Physics 10 Final (250 PTS MAX) – Test A
1:00PM TTh, Fall 2003

1. A disturbance with particle oscillations parallel to the direction the wave propagation is called a a) longitudinal wave b) transverse wave c) water wave d) light wave
2. When two waves interfere, which of the following add? a) Displacement b) Wavelength c) Phase d) None of these
3. Standing waves a) have no motion at all b) have zero amplitude at the nodal positions c) are always out of phase d) can have only one characteristic frequency
4. The propagation of energy through a medium or space from a disturbance is a(n) a) oscillation b) vibration c) wave d) harmonic
5. If the motions of two oscillators of the same frequency are always in the same direction, we say they are a) in resonance b) in phase c) out of phase d) destructive
6. The speed of sound is a) independent of temperature b) on the order of 34m/s in air c) generally greater in liquids than in solids d) none of these
7. Sonar depends on sound a) reverberation b) refraction c) reflection d) resonance
8. Concert halls experience sound problems because of a) multiple reflections b) reverberant sound c) refraction d) both (a) and (b)
9. The Doppler effect a) is caused by resonance b) occurs for a person riding in a car with the car horn blowing c) gives rise to beats d) is used in radar
10. For the Doppler effect to occur, there must be a) a moving listener b) a moving source of sound c) relative motion between a source of sound and listener d) all of these
11. Temperature is a) a relative measure of hotness and coldness b) a measure of heat c) internal energy in transit d) both (b) and (c)
12. Heat is a) a form of energy b) energy transferred because of a temperature difference c) internal energy in transit d) all of the preceding
13. Thermal expansion, or an increase in dimensions with increasing temperature, occurs a) in very few substances b) in most substances c) only in metals d) both (a) and (c)
14. When a bimetallic strip is heated, it bends toward the metal with the a) smaller thermal expansion b) greater thermal expansion c) greater specific heat d) lower specific heat
15. Which of the following heat units is neither the largest nor the smallest? a) kilocalorie b) Btu c) calorie d) all are equal
16. Planck's hypothesis a) explained the photoelectric effect b) justified the ultraviolet catastrophe c) allowed for only discrete energies for thermal oscillators d) required classical wave theory
17. Classical theory predicted a) electron energy to depend on light frequency, but not on intensity b) photocurrent to be proportional to light intensity c) no photoemission below a certain light frequency regardless of intensity d) both (a) and (c)
18. The coherence of laser of light is important for a) no practical applications b) drilling holes c) getting laser light to pass through air d) holography e) none of above
19. Which important laser emits light in the visible range, 400 to 700 nm? a) argon ion b) nitrogen c) carbon dioxide d) neodymium YAG e) chemical
20. Population inversion has a) more atoms in lower energy level b) less atoms in higher energy level c) more atoms in higher energy level d) the same number of atoms in all energy level
21. What would be the final temperature of a mixture of 50 g of 10° C water and 50 g of 50° C water? (a) 10°C (b) 20°C (c) 30°C (d) 40°C
22. Suppose a bar 1 m long expands 0.8 cm when heated. By how much will a bar 100 m long of the same material expand when similarly heated? (a) 100.5 m (b) 100.8 m (c) 100 m (d) 10 m
23. During a certain thermodynamic process a sample of gas expands and cools, reducing its internal energy by 3000 J, while no heat is added or taken away. How much work is done during this process? (a) 3000 cal (b) 3000 Joule (c) 4000 Joule (d) 4000 cal

24. A European visitor reads that the average temperature of two different places in the United States is 59° F. He asks you what these temperatures are in Celsius. Could you help him? (a) 59°C (b) 15°C (c) 45°C (d) 77°C
25. On a very hot day the temperature gets up to 100° F. A strict SI buff has his Kelvin thermometer along. What does it read? (a) 100K (b) 37.78K (c) 310.78K (d) 137.78K
26. Suppose the heat engine in with 40% efficiency had a heat input of 180 kcal per cycle. What would be the heat output? (a) 40 Kcal (b) 120 Kcal (c) 108 Kcal (d) 180 Kcal
27. A droplet of ink in an industrial ink-jet printer carries a charge of $1.6 \bullet 10^{-10}$ C and deflected onto paper by a force of $3.2 \bullet 10^{-4}$ N. Find the strength of the electric field to produce this force. (a) 2.0×10^6 N/C (b) 3.2×10^6 N/C (c) 2.0×10^6 N (d) 3.2×10^6 N
28. How much does it cost to operate a 100-W lamp continuously for 1 week if the power utility rate is 15 cents/kWh. (a) $15.00 (b) $2.52 (c) 5.00 (d) 10.00
29. A 6-cm-tall object is placed 60 cm from a concave mirror with a focal length of 20 cm. Find the location and size of the image. (a) 20 cm (b) 60 cm (c) 30 cm (d) 120 cm
30. Light from the bottom of a swimming pool is incident on the surface at an angle of 30 degrees. What is the angle of refraction? ($n_w = 1.3333$) (a) 30^o (b) 60^o (c) 41.8^o (d) 20^o
31. How many diopters are there for a converging lens with a focal length of 0.4 cm? (a) 100 diopter (b) 200 diopter (c) 250 diopter (d) 300 diopter
32. If you wish to warm 100 kg of water by 30° C for your bath, how much heat is required? (Give your answer in calories and joules.) (a)1000 Kcal (b) 2000 Kcal (c) 3000 Kcal (d) 4000 Kcal
33. Find the mass of 0° C ice that 10 g of 100° C steam will completely melt. (a) 80 gm (b) 40 gm (c) 160 gm (d) 200 gm
34. What would be the final temperature when 100 g of 25° C water is mixed 75 g of 40° C water? (Hint: Equate the heat gained by the cool water to the heat lost by the warm water) (a) 31.4°C (b) 31.4°F (c) 31.4°K (d) 22.1°C
35. Find the mass of 0° C ice that 10 g of 100° C steam will completely melt. (a) 80 gm (b) 40 gm (c) 160 gm (d) 200 gm
36. Convert temperatures -30°C to the Fahrenheit scale: (a) 32°F (b) -22°F (c) 14°F (d) 10°F
37. What is the Kelvin temperature when the Fahrenheit and Celsius temperatures are equal? (a) 40K (b) -40C (c) -40F (d) 233K
38. A system receives 25 kcal of heat energy. If 5.0 kcal go into internal energy, how many joules of energy of mechanical work are done by the system? (Hint: 1 kcal = 4.2 kj.) (a) 20KJ (b) 84 KJ (c) 25 KJ (d) 5.0 KJ
39. Two point charges are separated by 6 cm. The attractive force between them is 20 N. Find the force between them when they are separated by 12 cm. (What can you answer this problem without knowing the magnitudes of the charges?) (a) 6 N (b) 5 N (c) 12 N (d) 20 N
40. Rearrange the equation Current = voltage/resistance to express resistance in terms of current and voltage. Then solve the following: A certain device in a 120-V circuit has a current rating of 20 A. What is the resistance of the device (how many ohms)? (a) 20Ω (b) 120Ω (c) 6Ω (d) 10Ω
41. What is the wavelength of a 340-Hz tone in air? (a) 340 m (b) 1 m (c) 10 m (d) 100 m
42. If light in air is incident at 30˚, at what angle is it refracted in water? ($n_w = 1.3333$) (a) 22^o (b) 44^o (c) 12^o (d) 41.8^o
43. The focal length of a converging lens is 30 cm. Locate the image of an object placed 60 cm from the center of this lens. (a) 30 cm (b) 60 cm (c) 90 cm (d) 15 cm
44. The speed of light in diamond is $1.24 \bullet 10^8$ m/s. What is the index of refraction for diamond? (a) 1.24 (b) 2.4194 (c) 3.0 (d) 1.5
45. What will be the final temperature of 100 g of 20° C water when 100 g of 40° iron nails are submerged in it? (The specific heat of iron is 0.12 cal/g C°. Here you should equate the heat gained by the water to the heat lost by the nails.) (a) 31.4°C (b) 22.1°C (c) 22.1°F (d) 22.1°K
46. A 50-gram chunk of 80° C iron is dropped into a cavity in a very large block of ice at 0° C. How many grams of ice will melt? (The specific heat capacity of iron is 0.11 cal/g°C.) (a) 50 gm (b) 5.0 gm (c) 5.5 gm (d) 10 gm