*Use what you have learned during the lesson to answer the questions to the best of your ability.*

1. [ True / **False** ] A single telescope can observe light from all wavelengths.
2. [ True / **False** ] The universe can be fully explained by what scientists have observed in visible light.
3. [ **True** / False ] Some objects can be viewed in multiple wavelengths.
4. [ True / **False** ] Images of the universe in different wavelengths will look the same.
5. [ **True** / False ] The temperature of an object is an indication of how much energy it emits.
6. Sort the electromagnetic spectrum in terms of *decreasing* energy.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Most Energetic | *Gamma Rays* | *X-Rays* | *Ultraviolet* | *Visible* | *Infrared* | *Microwaves* | *Radio Waves* | Least Energetic |

1. Compare *logarithmic* scales and *linear* scales. Which one do we use when discussing the electromagnetic spectrum? ***Student responses may vary.***



1. Why do scientists use *scientific notation* and/or *scientific prefixes* when writing numbers (instead of standard form)?

*They are both shortcuts to writing really big or really small numbers. Scientific notation is a organized way to express how many zeros are in front/behind the significant figures (i.e. numbers). Scientific prefixes are a shortcut to scientific notation - it is a single letter that represents how many zeros are in front/behind the significant figures (i.e. numbers).*

1. Which wavelength of astronomy provides the most significant information about the universe?
Construct a *claim*, and include *evidence* and *reasoning* in your argument.

***Student responses will vary.*** *Students can make whatever claim (i.e. “\_\_\_ astronomy provides the most significant information about the universe”) they wish. The focus of this question is providing evidence (information gathered from internet research and/or class discussion) and reasoning (how does evidence fit to claim) to support their claim*

1. Why do you believe the article about the Crab Nebula did not include gamma rays? Use evidence gained from watching the video and from the class discussion earlier.
[Hint: consider when the different wavelengths were first used in astronomy.]

*Gamma-ray astronomy is a relatively new field compared to other wavelengths. We have optically observed the Crab Nebula since 1054 AD; we have only recently (last ten years) observed the Crab Nebula in gamma-rays. The article was written five years ago - if the field is very new it’s possible that the article just needs updating. Also, there are still unanswered questions - we don’t know why there are flare-ups and scientists are still learning about what conclusions can be made from the gamma-ray emission from the Crab Nebula.*

1. What does the night sky look like in other wavelengths?

*The night sky looks different in different wavelengths. Some objects are not visible in certain wavelengths; some objects appear small or bigger, or have a different shape, in other wavelengths. In lower energies the night sky looks very populated (lots of things), but at higher energies the night sky looks very unpopulated (not a lot of things).*

1. What can we learn about our galaxy and universe by observing in other wavelengths?

*We can learn how planets, stars, galaxies, and the universe was formed by examining objects at different evolutionary phases in different wavelengths. We can see which objects have higher energies (and are therefore hotter), and which energies have lower energies. We can also see how temperatures (energies) vary within a single object. As we gather more and more information we are able to learn more about the universe.*