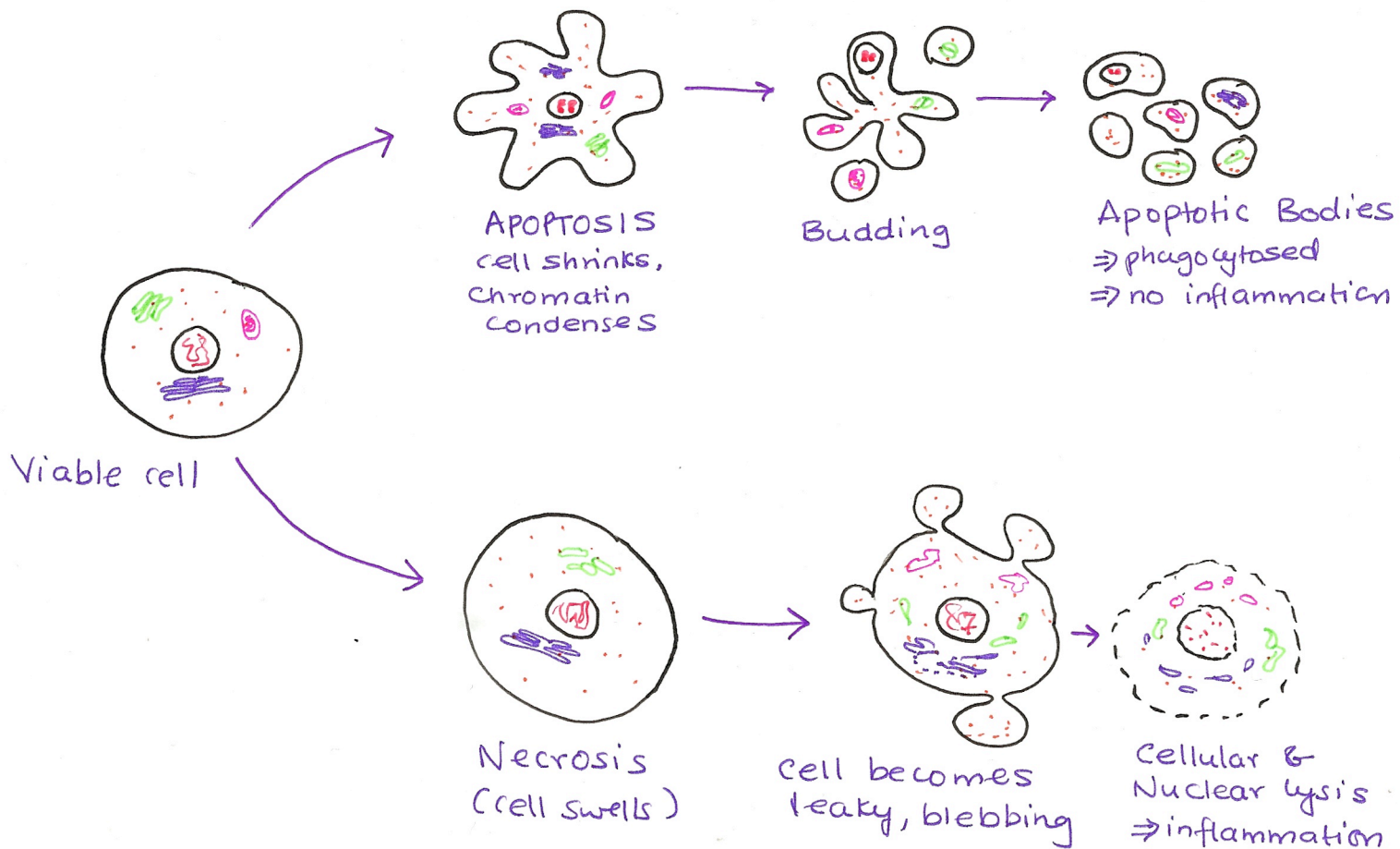


Apoptosis



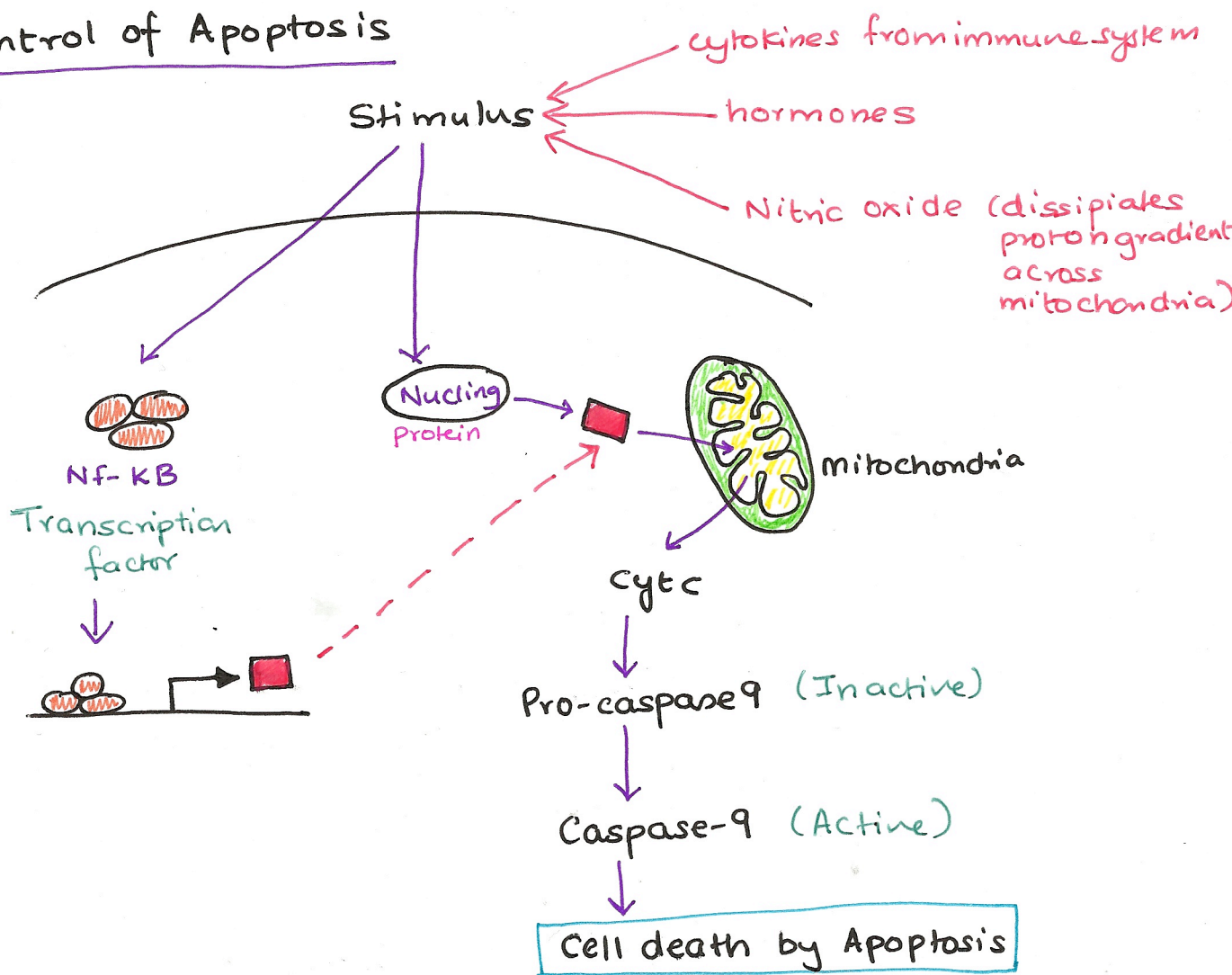
Apoptosis - programmed cell death (in Eukaryotes)

- orderly & tidy cell death, no inflammation
- ~ after 50 cell divisions (Hayflick constant)

Necrosis - Release of hydrolytic enzymes, inflammation & swelling

Sequence

- Enzymes break down cell cytoskeleton
- Cytoplasm becomes dense
- Organelles tightly packed
- Chromatin condenses, nuclear envelope breaks
- DNA fragments
- Cell membrane bulges outwards, forming 'blebs'
- Cell matter compartmentalised into membrane-bound vesicles.
- Vesicles taken up by phagocytosis
- Cellular debris disposed of with damage to surrounding tissue.

Control of Apoptosis

- External stimuli - cytokines, hormones, growth factors, nitric oxide
- $\Rightarrow$ trigger internal metabolic pathways
- $\Rightarrow$ transcription of proteins that result in mitochondria releasing cytochrome c
- $\Rightarrow$ Cytochrome c activates caspase-9
- $\Rightarrow$ caspase-9 triggers pathways that lead to apoptosis

Role in development

- Weeds out ineffective or harmful T-lymphocytes during development of the immune system
- Allows digits to separate during limb development (tissue remodelling)
- Organogenesis - heart development