural process that occurs in the brain in which synapses that are no longer needed are removed.
	In this SAQ, I will give detailed account of how and why this happens with reference to selective elimination and engulfment and improving efficiency.
Dear All, Please Focus! • DEFINE • ANALYSE • PLAN • FOCUS	To help explain this process I will use an experiment conducted by Draganski et al. which measured structural changes using MRI scans.
	The behaviour that was the focus of this study was juggling, a skill which involves complex visuo-spatial awareness.

Theory/ concept (Main course) (Don't leave your examiner hungry! If they ordered lasagne, don't give them curry! Listen carefully to their order!)	Neural pruning can happen as part of normal brain maturation but may also be experience-dependent and therefore is part of the process of learning.
	For example, when we practise a new skill (or repeatedly perform a behaviour), we develop new connections or synapses between neurons, which form into neural networks. However, these synapses can also be pruned/removed if and when we stop practising.
	This happens due to a process called selective elimination. Synapses that are infrequently activated become weaker, and ultimately, eliminated in order to make the brain more efficient.
	This happens through a process called engulfment. Microglial cells monitor our neural networks looking for under-used synapses. When they find them they engulf the synapse removing the axon terminal from the presynaptic cells and the dendritic spine from the postsynaptic cell. This reduces the communication between neighbouring neurons.

Supporting study (Side order) (All SAQs need a study, don't scrimp on the portion size, and make sure its well seasoned with lots of specific details)	Draganski *et al.* (2004) demonstrated <u>neural pruning</u> in their **experiment** which showed how specific **brain structures** decrease in **grey matter concentration** when a previously learned skill is no longer practised.
	Participants were assigned to either the **experimental group** (jugglers) or the **control group** (non-jugglers). An initial MRI scan provided a **baseline** to which future scans could be compared. There were no significant differences between the two groups who were also **matched** for age and sex. Another MRI was taken when the jugglers were able to perform a three-ball cascade trick competently for 60 seconds. Three months after they stopped juggling further MRI scans were performed.
	Voxel-based morphometry revealed increased **grey matter concentration (GMC)** in the jugglers' **intraparietal sulcus** and the **mid-temporal area** in comparison with the control group at the end of the period of juggling practice. However, when the jugglers stopped practising, the final brain scans showed decreased GMC in these regions.

Explicit link between study and concept The sweet spot - Dessert (Impress your examiner with something really rich and delicious right before they grade you!)	This decreased GMC can be explained using the concept of **neural pruning.**
	When the **experimental group stopped juggling** every day the new synapses that they had created became **weaker** as they were no longer being **activated**.
	Gradually, these synapses would have been **engulfed** by microglial cells leading to **selective elimination**.
	This is a good example of the old saying '**use it or lose it**'!
	This process would help the jugglers' brains to become more **efficient** as unnecessary neural connections will not slow them down when they are processing other types of sensory information.

Markband	Level descriptors		
	Focus and relevance	Accuracy and depth of knowledge and understanding	Effective use of appropriate research evidence
0	The answer does not reach a standard described by the descriptors below.		
1–3	The response is of limited relevance to or only rephrases the question.	Knowledge and understanding is mostly inaccurate or not relevant to the question.	The research supporting the response is mostly not relevant to the question and if relevant only listed.
4–6	The response is relevant to the question, but does not meet the command term requirements.	Knowledge and understanding is accurate but limited.	The response is supported by appropriate research which is described.
7–9	The response is fully focused on the question and meets the command term requirements.	Knowledge and understanding is accurate and addresses the main topics/ problems identified in the question.	The response is supported by appropriate research which is described and explicitly linked to the question.

Total mark (9)		Grade (1-7)	
What went well			
Even better if			
DIRT			