

Pre- & Post-Activity Surveys

Measuring the Rotational Speed of Spiral Galaxies & Discovering Dark Matter

Teacher Name: _____

School: _____

Class: Physics Astronomy Earth Science Other _____ (Please circle)

Grade Level: _____

Date(s): _____

Teacher Instructions:

This survey accompanies the “*Measuring the Rotational Speed of Spiral Galaxies and Discovering Dark Matter*” Activity. Students should get a numbered copy of the Pre- and Post-Activity Survey. Please have the students check that their Pre- and Post-Activity Surveys have the same identifying number at the top right-hand corner. Before the activity begins, have the students complete the Pre-Activity questions and turn them in to the instructor. After the Activity is over, have students complete the Post-Activity Survey and turn them into the instructor. This is essential because we want to have paired samples of pre- and post-answers so that we can judge how much individual students have learned.

Please send the completed surveys, bundled by class so that the pre- and post-surveys for each student remain together, to:

Professor Tammy Smecker-Hane
Department of Physics & Astronomy
4129 F. Reines Hall
University of California
Irvine, CA 92697-4575

so that we can analyze the results. We will be happy to send you the results from your classes as well as our cumulative results in the future.

If you have any questions, please email Tammy Smecker-Hane at tsmecker@uci.edu.

Pre-Activity Survey

Measuring the Rotational Speed of Spiral Galaxies & Discovering Dark Matter

Student Instructions:

Please circle the correct answer (only ONE) to the 5 questions below. This survey measures how much you know about our subject BEFORE we begin our lesson. You will NOT be graded on your responses. *For your own privacy, please do not include your name or any other identifying information.*

1. How do the gas and stars inside a flat, disk-shaped spiral galaxy move?
 - a) They do not move at all but stay in the same place.
 - b) They have random chaotic motions like bees around a beehive.
 - c) They orbit around the center in an organized way like a CD or DVD.
 - d) They vibrate up and down vertically in the disk.
2. An object emits light at a specific wavelength λ_0 . If the object is moving away from you then the light you would observe would have a wavelength λ that is
 - a) redshifted, $\lambda > \lambda_0$.
 - b) blueshifted, $\lambda < \lambda_0$.
 - c) the same wavelength, $\lambda = \lambda_0$.
 - d) You would observe no light at all.
3. When an electron bound to a hydrogen atom moves from a higher energy level to a lower energy level then
 - a) a photon is emitted.
 - b) a photon is absorbed.
 - c) energy is not conserved.
4. Approximately what percentage of a galaxy's mass is composed of dark matter that does not emit light at any wavelength?
 - a) 0 to 10%
 - b) 20 to 30%
 - c) 50 to 60%
 - d) 80 to 90%
5. Astronomers believe that dark matter is probably made of
 - a) black holes
 - b) planets
 - c) cold gas
 - d) an elementary particle

Post-Activity Survey

Measuring the Rotational Speed of Spiral Galaxies & Discovering Dark Matter

Student Instructions:

Please circle the correct answer (only ONE) to the 5 questions below. This survey measures how much you know about our subject AFTER the lesson. You will NOT be graded on your responses. *For your own privacy, please do not include your name or any other identifying information.*

1. How do the gas and stars inside a flat, disk-shaped spiral galaxy move?
 - a) They do not move at all but stay in the same place.
 - b) They have random chaotic motions like bees around a beehive.
 - c) They orbit around the center in an organized way like a CD or DVD.
 - d) They vibrate up and down vertically in the disk.
2. An object emits light at a specific wavelength λ_0 . If the object is moving away from you then the light you would observe would have a wavelength λ that is
 - a) redshifted, $\lambda > \lambda_0$.
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 - d) You would observe no light at all.
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