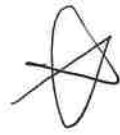


Redshift / Blueshift HO



Station 1: Historic Galaxy Spectra

Read the article describing how to interpret the spectra images. Once you have done so, please use the spectra images to answer the questions below.

1. Explain what astronomers measure in each spectra to determine the direction and speed of the galaxy. *The wave lengths, shift, blueshift closer, redshift farther*

2. Given your knowledge of the images, which colors of the rainbow must be on the left and right sides of the spectra? *left side should be blue, right red*

3. As galaxies have more and more redshift, how would you expect their velocities to change? *There velocity would change and be higher/increase*

4. The top galaxy spectrum is quite thick and they get progressively thinner as you go down the page. What do you think is the cause of the different galaxy spectra thicknesses?

The brighter and closer the object is the thicker the spectra is, the dimmer and farther the thinner the line/spectra is

Station 2: Calculating the Velocities of Galaxies

Use the spectra and instructions at the station handout to fill out the table below and calculate how fast these galaxies are moving **and** which direction they are moving.

Galaxy Spectral Shift Table				
Galaxy	Hydrogen Spectral Line Location (nm)	Wavelength Shift (nm)	Velocity (km/s)	Direction (Away or Closer)
Virgo A	658.8 nm	2.8 nm	1,280.5 ^{km/s}	away
M65 Spiral in Leo	657.7 nm	1.7 nm	777.4 ^{km/s}	away
Andromeda	655.4 nm	-0.6 nm	-244.4 ^{km/s}	closer
Human Eye	1 nm	1 nm	454.3 ^{km/s}	—

+ means away
- means closer

$$\begin{aligned} & -656 \\ 658.8 - 656 &= 2.8 \end{aligned}$$

$$\frac{2.8}{656} \cdot 300,000$$

$$V = H_0 D$$

$$D = \frac{V}{H}$$

$$D \cdot 3.3 = \text{light years}$$

Station 3: Redshifting Galaxies from Universe Expansion

Galaxy	Redshift (km/s)	Distance (Mpc)	Distance in lightyears
A	2500	38.8 Mpc	128.04
B	13500	209.3 Mpc	690.69 & 690.7
C	3900	60.5 Mpc	199.7
D	7400	114.7 Mpc	378.5
E	9600	148.8 Mpc	491.04

Step 3: How far does an object need to be in order for Universal Expansion to be visible to the human eye? The object has to be 35.3 Mpc, 116.7 light years

Step 4: Can we use telescopes to see stars affected by Universal Expansion?

Yes if there moving away from you or closer No, not yet

Station 4: Finding Exo-planets through Redshift - Blueshift

After reading the article online, please work together as a small group to answer the questions below.

1. What causes the redshift and blueshift in the radial velocity method?

A star moving closer and farther

2. What is an exoplanet?

An exoplanet is a planet pulling a star, planet outside our solar system

3. What are two advantages of the Radial Velocity Method?

The advantages are that you can detect something you can grab things; easy to do; do it from the ground

4. Using the blue graph, what do you think is the Period of the 51 Pegasi exoplanet?

Around 1.0 Phase 4.2 days

5. What are two disadvantages of the Radial Velocity Method?

It can not accurately determine the mass of a distant planet. You will only find planets that are not / least likely to have life, cannot find small exoplanets, can't tell the size