Given (a.k.a. `First') Name(s): _____ Family (a.k.a. `Last') name: _____

ON YOUR PARSCORE: Write your name, and `bubble' your I.D. number, your test version, and your multiple-choice answers. **I will keep the Parscore forms.**

ON THIS TEST PACKET: Write your name. Circle your multiple-choice answers on this packet, so that you can check them. **I will hand this packet back to you when we go over the test, and you'll keep it. This is how you'll find out your grade.**

Astronomy 4 Test #2 PRACTICE VERSION

True/False

Indicate whether the statement is true or false. (3 pts. each)

1. The phases of the Moon are caused by the Earth's shadow on the Moon.

2. Research astronomers stopped using refracting telescopes in the early 20th century, because they can't bring all colors of light to a focus at the same point, the way reflectors can.

3. The most likely reason why NASA's Chandra X-Ray Space Telescope was launched into space is because X-rays don't make it through the Earth's atmosphere to the ground.

4. When we see a satellite being launched into orbit, the rocket starts out going vertically, because it needs to get out of the thick lower atmosphere before starting to go sideways really fast.

5. When it's summer in the Earth's northern hemisphere, it's also summer in the Earth's southern hemisphere.

Matching (4 pts. each)

For each question, choose the one item (from a through e) that fits the best. (Items from a-e can be used more than once.)

a. Full Moon
b. Crescent Moon
c. Third Quarter Moon
d. New Moon
e. First Quarter Moon

6. During this phase, the Moon rises as the Sun is setting.

7. This is the phase when a solar eclipse is possible.

8. This is the phase when a lunar eclipse is possible.

9. The near side of the Moon looks less than half lit-up.

Multiple Choice - General Knowledge

Choose the ONE best answer and mark it on your Parscore form. (5 pts. each)

10. Why do many of today's ground-based astronomers use *adaptive optics* systems on their telescopes?
    a. Telescopes equipped with adaptive-optics systems can record images of much brighter objects than telescopes that don't have these systems.
    b. The AO systems remove the blurring effects of turbulence in the Earth's atmosphere.
    c. The AO systems allow a small telescope to gather as much light as a telescope with a much larger aperture.
    d. If you place a large, heavy telescope on the mount for an adaptive-optics system, it will hold the telescope very steady.

11. Imagine that you see an astronaut on television, and they appear `weightless' inside the International Space Station. What causes this effect?
    a. They are moving too fast for gravity to affect them.
    b. There is no gravity there, because they have gone far beyond the Earth's gravity.
    c. They and the space station are constantly `falling around' the Earth together.
    d. In space, the Earth's magnetic field counteracts the force of gravity.

12. If you're studying light that bounced off a planet, how can you tell if the planet is moving toward you or away from you?
    a. The light will be redshifted or blueshifted, depending on whether the motion is away from you or toward you.
    b. The planet will look dimmer, the faster it moves toward you.
    c. If the planet is moving toward you, you'll notice that the light is hitting your telescope a little faster than if the planet is moving away from you.
    d. It will show an emission spectrum if it's moving away, and an absorption spectrum if it's moving toward you.

13. Newton discovered that gravity has something in common with light - they both follow `inverse-square' laws. Let's think about what this means for the Moon's gravitational pull on the Earth. If the Moon were half as far away from the Earth as it really is, what would be true about the strength of its gravitational pull?
    a. It would be nine times as strong.
    b. It would be twice as strong.
    c. It would be four times as strong.
    d. It would be one-half as strong.

14. A telescope with a larger-diameter objective lens shows _____ a telescope with a smaller-diameter objective lens.
    a. less detail than
    b. Actually, only reflecting telescopes can show more detail than the human eye.
    c. the same amount of detail as
    d. more detail than

15. If you wanted to observe deep-sky objects (such as faint nebulae and galaxies), which phase of the Moon would provide the least light to interfere with your observations?
    a. Full Moon
    b. First Quarter
    c. Third Quarter
    d. New Moon

16. When a planet's surface or atmosphere absorbs light (thus forming an absorption spectrum), what's happening, at an atomic level?
    a. Electrons are being boosted into higher-level orbits.
    b. Electrons are dropping into lower-level orbits.
    c. The atoms in the planet's surface or atmosphere are being made to move more slowly.
    d. The atoms in the planet's atmosphere are getting farther apart.

17. If you watched the sun set (and the stars rise) every clear evening for a full year, what would you notice about the relationship between the sunset and the `rising times' of the stars?
    a. The length of a solar day and a sidereal day are the same.
    b. Rising and setting times don't mean anything for stars, since all stars are circumpolar, like the Big Dipper and the Little Dipper.
    c. A given star always rises at the exact same time each night.
    d. A given star will rise about 4 minutes earlier each night.

18. A friend of yours says `There will be a solar eclipse tomorrow, since tomorrow is Full Moon'. Which of the following is the most accurate response?
    a. That's right, since solar eclipses occur when the Earth is between the Sun and the Moon.
    b. That's right, since the Moon will give us plenty of light to see the eclipse tomorrow night.
    c. That's wrong, since solar eclipses can only occur at New Moon.
    d. That's wrong, since eclipses only occur when the Moon is on the ecliptic.

Multiple Choice - Deeper Thought

These questions are just like the other multiple-choice questions, just a little harder. As before, choose the ONE best answer and mark it on your Parscore form.
(8 pts. each)

19. Imagine that you go out one night to observe the Moon. You see it rising at sunset, and it looks fully lit-up. What will the Moon look like in 2 weeks?
    a. It will look fully lit-up, and you will see it rising around sunrise.
    b. You won't be able to see it at night, because it will appear close to the Sun in the sky.
    c. About half of the visible side of the Moon will be lit-up, and it will rise around midnight, be highest around dawn, and set around noon.
    d. About half of the visible side of the Moon will be lit-up, and it will rise around noon, be highest around sunset, and set around midnight.

20. Imagine you're orbiting the Earth in a space station, and you pass over a friend's house at nearly 18,000 miles per hour. This doesn't give you much time to talk to them on the radio, so you decide to try and use rocket engines to slow the station down, and stay over their house much longer. Why will (or won't) this work?
    a. The rotation of the Earth will make it impossible to slow down to the correct speed.
    b. If you try and slow yourself down, the lack of atmosphere in space will cause the station to speed up, out of control, away from the part of the Earth where your friend's house is.
    c. At the altitude where the station orbits, a speed of nearly 18,000 mph is required in order for the station to remain in orbit around the Earth.
    d. If you want an orbiting station to remain over one place on Earth, it would have to be directly over either the North Pole or the South Pole.

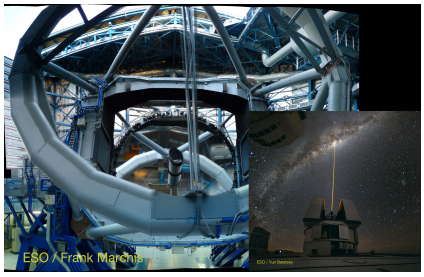
21. Imagine a friend of yours says "There's a solar eclipse next month, on the other side of the world. Let's buy plane tickets! If we get into the path of the Moon's shadow, we can see the faint, delicate outer atmosphere of the Sun!" You recently heard that the Moon will be near the *perigee* of its orbit at that time. Why might this make you hesitate before buying the plane tickets?
    a. Since the Moon's farther away than usual, it won't completely cover the bright part of the Sun, thus keeping the Sun's outer atmosphere invisible.
    b. Because the Moon will be slightly farther away than usual, it will allow more of the dangerous invisible rays from the Sun to go past it, making the part of the Earth's surface in the shadow's path a very dangerous place to be.
    c. Since the Moon's farther away than usual, you won't be able to see much detail on the Moon, and that's the whole point of seeing an eclipse.
    d. Because it's at the far point of its orbit, the Moon will be moving faster than usual, so it will zip across the Sun, as seen from Earth, making a disappointingly short eclipse.

22. Think about a ray of light that is reaching your eye from a distant star. If something about the star changed, and caused the waves of light in that ray to have a shorter wavelength, what would change about the light's appearance?
    a. The light would look redder than it did before.
    b. The light would look bluer than it did before.
    c. The light wouldn't change color, but it would speed up significantly.
    d. If you changed the wavelength of the light even a little bit, it would become invisible to our eyes and undetectable with astronomical instruments.

23. (Extra Credit, 9 pts) Imagine that you attach a spectrograph to your telescope, and you record a spectrum from a planet orbiting another star. You check for the presence of a spectral line that should have a wavlength of 558.000 nm. You find that the line is present, but it has a wavelength of 558.093 nm. How fast was the planet moving away from our solar system, on the night that you recorded the spectrum?
    a. About 150,000 meters per second
    b. About 25,000 meters per second
    c. About 75,000 meters per second
    d. About 50,000 meters per second
    e. About 100,000 meters per second

For each slide: Q1 = 3pts, Q2,3 = 6pts, Q4 = 8pts

Slide Section



These images show one of the large `VLT' telescopes at the European Southern Observatory's facility at Cerro Paranal, Chile. The place where the laser beam comes out (seen in the inset photo) is just out of sight off of the top edge of the large photo. Also note that if you look down the telescope tube (in the main photo), you can see the tube's front-end structure.

24. **(T/F)** judging from the design and components of this telescope, it is a large reflecting telescope.

25. Why do astronomers build telescopes with large diameters like this one (8 meters, in this case)?
    a. They have much lower magnifications than smaller telescopes, allowing much larger portions of the sky to be photographed at one time.
    b. Their large size means they don't vibrate much in case of high winds or earthquakes.
    c. Unlike the old days, astronomers now ride inside the front ends of the telescopes to operate their detector instruments, thus large `scopes are needed.
    d. Their large mirrors (or lenses) can gather much more light than smaller telescopes.

26. Imagine that this telescope had a flaw similar to the Hubble Space Telescope's - its light-gathering element was shaped wrong. What problem would this cause for the telescope?
    a. It wouldn't be able to gather much light compared to the pupil of a human eye.
    b. It would mean that the telescope could only work if placed above the Earth's atmosphere, like the Hubble telescope.
    c. The imperfect shape would mean that it could focus rays of visible light, but not rays of light of any other wavelength.
    d. It would not be able to bring rays of light from a distant object to a focus.

27. Why is there a laser beam shooting out of the front of this telescope (in the inset picture)?
    a. The astronomers are taking pictures of the surface of a planet (most likely Mars), and the laser allows them to light up the planet's surface with a very specific color of light.
    b. The beam creates an `artificial star', which is used by an adaptive-optics system to measure (and counteract) the blurring effect of Earth's atmosphere.
    c. The astronomers are engaged in the opening phases of a war with a race of beings that live on a planet orbiting the supermassive black hole at our galaxy's center.
    d. The astronomers are bouncing light off of objects near the center of the Milky Way galaxy, to measure their distances from Earth.

28. **(T/F)** This photograph was made by taking several exposures of the Moon over a period of time. It illustrates the Moon's cycle of phases, from Full to New and back to Full again.

29. In this image, we see the shadow of a solar-system object being cast onto the Moon. This is the shadow of which body?
    a. The Sun
    b. The Moon's shadow, reflected off of the Earth
    c. Mars
    d. The Earth

30. In this image, we see the dark `core' of the shadow of a solar-system body. What do we call this particularly dark part of the shadow?
    a. The penumbra
    b. The antumbra
    c. The umbra
    d. The corona

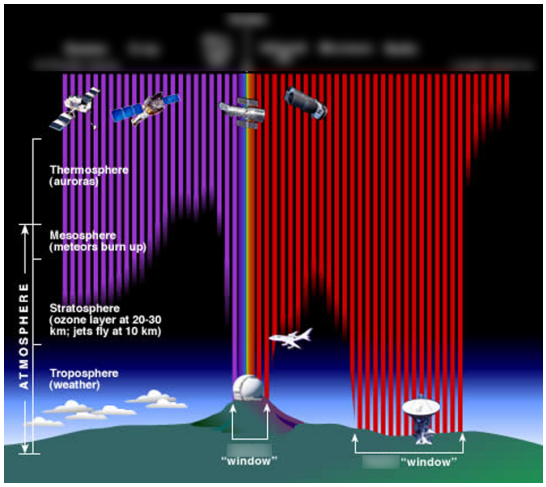
31. If you were on the Moon during the middle photo in this sequence, and you were in the dark portion of the shadow, what would you see?
    a. The Earth would look like a dark disk as it covered up the Sun.
    b. You'd see the Moon covering up the Sun.
    c. The Sun would be in front of the Earth, and its bright light would make the Earth impossible to see.
    d. It would be an annular solar eclipse, with a ring of the Sun's bright surface visible around the Earth.

32. (T/F) The side of the Moon we see here is only visible during the *waxing* part of the cycle of phases. During the *waning* part, the other side of the Moon faces the Earth.

33. What will the Moon look like a few days after it looks like this?
    a. Fully lit-up, or nearly so
    b. A thin crescent
    c. Only the left half of the near side will look lit up
    d. Almost entirely dark-looking

34. What causes the left half of the Moon's near side to look dark during this phase?
    a. That part of the nearside is too far away to see.
    b. Our line of sight towards the Moon is different from the direction the Sun is shining on it.
    c. The shadow of the Earth is on that part of the nearside.
    d. The shadow of the Sun is on that part of the nearside.

35. The Moon is slowly getting farther away from the Earth. Billions of years in the future, what will be different about the Moon's cycle of phases?
    a. It will take longer for the Moon to go through its cycle of phases.
    b. The Moon will show only Full and New phases billions of years from now.
    c. The Moon will take much less time to go once around its orbit.
    d. The Moon will appear permanently stuck in the Full phase.



This diagram shows different types of electromagnetic radiation and their different abilities to go through the Earth's atmsophere. Note that some of the terms have been blurred out.

36. (T/F) The types of electromagnetic radiation shown on the left side of this diagram travel at the same speed as the types shown on the right side.

37. In the center of the diagram, we see a range of EM radiation that makes it all the way through the atmosphere to the telescope dome. Which type of EM radiation is this?
    a. Radio waves
    b. X rays
    c. Visible light
    d. Infrared radiation

38. Much of the right side of this diagram is taken up by a range of EM radiation that makes it to the ground, where dish-shaped antennae can receive it. What do we call this portion of the EM spectrum?
    a. Visible light
    b. Radio waves
    c. Gamma rays
    d. Ultraviolet light

39. Near the center of the diagram, we see a picture of a space telescope that uses the same range of EM radiation as the ground-based telescope (the one in the white dome) does. If this range of EM radiation makes it all the way to the ground, why did anyone bother launching a telescope into space in order to record data in this portion of the spectrum?
    a. A telescope that's moving fast - such as one in orbit - can record more data in a short time because it's moving at almost the speed of light.
    b. Since the telescope is in space, it is much closer to the objects it's looking at, such as stars and galaxies.
    c. The telescope can record sharper images because it is above the blurring effects of the Earth's atmosphere.
    d. Very little of this range of the spectrum actually makes it to the ground, so the space telescope can record much more light in a shorter period of time.

Answers for Astronomy 4 Test #2 Practice Version

A few notes before the answer key:

1) The pattern of answer choices has NO MEANING WHATSOEVER! When I write multiple-choice tests, I DO NOT spend any time or energy on picking the answer choices. I just hit “Scramble” on my test-writing software. Please don't make the mistake of trying to look for “patterns” in the answer choices... I am not spending even a second of my time creating such patterns.
2) The questions on this test only cover a PORTION of the topics on the What2Know list. Many of those topics didn't make it onto this test, but you still have to know them for YOUR test. Don't think that it's not on YOUR test, just because it's not on THIS test. I simply grabbed some questions from my database, and scrambled the answer choices. When preparing for tests, your best bet is always to know the material from the What2Know list as thoroughly as possible!

ANSWERS:

1 F	14 d	27 b
2 T	15 d	28 F
3 T	16 a	29 d
4 T	17 d	30 c
5 F	18 c	31 a
6 a	19 b	32 F
7 d	20 c	33 a
8 a	21 a	34 b
9 b	22 b	35 a
10 b	23 d	36 T
11 c	24 T	37 c
12 a	25 d	38 b
13 c	26 d	39 c