Physics 1051. Planetary Astronomy

Quiz 4 REVIEW. Light and spectroscopy

1. Which of these properties for waves on a string are measured in length units (e.g., meters, mm, etc)? (Circle more than one.)

   (a) speed (b) frequency (c) amplitude (d) wavelength (e) polarization

2. Which type of electromagnetic radiation has the longest wavelength?

   (a) Radio (b) visible (c) ultraviolet (d) infrared
   (e) gamma rays

3. What are the colors contained in white light, ordered from low to high frequency? (First letter only. Give at least six colors.)

4. Which type of electromagnetic radiation has the lowest frequency?

   (a) Radio (b) visible (c) ultraviolet (d) infrared (e) gamma rays

5. Which type of electromagnetic radiation has the highest frequency?

   (a) Radio (b) visible (c) ultraviolet (d) infrared
   (e) gamma rays

6. Name a behavior of light which is characteristic of waves but not particles.

   _____

7. Which of these is a type of electromagnetic radiation which is harmful to living tissues? (Circle one)

   (a) gamma rays b) infrared c) radio d) visible light e) cosmic rays

8. The temperature of an ideal blackbody can be measured from the _____ its spectrum.

   (a) emission lines in
   (b) absorption lines in
   (c) peak intensity of
   (d) wavelength of peak intensity for
   (e) width of absorption lines in

9. The pitch of a train horn will drop as the train passes because of the _____ effect.

10. The spectrum of a star moving away from us will be _____ compared to a similar star at rest.

(a) redshifted

(b) blueshifted

(c) neither redshifted or blueshifted

(d) brighter

(e) dimmer

11. The spectrum of a star moving toward us will be _____ compared to a similar star at rest.

    (a) redshifted

    (b) blueshifted

    (c) neither redshifted or blueshifted

    (d) brighter

    (e) dimmer

12. The amount of radiation leaving a blackbody depends on temperature raised to the _____ power.

    (a) 1st (b) 2nd (c) 3rd (d) 4th (e) 5th

13. Varying the current flowing through a lightbulb will change the filaments temperature and allow one to demonstrate _____.

    (a) Wien's law (b) Stefan's Law (c) Kirchoff's laws (d) Wien's law and Stefan's law (e) Newton's law

Light and telescopes

(NOTE: Only those with ** are important.)

1. The diameter of the pupil is about 0.2 inches. How many times fainter than the naked-eye limit can be seen with a 1-inch diameter telescope? (Hint: LGP)

   (a) 2 times (b) 4 times (c) 5 times (d) 25 times

2. The Light Gathering Power (LGP) of a telescope of mirror diameter D is proportional to

   (a) D (b) D^2 (c) 1/D (d) the eye's pupil diameter

3. The following are designs of reflecting telescopes except the

   (a) refractor (b) Newtonian (c) Prime focus (d) Cassegrain (e) Coude

4. What is the faintest star that we can see using a telescope with a lens diameter 10 times greater than that of our pupil?

   (a) 1.0 (b) -6.0 (c) 4.0 (d) 6.0 (e) 11.0

5. The various types of reflecting telescopes can be distinguished by the position of their _____.

   (a) focal plane (b) primary mirror (c) secondary mirror (d) finder scopes (e) clock drive

6. The resolution of a telescope improves as you increase _____.

   (a) the magnification (b) the secondary mirror diameter (c) the distance to the double stars (d) the focal length (e) the objective's diameter

7. ** In the _____design of reflecting telescope, there is a whole through the center of the primary.

   (a) Cassegrain (b) refractor (c) Prime (d) Coudé (e) Newtonian

8. ** Diffraction and refraction are examples of _____

   (a) telescopic imperfections (b) tricks of the eye (c) wave properties of light (d) particle properties of light (e) energy

9. Light comes in discrete 'pieces' of energy called _____

   (a) Joules (b) keppers (c) Planck's (d) photons (e) bullets

10. ** Besides visible light, the type of electromagnetic radiation which is least absorbed by the Earth's atmosphere is _____.

    (a) radio waves (b) X-rays (c) gamma-rays (d) cosmic-rays (e) infrared waves

11. ** Which wave property of light is often measured in nanometers and is related to color?

    (a) frequency (b) energy (c) wavelength (d) c, the speed of light (e) redshift

The Sun

1. What is the temperature of the Sun's surface (the photosphere)?

   (a) 600 K (b) 2000 K (c) 3800 K (d) 5800 K (e) 10,000 K

2. The average temperature of the surface of the Sun is closest to _____.

   (a) 512 K (b) 1600 K (c) 5800 K (d) 16,000 K (e) 30,000 K

3. The temperature of the gases in the Sun's atmosphere are highest in the _____

   (a) transition region
   (b) photosphere
   (c) chromosphere
   (d) corona
   (e) tecate

4. This layer of the Sun's atmosphere includes gas with temperatures ranging from 15,000 K to about 1,000,000 K.

   (a) photosphere (b) radiative zone (c) transition region (d) chromosphere (e) convective zone

5. The Sun has _____ rotation.

   (a) no detectable
   (b) extremely fast
   (c) inversely chaotic
   (d) time-varying
   (e) differential

6. Above the radiative zone of the Sun is a zone where heat is transferred upward by bulk motion of gas, a process called _____.

   (a) conduction (b) convection (c) radiation (d) projection (e) reflection

7. The Sun generates all of its energy in a region called the _____.

   (a) core (b) fun zone (c) radiative zone (d) convective zone (e) nucleus

8. The most powerful, short-lived explosions on the Sun's surface are called _____.

   (a) coronal holes (b) flares (c) prominances (d) filaments (e) fusion

9. Which of these surface features on the Sun is the most short-lived?

   (a) sunspots (b) flares (c) supergranules (d) prominances (e) coronal holes

10. When a gas is maintaining a stable, spherical shape, gravity is balanced by _____

    (a) temperature (b) pressure (c) density (d) frictional forces (e) electrical sources

11. Evidence for convection on the Sun is seen in bubble-like features about 1000 km across called _____

    (a) flares (b) Texans (c) granules (d) prominences (e) sunspots

12. The inhibition (prevention) of convection in regions of strong magnetic fields gives rise to _____

    (a) sunspots (b) prominences (c) flares (d) granules (e) the sunspot cycle

13. The Sun's chromosphere is more difficult to observe (fainter) than the photosphere because it is _____

    (a) more colorful (b) cooler (c) farther away (d) more diffuse (less dense) (e) eclipsed by the Sun

14. What is the deepest layer that we can see of the Sun in visible wavelengths?

    (a) corona (b) chromosphere (c) photosphere (d) convective zone (e) radiative zone

15. Which layer of the Sun emits most of the photons that reach our eyes directly?

    (a) corona (b) chromosphere (c) photosphere (d) convective zone (e) radiative zone

16. T or F. The density and temperature in the solar corona are much higher than in the photosphere.

17. Name a region of the Sun that produces an emission line spectrum, in accordance with Kirchoff's laws.

    _____

18. In what surface feature of the Sun would you expect to observe absorption lines that are split into 3 lines because of a strong magnetic field? _____

19. The nearest star to the Earth can be easily resolved by telescopes. It is called _____.

20. What provides the most direct evidence of nuclear reactions currently occuring in the Sun's core?

    (a) visible light emitted from the core
    (b) gamma rays emitted from the core
    (c) x-rays
    (d) helioseismic vibrations on the surface
    (e) neutrinos emitted from the core

21. The *number* of sunspots on the Sun increases and decreases with a period of about _____.

22. The latitude of sunspots on the Sun increases and decreases with a period of about _____.

23. After one, 11 year sunspot cycle, things are back to the starting state except that the _____ of the sunspot pairs is reversed.

24. The CME's from the Sun can lead to _____ on Earth.

    (a) coronas (b) annihilation (c) auroras (d) migraines (e) helioseismology

25. What is the name of the particular nuclear fusion process that provides most of the Sun's power?

    _____

26. T or F. Since neutrinos can pass through light years of lead without obstruction, we can't construct a neutrino detector on Earth.

Ch. 6. Solar System Overview

(Review questions for Quiz 5)

1. T or F. The total mass of all the planets is about half the mass of the Sun.

2. T or F. Some terrestrial planets have no Moons.

3. T or F. *Curiosity* is a rover that recently landed on Venus.

4. T or F. A planet with a density of 5000 kg/m^3 most likely has a gaseous composition.

5. (2pts) Name 4 things in our solar system, excluding the planets (and things on the planets).
   _____, _____, _____, _____

6. All of the following are properties of terrestrial planets except _____.

   (a) high density (b) possessing many moons (c) close to the Sun (d) lacking ring systems (e) Earth-like composition

7. On which of the terrestrial planets are surface features most easily seen from an Earth-based telescope?

   (a) Mercury (b) Venus (c) Mars (d) Jupiter (e) Saturn

8. When we divide a planet's mass by its volume, we get _____

   (a) the planet's average density
   (b) the planet's central density
   (c) the planet's uncompressed density
   (d) 1100 kg/m^3 for all terrestrials
   (e) its average pressure

9. Which type of planet, Jovian or Terrestrial, has the higher ... (1 pt each)

(a) spin rate? (J or T)_____?

(b) mass? (J or T)_____?

(c) radius? (J or T)_____?

(d) distance from the Sun? (J or T)_____?

(e) density? (J or T)_____?

10. (1 pt) The spacecraft that was sent to *primarily* observe Jupiter was _____.

    (a) Cassini (b) Venera (c) Magellan (d) Messenger (e) Galileo

11. (1 pt) A spacecraft that was sent to observe Venus was _____.

    (a) Cassini (b) Venera (c) Magellan (d) Messenger (e) Galileo

12. (1pt) Without dust, the nebular theory for the solar system had trouble explaining _____.

    (a) CCW orbits of planets (b) coplanar orbits of planets (c) a star at the center (d) how the gas could begin clumping together (e) the rotation of the Sun

13. (1pt) The flattening of the solar nebula and its increase in spin during collapse are related to the conservation of _____.

    (a) energy (b) momentum (c) angular momentum (d) mass (e) spin

14. (1pt) The terrestrial planets tend to be made out of high-melting point materials, while the Jovian planets contain mostly gases and low-melting point materials. This is consistent with the The condensation sequence predicts that the inner planets will be made out of

    (a) high melting point materials

    (b) iron, not silicates

    (c) silicates, not iron

    (d) low melting point materials

    (e) water and ammonia

15. The age of the solar system, as measured by radioactive dating of the oldest meteorites, is _____ years.

    (a) 4.6 billion (b) 12 billion (c) 4.5 million (d) 12 thousand (e) 46 billion

16. Which of these solar system objects are found far from the Sun and high in mass?

    (a) Jovian planets (b) the solar wind (c) terrestrial planets (d) Pluto (e) Alpha Centauri

Ch. 7. Planet Earth

1. Which layer of the Earth's atmosphere contains most of its mass?

   (a) troposphere (b) lithosphere (c) mesosphere (d) stratosphere (e) ionosphere

2. Which layer of the Earth's atmosphere contains most of the clouds and weather?

   (a) troposphere (b) lithosphere (c) mesosphere (d) stratosphere (e) ionosphere

3. The fraction of the Earth's atmosphere that is made up of CO_2 is _____

   (a) in-between that on Venus and Mars (b) lower than that on Venus and Mars (c) higher than on Venus and Mars (d) steadily decreasing (e) over 99%

4. The _____, which extends far above the ionosphere, helps protect us from energetic charged particles from space (cosmic rays).

5. (1pt) The Earth's core is subdivided into _____ parts. (Note: "core" not "interior".)

   (a) 2 (b) 3 (c) 4 (d) 5 (e) 6

6. (1pt) The color of the rainbow that is scattered most effectively by air molecules is _____.

   (a) red (b) orange (c) yellow (d) green (e) violet

7. The best way to reveal the outlines of crustal plates on the Earth is a map of _____.

   (a) the continents (b) earthquake epicenters (c) islands (d) the oceans (e) lines of latitude

8. Which property is unique to the Earth among the terrestrial planets.

   (a) clouds (b) the greenhouse effect (c) a dense core (d) plate tectonics (e) volcanos

9. The type of seismic wave which can propagate through the Earth's mantle but NOT through the liquid core is the _____

   (a) P wave (b) S wave (c) L wave (d) sine wave (e) N wave

10. Which type of seismic wave can not penetrate through the outer core? _____

11. The analysis of seismic waves has shown us that the Earth _____

    (a) is rotating

    (b) has a creamy, caramel center

    (c) has a liquid inner core

    (d) has a liquid outer core

    (e) has a magnetic inner core

12. The driving force behind plate techtonics is thought to be _____ in the Earth's mantle.

    (a) radioactivity (b) rotation (c) convection (d) differentiation (e) flooding

13. If we trace the Earth's continental drift backward in time for 200 million years, we find _____

    (a) no change from today (b) one large continent, dubbed Pangaea (c) no mountain chains (d) the oceans are much smaller (e) a time when the crust was molten

14. The stage of planetary development which involves the sinking of dense material to the core is called _____

    (a) differentiation (b) cratering (c) flooding (d) slow surface erosion (e) weathering

15. T or F. So long as CO_2 makes up less than 1% of Earth's atmosphere there is no danger of global warming.

16. During the early development of Earth, the densist materials sank to the core in a process called _____

    (a) differentiation (b) cratering (c) flooding (d) slow surface erosion (e) weathering

EXTRA (1pt): The last video I showed you about the Sun was a montage of images from/about the _____ satellite.

Large The Moon and Mercury

1. The theory of the Moon's formation which is most widely accepted is the _____ hypothesis.

    (a) fission/"daughter" (b) co-accretion/"sister" (c) capture (d) large-impact (e) moon

2. The main difference between the surfaces of the near and far sides of the Moon is _____

    (a) the far side has fewer maria (b) the far side is always dark (c) there are no craters on the far side (d) the far side has no mountains

3. T or F. Mercury at its brightest is brighter than Venus.

4. Mercury rotates _____ times relative to the stars in the time it takes to make 2 orbits around the Sun.

    (a) 1.5 (b) 0.666 (c) 0.5 (d) 2.0 (e) 3.0

5. Mercury rotates _____ times with respect to the Sun during one revolution.

(a) 1.5 (b) 0.666 (c) 0.5 (d) 2.0 (e) 3.0

6. T or F. Mercury's weak magnetic field is consistent with its nearly complete lack of the element iron.

7. Radio observations of Mercury revealed hot spots on its surface which are caused by _____.

   (a) recent meteorite impacts (b) outgassing (c) highly reflective materials (d) the spin-orbit resonance and its eccentric orbit (e) differentiation

VENUS

8. The surface temperature on Venus is about _____ while the average on Earth is about 290 K.

   (a) 200 K (b) 373 K (c) 560 K (d) 730 K (e) 990 K

9. T or F. There is strong circumstantial evidence that active volcanism continues on Venus.

10. T or F. Venus at its brightest is brighter than Jupiter.

11. The lack of small craters on the surface of Venus is attributed to _____.

    (a) clouds of planetesimals in the early solar system (b) the greenhouse effect (c) the breakup of meteoroids by the atmosphere (d) chance (e) sulfuric acid

12. The rotation of Venus was first deduced correctly by the broadening of radio signals reflected back to Earth. The change of the signal's frequency caused by the motion of the signal source is called the _____ effect.

    (a) photoelectric (b) Zeeman (c) Coriolis (d) Diamond ring (e) Doppler

13. The orangish tinge of Venus is caused by compounds of _____, while the reddish color of Mars is caused by compounds of _____.

    (a) iron, sulfur (b) sulfur, iron (c) oxygen, sulfur (d) sulfur, carbon (e) carbon, sulfur

MARS

14. Which surface feature is *not* attributed to the presense of water on Mars?

    (a) flow channels (b) Valles Marineris (c) splosh craters (d) ocean shorelines (e) riverbeds

15. The oldest regions on the martian surface are those with _____.

    (a) white ices (b) volcanoes (c) many impact craters (d) rivers (e) deep basins

16. T or F. Olympus Mons is the largest impact crater on Mars.

17. (2pt) Place these missions to Mars in chronological order: Pathfinder, Spirit & Opportunity, Curiosity, Viking

    (1) _____
    (2) _____
    (3) _____
    (4) _____

Miscellaneous Questions on Terrestrial Planets

18. On the surface of this terrestrial body, an unprotected human would not explode but implode (contract) because of the high pressure.

    (a) Mercury (b) Venus (c) Earth (d) Mars (e) the Moon

19. On some planets the atmosphere acts like a heat blanket, preventing infrared radiation from escaping. This is called _____.

20. Seen from above the solar system, the terrestrial planet that rotates clockwise is _____.

    (a) Mercury (b) Venus (c) the Moon (d) Mars (e) Earth

21. (4pts) Write down either Mercury, the Moon, Venus, Earth, or Mars next to each term which relates to them.

_____ scarps
_____ rilles and maria
_____ Aphrodite Terra
_____ Tharsis bulge
_____ Venera spacecraft
_____ runaway greenhouse effect
_____ Viking spacecraft
_____ Spirit and Opportunity rovers

22. (4pts) Write down either Mercury, the Moon, Venus, Earth, or Mars next to each term which relates to them.

_____ Olympus Mons
_____ Margaret Meade
_____ Curiosity rover
_____ Ishtar Terra

_____ Mare Orientale

_____ Caloris Basin

_____ rayed crater Copernicus

_____ Lava domes and coronae