

Midterm Exam Title Page

Print name: _____ Sign name: _____ Student ID#: _____

Print and sign your name on your SCAN-TRON 882 form. Under "subject," please put your Student ID #.

THIS TEST IS CLOSED BOOK, CLOSED NOTES, AND NO CALCULATORS!

Mark all answers on a SCAN-TRON 882 form. Use a # 2 pencil. Completely fill in the appropriate bubble. Be sure to properly erase all altered answers and stray marks!

For true/false questions, mark bubble **A** if the statement is *true* and bubble **B** if *false*. For multiple choice questions, mark the bubble corresponding to the answer you think *best* answers the question.

All 40 questions carry equal weight. Read each question *carefully* before answering. **There is no penalty for guessing.** If you need extra room for your work, you can use the last (blank) page.

Before leaving the classroom, be sure you turn in *both* your SCAN-TRON form and this multi-page set of questions. You have until 12 o'clock to complete the exam. Budget your time appropriately. Good luck!

Possibly Useful Information

$$d = vt \quad \text{density } \rho = M/V \quad c = 3 \times 10^8 \text{ m/s}$$

$$\text{For a sphere, } V = \frac{4}{3}\pi R^3 \text{ and } A = 4\pi R^2 \quad \text{For a circle, } A = \pi R^2, C = 2\pi R \quad \pi \approx 3.14$$

There are about 3.2×10^7 seconds in every year and 8.64×10^4 (roughly 10^5) seconds per day.

$$\text{Kelvin} = \text{Celsius} + 273 \quad \text{Fahrenheit} = (9/5) \text{ Celsius} + 32$$

$$1 \text{ A. U.} = 1.5 \times 10^8 \text{ km} \quad 1 \text{ light year (ly)} \approx 63,000 \text{ A. U.} \approx 9.5 \times 10^{12} \text{ km} \approx 10^{13} \text{ km}$$

$$1 \text{ pc} = 3.26 \text{ ly} \approx 3 \times 10^{18} \text{ cm} \approx 3 \times 10^{13} \text{ km} \quad 1 \text{ \AA} = 10^{-8} \text{ cm} = 10^{-10} \text{ m}$$

$$60'' \text{ (arcsec)} = 1' \text{ (arcmin)} \quad 60' = 1^\circ \text{ (degree)} \quad 360^\circ = \text{full circle} = 2\pi \text{ radians} = 24 \text{ hours}$$

$$\lambda_{\text{peak}} T \approx 3 \times 10^7 \text{ \AA K} = 0.3 \text{ cm K} \quad \lambda \nu = c \quad P = 1/\nu \quad \text{resolution} \propto \lambda/D$$

$$\text{energy/area/sec} = \sigma T^4 \quad \text{luminosity} = \text{energy/sec} = 4\pi R^2 \sigma T^4 \text{ (for a sphere)}$$

$$E = h\nu \quad F = GM_1 M_2 / d^2 \quad (\lambda - \lambda_0) / \lambda_0 = \Delta\lambda / \lambda_0 = v/c$$

$$P^2 = kR^3 \text{ where } k \approx \text{constant} \approx 4\pi^2 / (GM_1) \text{ if } M_1 \gg M_2$$

$$\text{In general, } P^2 = (4\pi^2 R^3) / [G(M_1 + M_2)] \quad \text{For planets, } v \propto 1/\sqrt{R}$$

Midterm Exam

- (1) T or F. The planet Venus can be seen in a dark night sky, around midnight, from Berkeley during some portions of the year.
- (2) If the Earth's radius were increased by a factor of 3, and the Earth's mass were increased by a factor of 3, how much would you weigh while standing on the new (larger) surface of the Earth?
- (a) 9 times as much
 - (b) 3 times as much
 - (c) $1/3$ as much
 - (d) $1/9$ as much
 - (e) You weight would remain unchanged
- (3) Ultraviolet light from a star is measured to have a wavelength of 1500 \AA . What is its approximate frequency?
- (a) $2 \times 10^{15} \text{ Hz}$
 - (b) $2 \times 10^6 \text{ Hz}$
 - (c) $4.5 \times 10^{13} \text{ Hz}$
 - (d) $4.5 \times 10^1 \text{ Hz}$
 - (e) $4.5 \times 10^6 \text{ Hz}$
- (4) Which one of the following statements is an advantage that reflecting telescopes have over refracting telescopes?
- (a) Reflecting telescopes can see farther than a refracting telescopes with the same diameter.
 - (b) Reflecting telescopes magnify light from distant stars better than refracting telescopes.
 - (c) Reflecting telescopes do not suffer from chromatic aberration.
 - (d) Reflecting telescopes are less affected by dust in the atmosphere than refracting telescopes.
 - (e) Reflecting telescopes are better for impressing girls.
- (5) T or F. If you double a star's radius and keep the temperature fixed, it will increase the luminosity more than if you double the star's temperature and keep the radius fixed.
- (6) If you are in Berkeley in the winter and you see that the Moon is full, then at what time did the Moon rise that day?
- (a) 6 am
 - (b) 6 pm
 - (c) 9 am
 - (d) 9 pm
 - (e) noon
- (7) According to Kepler's first law, the orbits of planets are ellipses with the Sun at one focus. In the case of Jupiter, what is at the other focus?
- (a) Nothing
 - (b) Jupiter's moon, Io
 - (c) Mars
 - (d) Saturn
 - (e) The asteroid belt
- (8) If you wanted to prevent the Earth from having seasons, what could you do?
- (a) Align the Earth's rotation axis to be perpendicular with respect to its orbital plane.
 - (b) Align the Earth's rotation axis to be parallel with respect to its orbital plane.
 - (c) Change the Earth's orbit to be circular.
 - (d) Increase the semimajor axis of Earth's orbit.
 - (e) None of the above.