

## PHYSICS DEPARTMENT

Final Exam

May 2, 2006

PHY 1033

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Name (print): \_\_\_\_\_

*On my honor, I have neither given nor received unauthorized aid on this examination.*

Signature: \_\_\_\_\_

**YOUR TEST NUMBER IS THE 5-DIGIT NUMBER AT THE TOP OF EACH PAGE.****DIRECTIONS**

- (1) Code your test number on your pink answer sheet (use 76–80 for the 5-digit number). Code your name on your answer sheet. Darken circles completely (errors can occur if too light). Code your UFID on your answer sheet.
- (2) Print your name on this sheet and sign it also.
- (3) You may use a calculator and 1 side of handwritten  $8\frac{1}{2} \times 11$  formula sheet. No other materials allowed.
- (4) Do all scratch work anywhere on this exam that you like. At the end of the test, this exam printout and the formula sheet are to be turned in. No credit will be given without both answer sheet and printout with scratch work most questions demand.
- (5) Work the questions in any order. Incorrect answers are not taken into account in any way; you may guess at answers you don't know if you feel that a correct answer is listed. Guessing on all questions will most likely result in failure.
- (6) It is not our intention to omit the right answer, but if you believe that none of the answers is correct, please mark the answer closest to your answer.
- (7) **Blacken the circle of your intended answer completely, using a number 2 pencil.** Do not make any stray marks or the answer sheet may not read properly.
- (8) As an aid to the examiner (and yourself), in case of poorly marked answer sheets, please circle your selected answer on the examination sheet.
- (9) **Take  $g=10 \text{ m/s}^2$  and  $c = 3 \times 10^8 \text{ m/s}$  throughout this test.**
- (10) Good luck!!!

>>>>>>> **WHEN YOU FINISH** <<<<<<<<<  
Hand in the pink answer sheet separately.

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

1. Suppose at the surface of the Earth a person can do 20 pushups. In a spaceship far away from any gravitational influence, accelerating at  $g$ , the same person could do
 

(1) less than 20 pushups.      (2) —      (3) more than 20 pushups.      (4) —      (5) 20 pushups.
2. Relativity equations for time, length and momentum hold true for
 

A. everyday low speeds      B. relativistic speeds

(1) —      (2) neither A nor B      (3) A only      (4) B only      (5) both A and B
3. X-rays may be regarded as
 

(1) both of these      (2) high frequency radio waves.      (3) —      (4) none of these      (5) high frequency sound waves.
4. Two beams of light, a red beam and a blue beam, have the same energy. The beam with the greater number of photons is the
 

(1) —      (2) red beam.      (3) both the same      (4) blue beam.      (5) —

5. **BONUS** If the speed of a moving object doubles, which of the following also doubles?  
(1) acceleration      (2) momentum      (3) kinetic energy      (4) inertia      (5) —
6. The photoelectric effect best demonstrates the  
(1) none of these      (2) —      (3) wave nature of light.      (4) particle nature of light.      (5) both of these
7. A 340-hertz sound wave travels at 340 m/s in air with a wavelength of  
(1) None of these.      (2) 1 m.      (3) 1000 m.      (4) 10 m.      (5) 100 m.
8. **BONUS** Objects infinitely far away are focused by a converging lens  
(1) in front of the focal point.      (2) beyond the focal point.      (3) —      (4) —      (5) at the focal point.
9. Fire a cannonball from a cannon and it curves due to gravity. Shine a light from a flashlight and it  
(1) curves per second the same as the cannonball.  
(2) not enough data.  
(3) curves half as much as the cannonball.  
(4) follows a straight-line path with no curvature at all.  
(5) curves slightly, but not as much per second as the cannonball.
10. The half-life on an isotope is one day. At the end of three days, how much of the isotope remains?  
(1) one-quarter      (2) —      (3) none      (4) one-half      (5) one-eighth
11. The atomic number of an element is the same as the number of its  
(1) protons.      (2) nucleons.      (3) partons.      (4) —      (5) neutrons.
12. Sound waves can interfere with one another so that no sound results.  
(1) True      (2) —      (3) —      (4) False      (5) True or false, depending on the air temperature.
13. Which radiation has no electric charge associated with it?  
(1) none of these      (2) beta rays      (3) all of these      (4) alpha rays      (5) gamma rays

14. According to the special theory of relativity, if you measure your own pulse while traveling at very high speeds, you would notice your pulse rate to
- (1) increase.            (2) decrease.            (3) —            (4) be the same as usual.            (5) —
15. When a nucleus emits a beta particle, its atomic number
- (1) changes, but its mass number remains constant.  
(2) changes, and so does its mass number.  
(3) none of these  
(4) remains constant, but its mass number changes.  
(5) remains constant, and so does its mass number.
16. The helium in a child's balloon is composed of
- A. former beta particles.            B. alpha-particle remnants of previous radioactive processes.
- (1) —            (2) A only            (3) both A and B            (4) B only            (5) neither A nor B
17. Compared to clocks in a stationary reference frame, clocks in a moving reference frame run
- (1) backwards.            (2) at the same speed.            (3) —            (4) faster.            (5) slower.
18. The ratio of the energy of a photon to its frequency is
- (1) the photon's speed.            (2)  $\pi$             (3) not known.            (4) the photon's wavelength.            (5) Planck's constant.
19. The length of a meterstick projected like a spear at  $0.87c$  is seen by a person at rest to be
- (1) 1.25 m.            (2) 0.5 m.            (3) 0.87 m.            (4) 1.5 m.            (5) 1 m.
20. Particle A has twice the charge of nearby particle B. Compared to the force on Particle A, the force on Particle B is
- (1) the same.            (2) four times as much.            (3) None of these.            (4) twice as much.            (5) half as much.
21. The uncertainty principle applies not only to momentum and position, but also to energy and time. This statement is
- (1) —            (2) —            (3) false.            (4) —            (5) true.
22. Sound waves cannot travel in
- (1) steel.            (2) water.            (3) none of these.            (4) a vacuum.            (5) air.

23. Which has more energy per photon?

- (1) —            (2) red light            (3) —            (4) Both have the same energy.            (5) blue light

24. When two lamps are connected in parallel to a battery, the electrical resistance that the battery senses is

- (1) more than the resistance of either lamp.  
(2) impossible to say  
(3) none of these  
(4) —  
(5) less than the resistance of either lamp.

25. When the speed of sound near the ground is greater than it is at higher altitudes, the sound tends to be bent

- (1) upward.            (2) downward.            (3) to the right.            (4) to the left.            (5) None of these.

26. From a general relativistic point of view, a person on the ground floor of a skyscraper ages

- (1) faster than a person on the top floor.  
(2) slower than a person on the top floor.  
(3) this question cannot be answered.  
(4) at the same speed as a person on the top floor.  
(5) —

27. According to the uncertainty principle, the more we know about a particle's momentum, the less we know about its

- (1) kinetic energy.            (2) speed.            (3) mass            (4) none of these            (5) location.