Guide Questions for Topic: Cell Death by Apoptosis

1. How does apoptosis contribute to an animal's digits (i.e., fingers and toes) during development?
2. How does apoptosis contribute to homeostasis within blood system in mammals?
3. How does apoptosis contribute to higher organisms' (e.g., humans) defense against cancer?
4. Which of the following are the major hallmarks of cells undergoing apoptosis?
5. How do macrophages contribute to the completion of apoptosis within organisms?
6. How do macrophages distinguish apoptotic and nonapoptotic cells?
7. What enzymatic activity do caspases exhibit? How do caspases contribute to apoptosis?
8. Why does degradation of ICAD cause DNA fragmentation during apoptosis?
9. Why does degradation of nuclear lamins cause nuclear fragmentation during apoptosis?
10. Degradation of the actin cytoskeleton during apoptosis causes _____.
11. How do initiator and effector caspases differ? What do they have in common?
12. Caspase-9 is an example of _____, whereas caspases-3 is an example of _____.
13. How do Apaf-1 and cytochrome c contribute to the progression of apoptosis?
14. What role does cytochrome c play within healthy, nonapoptotic cells?
15. What role do the Bcl-2 family of proteins play within cells?
16. What do the amino acid sequences of all Bcl-2 family members have in common?
17. How does activation of Bax and Bak contribute to the progression of apoptosis?
18. How do the anti-apoptotic Bcl-2 proteins (e.g., Bcl-2 and Bcl-x_L) affect apoptosis?
19. How do the BH3-only proteins contribute to Bax and Bak activation during apoptosis?
20. Recall from our discussion on Cell Signaling that growth factors activate the kinase Akt through the PI 3-kinase signaling. Also recall that, once active, Akt prevents cells from entering apoptosis by phosphorylating and inhibiting the proteins Bad and FOXO. Now that we you have examined the molecular events that induce apoptosis, why does inhibition of Bad and FOXO protect cells from apoptosis?
21. Several weeks ago, we discussed how p53 induces expression of PUMA when cells accumulate DNA damage, which in turn induces apoptosis. Now that we you have examined the molecular events that induce apoptosis, why does induction of PUMA expression causes apoptosis?