Physics 107 (Astronomy): Exam 4 review sheet

Understand the basic components/structures of the solar system, the Sun, planets, comets, meteoroids, asteroids, Kuiper belt, Oort cloud.

Understand what density is and how it can be used to help determine composition of a planet/moon.

Understand the pattern of properties of planets in the solar system (what distinguishes terrestrial from Jovian planets for example, density, composition, …).

Understand the basic properties/features of the solar system and how they relate to our models for the formation of the solar system (these include things like the differences between the terrestrial and Jovian planets, the sense of spin and orbit of the planets, etc.)

Understand the basic process of nebular contraction for the formation of the solar system and the idea of accretion in the formation of planets

Understand that we see evidence of circumstellar discs around other stars which support the basics of our models of solar system formation

Understand the basic methods used to detect planets around other stars (primarily the radial velocity method, also the extra solar transit method) understand what principles are involved in how each method works

Understand the basic structures of the Earth and moon, and how we know them

Understand the basic ideas behind radioactive dating of rocks and how we used this and rock samples from the moon to determine the history of the cratering rate in the solar system.

Understand what we learn about a surface in the solar system by looking at the crater density

Understand why the terrestrial planets probably had no primary atmospheres

Understand the basic idea of the origin of magnetic field of planets

Understand the basic structure and properties of the Jovian planets, including how their interiors differ from terrestrial planets but still lead to the production of magnetic fields

Understand the basic composition and structure of the Sun.

Understand the basic mechanism of energy production in the sun.

Understand what a sunspot is and why it's darker than the rest of sun.

Be able to describe the solar sunspot cycle.

Understand the forms of radiation transport in the different regions of the sun (radiation zone vs. convection zone).

Understand the basic mechanism giving rise to the Sun's magnetic field and how the differential rotation leads to the 22 year solar cycle.

(over)

Study Suggestions:

Go through old HW (online and hand-in) and in-class exercises: make sure you understand WHAT they are about and HOW to do every one: the best way is to re-do them. For any item you didn't get right, make sure you know why and make sure you know how to do it correctly. Once you are sure what an item is about, try to imagine variations on the question. For example, for a quantitative problem involving a relationship among 3 quantities where I asked about quantity1 when quantity2 and quantity3 are known, imagine how you might phrase a question about quantity2 if quantity1 and quantity3 are known

Find problems similar to HW in the problems at the ends of the relevant chapters and work them.

Review the relevant parts of the textbook and my notes.

Come see me about anything you are unsure of—both "what's it about?" or "how to do a problem" issues, or anything else.

The equation sheet will be the same as from the last exam, repeated on the next page.

Relationships and data;

$$\frac{\theta}{360} = \frac{s}{2\pi R}$$

$P^2 = a^3$ (P in years, a in AU)

$$P^2 = \frac{4\pi a^3}{G(m_1 + m_2)}$$ (all in SI units)

$$e = \frac{dist\,between\,foci}{2a}$$

$$e = \sqrt{1 - \frac{b^2}{a^2}}$$

$$F = G\frac{m_1 m_2}{r_{12}^{\ 2}}$$

F=ma

$$v_{circ} = \sqrt{\frac{GM}{r}}$$

$$v_{escape} = \sqrt{\frac{2GM}{r}}$$

frequency=1/Period

$$frequency = f = \frac{c}{\lambda}$$

Wien's law: $\lambda_{Imax} = \left(\frac{3\times10^6}{T_{Kelvin}}\right) nm$

Stefan's Law: $Flux = \sigma {T_K}^4$

Power = (Flux) x (area emitting)

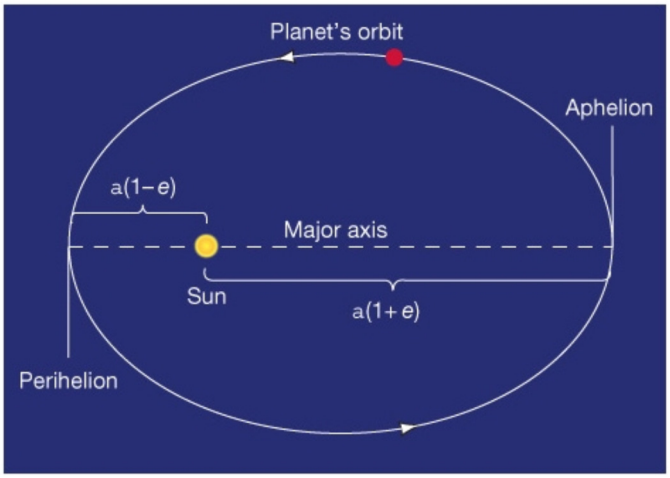
$$T_{kelvin} = T_{celsius} + 273$$

$$E_{photon} = hf$$

$$\frac{\lambda'}{\lambda} = \frac{f}{f'} = (1 + \frac{v}{c})$$

$$\theta_{resolvable,radians} = \frac{\lambda}{D}$$

$$Intensity = \frac{Power}{4\pi R^2}$$



$$\sigma = 5.67\times10^{-8}\frac{W}{m^2 K^4}$$

$$G = 6.67\times10^{-11}\frac{Nm^2}{kg^2}$$

$$h = 6.34\times10^{-34}\,Js$$

$$c = 3.00\times10^{8}\frac{m}{s}$$

1 degree = 60 arc minutes
1 arc minute = 60 arc sec
360 degrees= 2π radians
1 a.u. = 150x10^6 km
1 light-year=distance light travels in 1 year
Area of circle: $A = \pi R^2$
Area of sphere: $A = 4\pi R^2$
Volume of sphere: $V = \frac{4}{3}\pi R^3$

Prefix	Symbol	Meaning
deci	d	10^{-1}
centi	**c**	**10^{-2}**
milli	**m**	**10^{-3}**
micro	**μ**	**10^{-6}**
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a	10^{-18}

Prefix	Symbol	Meaning
deka	da	10^{1}
hecto	h	10^{2}
kilo	**k**	**10^{3}**
mega	**M**	**10^{6}**
giga	**G**	**10^{9}**
tera	T	10^{12}
peta	P	10^{15}
exa	E	10^{18}

Example: 1 nanometer = 10^{-9} meter OR 1nm = 10^{-9} m