STARLIGHT STAR BRIGHT!

NAME_____/33

Stars are found throughout the universe, scattered and "floating" everywhere. Try to imagine popcorn popping high up into the air in all directions, but then freezing in place. That's how stars are positioned. They are not little dots of paint scattered over a giant bubble surrounding Earth. Some people used to think they were all the same distance away from Earth like that. People used to think that stars were tiny, especially compared to the sun and moon. But we now know that stars are massive, and that our own sun IS a star, just one that is very close to us. Finally, people also used to think that stars could "fall" out of the sky because occasionally people would see a streak of light dashing across the sky. We now know that these streaks are just tiny space rocks (usually no larger than a softball) that are streaking through our atmosphere because friction is burning them up. They are called meteors. It's really the wrong thing to call them "falling stars." Stars never fall, streak, or burn out like that.

STAR BRIGHTNESS

Stars are bright because they make their own light by the process of fusion. When atoms get fused (welded together) an incredible amount of energy is released which ultimately turns into light and heat. A large star does a lot of fusion, so a LOT of heat and light is released. A small star does less fusion, so LESS heat and light is released.

So, when you are looking at the night sky and see a star that seems brighter than all the rest, you can probably assume that it is also BIGGER than all the rest. *But, not always….*

APPARENT BRIGHTNESS AND ABSOLUTE BRIGHTNESS

Let's say you have 2 stars, both the exact same size. Their ACTUAL (real) brightness is exactly the same. But now let's move one of those stars very far away and put the other one up close to you. Just like a car's headlights APPEAR to be dim when the car is far away and APPEAR to get brighter as the car gets closer, a star that is closer appears brighter and a star that is distant appears dimmer. This is called APPARENT brightness. You could have a VERY HUGE star appear to be dim, just because it is very far away. Likewise, you could have a VERY SMALL star appear to be bright, just because it is so close.

Questions:

Celeste loves astronomy and has dangled several "stars" all around her room as decorations. They are all the same size Styrofoam balls. Right now she is lying in her bed next to the star she painted red and there is another star way over by her door painted blue.

1. What is the red star's APPARENT brightness?
    a. It is brighter than the other stars
    b. It is dimmer than the other stars
    c. It is the same brightness as the other stars

2. What is the blue star's APPARENT brightness?
    a. It is brighter than the other stars
    b. It is dimmer than the other stars
    c. It is the same brightness as the other stars

3. What is the red and blue star's ACTUAL brightness?
    a. They are brighter than the other stars
    b. They are dimmer than the other stars
    c. They are the same brightness as the other stars

4. What makes a star be bright in the first place?
    a. Its gravity
    b. The fusion it is doing
    c. The heat it makes

5. How do a car's headlights APPEAR when they are far away?
    a. They are brighter at that time
    b. They are dimmer at that time
    c. They are the same brightness the whole time they are moving

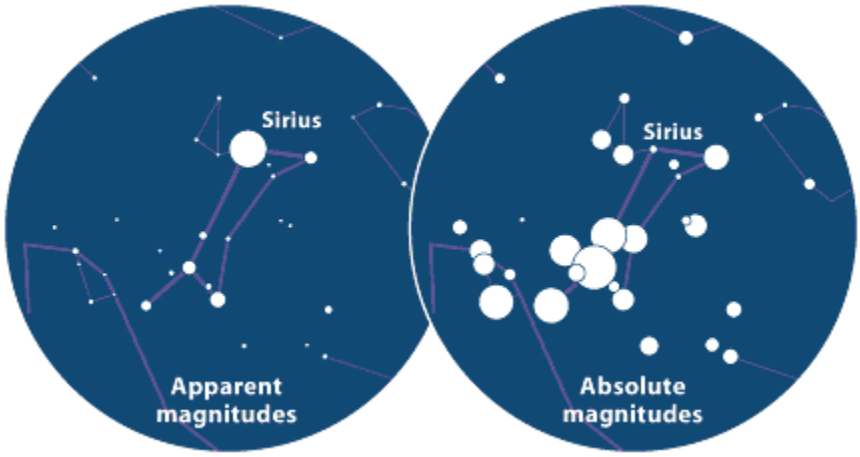
6. How do a car's headlights APPEAR when they are close?
    a. They are brighter at that time
    b. They are dimmer at that time
    c. They are the same brightness the whole time they are moving

7. What is the ACTUAL brightness of a car's headlights?
    a. They are brighter at all times
    b. They are dimmer at all times
    c. They are the same brightness at all times

8. What is the streak of light going across the sky?
    a. A star that is falling
    b. A star that is firing rays of light sideways
    c. A space rock burning up in the atmosphere

9. What is the name of the atom fusing process that makes stars be bright and give off light?
    a. Bioluminescence (the same thing that makes a firefly glow)
    b. Gravity light pulsing
    c. Fusion

10. Generally, bright stars are
    a. Smaller
    b. Bigger
    c. Neither, because all stars are the same size



On the left-hand map of Canis Major, dot sizes indicate stars' ***apparent magnitudes;*** the dots match the brightnesses of the stars as we see them. The right-hand version indicates the same stars' ***absolute magnitudes*** - how bright they would appear if they were all placed at the same distance (32.6 light-years) from Earth. Absolute magnitude is a measure of true stellar luminosity.

11. Canis Major is a dog constellation. Look at the neck of the dog, the star Sirius. What is it's actual size compared to the star that makes the tip of its tail?

_____

12. Sirius is the brightest star we can see in the sky. Based on what you can see in the absolute magnitude picture, what do you KNOW FOR SURE about its distance from Earth?

_____

OBJECT	APPARENT MAGNITUDE	ABSOLUTE MAGNITUDE
The Sun	-26.8	4.8
100 watt bulb at 3 m	-17.1	66.3
full moon	-12.5	32
Venus	-4.4	28
Sirius (brightest star)	-1.5	1.4
Alpha Centauri (closest star)	-0.04	4.4
Andromeda galaxy (farthest naked eye object)	3.5	-21
Faintest naked eye stars	6-7	---
Faintest star visible from Earth telescopes	~25	---

13. Do negative numbers mean more bright or more dim? _____

14. Which object above seems the brightest to our eyes? _____

15. Which object above seems the dimmest to our eyes? _____

16. Look at Venus' absolute brightness compared to Sirius' absolute brightness. Which is actually brighter?

    _____

17. Now look at Venus' apparent brightness compared to Sirius' apparent brightness. Which one seems to be brighter when you look up into the sky? What is the reason why it seems to be brighter? (2pts)

    _____ _____

<u>List the objects in order of their REAL brightness, starting with the brightest first.</u>

18. _____

19. _____

20. _____

21. _____

22. _____

23. _____

24. _____

25. Looking at your above list, why is the first one the brightest of all? _____

26. Compare Sirius and Alpha Centauri in your list. Which star is bigger? _____

27. Compare Venus and the moon in your list. Both objects simply reflect light. Which one reflects more, and tell why (2pts)

    _____ _____

WHERE DO THE STARS GO DURING THE DAY?

The answer to this question is also all about BRIGHTNESS. Simply put, the sunlight drowns out the faint light of the stars, so they are not visible. They are there, you just can't see them. Think of a kid screaming while standing in the bleachers all by himself. Can you hear him if you are on the football field? Yes, absolutely. You might even recognize that it is your friend John's voice. Now put 500 people in the bleachers. They all scream, including John. Can you hear John's voice? No. Did his voice disappear? No, it is still there, but you can't distinguish it from the other voices. His voice got drowned out by all the others. That is what sunlight does. There are SO MANY beams of light (photons) from the sun that it drowns out (hides or covers up) the few beams of light coming from distant stars.

28. An ancient stargazer says, "Our Earth is surrounded by small, beautiful stars." How is this person totally wrong?
    a. Stars are massive.
    b. The Earth is not *surrounded* by stars… just look out during day time hours—there are no stars there!
    c. This statement is correct.

29. An ancient stargazer says, "Stars are like dots of paint on a giant bubble surrounding Earth." How is this person totally wrong?
    a. Stars are not all the same distance from Earth; they are scattered everywhere.
    b. Stars are not all the same distance from Earth and they don't surround Earth… Just look out during the day. There are no stars on the day side of the Earth.
    c. This statement is correct.

30. An ancient stargazer says, "Wow! Look at that streak of light! It's a falling star!" How is this person totally wrong?
    a. When stars fall, they don't fall toward Earth
    b. Stars don't fall, period.
    c. This statement is correct.

31. Where do stars go during the day?
    a. They are farther away during daytime, so we can't see them.
    b. They are on the other side of the Earth during daytime, so we can't see them.
    c. They don't go anywhere; the sunlight just makes it impossible to see their light.