Astronomy 101 Quiz 34+5 Form A

Name: _____

Lab section number: _____

(In the format "M0**". See back page; if you get this wrong you may not get your quiz back!)

Contents:

- Question 1: which form do you have?
- Questions 2-11: Quiz 3+4 retake (10 questions)
- Questions 12-21: Quiz 5 (10 questions)

Instructions:

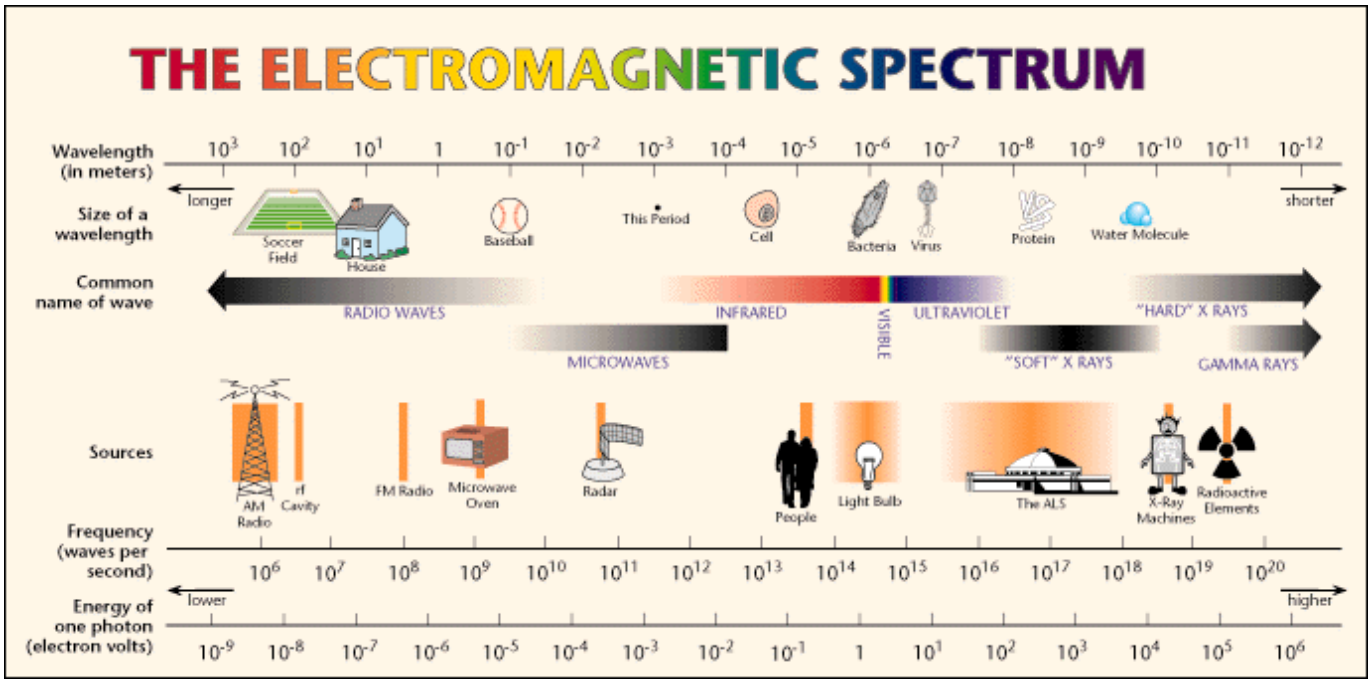
- Quiz time: 45 minutes
- Please put bags under your seats to allow proctors to move around the room.
- There is scratch paper and a blank seasons diagram on the back. You may tear these off.
- You may use notes that you handwrote yourself, or wrote with a stylus and printed, along with your exercises. No electronic devices or things written by others are allowed.
- If you have a question, raise your hand, and a proctor will assist you.
- Do not attempt to communicate with anyone other than teaching staff during the quiz.
- **Circle your answers on this paper as well as completing the Scantron. Turn both in to us at the end of class.**
- **Put your name as "Last First" on your Scantron as well as entering your SUID.**

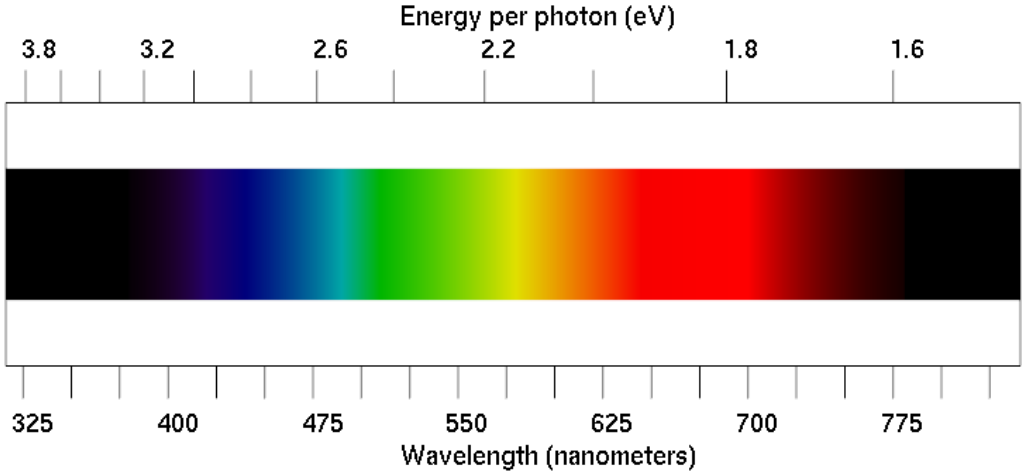
Good luck!

Lab Schedule

Section	Instructor	Time
M024	Sierra Thomas	Monday 8:00 AM-9:20 AM
M003	Sierra Thomas	Monday 9:30 AM-10:50 AM
M004	Kishan Sankharva	Monday 11:00 AM-12:20 PM
M005	Kishan Sankharva	Monday 12:45 PM-2:05 PM
M006	Chad Skerbec	Monday 2:15 PM-3:35 PM
M007	Chad Skerbec	Monday 3:45 PM-5:05 PM
M008	Tyler Hain	Monday 5:15 PM-6:35 PM
M009	Tyler Hain	Monday 6:45 PM-8:05 PM
M010	Vidyesh Rao	Monday 8:15 PM-9:35 PM
M027	Tyler Hain	Tuesday 3:30 PM-4:50 PM
M028	Tyler Hain	Tuesday 5:00 PM-6:20 PM
M029	Vidyesh Rao	Tuesday 6:30 PM-7:50 PM
M030	Vidyesh Rao	Tuesday 8:00 PM-9:20 PM
M025	Sierra Thomas	Wednesday 8:00 AM-9:20 AM
M011	Sierra Thomas	Wednesday 9:30 AM-10:50 AM
M012	Chad Skerbec	Wednesday 11:00 AM-12:20 PM
M013	Chad Skerbec	Wednesday 12:45 PM-2:05 PM
M014	Byron Sleight	Wednesday 2:15 PM-3:35 PM
M015	Byron Sleight	Wednesday 3:45 PM-5:05 PM
M016	Byron Sleight	Wednesday 5:15 PM-6:35 PM
M017	Patrick Adams	Wednesday 6:45 PM-8:05 PM
M018	Patrick Adams	Wednesday 8:15 PM-9:35 PM
M019	Byron Sleight	Thursday 5:00 PM-6:20 PM
M020	Patrick Adams	Thursday 6:30 PM-7:50 PM
M031	Vincent Musso	Thursday 8:00 PM-9:20 PM
M026	Vidyesh Rao	Friday 8:00 AM-9:20 AM
M021	Kishan Sankharva	Friday 9:30 AM-10:50 AM
M022	Vincent Musso	Friday 11:00 AM-12:20 PM
M023	Vincent Musso	Friday 12:45 PM-2:05 PM

Reference


THE ELECTROMAGNETIC SPECTRUM
Wavelength (in meters)
longer
shorter
Size of a wavelength
Soccer Field
House
Baseball
This Period
Cell
Bacteria
Virus
Protein
Water Molecule
Common name of wave
RADIO WAVES
MICROWAVES
INFRARED
VISIBLE
ULTRAVIOLET
"SOFT" X RAYS
"HARD" X RAYS
GAMMA RAYS
Sources
AM Radio
rf Cavity
FM Radio
Microwave Oven
Radar
People
Light Bulb
The ALS
X-Ray Machines
Radioactive Elements
Frequency (waves per second)
lower
higher
Energy of one photon (electron volts)


Energy per photon (eV)
3.8
3.2
2.6
2.2
1.8
1.6
325
400
475
550
625
700
775
Wavelength (nanometers)

1. What form is your exam? (Your exam is form A.)

   (A) Form A

   (B) Form B

   (C) Form C

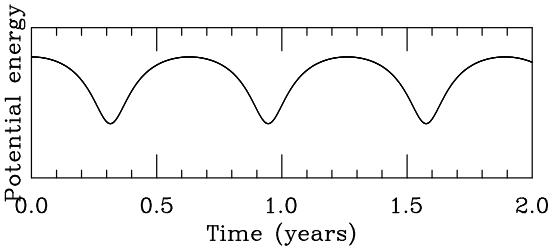
   (D) Form D

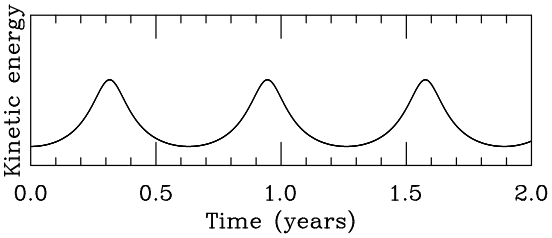
   (E) Form E

2. Here are some pairs of plots for kinetic and gravitational potential energy. Which one represents the fluctuation of KE and GPE for a planet in a slightly eccentric orbit, like Earth?

   Hint: Examine these plots carefully. You will need to compare the behavior of the kinetic energy with behavior of the potential energy at the same time.

(A)





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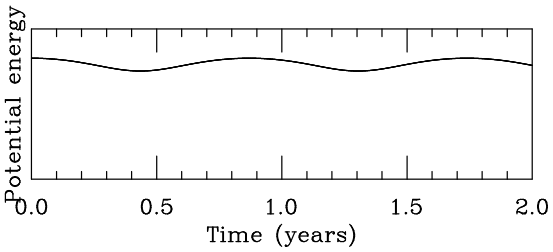
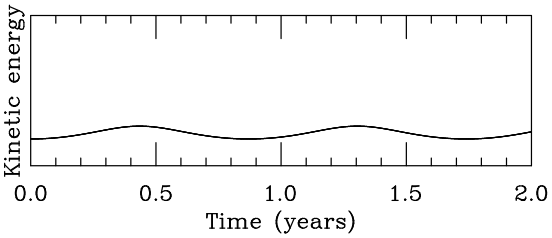
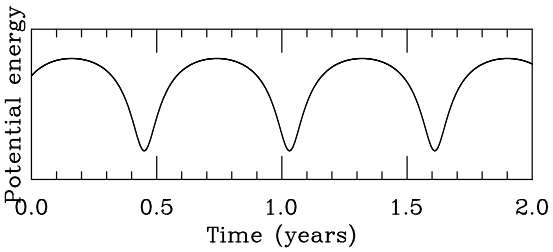
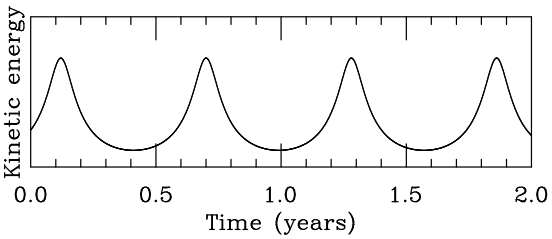


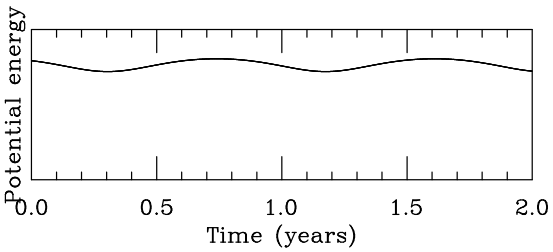


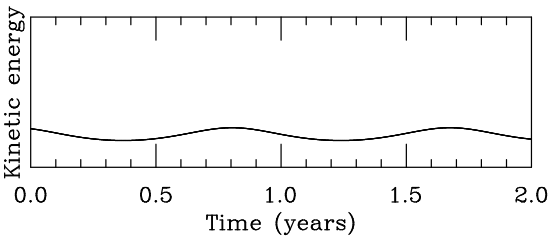
(C)





(D)





3. Suppose that the mass of the Moon were doubled, without changing the shape of its orbit. Which of the following would happen?

   - I. The gravitational force that the Moon exerts on the Earth would double
   - II. The gravitational force that the Earth exerts on the Moon would double
   - III. The time that it would take to orbit the Earth would double

   (A) Only II
   (B) I, II, and III
   (C) I and III
   (D) I and II
   (E) Only I

4. The Moon has only about 1/100 the mass of the Earth.
   However, astronauts on the Moon don't experience gravity that is only 1 percent of Earth's; instead, gravity on the Moon's surface is about 15 percent as strong as on Earth's surface. Why is this?

   (A) Because the Earth's gravity provides the other 14 percent
   (B) Because the centrifugal force from the Moon's rotation holds the astronauts down
   (C) Because the Moon is in orbit around the Earth
   (D) Because the Moon is also smaller than the Earth, meaning that the astronauts are closer to its center
   (E) Because the Moon is more dense than Earth, and more dense material has stronger gravity

5. Galileo argued that the planets and Earth must orbit the Sun. His arguments were based strongly on direct observations of the sky made through a telescope.

   Which of the properties of science that we have discussed was Galileo exhibiting by basing his arguments about the nature of the Solar System on observations?

   (A) Objectivity
   (B) Universality
   (C) Self-skepticism
   (D) Empiricism

6. Which of the following is **not** true regarding Newton's laws of motion and gravity? (Or, if all of them are true, choose option E.)

   (A) Newton's laws of motion describe the response of objects to forces that act upon them

   (B) Kepler's laws of orbital motion are a consequence of Newton's laws of motion and gravity

   (C) Newton's laws of motion and gravity apply in space in the same way that they apply on Earth

   (D) When combined with mathematics, Newton's laws of motion and gravity can explain why the planets move in elliptical orbits

   (E) All of the above are true.

7. A spacecraft is launched from Earth toward the Moon.

   Note that the Earth's mass is about 81 times greater than the Moon's mass.

   Somewhere between the Earth and the Moon, there is a point where the gravitational forces of the Earth and the Moon on the spacecraft cancel out, since they pull in opposite directions and equal strength. Where is that point?

   (A) 9 times closer to the Moon than to the Earth

   (B) 9 times closer to the Earth than to the Moon

   (C) 81 times closer to the Earth than to the Moon

   (D) Equally distant from the Earth and the Moon

   (E) 81 times closer to the Moon than to the Earth

8. An astronaut travels to another planet (with no air), holds a rock a meter above the ground, and drops it. Which of the following things affect how long it takes the rock to hit the ground?

   - I. The mass of the planet
   - II. The mass of the rock
   - III. The size (radius) of the planet

   (A) I and III

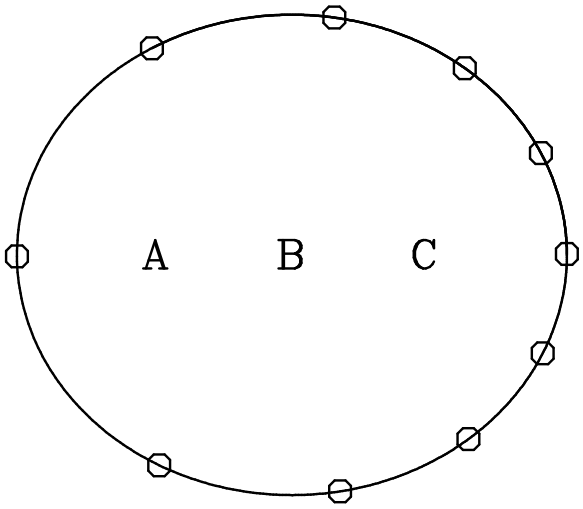
   (B) I only

   (C) II and III

   (D) I and II

   (E) I, II, and III

9. An asteroid orbits the Sun in an orbit like the one shown below.



This asteroid takes ten months to make one complete orbit. Its position after each month is indicated, *i.e.* the labeled points are located one month apart.

Which position is the correct position of the Sun?

(A) Position A
(B) Position B
(C) Position C
(D) There's isn't enough information given to know for sure

10. Which object do Kepler's laws of orbital motion *not* apply to?

(A) Halley's comet
(B) Ganymede, one of the moons of Jupiter
(C) A spacecraft with a rocket engine that is turned on
(D) Earth's Moon
(E) Kepler's laws of orbital motion apply to all of these

11. Suppose you wanted to measure the mass of Jupiter by examining its moons. Which of the following things would you need to measure about its moons to determine the mass of Jupiter?

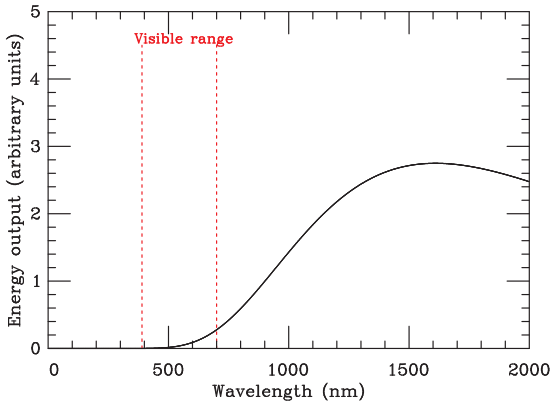
- I. The time it takes one of the moons to orbit Jupiter
- II. The mass of one of its moons
- III. The length of the long axis of one of its moons' orbit

(A) I and II
(B) II only
(C) III only
(D) I and III
(E) I only

12. Which of the following is not a type of light (as the term is used in astronomy)?

(A) Infrared
(B) Ultraviolet
(C) Microwaves
(D) Gamma rays
(E) All of the above are types of light

13. What kind of object could produce the spectrum shown here?



(A) A hot asphalt parking lot on a summer day (50° C / 323 K)
(B) A very hot star, hotter than the Sun
(C) A living human body
(D) A red-hot piece of metal being worked by a blacksmith, heated to 1800 K
(E) A star like the Sun

14. Suppose we get one of those famous Syracuse snowstorms, and you build a snowman in the Quad that is about the same size as you and stand next to it.

    Which statement is true?

    (A) You are emitting infrared light, but the snowman is not emitting light

    (B) Neither of you is emitting light

    (C) Both you and the snowman are emitting infrared light; the light coming from you is more intense and has longer wavelength than the light coming from the snowman.

    (D) Both you and the snowman are emitting infrared light; the light coming from you is more intense and has shorter wavelength than the light coming from the snowman.

    (E) You are emitting infrared light, and the snowman is emitting ultraviolet light

15. Rattlesnakes make use of their ability to see infrared light to hunt their prey at night. Which of the following animals is *least* likely to be detected by a hungry diamondback rattlesnake on a dark night in Arizona using its infrared vision?

    Assume that the desert rocks are all brown, that the Moon or other sources of visible light are not present in the sky, and that the temperature at night is 30° C.

    (A) A brown-colored kangaroo rat whose body temperature is 39° C

    (B) A black phainopepla (a kind of American desert bird) whose body temperature is 40° C

    (C) A blue and yellow lizard whose body temperature is 30° C

    (D) A grey-colored toad that has just hopped out of cool water, and whose skin is 24° C

    (E) It depends on which critter speaks Parseltongue most fluently

16. Suppose that humans evolved on a planet orbiting a star whose temperature was 3000 K. (The Sun's surface is around 5800 K.)

    What might be true about our eyes if they evolved to make best use of the light provided by this star?

    (A) We might lose the ability to see red light, but might be able to see ultraviolet light

    (B) We might gain the ability to see much longer wavelengths of infrared light (around 10,000 nm), giving us vision like a rattlesnake's, since the star would produce a lot of this light

    (C) We might gain the ability to see X-rays

    (D) We might lose the ability to see blue light, but might be able to see into the near infrared

    (E) None of the above would be an evolutionary advantage on this world.

17. Extended exposure to direct sunlight can cause skin cancer in susceptible people. Why is this?

(A) The Sun's surface is hot enough to generate a great deal of gamma rays; these gamma rays are an invisible component of sunlight that can cause genetic damage by ionizing atoms in cells.

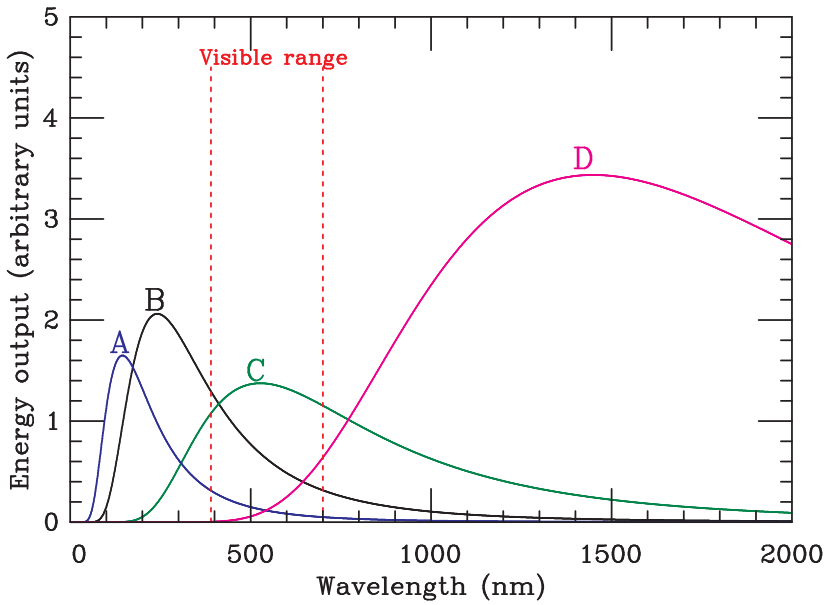
(B) Sunlight consists of mostly ultraviolet light; it is so intense that it can disrupt the chemical processes in cells

(C) The Sun produces a great deal of infrared light with extremely long wavelengths; long-wavelength light can travel through the outer layer of skin to alter the structure of DNA in mesothelial cells beneath

(D) The Sun produces sunlight by nuclear reactions; these nuclear reactions can cause cancer by changing the structure of DNA, much like exposure to radioactive materials found on Earth

(E) The individual ultraviolet photons that make up sunlight have enough energy to ionize atoms and change the chemical structure of DNA

18. This question and the next two all concern this set of spectra:



(The colors here are purely there to allow you to distinguish the curves, and have no other meaning.) Which of these spectra appears brightest to *the human eye*?

(A) A

(B) B

(C) C

(D) D

(E) You can't tell from the information here.

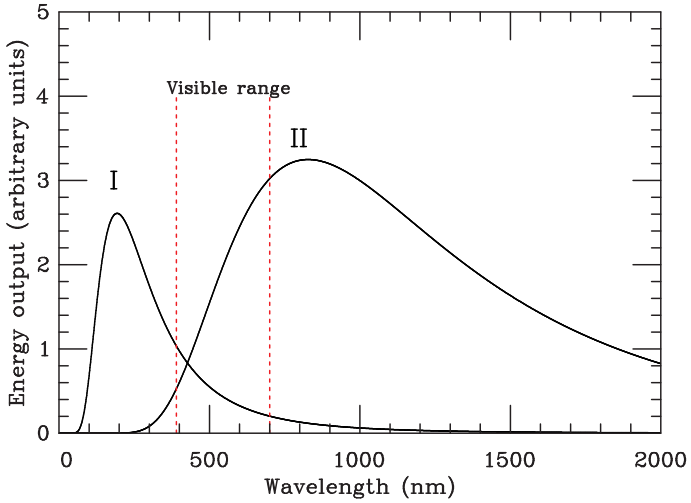
19. In the spectra shown in the previous problem, which object would appear to glow reddish-orange to a human observer?

(A) Object A
(B) Object B
(C) Object C
(D) Object D
(E) You cannot tell from these spectra

20. Which of these objects has the highest temperature?

(A) Object A
(B) Object B
(C) Object C
(D) Object D
(E) You cannot tell from the spectra shown

21. Two different stars (I and II) give off light with the spectral curves shown here.



What do you conclude about their temperatures and sizes?

(A) Star I is larger, but Star II is hotter
(B) Star I is hotter, but Star II is larger
(C) Star I is both hotter and larger
(D) Star II is both hotter and larger
(E) There isn't enough information to determine one of these two things