Bio121
K. Mulligan

Review Questions
Lectures 22 & 23

1. What is binary fission? Compare and contrast to eukaryotic division.

2. List and describe all of the different phases of the cell cycle.

3. How is the cell cycle involved in the determination of cell number, cell type and cell quality?

4. List and describe the difference cell cycle checkpoints.

5. What are Cdks? What are cyclins? How is their activity regulated? How are they important to the cell cycle?

6. What signals are important at the G1 checkpoint? What happens if cells do not pass the G1 checkpoint?

7. What are mitogens?

8. Describe the molecular pathway triggered by mitogens. *(Hint: this is a LONG answer; you need to describe the pathway from mitogen all the way to S-cyclin; understand the mechanisms of each protein in the pathway)*

9. What types of genes are regulated by E2F? (Think about what stage of the cell cycle E2F helps a cell to advance to and what happens during that stage; your answer should be in the form of: "E2F regulates genes important for _____," and list specific processes in the blank.)

10. Why is overactive Ras and myc found in so many tumors?

11. What happens at the G2/M checkpoint? What could happen if a cell bypassed this checkpoint? What happens to cause a cell to move past this checkpoint?

12. What critical function does the M-Cdk complex have? (List its substrates along with

each of their cell cycle functions)

13. Briefly describe the different phases of M phase.

14. What happens at the M phase (metaphase-to-anaphase transition) checkpoint? What is APC/C? What proteins do APC/C target and why are these targets important for moving past this checkpoint?

15. Why must M-cyclin be degraded at the metaphase-anaphase transition?

16. How are kinetochores attached to microtubules? Understand how the structure allows movement of the chromosomes to spindle poles.

17. What is cytokinesis? Why are actin and myosin important?

18. (Review) Define necrosis and programmed cell death. What is the difference between these types of cell death?

19. What processes require apoptosis? (Another way to state this question: what problems might arise during development or in adult life if apoptosis did not occur properly?)

20. What are the characteristics of an apoptotic cell?

21. What is the primary cause of apoptosis during mitosis?

22. What are caspases and how are they important for apoptosis? What is a procaspase?

23. What is the difference between initiator and executioner caspases?

24. Describe the extrinsic apoptotic pathway.

25. Describe the intrinsic apoptotic pathway.

26. Why are Bcl2 proteins so critical? What process do they control? What are the different Bcl2 family members? Describe the molecular mechanism of the Bcl2 family members.

27. How does DNA damage lead to either cell cycle arrest or apoptosis? What proteins are involved and what are their functions? *(Hint: Your answer should include Mdm2, p53, p21, BH3-only)*

28. Why would a cell become apoptotic rather than just arrest the cell cycle?

29. How does p21 cause cell cycle arrest?

30. Why is p53 so critical? What would happen if p53 did not function properly?