Astronomy 100

Sample exam 2 (The solar system, telescopes and light)

Open book, exercises, notes; no other textbook, no collaboration. You have 50 minutes.

Short answer — answer all questions.

1. (2 points) Give the **full citation** (author or sponsoring organization, title or URL, publication date or last update date) of a refereed, peer-reviewed or edited source you will be using for your poster.

2. (2 points) State "similar" or "different" when comparing a **neutron** with a **proton**.

a. Electrical charge

b. Mass

3. (2 points) State "**absorption**" or "**emission**" for the best type of **spectrum** to find out the information requested:

a. The identity of a hot gas in a nebula

b. The identity of a cool gas in a star's "atmosphere"

4. (2 points) Which of the following qualities of a **telescope** depend on the **diameter** of the **objective lens**? Circle *all* correct answers.

a. Magnification b. Resolution c. Light-gathering capability d. Weight

5. (2 points) Which of the following features of a telescope would lead to better **magnification**? Circle *all* correct answers.

a. A longer focal length objective lens

b. A shorter focal length objective lens

c. A longer focal length eyepiece lens

d. A shorter focal length eyepiece lens

6. (2 points) a. Name a body in the solar system from which we could obtain pristine (original) rocky solar nebula material.

b. Name a body in the solar system from which we could obtain pristine (original) icy solar nebula material.

7. (2 points) **Order** the creation of the following bodies in the solar system, from oldest (1) to youngest (4):

a. Planetesimals b. Chondrules c. Planets d. Solar nebula

Essay questions (10 points each) — choose **three** of the following questions; circle the numbers of the ones chosen, so I know which ones to grade. Please answer each question in sentence/paragraph format or a drawing, depending on what is asked.

11. Your astronomical research on binary stars has ground to a halt! The telescopes you use cannot resolve these distant pairs of stars with the telescope you use currently. Your two faithful assistants, Edwin and Williamina, have suggestions:

• Williamina says, "We'll use a bigger diameter objective mirror. This will increase the size of the light bucket for seeing these stars."

• Edwin says, "That'll be too expensive. We'll simply switch to a shorter wavelength by putting an ultraviolet wavelength-sensitive CCD on the back of the existing telescope."

Will either of these plans work? If both will work, which plan is better, or are they equivalent? Please **explain** your answer, whether your answer is "yes" or "no".

12. The Earth's **atmosphere** is remarkably different than that of the other terrestrial planets in the solar system. For instance, the Earth's atmosphere is 78% nitrogen and 21% oxygen with only a trace of carbon dioxide. Assuming that all the terrestrial planets started off with the same atmospheric composition, **did the Earth's atmosphere change or did the other planets' atmospheres change**? Explain which changed (might it be both?) and what process caused the change.

Hint: The words "water vapor" and "gravity" (or synonyms) must be used in your answer.

13. In exercise 6, you did the **spectroscope** experiment. Suppose you are looking at the emission spectrum of **gaseous helium**. You dutifully write down the wavelengths of emission. You notice a power dial on the side of emission lamp and, just for fun, decide to turn up the power. The color of the helium lamp changes and you look through the spectroscope. **The emission wavelengths are different**! Alarmed, you turn the power back down and the gas emits the original wavelengths. Explain these observations, specifically with regard to the helium gas; in other words, **what happened to the helium**? You may assume that you did not break the gas discharge tube or lamp!