

## GRE Physics Practice Test 2

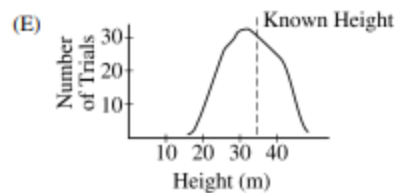
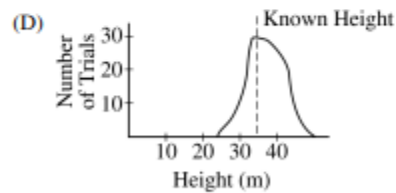
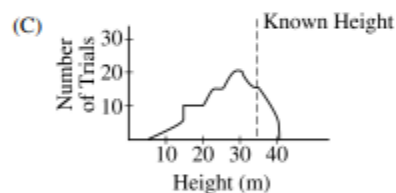
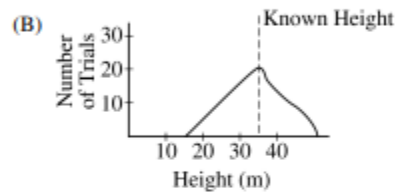
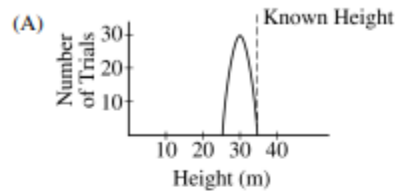
13. Two stars are separated by an angle of  $3 \times 10^{-5}$  radians. What is the diameter of the smallest telescope that can resolve the two stars using visible light ( $\lambda \cong 600$  nanometers)? (Ignore any effects due to Earth's atmosphere.)

(A) 1 mm  
 (B) 2.5 cm  
 (C) 10 cm  
 (D) 2.5 m  
 (E) 10 m

14. An 8-centimeter-diameter by 8-centimeter-long NaI(Tl) detector detects gamma rays of a specific energy from a point source of radioactivity. When the source is placed just next to the detector at the center of the circular face, 50 percent of all emitted gamma rays at that energy are detected. If the detector is moved to 1 meter away, the fraction of detected gamma rays drops to

(A)  $10^{-4}$   
 (B)  $2 \times 10^{-4}$   
 (C)  $4 \times 10^{-4}$   
 (D)  $8\pi \times 10^{-4}$   
 (E)  $16\pi \times 10^{-4}$

15. Five classes of students measure the height of a building. Each class uses a different method and each measures the height many different times. The data for each class are plotted below. Which class made the most precise measurement?



16. A student makes 10 one-second measurements of the disintegration of a sample of a long-lived radioactive isotope and obtains the following values.
- 3, 0, 2, 1, 2, 4, 0, 1, 2, 5
- How long should the student count to establish the rate to an uncertainty of 1 percent?
- (A) 80 s  
(B) 160 s  
(C) 2,000 s  
(D) 5,000 s  
(E) 6,400 s
17. The ground state electron configuration for phosphorus, which has 15 electrons, is
- (A)  $1s^2 2s^2 2p^6 3s^1 3p^4$   
(B)  $1s^2 2s^2 2p^6 3s^2 3p^3$   
(C)  $1s^2 2s^2 2p^6 3s^2 3d^3$   
(D)  $1s^2 2s^2 2p^6 3s^1 3d^4$   
(E)  $1s^2 2s^2 2p^6 3p^2 3d^3$
18. The energy required to remove both electrons from the helium atom in its ground state is 79.0 eV. How much energy is required to ionize helium (i.e., to remove one electron) ?
- (A) 24.6 eV  
(B) 39.5 eV  
(C) 51.8 eV  
(D) 54.4 eV  
(E) 65.4 eV
19. The primary source of the Sun's energy is a series of thermonuclear reactions in which the energy produced is  $c^2$  times the mass difference between
- (A) two hydrogen atoms and one helium atom  
(B) four hydrogen atoms and one helium atom  
(C) six hydrogen atoms and two helium atoms  
(D) three helium atoms and one carbon atom  
(E) two hydrogen atoms plus two helium atoms and one carbon atom
20. In the production of X rays, the term "bremsstrahlung" refers to which of the following?
- (A) The cut-off wavelength,  $\lambda_{min}$ , of the X-ray tube  
(B) The discrete X-ray lines emitted when an electron in an outer orbit fills a vacancy in an inner orbit of the atoms in the target metal of the X-ray tube  
(C) The discrete X-ray lines absorbed when an electron in an inner orbit fills a vacancy in an outer orbit of the atoms in the target metal of the X-ray tube  
(D) The smooth, continuous X-ray spectra produced by high-energy blackbody radiation from the X-ray tube  
(E) The smooth, continuous X-ray spectra produced by rapidly decelerating electrons in the target metal of the X-ray tube
21. In the hydrogen spectrum, the ratio of the wavelengths for Lyman- $\alpha$  radiation ( $n = 2$  to  $n = 1$ ) to Balmer- $\alpha$  radiation ( $n = 3$  to  $n = 2$ ) is
- (A) 5/48  
(B) 5/27  
(C) 1/3  
(D) 3  
(E) 27/5
22. An astronomer observes a very small moon orbiting a planet and measures the moon's minimum and maximum distances from the planet's center and the moon's maximum orbital speed. Which of the following CANNOT be calculated from these measurements?
- (A) Mass of the moon  
(B) Mass of the planet  
(C) Minimum speed of the moon  
(D) Period of the orbit  
(E) Semimajor axis of the orbit
23. A particle is constrained to move in a circle with a 10-meter radius. At one instant, the particle's speed is 10 meters per second and is increasing at a rate of 10 meters per second squared. The angle between the particle's velocity and acceleration vectors is
- (A)  $0^\circ$   
(B)  $30^\circ$   
(C)  $45^\circ$   
(D)  $60^\circ$   
(E)  $90^\circ$