**Crash Course Astronomy #41 Dark Matter** **NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. If you measure how fast a galaxy rotates, you can calculate its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. By measuring the Doppler shift, you can measure its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. For many galaxies, the further out from the center the \_\_\_\_\_\_\_\_\_\_\_\_\_\_, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ were moving.
4. Rubin found there must be five or six times as much of this \_\_\_\_\_\_\_\_\_\_\_\_\_ material than the \_\_\_\_\_\_\_\_\_\_\_\_ light in galaxies.
5. Rubin’s observations and measurements were far better to help explain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
6. A possible explanation of this indivisible matter could be \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
7. What happens to light as it travels through the warping of space?
8. This bending of light is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
9. According to Einstein’s equations, the mass of the object affects the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the more that it can warp the path of a light beam.
10. We can measure the \_\_\_\_\_\_\_\_ of a cluster by the \_\_\_\_\_\_\_\_\_\_\_ of the objects behind it.
11. The \_\_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_ billion light years away is not just a cluster but a collision of 2 galaxies.
12. When clusters collide, gases of the clusters give off \_\_\_\_\_ energy \_\_\_\_\_\_\_\_\_ that helps astronomers map the area around the area of the cluster.
13. The \_\_\_\_\_\_\_\_\_\_ of the matter in the Bullet Cluster distorted those background galaxy image subtly, and by very carefully measuring the distortion, a map of all the mass in the Bullet Cluster was made including \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
14. What is the sequence of the universe development:
    1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_