

ASTRONOMY 100—Exam 3 Study Aid

Information that will appear on the exam

$$\begin{array}{lll}
 M_{\odot} = 2 \times 10^{30} \text{ kg} & M_{\oplus} = 6 \times 10^{24} \text{ kg} & 1^{\circ} = 60 \text{ arcminutes} \\
 1 \text{ mm} = 10^{-3} \text{ m} & 1 \text{ km} = 10^3 \text{ m} & 1 \text{ kg} = 2.2 \text{ pounds on Earth's surface} \\
 1 \text{ nm} = 10^{-9} \text{ m} & 1 \mu\text{m} = 10^{-6} \text{ m} & 1 \text{ AU} = 1.5 \times 10^{11} \text{ m} & 1 \text{ ly} = 9.5 \times 10^{15} \text{ m} \\
 \text{Radius of Earth} = 6378 \text{ km} & \text{Radius of Sun} = 7 \times 10^{10} \text{ cm} & \text{Distance to Moon} = 380,000 \text{ km} \\
 c = 3.0 \times 10^8 \text{ m s}^{-1} & G = 6.7 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2} \\
 P_{yr}^2 = a_{AU}^3 & F = ma & F = \frac{GMm}{R^2} & \lambda_{Peak}(mm) = 2.9/T(K) & L = 4\pi\sigma T^4 R^2 \\
 \lambda\nu = c & E = h\nu & \frac{\Delta\lambda}{\lambda_{lab}} = \frac{\lambda - \lambda_{lab}}{\lambda_{lab}} = \frac{v}{c} & d(\text{pc}) = 1/p(\text{arcsec}) \\
 L \propto M^{3.5} & T \propto M^{-2.5} & R_S = 2GM/c^2 & E = mc^2 \\
 v = H \times d & z = \frac{\Delta\lambda}{\lambda_{lab}}
 \end{array}$$

Sample Multiple Choice Questions

1. Where is the center of the Universe?
 - A. the Earth
 - B. the Sun
 - C. the Milky Way
 - D. the Big Bang
 - E. There is no center.
- 2–4. Choose the best answer from among the following for the next three questions. Answers may be used more than once or not at all.
 - A. Milky Way
 - B. Virgo Cluster
 - C. Local Group
 - D. Orion Arm
 - E. Andromeda Galaxy
2. Our galaxy is one of about thirty members of this collection of galaxies.
3. About 750 Kpc away
4. A collection of thousands of galaxies centered about 15 Mpc away from us.
5. The cosmic background radiation comes from a time in the evolution of the universe
 - A. when protons and neutrons were first formed.
 - B. when the big bang first began to expand.
 - C. the inflationary period.
 - D. when gamma rays had enough energy to destroy nuclei.
 - E. when electrons began to recombine with nuclei to form atoms.
6. Whether the universe is open, closed or flat depends on the _____ of the universe.
 - A. luminosity
 - B. density
 - C. temperature
 - D. radius
 - E. rotation rate
7. The age of the universe can be determined if
 - A. the universe is flat.
 - B. the amount of dark matter in the universe can be accurately determined.
 - C. the rate of recession of the galaxies in the Local Group can be accurately determined.
 - D. the temperature of the cosmic background radiation can be accurately determined.
 - E. the Hubble constant and density of the universe can be accurately determined.
8. If H equals 50 km/sec/Mpc, then a galaxy with a radial velocity of 2000 km/sec probably has a distance of
 - A. 2050 Mpc
 - B. 1950 Mpc
 - C. 40 Mpc
 - D. 0.025 Mpc
 - E. 100,000 Mpc
9. If the space telescope proved that Hubble's constant is actually half as large as it is currently believed to be, the implied age of the universe would be _____ the currently accepted value.
 - A. one fourth of
 - B. half of
 - C. the same as
 - D. two times
 - E. four times

10. The Universe is said to be closed if
- A. gravity is strong enough to stop the expansion in a finite time.
 - B. the density of the Universe is less than the critical density.
 - C. the Universe has a center and an edge.
 - D. the Hubble Constant is less than 50 km/s/Mpc.
 - E. holiday shopping hours are restricted.
11. One quarter of the mass of the universe today is helium. This helium was produced
- A. by nuclear reactions burning hydrogen in the centers of stars.
 - B. by the radioactive decay of heavy elements like uranium and thorium.
 - C. in supernova explosions.
 - D. by supermassive black holes in the centers of galaxies.
 - E. by nuclear reactions occurring a few minutes after the Big Bang.
12. The hydrogen Balmer line H β has a wavelength of 486.1 nm in the laboratory. It is observed in a quasar at 2430.5 nm, what is the red shift of this quasar?
- A. 5 B. 0.5 C. 0.25 D. 4 E. 1944.4
13. A recently formed cluster of stars might be identified by the presence of
- A. bright blue stars.
 - B. dusty patches hiding parts of the cluster.
 - C. glowing gas between the stars.
 - D. reflection nebulae around some stars.
 - E. All of the above.
14. If galaxy A is four times more distant than galaxy B, then according to the Hubble Law, galaxy A will recede _____ than galaxy B.
- A. 16 times faster B. 4 times faster C. 2 times faster D. 1.2 times faster E. 0.25 times faster
15. Besides Hubble's observation of the expanding universe, the best evidence for the Big Bang comes from
- A. dark matter.
 - B. globular clusters.
 - C. the cosmological principle.
 - D. the Local Group and the Virgo Cluster.
 - E. the cosmic microwave background and the amount of helium in the universe.
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