

Student Handout Advanced

INTRODUCTION

This handout should be used with the Click and Learn "The p53 Gene and Cancer" (http://www.hhmi.org/biointeractive/p53-gene-and-cancer). It is intended as a full introduction to the p53 molecule, its interaction with other molecules, and its role in cancer.

PROCEDURE

Follow the instructions as you proceed through the Click and Learn and answer the questions in the spaces below.

1. On **slide 1**, "p53" is referred to as a molecule, a protein, and a gene; it is also referred to as being mutated. In your own words, and based on your knowledge of molecular genetics, how are these terms related?

- 2. Read **slide 2** and define the following terms:
 - a. Oncogene:
 - b. Tumor suppressor gene:
 - c. DNA repair gene:
- 3. Based on the information on slide 2, how is p53 related to oncogenes and tumor suppressor genes?
- 4. Watch the video clip on **slide 2** and answer the following questions:
 - a. How is a mutated oncogene analogous to a 100-pound weight on the gas pedal in a car?
 - b. How does the car analogy apply to a mutated tumor suppressor gene?



- c. What is required for a cell to "spin out of control"?
- 5. What three conditions or factors activate p53 to shut down cell division (slide 3)?
- 6. Why is p53 called the "guardian of the genome"?
- 7. The p53 protein contains three domains. In your own words, what is the function of each domain (slide 4)?
 - a. Transactivation domain:
 - b. DNA binding domain:
 - c. Complexing domain:
- 8. Slide 5 explains p53's function. What is a transcription factor?
- 9. Based on the information given in **slides 3 and 5**, for what set of cancer genes does p53 act as a transcription factor?



- 10. What are the two roles of Mdm2 (slide 6)?
- 11. Watch the video clip on **slide 6** and answer the following questions:
 - a. What is the purpose of ubiquitin?
 - b. What is the role of the proteasome?
- 12. Hypothesize how Mdm2 "tags" p53 for degradation.
- 13. Read **slide 7** and watch the animation. Answer the following:
 - a. How does p53 "turn on" transcription?
 - b. Name two cell processes that are regulated by p53?

c. Cancer can be defined as "uncontrolled cell division." Based on this definition, explain how mutations in the p53 gene play a role in cancer.