

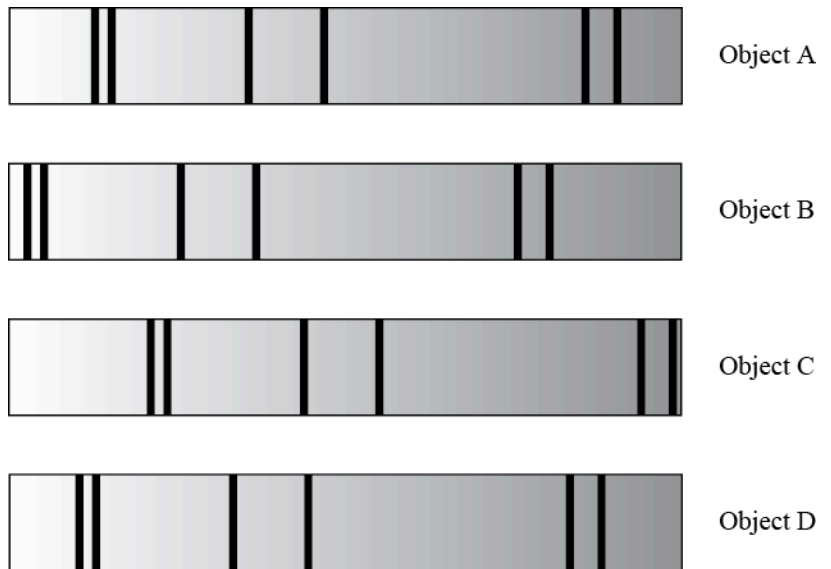
ASTRONOMY 101 EXAM QUESTIONS: A SAMPLE

This is a closed-book, closed-note exam and you have approximately ten minutes to complete it. You are not to talk to, or attempt to obtain answers from, other students for any reason. **ALWAYS SELECT THE BEST ANSWER.** Each question is worth 1 point. If you have questions, please raise your hand.

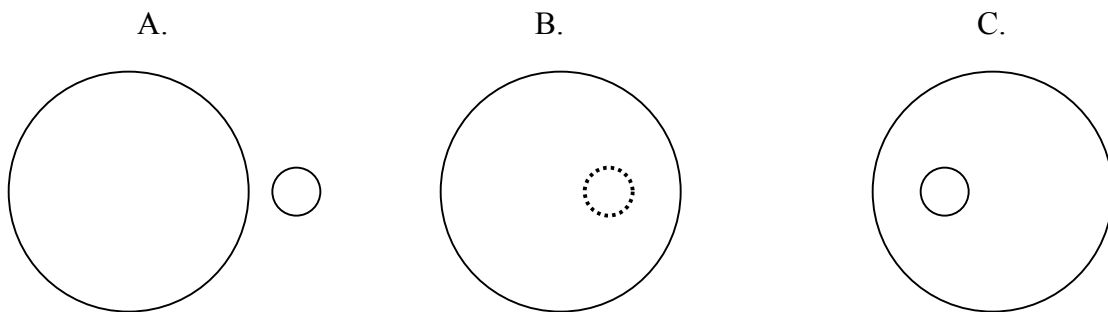
Use the four spectra shown at right for Objects A-D, to answer the next question. Note that one of the spectra is from an object at rest (not moving) and the remaining spectra come from objects that are all moving toward the observer. Assume that the left end of each spectrum corresponds to shorter wavelengths (blue light) and that the right end of each spectrum corresponds with longer wavelengths (red light).

1. Which of the four objects (A-D) is moving with the fastest speed?

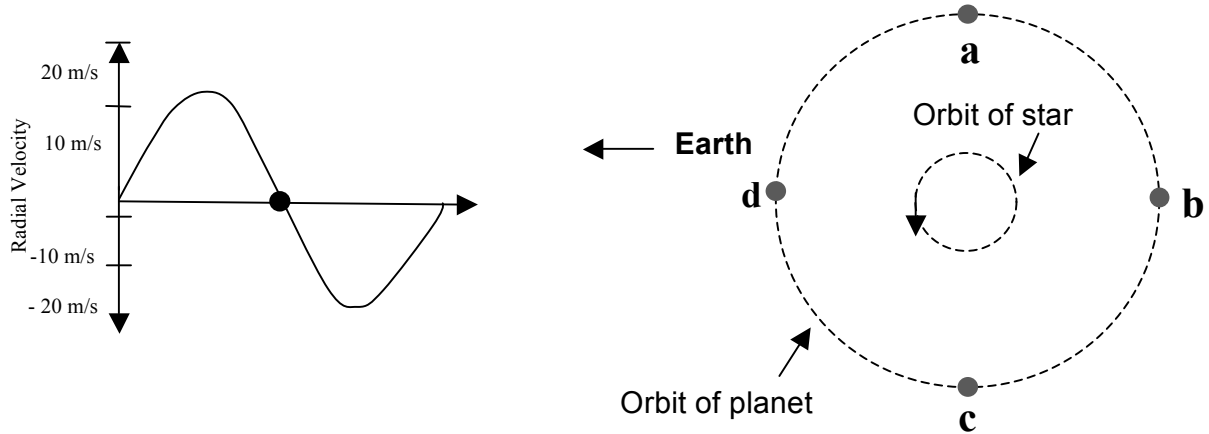
- a. Object A
- b. Object B
- c. Object C
- d. Object D
- e. More than one object is moving with the fastest speed.



2. The sketches below illustrate how two main sequence stars might look like at three different times. In which case shown below would the amount of light we would observe on Earth be the LEAST. Note: The sketch with the small circle shown in dashed lines illustrates the time when that star was located behind the other star.

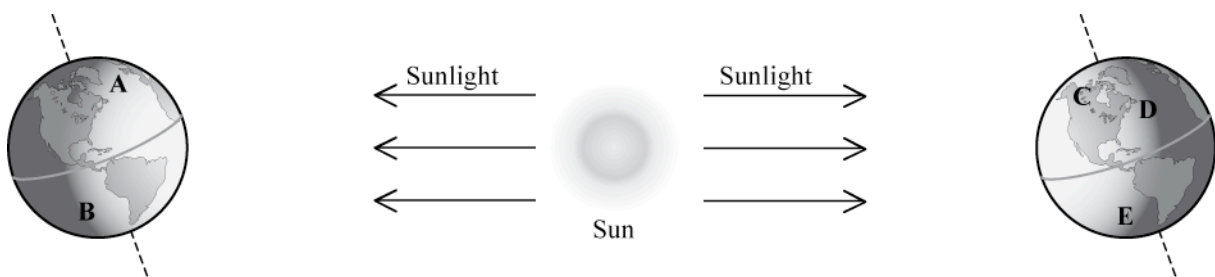


3. Given the location marked with the dot on the star's radial velocity curve, at what location (a-d) would you expect the planet to be located at this time?



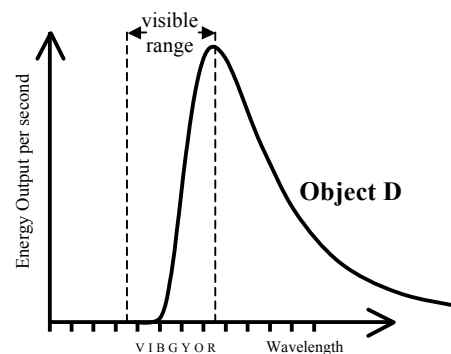
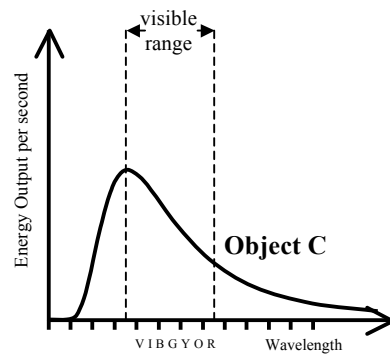
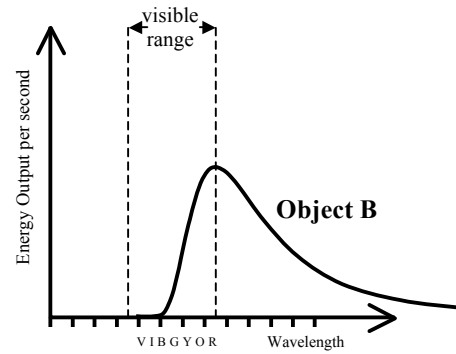
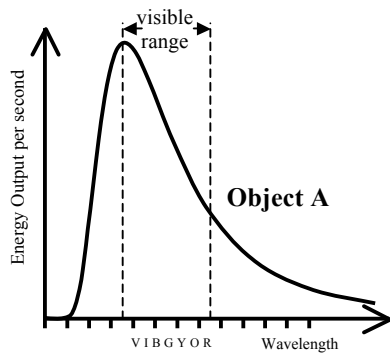
4. Energy is released from atoms in the form of light when electrons:
- are emitted by the atom.
 - move from high energy levels to low energy levels.
 - are absorbed by atoms.
 - move in their orbit around the nucleus.
 - move from low energy levels to high energy levels.

5. Which one lettered position (A-E), in the image below, best represents the location on Earth that is experiencing summer in the Southern Hemisphere?



Note: this drawing is not to scale. In fact you could fit more than 11,000 Earths between the Sun and Earth.

Use the spectral curves for Objects A-D shown below to answer the next two questions.

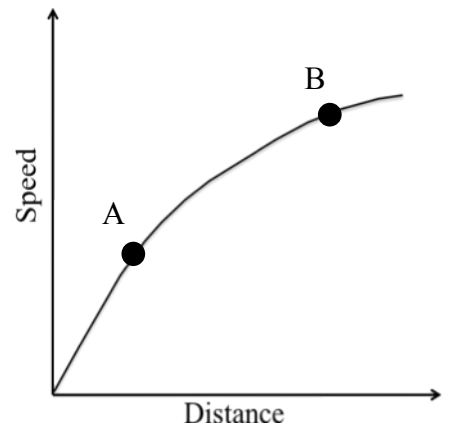


6. Which of these objects is the smallest?
- Object A
 - Object B
 - Object C
 - Object D
 - There is insufficient information to answer this question.
7. Which, if any, of the objects could be approximately the same size as Object D?
- Object A
 - Object B
 - Object C
 - They are all the same size.
 - None of the above.
-
8. Which of the following is true of a binary star system consisting of a Red Giant and a White Dwarf?
- You will receive more light when the dwarf is behind the giant than when the giant is behind the dwarf.
 - The time it takes for the dwarf to pass behind the giant is shorter than the time for the giant to pass behind the dwarf.
 - The force of gravity exerted on the dwarf by the giant is stronger than the force of gravity exerted on the giant by the dwarf.
 - The orbital period of the dwarf is shorter than the orbital period of the giant.
 - None of the above.

9. Chili Pepper is a main sequence star that appears red when viewed from Earth. Which of the following is (always) true:
- It is hotter than an O spectral type main sequence star.
 - It will appear brighter than a white dwarf.
 - It will live longer than a B spectral type main sequence star.
 - It is the same size as a red giant star of the same temperature.
 - None of the above is correct.
-

Use the Hubble plot at right to answer the following three questions

10. Which point (A or B) represents a galaxy that is moving faster away from us?
- Point A
 - Point B
 - They both represent galaxies with the same speed.
 - There is insufficient information to determine this.
11. Which point (A or B) corresponds with a faster expansion rate for the universe?
- Point A
 - Point B
 - The expansion rate of the universe is the same for both locations.
 - There is insufficient information to determine this.
12. Which point (A or B) corresponds with an earlier time in the universe?
- Point A
 - Point B
 - They both correspond to the same time in the universe.
 - There is insufficient information to determine this.
-



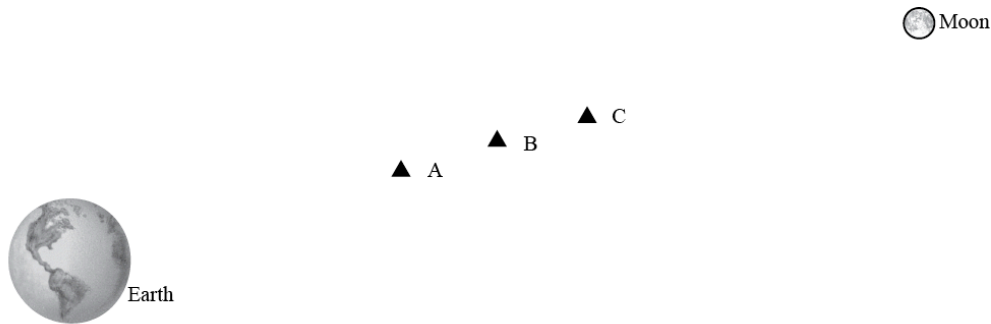
13. Consider the information given below about three Main Sequence Stars A, B, and C.
- Star A will be a main sequence star for a total of 4.5 billion years.
 - Star B has the same luminosity as the Sun.
 - Star C has a spectral type of M5.

Which of the following is a true statement about these stars?

- Star A has the greatest mass.
- Star B has the greatest mass.
- Star C has the greatest mass.
- Stars A, B and C all have approximately the same mass.
- There is insufficient information to determine this.

14. What do astronomers mean by “the Universe is expanding”?
- New matter is constantly being created causing the universe to get bigger.
 - The older the universe gets, the more galaxies we can see, since their light will have had more time to reach us.
 - Space-time is expanding, causing the Universe to get bigger and galaxies to be further apart from each other.
 - Our knowledge of the Universe is expanding because of better telescopes, which allow us to see more of the universe.
-

Use the picture below to answer the next three questions. In this picture the Earth-Moon system is shown (not to scale) along with three possible positions (A-C) for a spaceprobe traveling from Earth to the Moon. Note that Position B is exactly halfway between Earth and the Moon.



15. In what direction would the net (total) force on the spaceprobe point if it were coasting very quickly toward the Moon when at Position B?
- toward the Moon
 - toward Earth
 - Since the force on the spacecraft by Earth is equal to the force on the spacecraft by the Moon the net (total) force would be zero and not point in either direction.
16. At which position (A, B or C) would the spaceprobe feel the greatest acceleration?
- at Position A
 - at Position B
 - at Position C
 - The acceleration would be the same at all the positions.
17. What would the spaceprobe do as it coasted through Position A on its way to the Moon?
- speed up
 - slow down
 - travel with a constant acceleration
 - travel with a constant speed
-

18. A galaxy that appears to have few, if any, bright blue stars, likely:
- never had blue stars in the galaxy.
 - had more blue stars long ago that are no longer present.
 - has been around long enough for the blue stars to have evolved into red main sequence stars.
 - never contained enough gas to have blue stars develop.



19. An important line in the spectrum of a typical cloud of hydrogen gas occurs at 486 nm for a cloud that is not moving relative to an observer. Imagine that you observe four different clouds of gas (A-D) from Earth and discover that this line is at the wavelength shown in the table below for each of the four clouds.

Cloud	Wavelength of Absorption line
A	449 nm
B	460 nm
C	458 nm
D	447 nm

Based on the information in the table above, which of the following is the most accurate ranking of the distance to the clouds (A-D), from closest to farthest from Earth.

- B, C, A, D
- D, A, C, B
- A=B=C=D
- Cannot be determined from the information provided.

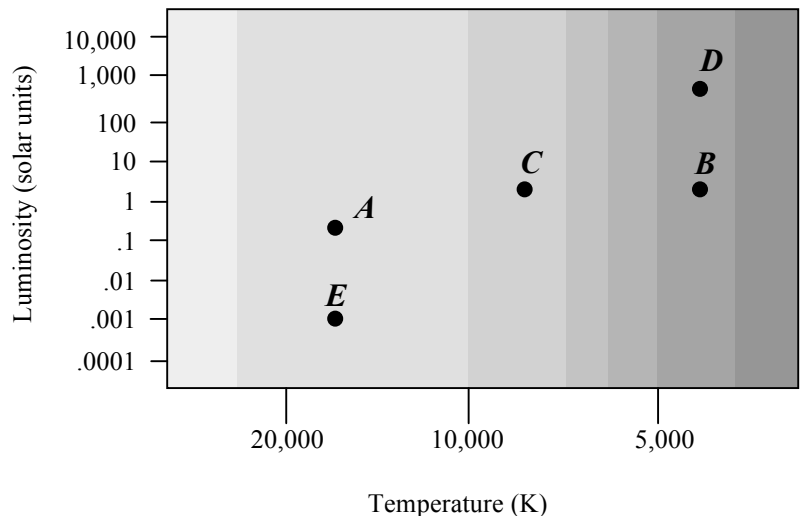
Use the graph at right, showing the Luminosity versus Temperature of Objects A-E, to answer the next two questions.

20. Which object(s) is(are) giving off just as much energy as Object B?

- Object D
- Object C
- Both D and C
- None of the above

21. Which of the following is the correct ranking for the size of the Objects A-E, from largest to smallest.

- $E=A>C=B>D$
- $D=B>C>A=E$
- $D>B=C>A>E$
- $E>A>C=B>D$
- None of the above



22. Which of the following describes one reason that the northern and the southern hemispheres have different seasons at the same time?

- The Earth is closer to the Sun during summer in the southern hemisphere and is farther from the sun during winter in the northern hemisphere.
- During the time of the year when the Sun is high in the sky in the northern hemisphere, it will be low in the sky in the southern hemisphere.
- The Earth is tilted, so the Sun is closer to one hemisphere than the other, which causes one hemisphere to be in winter and the other in summer.
- The amount of energy given off by the Sun changes throughout the year and provides more energy to one hemisphere than the other.



The amount the Earth is tilted changes over the course of the year and causes the amount of sunlight that reaches each hemisphere to be different, which causes the seasons to be opposites.

For the next two questions, use the two figures provided below, which show the motion of Stars A and B in the sky. Fig. 1 is the Northfacing view of the person in Fig. 2. Note that Star A reaches its maximum height above the horizon at 3:00 pm.

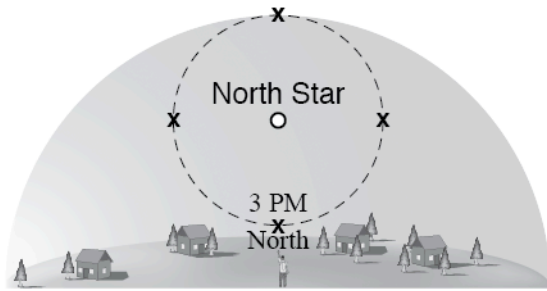


Figure 1

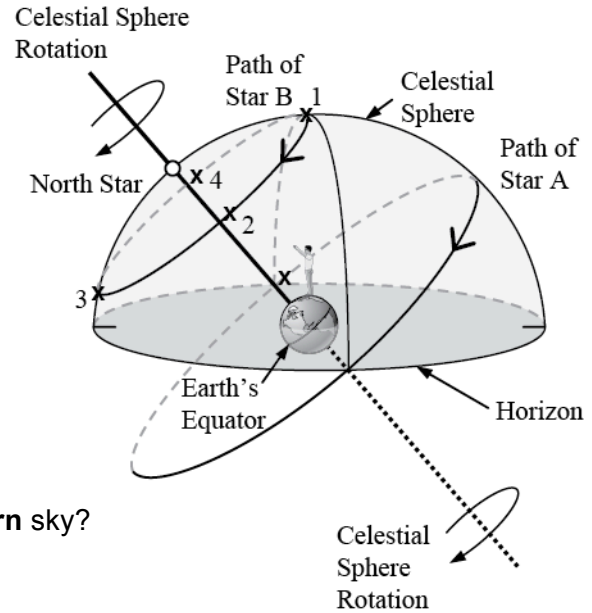
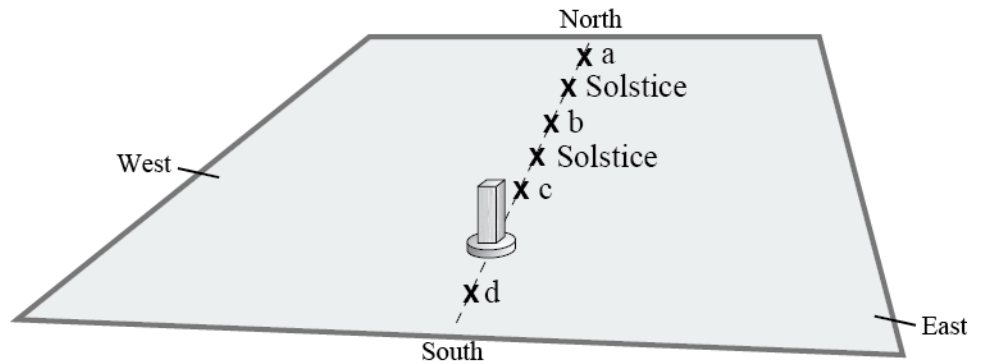


Figure 2

23. At what time will **Star B** be located high in the **Northeastern** sky?
- 11:00 pm
 - 3:00 am
 - 11:00 am
 - 6:00 am
 - 6:00 pm
24. At what time would you see **Star A** in the **southern** part of the sky?
- 3:00 am
 - 9:00 am
 - 3:00 pm
 - 9:00 pm
-
25. Which of the following is possible?
- A waxing crescent Moon near the eastern horizon just after sunset.
 - A waning gibbous Moon near the western horizon just after sunset.
 - A waning crescent Moon near the eastern horizon just before sunrise.
 - A full Moon near the western horizon at sunset.
 - A first quarter Moon rising at dawn.
26. Why are the arms of spiral galaxies typically blue in color?
- The motion of the arms causes the light to be Doppler shifted to blue wavelengths.
 - The gas and dust in the arms filter out all but the blue light from stars in the arms.
 - Stars are forming in the spiral arms so there are high mass, hot, blue stars in the arms.
 - Almost all the stars are in the arms of the disk of the galaxy and their light makes the arms appear blue.

27. For an observer in the continental U.S., which of the x's (a–d) in the figure at right correctly shows the position of the end of the stick's shadow at noon for different times of the year? Note that the positions of the end of the stick's shadow at noon on the solstices are shown.

- a. only Position a
- b. only Position b
- c. only Position c
- d. only Position d
- e. more than one of the positions (a, b, c, and/or d) is possible



Use the following information to answer the next four questions. Cutter Star has an apparent magnitude of +2.1 and an absolute magnitude of +2.1. Casper Star has an apparent magnitude of +3.72 and an absolute magnitude of +1.1. Answer the following four questions using this information.

28. Which of these stars is closer to Earth?

- a. Casper
- b. Cutter
- c. They are the same distance from Earth.
- d. There is insufficient information to determine this.

29. From which of these stars does Earth receive the greater amount of energy?

- a. Casper
- b. Cutter
- c. Earth would receive the same amount of energy from both stars.
- d. There is insufficient information to determine this.

30. You look to the west at 10am and see the Moon on the horizon. What is the phase of the Moon that will be high in the sky three weeks from now?

- a. Waning Gibbous
- b. Waxing Crescent
- c. New
- d. Waxing Gibbous
- e. Waning Crescent