

December 19, 2007

**Final Exam**

**PHYS 152**

Name \_\_\_\_\_

Bengal ID \_\_\_\_\_

**This is a closed book exam, no books, no notes, no calculators!**

**100 points max: 40 points from multiple choice questions, 40 points from T/F questions and 20 points from free response questions. There are two bonus questions (10 points) if you are interested.**

**Please give clear, legible, and reasonably complete (although brief) responses to free response questions.**

**See the last page for equations if needed.**

**Honest people will be protected. Anyone caught cheating will be given an "F" in the course and turned over to the Dean for further disciplinary action. A note will also be entered into the student's file showing academic dishonesty.**

**Good luck!**

**Multiple Choice Questions (2 points each)**

1. A sodium atom consists of:
  - a.) positively charged protons, negatively charged electrons, and neutral neutrons
  - b.) positively charged electrons, negatively charged protons, and neutral neutrons
  - c.) protons and electrons only
  - d.) protons, electrons, neutrons, and neutrinos
  
2. The contribution of Copernicus to the development of astronomy was a mathematical model for
  - a.) a geocentric cosmology in which the planets move in circular epicycles.
  - b.) a heliocentric cosmology in which planets move in elliptical orbits.
  - c.) a heliocentric cosmology in which the planets move in circular orbits.
  - d.) the solar system in which the planets move under the gravitational influence of the Sun
  
3. If the distance between the Sun and the Earth were doubled, the gravitational force on the Earth due to the Sun would
  - a.) be 4 times less its present value.
  - b.) be 16 times less its present value.
  - c.) be twice its present value.
  - d.) be half its present value.
  
4. A ground based radio telescope
  - a.) would be a powerful tool to study distant planets.
  - b.) would be worthless because no astronomical objects emit radio waves.
  - c.) would be worthless because radio waves cannot penetrate through Earth's atmosphere.
  - d.) would be worthless because no radio telescopes are invented yet.
  
5. If two massive bodies, initially held at rest in space, are released, then they will begin to
  - a.) move away from each other with constant acceleration.
  - b.) Move toward one another.
  - c.) Orbit one another in circles.
  - d.) Move in elliptical orbit's around one another.

6. Atmospheric windows exist in:
- a.) visible range of the EM spectrum
  - b.) radio range of the EM spectrum
  - c.) x-rays range of the EM spectrum
  - d.) a) and b)
7. Tides are explained by
- a.) the gravitational force of the Moon on the ocean water.
  - b.) the gravitational force of the Sun on the ocean water.
  - c.) both A and B
  - d.) Neither A nor B.
8. Accretion is
- a.) one of the Jupiter moons
  - b.) a process of condensation
  - c.) a process of small pieces sticking together
  - d.) neither of the above
9. Which terrestrial planet has the least dense atmosphere?
- a.) Mercury
  - b.) Venus
  - c.) Mars
  - d.) Earth
10. Scientists believe the core of the Saturn is mainly made of:
- a.) iron and rock
  - b.) hydrogen
  - c.) helium
  - d.) uranium
11. Scientists believe the core of the Mercury is mainly made of:
- a.) iron and rock
  - b.) hydrogen
  - c.) helium
  - d.) uranium

12. The asteroid belt lies between the orbits of:

- a.) Earth and Mars
- b.) Mars and Jupiter
- c.) Jupiter and Saturn
- d.) Pluto and Oort cloud

13. Io, Jupiter's satellite is known as:

- a.) the moon with the lowest surface temperature in the Solar System
- b.) the moon with the ocean below the ice
- c.) the moon with a lot of volcanoes
- d.) the moon with thick atmosphere

14. Doppler effect is widely used to study:

- a.) black holes
- b.) binary stars
- c.) sunspots
- d.) neutrinos

15. If mass is added to a white dwarf its radius:

- a.) increases
- b.) decreases
- c.) remains the same
- d.) it turns into a black hole

16. A star that is small and very luminous must have:

- a.) a very high temperature
- b.) a very low temperature
- c.) a very high velocity
- d.) a very low velocity

17. According to 2<sup>nd</sup> Kepler's law a planet would

- a.) move faster when it's close to the Sun
- b.) move slower when it's close to the Sun
- c.) move with a constant velocity around the Sun in circular orbit
- d.) move with a constant velocity around the Sun in elliptical orbit

18. Aurora Borealis can not be observed at the equator because of:
- a.) position of Earth's magnetic field lines
  - b.) Earth's shape (bulge at the equator)
  - c.) high temperatures on the equator
  - d.) strong winds at the equator
19. Free fall acceleration for a given planet is:
- a.) directly proportional to its mass
  - b.) inversely proportional to its mass
  - c.) directly proportional to its radius
  - d.) inversely proportional to its radius
20. What causes the radio pulses of a pulsar?
- a.) the star spins and beams of radio radiation from it sweep through space. If one of the beams points towards the Earth, we see a pulse
  - b.) the star changes its size (expands and contracts)
  - c.) the star undergoes nuclear explosions that generate radio pulses
  - d.) the star vibrates

**True or False Questions (1 points each)**

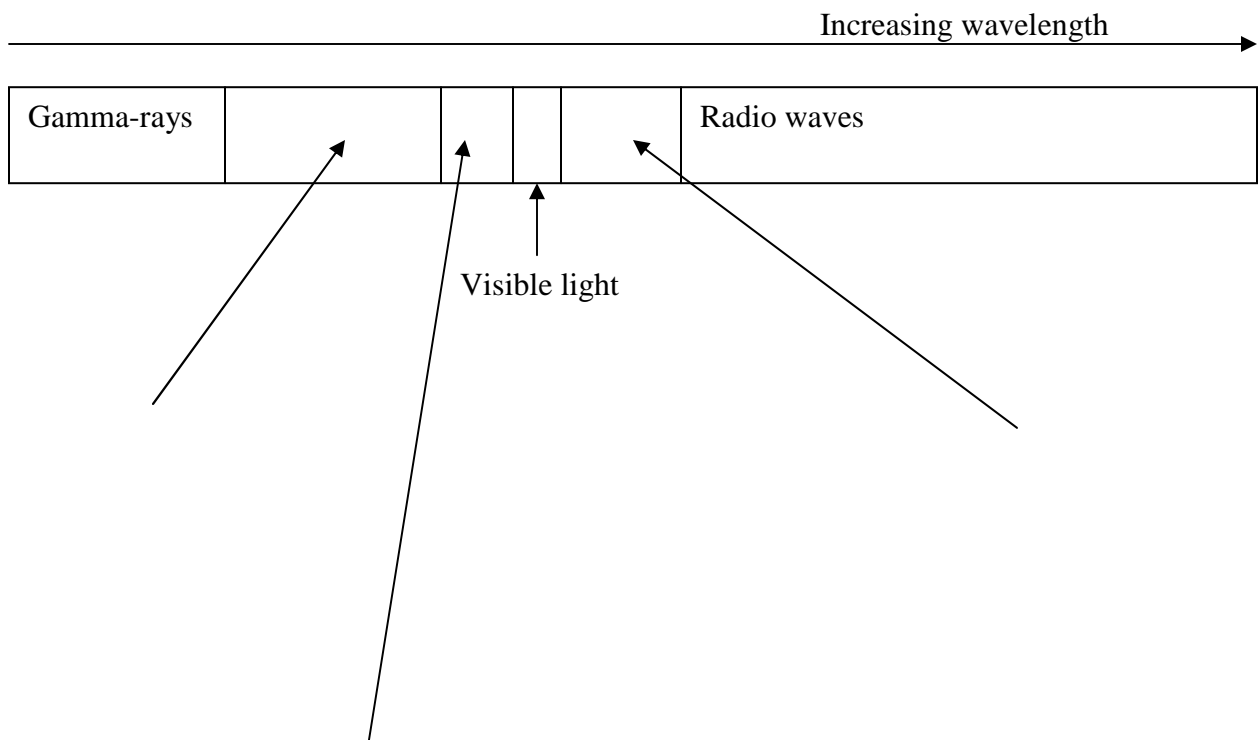
T F

1. ( ) ( ) The days and nights are of equal length during solstices.
2. ( ) ( ) A lunar eclipse happens every full moon
3. ( ) ( ) In the geocentric model of the Solar System developed by Ptolemy planets move with varying speeds in elliptical orbits around the Earth.
4. ( ) ( ) A hot star produces an emission spectrum.
5. ( ) ( ) The higher the frequency of an electromagnetic wave, the lower its energy.
6. ( ) ( ) If a star's spectral lines are shifted to longer wavelengths, the star is moving away from us.
7. ( ) ( ) Making smaller mirrors would increase the resolving power of a telescope.
8. ( ) ( ) Primary waves travel easily through a solid, but not through a liquid.
9. ( ) ( ) CO<sub>2</sub> is the only gas in our atmosphere that absorbs EM radiation.
10. ( ) ( ) Lunar rilles are carved by ancient lava flows.
11. ( ) ( ) All Jovian planets have rings.
12. ( ) ( ) Uranus looks blue because its methane atmosphere absorbs blue light.
13. ( ) ( ) All meteorites consist of chondrules.
14. ( ) ( ) Oort cloud is the source of short-period comets.
15. ( ) ( ) Kinetic energy of a meteoroid is directly proportional to its mass.
16. ( ) ( ) Sun's visible surface is called chromosphere.
17. ( ) ( ) Any star can eventually become a neutron star.
18. ( ) ( ) Betelgeuse (magnitude 1) is brighter than Aldebaran (magnitude 0.8).
19. ( ) ( ) Hawking radiation has recently been observed experimentally.
20. ( ) ( ) Pop I stars are mostly old and red.

**Free Response Questions (5 points each)**

1. State three Kepler's laws.

2. Fill out the three missing parts of the EM spectrum:



3. Sketch a refracting and a reflecting telescope and explain the difference between them.

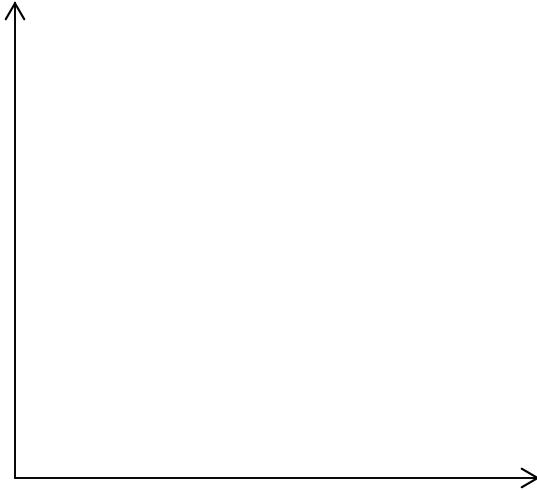
4. Sketch the Earth's structure. Make sure you include four distinct regions. Name them and give brief description of each of them.

5. Compare the Martian and the Venusian atmospheres. Why are they so different?

6. What are prominences? Make a sketch illustrating how magnetic field supports a prominence.

7. Plot an H-R diagram for the following stars: (Label the axis!)

Star	Temperature (K)	Luminosity (Solar Units)
A	6,000	1
B	10,000	25
C	4,000	150,000
D	15,000	0.01
E	20,000	3,000



8. Sketch the Hubble tuning-fork diagram, representing different types of galaxies.

**Bonus Questions (5 points each)**

1. Why do astronomers believe the Universe is expanding?

2. What is the Big Bang?