Crash Course Astronomy—All Questions

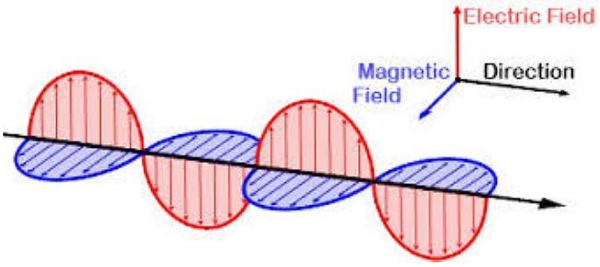
Lessons 23/24: Light and Distance

Canvas Instructions: This Quest is in the form of multiple-choice questions and a few fill in the blanks. After reading the question carefully, select your answer or answers. **If the question calls for multiple answers, two or more, you must provide all correct answers.** Because of this, I will give you two attempts to take the test. Consider this open book. All answers can be found in Crash Course Astronomy, the lecture material created for class which includes vocabulary, the assigned exercises, and the PowerPoint presentations, but if you feel the need to consult online sources, books, or magazines, please feel free to do so. This Quest has a total value of 30 points. **MUCH SUCCESS!!!**

1. Nearly all the information we have about the universe comes in the form of _____
   a. electromagnetic radiation.
   b. sound.
   c. electricity.
   d. space exploration.
   e. meteorites.

2. With light waves, and all other energies the "waving" is being done by _____.
   a. gravitational and magnetic fields.
   b. electric and gravitational fields.
   c. electric and magnetic fields.
   d. magnetic and nuclear force fields.

3. All electromagnetic waves are... Two Correct Answers are needed. Both answers must be correct for credit.

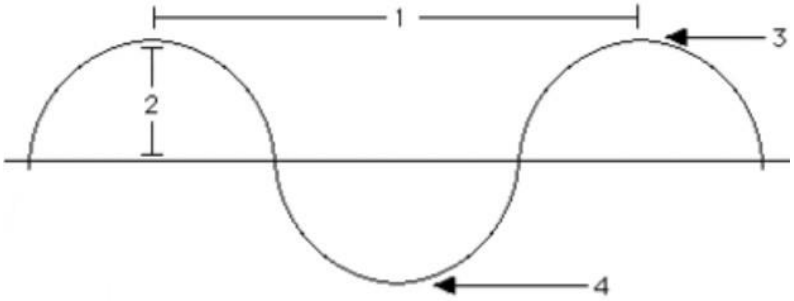


Transverse: Motion of the wave front is perpendicular to the direction of motion.
Longitudinal: Wave front is compressed and rarified in the direction of motion.
Mechanical: The wave front moves through a medium.

   a. transverse waves that have different frequencies.
   b. transverse waves that have the same speed.
   c. mechanical waves that have the same wavelength.
   d. mechanical waves that vary in speed depending upon the medium.
   e. longitudinal waves that have the same energy.

4. When light shines on an object, it can be
   a. reflected.
   b. transmitted.
   c. absorbed.
   d. diffracted.
   e. scattered.
   f. all answers are correct.

5. What is number one in the wave diagram?

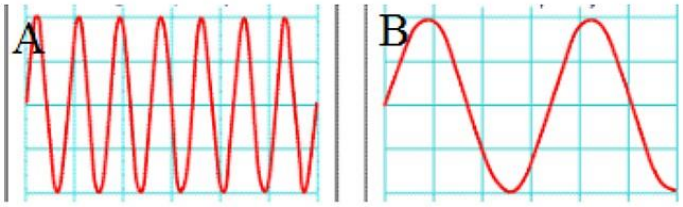


   a. the wavelength
   b. the amplitude
   c. the crest
   d. the trough
   e. the wave distance
   f. the amplitude
   g. the frequency

6. Electromagnetic radiation with a shorter wavelength has _____
   a. less energy.
   b. more energy.
   c. less speed.
   d. a greater speed.

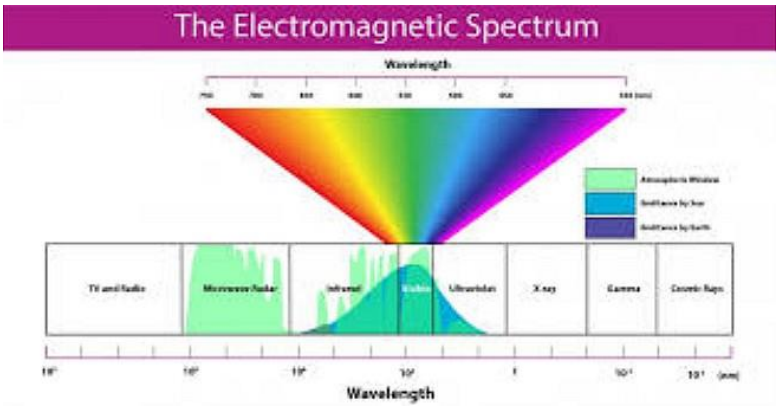
7. Frequency is equivalent the number of wave crests passing a position in a unit time interval, normally one second. High frequency in electromagnetic waves equals
   a. high energy and short wavelength.
   b. high energy and long wavelength.
   c. low energy and short wavelength.
   d. low energy and long wavelength.

8. Which electromagnetic wave has a greater frequency?



   a. A
   b. B
   c. Neither. Frequency cannot be measured this way.

9. The _____ determines the color of visible light.



   a. wavelength (and frequency).
   b. speed.
   c. amplitude.
   d. particles of the medium.

10. Our eyes detect different energies of visible light as _____
   a. different types of waves.
   b. different intensities.
   c. different polarities.
   d. different brightnesses.
   e. different colors.

11. The spread of colors, or wavelengths of EM radiation, is called _____
   a. a wave-spread.
   b. the bandwidth.
   c. a spectrum.
   d. a color wheel.
   e. the audible range.

12. The different energies of the electromagnetic spectrum are arranged by
   a. wavelength and brightness.
   b. speed and color.
   c. wavelength and frequency.
   d. speed and frequency.
   e. brightness and color.

13. Light with a wavelength that the human eye can detect is called _____
   a. visible light.
   b. ultraviolet light.
   c. infrared light.
   d. X-ray vision.
   e. invisible light.

14. Which of the following statements BEST describes visible light?
   a. Visible light is an electromagnetic wave of a single frequency that makes up a small part of the electromagnetic spectrum.
   b. Visible light is an electromagnetic wave of a single frequency that makes up most of the electromagnetic spectrum.
   c. Visible light includes a range of electromagnetic waves that make up a small part of the electromagnetic spectrum.
   d. Visible light includes a range of electromagnetic waves that make up most of the electromagnetic spectrum.

15. Which one of these words found below describes a relatively small range in the frequencies of the electromagnetic spectrum?
    a. gravity waves.
    b. radiation.
    c. electrical waves.
    d. infrared.
    e. EM radiation.

16. Which statement BEST describes the relationship between visible light and the electromagnetic spectrum?
    a. Visible light and the electromagnetic spectrum are different names for the same phenomenon.
    b. Visible light occupies about half of the electromagnetic spectrum.
    c. Visible light is a narrow band of energy in the electromagnetic spectrum.
    d. Visible light and the electromagnetic spectrum have a small area of overlap.

17. When physicist talk about white light, they are MOST likely referring to light that is
    a. a combination of all of the colors in the visible region of the electromagnetic spectrum.
    b. the unabsorbed refracted light produced by a black (ultraviolet) light.
    c. the narrow band corresponding to white light in the electromagnetic spectrum.
    d. a combination of all of the types of electromagnetic radiation.

18. Light with slightly shorter wavelengths than what our eyes can see is called _____.
    a. visible light.
    b. ultraviolet light.
    c. infrared light.
    d. X-rays.
    e. microwaves.

19. Light waves with the shortest wavelengths of all are called _____
    a. ultraviolet light.
    b. microwaves.
    c. subvisible EM energy.
    d. gamma rays.
    e. X-rays.
    f. cosmic rays.

20. Light with slightly longer wavelengths than the reddest color we can see is called _____
    a. infrared light.
    b. ultrared light.
    c. X-ray light.
    d. ultraviolet energy.
    e. microwaves.

21. Light with the longest wavelengths of all are called _____
    a. gamma rays.
    b. x-rays.
    c. microwaves.
    d. radio waves.
    e. low frequency waves.

22. Select the correct order of energies on the electromagnetic spectrum from low to high.
    a. Gamma, X-rays, Ultraviolet, Visible, Infrared, Microwaves, Radio waves.
    b. Radio waves, Microwaves, Infrared, Visible, Ultraviolet, X-rays, Gamma rays.
    c. Visible, Microwaves, Infrared, Ultraviolet, X-rays, Gamma rays, Radio waves.
    d. Microwaves, Radio waves, Visible, Infrared, Ultraviolet, X-rays, Gamma rays.

23. Which is true about the speed of radio waves compared to light waves? They are...
    a. smaller wavelength, so LESS than the speed of light (300,000 km/s) or 186,000 mi/s.
    b. less energy & frequency, so LESS than the speed of light (300,000 km/s) or 186,000 mi/s.
    c. less energy & frequency, but still the SAME speed as the speed of light (300,000 kilometers/second) or 186,000 miles/second.
    d. more energy & frequency, so MORE than the speed of light (300,000 km/s) or 186,000 mi/s.

24. Although this exercise describes light as a wave, it really has dual description and can be denoted as a particle. Several names for light described as particles can be noted as photons, quanta, energy packets, etc.
    a. True
    b. False

25. An object that's hotter will emit light with a higher energy, which corresponds to _____
    a. a shorter wavelength.
    b. a longer wavelength.
    c. a smaller frequency.
    d. a larger amplitude.

26. Astronomers say that light with a shorter wavelength is bluer, and light with a longer wavelength is _____
    a. pinker.
    b. redder.
    c. more violet.
    d. less blue.

27. Astronomers use large optical telescopes and satellite data to obtain information about the temperatures of the planets in the solar system. What wavelengths of electromagnetic radiation provide this information?
    a. gamma radiation
    b. infrared radiation
    c. radio waves.
    d. visible light.

28. Explain in terms of distance and the speed of light why it is currently very difficult for humans to visit planets that circle stars other than our sun.
    a. The spacecrafts used for travel are very heavy and thus very slow.
    b. Spacecrafts do not have a constant source of energy to run them.
    c. If a spacecraft could attain a maximum speed near to that of light, it would still be too slow to cover the vast distances between the sun and other stars.
    d. In the future spacecrafts may be able to attain a maximum speed near to that of light, but it is difficult to locate planets orbiting around stars.

29. In general, atoms are made up of three subatomic particles: _____, _____, and _____. Read carfully.
    a. photons, neutrons, and electrons.
    b. protons, neutrinos, and electrons.
    c. photons, neutrinos, and positrons.
    d. photons, neutrons, and positrons.
    e. protons, neutrons, and electrons.

30. Protons and neutrons occupy the centers of atoms in what is called the _____.
    a. kernel.
    b. nucleus.
    c. core.
    d. nucleosynthesis.

31. An element depends on how many _____.
    a. neutrons are in the nucleus.
    b. photons it emits.
    c. protons are in the nucleus.
    d. electrons are orbiting the nucleus.

32. If light hitting an atom that has just the right amount of energy, it will cause the electron to _____
    a. absorb energy and jump down to a lower energy state.
    b. absorb energy and jump up to a higher energy state.
    c. emit energy and jump up to a higher energy state.
    d. emit energy and jump down to a lower energy state.
    e. remain in its same orbit (quantum or energy state).

33. Electrons of different atoms jumping downward from higher to lower energy states emit _____ There are two Correct answers to this question and both must be given.
    a. identical colors (quanta) of light.
    b. different colors (quanta) of light.
    c. different frequencies of light.
    d. identical energies of light.

34. The principal of electrons of different elements jumping to specific energy levels and returning to specific energy levels was the key to understanding
    a. how far the stars were distant from the sun.
    b. the colors of the stars.
    c. the composition of the stars.
    d. the evolutionary sequence of the stars.

35. The kind of device that can precisely measure the wavelength of light is called a _____
    a. gravitometer.
    b. spectrometer.
    c. photometer.
    c. hygrometer.
    d. wave meter.

36. Stars and gas clouds in space, and in fact the universe itself, are primarily made of _____ and _____. Two answer must be provided and both must be correct.
    a. hydrogen.
    b. carbon dioxide.
    c. carbon.
    d. calcium.
    e. oxygen.
    f. nitrogen.
    g. helium.
    h. uranium.

37. The change in pitch (highness or lowness of the sound) as a motorcycle passes you is known as _____.
    a. the observer's effect.
    b. the photoelectric effect.
    c. the Doppler effect.
    d. the Hertzsprung shift.

38. If an object heads away from you, the wavelength from the source gets _____. This was the major discovery that led astronomers to the conclusion that the
    a. shorter and is red-shifted.
    b. longer and is red-shifted.
    c. shorter and is blue-shifted.
    d. longer and is blue-shifted.
    e. big bang was a real event.
    f. the universe wanted to collapse upon itself.
    g. that the universe was expanding.
    h. that dark energy and dark matter existed.

39. If a majority of the stars being observed from Earth in the Andromeda Galaxy have their light shifted towards the blue, astronomers would conclude that the Andromeda Galaxy is (Two correct answers must be provided, and both must be correct).
    a. moving towards the Earth.
    b. moving away from the Earth.
    c. probably is a smaller, less massive galaxy than the Milky Way.
    d. may one day probably collide with the Earth.

40. The vast majority of galaxies in our universe are moving away from us. We know this because we observe a _____ in the galaxies (absorption) spectra.
    a. redshift.
    b. blueshift.
    c. turbulence shift.
    d. superposition of blue and redshifts (similar to the Andromeda Galaxy).

41. In general, what does the redshift tell us about the universe in general?
    a. The universe is accelerating.
    b. The universe is contracting.
    c. The universe originated from a big pop.
    d. The universe is expanding.
    e. The universe originated from a big bang.

42. Which ancient civilization concluded that the Earth was round by observing sailing ships disappearing over the horizon?
    a. ancient Romans.
    b. ancient Greeks.
    c. ancient Egyptians.
    d. renaissance Italians.
    e. ancient Persians.
    f. Christopher Columbus.

43. Which philosopher calculated the size of the Earth using shadows, angles and wells?
    a. Aristotle
    b. Pythagoras
    c. Eratosthenes
    d. Socrates.
    e. Archimedes

44. You can see the Earth is a round planet _____.
    a. by looking at a rainbow.
    b. from the shores of the ocean.
    c. during a lunar eclipse.
    d. from the window of a commercial aircraft fly at about 40,000 feet (12,000 meters).
    e. during a solar eclipse.

45. In the 17th century, which two scientists laid the mathematical groundwork of planetary orbits?
    a. Johannes Kepler and Galileo Galilei.
    b. Isaac Newton and Robert Hooke.
    c. Galileo Galilei and Robert Hooke.
    d. Isaac Newton and Johannes Kepler.

46. The distance from the Earth to the sun is given the name _____.
    a. the basic astronomical distance, or BAD.
    b. the sun-Earth distance, or SED.
    c. the astronomical unit, or AU.
    d. the light-year, or LY.
    e. the parsec or PC.

47. The passage of a planet across the disk of the sun is called _____.
    a. a conveyance.
    b. a transit.
    c. osmosis.
    d. a permeation.

48. When using Venus transits to calculate the Earth-sun distance, why are results not to the degree of accuracy that astronomers would prefer?
    a. our atmosphere blurs the images making the moments of contact difficult to observe.
    b. the timing devices aren't accurate enough.
    c. telescopes aren't powerful enough to capture precisely the contact moments.
    d. the events occur too rarely and therefore even with technological improvements, Venus is a poor choice to use.

49. In the 1960s, radio telescopes were used to bounce radar pulses off of _____.
    a. the sun.
    b. Venus.
    c. Saturn.
    d. Mercury.
    e. Jupiter.

50. The ability of humans to and see objects that are relatively close to them in three dimensions is called _____.
    a. depth perception.
    b. 3D cognition.
    c. triangulation.
    d. perspicacity.

51. In astronomy the shift in position of an object viewed along two different lines of sight or a baseline is called _____.
    a. the distance modulus.
    b. triangulation.
    c. parallax.
    d. the astronomical unit.

52. When using parallax, the distance between the two observation points is called _____. There are two answers which must be given.
    a. the astronomical distance.
    b. the astronomical unit.
    c. the wavelength.
    d. the baseline.

53. In 1838 the first star to have its parallax successfully measured was 61 Cygni. The credit goes to the German astronomer and mathematician, Friedrich Bessel (1784-1846). Among the thousands of stars that could have been chosen, why 61 Cygni?
    a. It was a bright, easy to observe star producing a large, bright disk in the telescope.
    b. It was a double star making it twice as easy to obtain precise measurements.
    c. Its motion against the background of stars (called proper motion) was rapid, indicating that it might be near to the sun.
    d. Since 61 Cygni is located in a thicker part of the Milky Way (more stars) there were more background stars to help determine a change in position as Earth orbited the sun.

54. A light-year is defined as _____.
    a. the distance light travels in a year.
    b. the time that light travels in a year.
    c. the distance between the Earth and the sun.
    d. the time for Earth to orbit the sun.
    e. a basic measurement of distance in the universe.

55. A parallax shift of one second of arc (1/3600th of a degree) established over a baseline of one astronomical unit is called a _____. It is measured at _____.
Two Correct Answers are need and both answers must be correct.
a. a light year.
b. an astronomical unit.
c. a parsec.
d. a Kessel Run unit.
e. 3.26 light years.

56. At 4.2 light years, Proxima Centauri is
a. one of the brightest stars in the sky.
b. one of the most studied stars in the sky.
c. the nearest star to the sun.
d. 13.5 parsecs distant.
e. visible from the Southern Hemisphere.

57. Two stars that give off the same amount of energy are said to have the same _____.
a. intrinsic brightness.
b. apparent brightness.
c. apparent magnitude.
d. native luminosity.
e. bolometric magnitude.

58. If you have two stars that are the same luminosity, and one is twice as far as the other, it will be _____.
just as bright
a. 1/2 as bright.
b. 1/4 as bright.
c. 1/5 as bright.
d. 1/8 as bright
e. 1/16 as bright.

59. The temperature of a star can be found using _____.
a. parallax.
b. spectroscopy.
c. photometry.
d. trigonometry.
f. telemetry.

60. We see individual stars in other galaxies. If astronomers can determine that these stars have the same luminosity and color (are the same type of star) we can use their difference in brightness to determine _____.
a. the distance to the galaxy.
b. the size of our galaxy.
c. the scale of our solar system.
d. the accuracy of the astronomical unit.