Name _____ Student ID _____

TA's Name _____ Section _____ Date _____

Nell Byler – AA, AB – 8:30 & 9:30 am	Nick Hunt-Walker – AC, AH – 10:30 am & 3:30 pm
Nicole Silvestri – AF, AG – 1:30 & 2:30 pm	Ben Vega-Westhoff – AD, AE – 11:30 am & 12:30 pm
Instructor's name: Ana Larson	

CHECK NOW TO MAKE SURE YOUR NAME IS ON THIS EXAM AND THAT YOU HAVE 8 PAGES AND A TOTAL OF 18 QUESTIONS!

PLEASE TURN OFF YOUR CELL PHONE RIGHT NOW! THANK YOU!

All books, packs, cell phones, papers, Course Packs, etc. must be placed under your seat. We need room to come and go between rows. NO CALCULATORS ARE NEEDED. ALL CAPS OFF OR TURNED BACKWARDS.

Please do not start this exam until directed to do so. You will not be allowed to leave the [illegible]e the exam starts, so make sure you are ready to go to work once the bell rings. Extra pencils, [illegible]e bathroom run, etc. should be considered right now.

Any student who continues to work beyond the class bell will have 1 point deducted for e[illegible] of overtime s/he uses.

You are free to raise your hand during the exam and ask questions involving clarificati[illegible] exam questions.

Newton's Laws

- An object at rest stays at rest, an object in motion stays in motion unless acted upon by an outside force.
- The acceleration of an object is directly proportional to the force exerted on it and inversely proportional to its mass; acceleration = force/mass or $a = F/m$ (usually written as $F = ma$.
- For every action there is an equal and opposite reaction; forces come in pairs.

Gravity of a planet: $F_{gravity} = G\frac{Mm}{R^2}$,

F represents the force of gravity, G is the gravitational constant, M is the mass of the planet, m is the mass of the object on the surface, and R is the radius of the planet.

Mathematical logic: What is done on one side of the equation must be balanced by doing the same thing on the other side.

Wien's Law

$T = \frac{2.9 \times 10^6}{\lambda_{peak}}$ K; wavelength (λ) must be in nanometers and temperature (T) in Kelvins.

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kinetic energy = 1/2 × mass × velocity squared $KE = \frac{1}{2}mv^2$

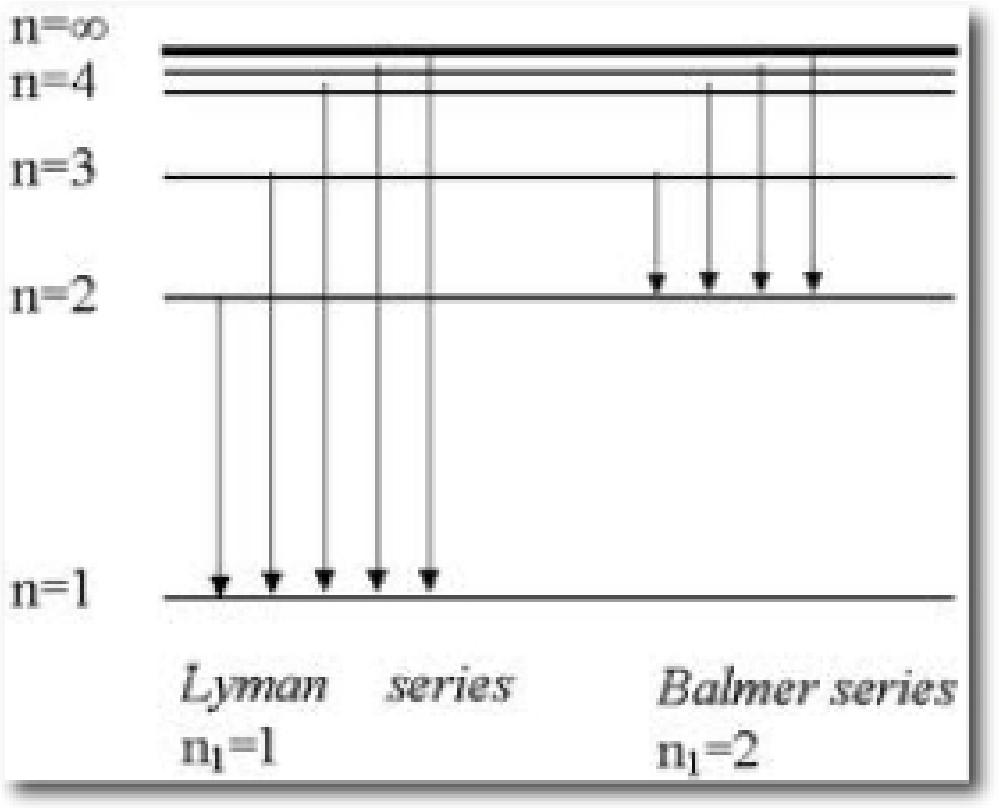
gravitational potential energy = mass × acceleration due to gravity × height $GPE = mgh$

Energy (mass energy) = mass × speed of light squared $E = mc^2$

Electromagnetic radiation

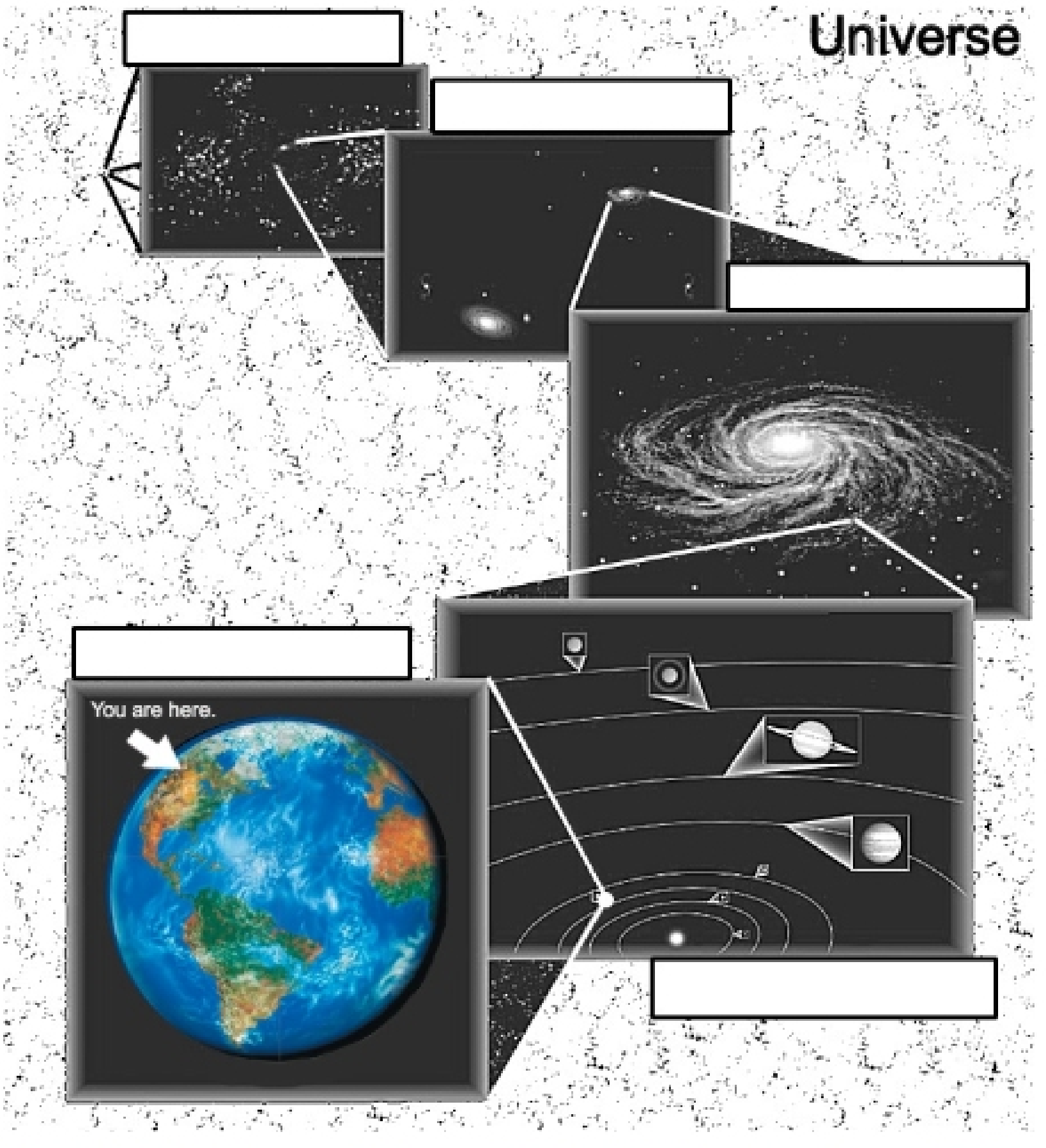
Energy (of a photon) = Planck's constant × frequency of light $E_{photon} = h\nu$ (or hf)

Wavelength × frequency = speed of light $\lambda\nu = c$



Lyman series (ultraviolet wavelengths) and Balmer series (visible wavelengths) for hydrogen.

Balmer wavelengths shown:
656.3 nm
486.1 nm
434.1 nm
410.2 nm



01. (5 pts) Fill in the blanks above with the **appropriate label** for the **major structures of the Universe** from our point of view. Choose from: planet, planetary system, star, galaxy, super-galaxy, local group, local galaxies, cosmic galaxy, universal supercluster, local supercluster.

02. (2 pts) Stars twinkle, planets don't. Planets orbit stars. What is another, more important distinction between a star and a planet?

A star shines from light generated by nuclear fusion in its core. A planet shines because it reflects

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light. PARTIAL CREDIT: 1 pt if get only 1 right. Energy generated from fusion; energy generated

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in the core OK.
