Physics 174 24 March, 2007
Solar System Astronomy

Examination II

Practice

Name: _____

Signature: _____

Student ID number: _____

Table: _____

Instructions:

On the scannable answer sheet:
- Put your name (last name first!) and ID number (in col. A-J).
- Identify the form in Special Codes column K.
- Answer all 50 questions using a number 2 pencil.

In addition:
- Do not open your exam until instructed to do so.
- Be sure to also answer each question in the blanks provided on this exam.
- You may not use any notes, texts, calculators or communications devices.
- All work must be your own.
- You have 50 minutes.

Notice

This practice exam includes questions from Exam II and the Final from Fall, 2006, as well as a few additional questions. While this practice exam only has 34 questions, the actual exam will have 50.

Useful equations:

$v = \lambda\upsilon$ (for light, v=c)

$E = h\upsilon$ (h = Planck's constant.)

$\theta_R \sim \lambda/D$ (The constant of proportionality depends on the units of λ and D.)

$\lambda_{mI} = C/T$ (If λ in μm and T in K, then C = 2880 μm K.)

$L = 4\pi r^2 \sigma T^4$ (σ = the Stefan-Boltzmann constant.)

_____ 1. An infrared telescope has a diameter of 10 m and is designed to operate at a wavelength of 10 μm. An optical telescope has a diameter of 1 m and operates at a wavelength of 0.5 μm (5000 Angstroms). Which has the better theoretical resolution?

a. The infrared telescope, because it has the higher ratio of wavelength to diameter.
b. The infrared telescope, because it has greater light-gathering capability.
c. The optical telescope.
d. They have the same resolution.
e. There is insufficient information to answer this question.

_____ 2. A wave has a velocity of 4 m/s and a wavelength of 2 m. What is the frequency? (1 Hertz = 1 cycle per second.)

a. 2 Hertz.
b. 0.5 Hertz.
c. 8 Hertz.
d. 4 Hertz.
e. None of the above.

_____ 3. Which portion of the electromagnetic spectrum is associated with photons with the highest energy?

a. Radio waves.
b. Gamma rays.
c. The thermal infrared.
d. The ultraviolet.
e. All photons have the same energy.

_____ 4. Which portion of the electromagnetic spectrum has the longest wavelength?

a. X-rays.
b. Visible light.
c. Gamma rays.
d. Ultraviolet.
e. Infrared.

_____ 5. A planet and its moon have equal surface temperatures and albedos. The planet has a radius five times that of the moon. How much more luminous is the planet than the moon?

a. 25 times.
b. 10 times.
c. 5 times.
d. They have the same luminosity.
e. The moon is more luminous than the planet.

_____ 6. Two asteroids of the same size differ in temperature by a factor of two. How much more luminous is the hotter asteroid than the cooler one?

a. 2 times.
b. 4 times.
c. 8 times.
d. 16 times.
e. Luminosity does not depend on temperature.

_____ 7. Two light bulbs produce the same amount of light, but one is three times further away than the other. How much fainter does it appear to be?

a. They will both look the same.
b. Three times fainter.
c. Six times fainter.
d. Nine times fainter.
e. None of the above.

_____ 8. What is albedo?

a. The angle between a planet's equator and the plane of the Solar System.
b. The ratio of a planet's density to the critical density.
c. The fraction of light reflected by a planet's surface.
d. Mrs. Bedo's son, Al.
e. None of the above.

_____ 9. Which of the following wavelengths of light are mostly blocked by the Earth's atmosphere?

a. X-rays.
b. Infrared.
c. Radio.
d. Optical.
e. Most light for all of the above can penetrate the Earth's atmosphere.

_____ 10. Which of the following parts of the electromagnetic spectrum gets through the Earth's atmosphere most easily?

a. Gamma-rays.
b. Infrared.
c. Optical.
d. Ultraviolet.
e. Most light for all of the above can penetrate the Earth's atmosphere.

_____ 11. When light waves change direction when they pass from one medium to another, this phenomenon is called ...

a. reflection.
b. diffraction.
c. refraction.
d. interference.
e. amplitude.

_____ 12. When light waves or sound waves bend around an obstruction or spread out after passing through an aperture, this phenomenon is called ...

a. reflection.
b. refraction.
c. diffraction.
d. interference.
e. amplitude.

_____ 13. A blackbody ... at all wavelengths.

a. absorbs radiation
b. emits radiation
c. has an albedo of zero
d. All of the above.
e. None of the above.

_____ 14. At what wavelength does the emission from the Sun (T=5780 K) peak?

a. Infrared.
b. Ultraviolet.
c. Visible.
d. Radio.
e. None of the above.

_____ 15. A spectrum with only emission lines is produced by ...

a. a hot blackbody.
b. a cool blackbody.
c. a cool gas in front of a hot blackbody.
d. a hot gas.
e. All of the above.

_____ 16. The spectrum of an object moving away from the observer is ...

a. shifted to longer wavelengths.
b. increased in amplitude.
c. shifted to shorter wavelengths.
d. decreased in amplitude.
e. None of the above.

For questions 17 through 26, match the terrestrial world below to the following statements.

a. Mercury
b. Venus
c. Earth
d. The Earth's Moon
e. Mars

_____ 17. This world orbits closest to the Sun.

_____ 18. This world has the smallest diameter of the terrestrial worlds.

_____ 19. This world is the most massive of the terrestrial worlds.

_____ 20. This world has the densest atmosphere of the terrestrial worlds.

_____ 21. This world has been described as having one and a half tectonic plates.

_____ 22. This world appears to have been entirely resurfaced roughly 500 million years ago.

_____ 23. This world has active plate tectonics and several continental plates.

_____ 24. This world has the lowest crater density of the terrestrial worlds.

_____ 25. This world has two regions of differing crater density described as maria and highlands.

_____ 26. Because of the greenhouse effect, the temperature of this world is over 400 °K warmer than it expected from its distance to the Sun.

_____ 27. Which of the following terrestrial worlds most resembles the Moon?

a. Mercury.
b. Venus.
c. Earth.
d. Mars.
e. None of these worlds looks anything like the Moon.

_____ 28. How do we know the absolute ages of the different regions on the surface of the Moon?

a. Rover missions.
b. Lunar orbiters.
c. Crater counting.
d. Radioactive dating of moon rocks.
e. None of the above.

_____ 29. The most abundant compound or element in the atmosphere of the Earth is ...

a. carbon dioxide (CO_2).
b. water vapor (H_2O).
c. nitrogen (N_2).
d. oxygen (O_2).
e. ozone (O_3).

_____ 30. The most abundant compound or element in the atmosphere of Mars is ...

a. hydrogen (H_2).
b. carbon dioxide (CO_2).
c. nitrogen (N_2).
d. oxygen (O_2).
e. argon (Ar).

_____ 31. Which of the following is the dominant greenhouse gas on Earth?

a. carbon dioxide (CO_2).
b. water vapor (H_2O).
c. nitrogen (N_2).
d. oxygen (O_2).
e. ozone (O_3).

_____ 32. Which of the following is the most likely cause of the increasing global temperature of the Earth over the past 200 years?

a. The introduction of more carbon dioxide (CO_2).
b. Changes in the behavior of the Sun.
c. Natural variations in weather patterns.
d. The increasing size of deserts at tropical latitudes.
e. Changes in the Earth's magnetic field.

_____ 33. What produced the maria regions on the Moon?

a. A lack of tectonic activity, leaving these areas flat and devoid of mountains.
b. The filling of giant impact basins by lava which then cooled.
c. The exposure of dark rock underneath the surface by large impacts.
d. Alien bulldozers.
e. None of the above.

_____ 34. Earthquakes allow geologists to probe ...

a. the rotational velocity of the Earth.
b. the internal structure of the Earth.
c. the total mass of the Earth.
d. the eccentricity of the Earth's orbit.
e. None of the above.